Registration No.: CCR102
Registrant: CPS Energy Calaveras Plant Site

Attachment 13-1 Compilation of Construction History

Environmental
Resources
Management
Southwest, Inc.

CityCentre Four
840 W. Sam Houston Pkwy N.
Suite 600
Houston, Texas 77024
(281) 600-1000
(281) 600-1001 (Fax)

~~October 17, 2016~~November 16, 2022

Mr. Michael Malone
CPS Energy
145 Navarro Street, Mail Drop 100406
San Antonio, Texas 78296

Project Nos. 0352436, 0636109

Subject: Compilation of Construction History
Calaveras Power Station
San Antonio, Texas

Dear Mr. Malone:

Environmental Resources Management Southwest, Inc. (ERM) is pleased to provide this Compilation of Construction History for the Calaveras Power Station, to assist CPS Energy in complying with Title 40, Code of Federal Regulations, Part 257 (40 CFR §257), Subpart D Coal Combustion Residual (CCR) Rules. Currently, CPS Energy operates ~~six~~ five CCR units at the Calaveras Power Station which are subject to the CCR Rule.

40 CFR §257.73(c)(1) requires that the owner or operator of the CCR unit must compile a history of construction, which shall contain, to the extent feasible, the information specified below:

(i) The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

(ii) The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7.5 minute or 15-minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.

(iii) A statement of the purpose for which the CCR unit is being used.

(iv) The name and size in acres of the watershed within which the CCR unit is located.

(v) A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

(vi) A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

(vii) At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

(viii) A description of the type, purpose, and location of existing instrumentation.

(ix) Area-capacity curves for the CCR unit.

(x) A description of each spillway and diversion design features and capacities and calculations used in their determination.

(xi) The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

(xii) Any record or knowledge of structural instability of the CCR unit.

The CCR units listed in Table 1 are shared by the J.T. Deely and J.K. Spruce Power Plants, which are co-located at 12940 U.S. Highway 181 South in San Antonio, Texas. The J.T. Deely Power Plant ceased operation at the end of December 2018. Figure 1 depicts the location of the Calaveras Power Station and the applicable CCR units on the most recent U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map. Locally, the Calaveras Power Station is located within the drainage of Calaveras Lake. Regionally, it is located within the San Antonio River watershed which drains over 4,194 square miles (approximately 2,684,000 acres)[1]

As required by the CCR Rule, all CCR units are inspected annually by a Texas Licensed Professional Engineer and each unit is observed for potential stability or operational issues. There is no reported historical evidence or current structural instabilities of any CCR unit described below.

To the extent feasible, the construction history of these CCR units is provided in the following sections. Pertinent drawings reviewed during the preparation of this compilation are provided in Attachment 1. *Assessment of Dam Safety of Coal Combustion Surface Impoundment Reports* for the J.T. Deely and J.K. Spruce Power Plants are provided in Attachments 2 and 3, respectively.

---

[1] San Antonio River Authority (www.sara-tx.org).

TABLE 1: Calaveras Power Station CCR Unit Descriptions

Unit Name	Unit ID	Purpose of Unit
Sludge Recycle Holding (SRH) Pond~~s (North and South)~~	026	Receives flue gas desulphurization scrubber sludge.
North Bottom Ash Pond (North BAP)	005	Received~~s~~ sluiced bottom ash.
South Bottom Ash Pond (South BAP)	006	Received~~s~~ sluiced bottom ash.
Evaporation Pond	021	Receives boiler chemical cleaning waste and other authorized liquid wastes.
Fly Ash Landfill	010	Receives fly ash, bottom ash, economizer ash, scrubber sludge from flue gas desulphurization ponds, and flue gas desulphurization gypsum (temporary storage).

SLUDGE RECYCLE HOLDING POND

The SRH Pond contains CCR sludge from the air pollution control equipment from both plants. The SRH Pond was constructed as a single impoundment with a divider wall that separates the impoundment into a north and south pond. A gate present in the divider wall is closed during normal operating procedures but can be opened. Each pond is approximately 1.5 acres in area and is located east of the plants, adjacent to the BAPs.

The SRH Pond began receiving CCR before October 14, 2015 and are still in service. Hence, in accordance with 40 CFR §257.53, the SRH Pond is classified as an active existing CCR surface impoundment.

The interior slopes of the SRH Pond is reportedly constructed with a 10-oz. Geotextile and a 30-mil High Density Polyethylene (HDPE) geomembrane over prepared subgrade. The North SRH Pond bottom liner consists of a six-inch layer of 4,000 psi concrete over one-foot of compacted sand overlying a 30-mil HDPE geomembrane. The South SRH Pond bottom liner also has a six-inch layer of 4,000 psi concrete. Under the concrete is one-foot of compacted fill overlaying a 10-oz. Geotextile, a 30-mil HDPE geomembrane and another 10-oz. Geotextile. The SRH Pond is separated by a concrete divider wall with a sluice gate that allows the North SRH Pond and South SRH Pond to be isolated from each other. Water is pumped from the SRH Ponds to clarifiers via two 18-inch steel pipes. Both SRH ponds have eight-foot-wide concrete overflow chutes that discharge to the South BAP. These overflow chutes are at an approximate elevation of 499.5 feet MSL.

The estimated maximum inventory of CCR to be on-site in the SRH ponds at a given time is approximately 7 acre-feet. This estimate is based on a worst-case assumption of both SRH ponds being completely full of CCR up to the limits of the freeboard as allowed by the Inflow Flood Control Plan. A storage capacity curve for the SRH Pond will be provided as Figure 2.

There is no instrumentation present in the SRH Pond.

BOTTOM ASH PONDS

The North and South BAPs contain sluiced CCR from the wet feed process at the ~~J.T.~~JT Deely Plant. The BAPs were constructed by CPS Energy in 1977 as part of the original plant construction. The North BAP is approximately 6.1 acres in area, while the South BAP is approximately 6.8 acres. They are located east of the plants, adjacent to the SRH Pond.

The historical construction drawings for the BAPs indicate that the BAPs were partially excavated, and the embankments were likely constructed from excavated material; however, construction specifications or other documentation are not available. Historical subsurface soil information preceding construction is also not available. A geotechnical investigation and structural stability assessment (SSA) was initially conducted by Raba Kistner Consultants, Inc. (RKCI) in May 2014. A copy of the RKCI SSA entitled *Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas* was provided in the *Assessment of Dam Safety of Coal Combustion Surface Impoundments, Final Report* (Assessment of Dam Safety Report) prepared by CDM Smith (June 2014). Additional surveying was completed by Pape-Dawson Engineers, Inc. and updated SSA completed by HTS, Inc. Consultants (July 2016). The SSAs are discussed in more detail in the *Structural Stability and Safety Factor Assessments – 5-Year Update* (ERM, October 2021). Available data on the physical and engineering properties of the foundation and abutment materials are provided in the RKCI Report attached to the CDM Smith Assessment of Dam Safety Report. Borings from the RKCI investigation indicate the embankments and foundation materials consist of sandy clay and clayey sand with seams of clay and sand.

The expected maximum depth of CCR within the BAPs as of the date of this report is approximately six inches (the majority of CCR has been removed in anticipation of closure). Identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation include the impoundment embankments and outlet structures, if not maintained and/or allowed to overtop presenting a risk of release or breach. The BAPs have been substantially emptied of CCR and water and are maintained dry in anticipation of closure and therefore, the risk of release or breach is very low.

The BAPs began receiving CCR before October 14, 2015, ceased receiving CCR at the end of December 2018, and currently contain CCR. The BAPs are preparing for closure, but are not yet closed and hence, in accordance with 40 CFR §257.53, the BAPs are classified as inactive existing CCR surface impoundments.

The BAPs share a common embankment that separates the ponds. The ponds are reportedly lined with clay, but the thickness and hydraulic conductivity of the clay are unknown. One 24-inch steel pipe in each pond allows water to be returned to the plant for reuse. Additionally, both ponds have two discharge points. The discharge points consist of an outlet structure with a horizontal 12-inch steel discharge pipe at an approximate elevation of 489 feet MSL (bottom drain used to empty the pond), and a vertical 12-inch steel overflow pipe at an approximate of elevation 499 feet MSL (normal operation level pool drain).

The outfall structure is in one corner of each pond (northeast for North BAP and southeast for South BAP) and is partially surrounded by steel sheet piling. The sheet piling and pond berms create an opening for water to reach the discharge pipes. This opening is typically protected by floating sorbent booms. Water from these outlets discharge to Calaveras Lake through a TPDES permitted outfall.

It is estimated that approximately 118 acre-feet is the maximum inventory of CCR to be on-site over the active life of the North and South BAPs. This estimate is based on a worst-case assumption of the BAPs being completely full of CCR up to the limits of the freeboard as allowed by the Inflow Flood Control Plan. Storage capacity curves for the BAPs will be provided as Figures 3 and 4.

There is no instrumentation present in the BAPs.

EVAPORATION POND

The EP is located generally northeast of the plants. The EP side and bottom liner consist of a one-foot layer of cohesive soil overlying a 30-mil Polyvinylchloride geomembrane and an additional one-foot of cohesive soil free of rocks, roots, and other foreign materials and the subgrade consists of two-feet of soil, with all large rock removed, and compacted to 90% density according to construction notes in the original construction drawings when constructed as a landfill in 1990. The EP was converted to a fly ash impoundment in 1996.

The historical construction drawings for the EP do not indicate what material the embankments were constructed of, although the EP was likely partially excavated with embankments made of excavated material; construction specifications or other documentation are not available. Historical subsurface soil information preceding construction is also not available for review. A geotechnical investigation and structural stability assessment (SSA) was initially conducted by Raba Kistner Consultants, Inc. (RKCI) in May 2014. A copy of the RKCI SSA entitled *Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas* was provided in the *Assessment of Dam Safety of Coal Combustion Surface Impoundments, Final Report* (Assessment of Dam Safety Report) prepared by CDM Smith (June 2014*)*. The SSA is discussed in more detail in the *Structural Stability and Safety Factor Assessments – 5-Year Update* (ERM, October 2021). Available data on the physical and engineering properties of the foundation and abutment materials are provided in the RKCI Report attached to the CDM Smith Assessment of Dam Safety Report. Borings from the RKCI investigation indicate the embankments and foundation materials consist of sand, sandy clay, clayey sand, and clay.

The expected maximum depth of CCR within the EP as of the date of this report is approximately 22 feet (from approximately 2 feet below the top of embankment at elevation 522 feet msl to the pond bottom at elevation 498 feet msl). Identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation include the impoundment embankments, if not maintained and / or allowed to overtop presenting a risk of release or breach.

The EP is a surface impoundment that was constructed and received CCR before October 14, 2015. The EP currently does not receive any CCR or non-CCR waste streams. Hence, in accordance with 40 CFR §257.53, the EP is classified as an inactive existing CCR surface impoundment.

The EP receives ash washdown water from washing of the air pollution control system and other miscellaneous CCR washdown sources. That waste contains CCR as defined in 40 CFR §257.52.

There are no inlet or outlet structures to the EP. Liquid from ash washdown, boiler chemical cleanouts, and other authorized liquid wastes is trucked to the pond, where it is allowed to evaporate.

It is estimated that approximately 83 acre-feet is the maximum inventory of CCR to be on-site over the active life of the EP. This estimate is based on a worst-case assumption of the EP being completely full of CCR up to the limits of the freeboard as allowed by the Inflow Flood Control Plan. A storage capacity curve for the EP will be provided as Figure 5.

There is no instrumentation present in the EP.

FLY ASH LANDFILL

The Fly Ash Landfill (FAL) is a Class 2 landfill constructed by CPS Energy in 1992 to increase the on-site disposal storage capacity of CCR wastes, prior to construction of the J.K. Spruce Plant. The FAL is located generally northeast of the plants.

The FAL was constructed and received CCR before October 14, 2015. In addition, the FAL currently receives CCR wastes consisting of bottom ash, fly ash, scrubber solids, coal dust, gypsum, fly ash dust bags, and ion exchange resin waste generated by plant operations. Those wastes contain CCR as defined in 40 CFR §257.52. Hence, in accordance with 40 CFR §257.53, the FAL is classified as an active existing CCR landfill.

The FAL has an approximate total area of 23 acres. According to as-built drawings provided by CPS Energy, the bottom of the landfill is lined with a 30-mil High Density Polyethylene (HDPE) with a geotextile cushion and sand drainage layer. In 2010, repairs were made to portions of the liner on the north and west side embankments to prevent deterioration of the slopes. A geocomposite drainage net covered by two feet of coarse CCR provides the drainage layer over the liner on the interior embankments of the landfill.

It is estimated that approximately 550 acre-feet is the maximum inventory of CCR to be on-site over the active life of the FAL. This estimate is based on a worst-case assumption of the FAL being completely full of CCR up to the limits of the freeboard as allowed by the Run-on / Run-off Control Plan. A storage capacity curve for the FAL will be provided as Figure 6.

There is no instrumentation present in the FAL.

Based on our evaluation of the available information for the CCR units at the Calaveras Power Station, to the extent feasible, this Compilation of Construction History meets the requirements of 40 CFR §257.73(c)(1).

Sincerely,

Environmental Resources Management Southwest, Inc.

Charles Johnson
Senior Engineer, P.E. (TX)

Charles Johnson
Printed Name of Licensed Professional Engineer

Signature of Licensed Professional Engineer

Date: ______________

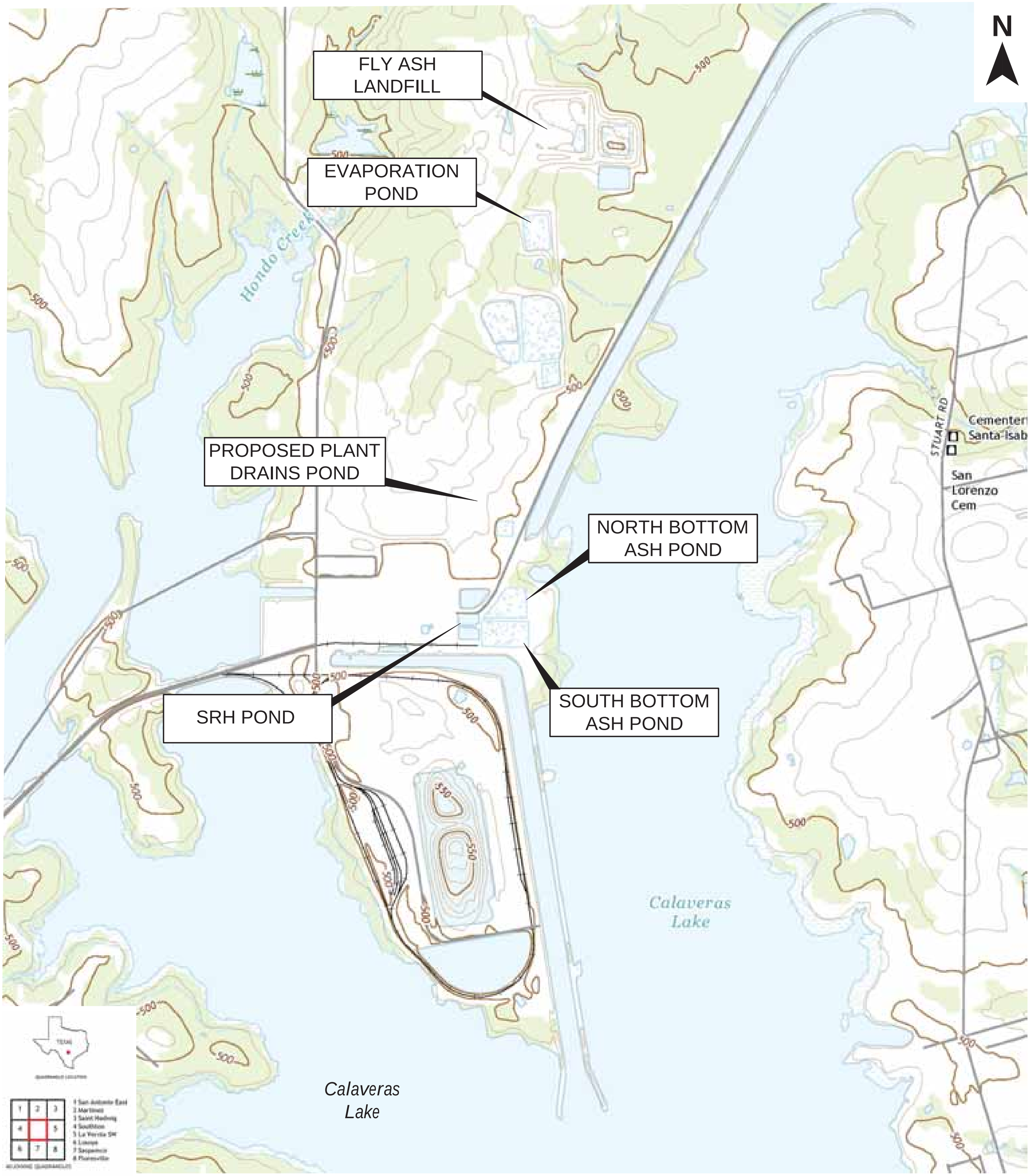
128280
TBPE P.E. License No.

Figures

Environmental Resources Management Southwest, Inc.
CityCentre Four
840 W. Sam Houston Pkwy. N. – Suite 600
Houston, Texas 77024
(281) 600-1000

T:\DWG\AutoCAD\dwg\0636109\0636109_site location.dwg, 11/16/2022 5:20:50 PM

DRAWN: CAK



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

0 2000 4000

SCALE FEET

Figure 1

CCR Unit Locations

CPS Energy
Calaveras Power Station
San Antonio, Texas

Environmental Resources Management
erm.com

ERM

Drawings Reviewed During Preparation

Attachment 1

Environmental Resources Management Southwest, Inc.
CityCentre Four
840 W. Sam Houston Pkwy. N. – Suite 600
Houston, Texas 77024
(281) 600-1000

SPRUCE PLANT DRAINS POND

OWNER

CPS ENERGY
500 McCULLOUGH
SAN ANTONIO, TX 78215

DESIGN ENGINEER

AECOM TECHNICAL SERVICES, INC
13640 BRIARWICK DRIVE, SUITE 200
AUSTIN, TX 78729

SITE INFORMATION

JK SPRUCE POWER PLANT
12940 US HWY 181
SAN ANTONIO, TX 78223

GEOTECHNICAL ENGINEER

RABA KISTNER CONSULTANTS, INC
12821 W. GOLDEN LANE
SAN ANTONIO, TX 78249

P.O BOX 690287
SAN ANTONIO, TX 78269

SURVEYOR

SURVEY DATA PROVIDED BY:
PAPE–DAWSON ENGINEERS
2000 NW LOOP 410
SAN ANTONIO, TX 78213

SURVEY NOTES

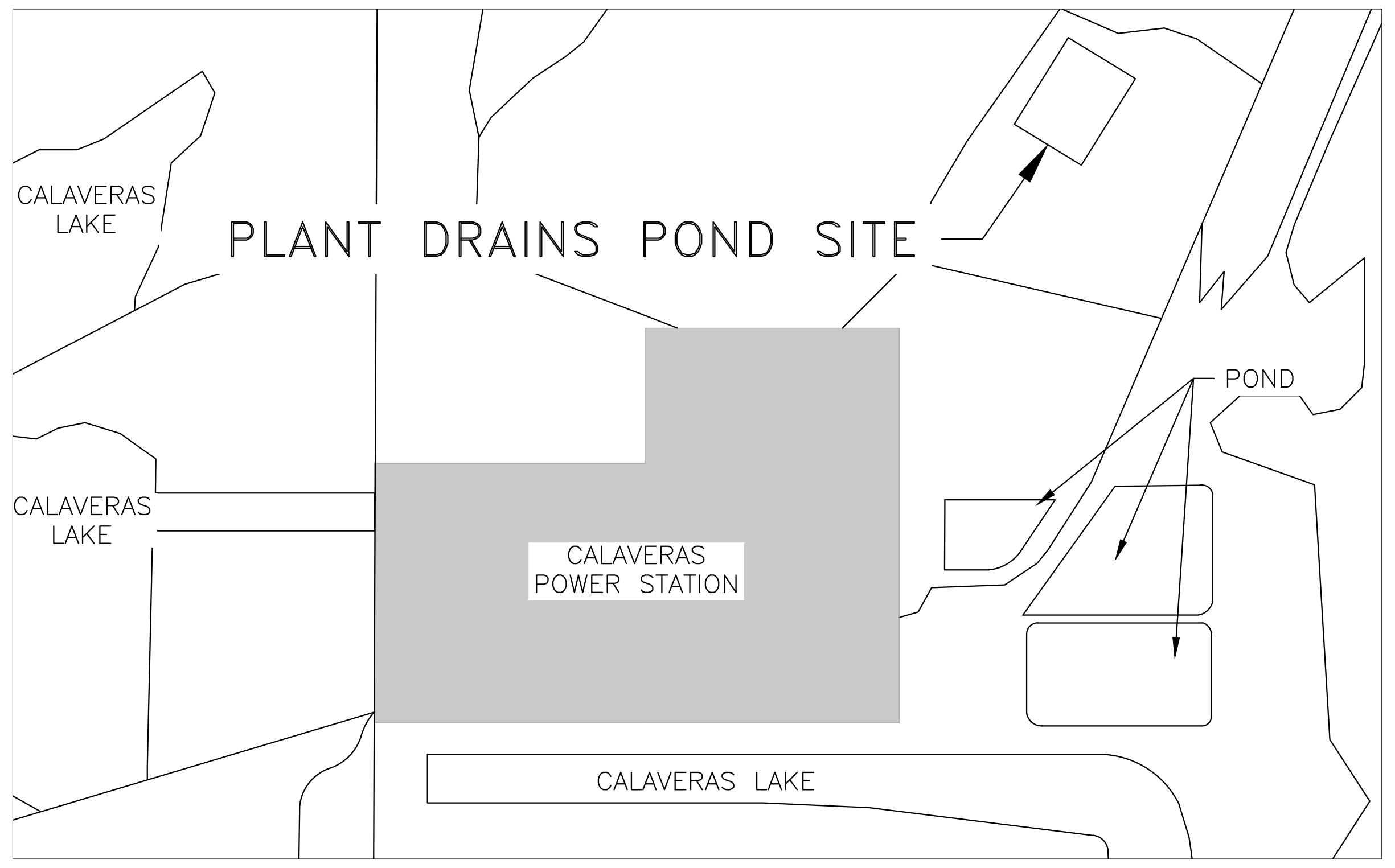
1. ELEVATIONS ARE BASED ON NAVD 88 FROM BENCHMARKS AY0369 AND AY0442
2. COORDINATES AND DISTANCES SHOWN ARE BASED ON A PROJECT COORDINATE SYSTEM ESTABLISHED BY APPLYING A SURFACE ADJUSTMENT FACTOR OF 1.00017 (CSF 0.999830028895) TO STATE PLANE GRID COORDINATES VALUES NAD83 (96), U.S. SURVEY FEET AND SUBTRACTING 13 MILLION FROM THE NORTHING AND 2 MILLION FROM THE EASTING. PROJECT COORDINATES = STATE PLANE GRID VALUES * 1.00017, –13,000,000 TO NORTHING AND –2,000,000 TO EASTING.

BASIS OF BEARING

1. POSITION DATA AS SHOWN HEREON ARE RELATIVE TO THE NORTH AMERICAN DATUM OF NAD83 (NA2011) EPOCH 2010.00, FROM THE TEXAS COORDINATE SYSTEM ESTABLISHED FOR THE SOUTH CENTRAL ZONE

HORIZONTAL AND VERTICAL PROJECT CONTROL POINTS

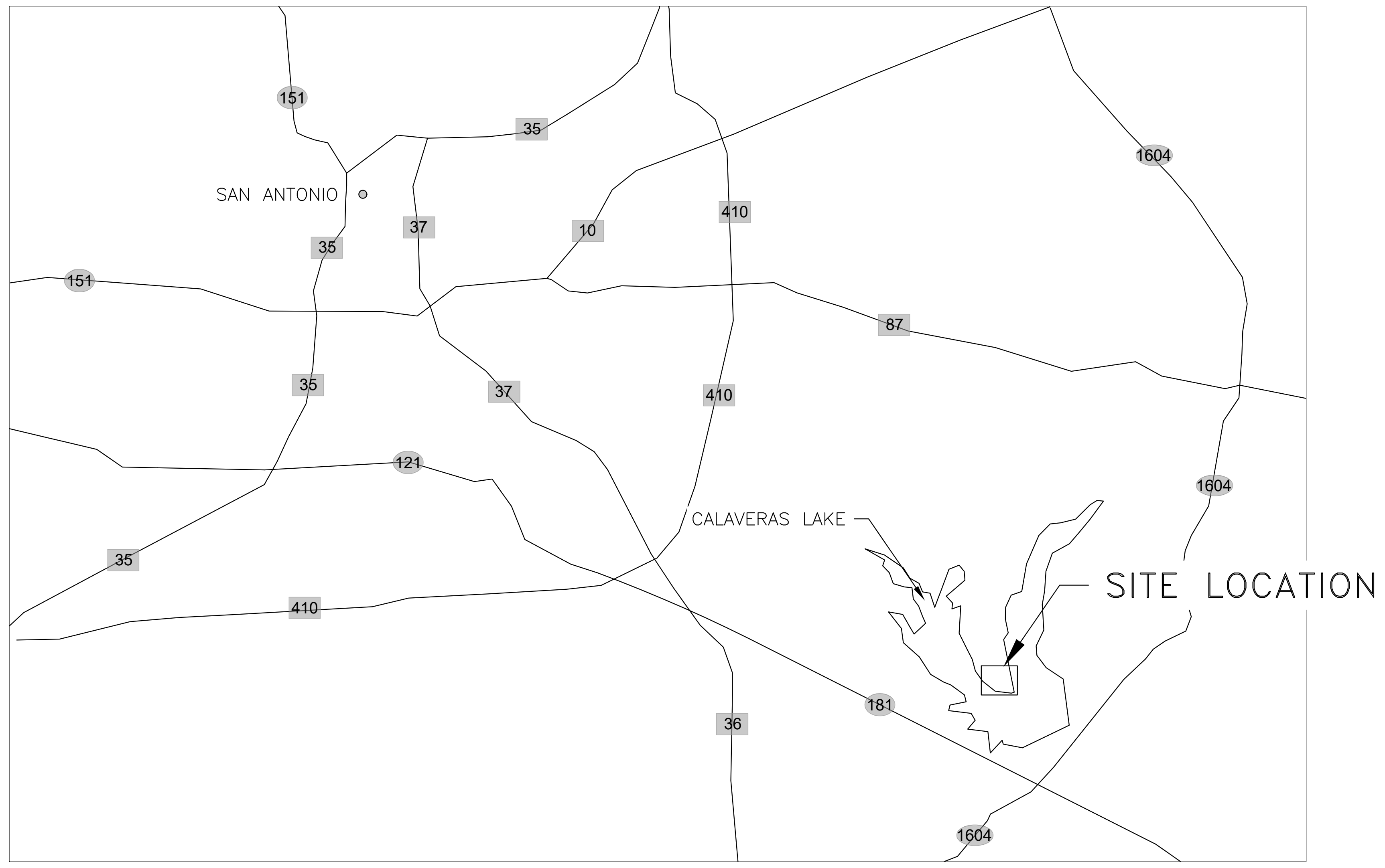
CONTROL POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
173	666,663.41	186,398.82	513.18	SET MAG NAIL & WASHER (TRAV)
313	666,265.49	187,068.84	493.74	SET I.R. REDCAP (TRAV)
314	666,716.25	186,804.88	507.47	SET I.R. REDCAP (TRAV)
315	666,992.22	186,868.91	508.94	SET I.R. REDCAP (TRAV)



SITE LOCATION MAP
NTS

Texas 811
Know what's below. Call before you dig.

FOR CPS ENERGY
SAN ANTONIO, TX 78223



VICINITY MAP
NTS

DRAWING INDEX

SHEET NUMBER	REVISION	REV DATE	SHEET TITLE
2–470–C0001	3	06–17–2022	COVER SHEET
2–470–C0002	1	05–02–2022	GENERAL NOTES AND LEGEND
2–470–C0003	2	06–17–2022	OVERALL SITE PLAN
2–470–C0004	2	06–17–2022	SITE PLAN
2–470–C0005	2	06–17–2022	GRADING AND DRAINAGE PLAN
2–470–C0006	1	05–02–2022	SECTIONS AND DETAILS 01
2–470–C0007	1	05–02–2022	SECTIONS AND DETAILS 02
2–470–C0008	1	05–02–2022	SECTIONS AND DETAILS 03
2–470–C0009	1	05–12–2022	SECTIONS AND DETAILS 04
2–470–C0010	0	06–17–2022	STORMWATER DIVERSION PLAN
2–470–C0011	0	06–17–2022	STORMWATER DIVERSION SECTIONS AND DETAILS 01
2–470–C0012	0	06–17–2022	STORMWATER DIVERSION SECTIONS AND DETAILS 02

3

REVISION 3 MODIFICATIONS OF THIS DRAWING ARE RELEASED UNDER THE AUTHORITY OF ALEXANDER W. GOURLAY, TEXAS PE. 14733

ISSUE FOR CONSTRUCTION

ALEXANDER W. GOURLAY
143733
REV. 1, 2, AND 3 ONLY
6/17/22

12-17-21

NO	DATE	REVISION	DWN	CHKD	APRV
3	06-17-2022	ISSUE FOR CONSTRUCTION - STORMWATER DIVERSION	AWF	TER	AWG
2	05-12-2022	REVISED C0001 TO REVISION 2 & C0009 TO REVISION 1	AWF	AJP	AWG
1	05-02-2022	ISSUE FOR CONSTRUCTION - POND DESIGN UPDATES	AJP	AWF	AWG
0	12-17-2021	ISSUE FOR CONSTRUCTION	AWF	DEM	DEM

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

cps ENERGY
J K SPRUCE POWER PLANT

SPRUCE PLANT DRAINS PROJECT

COVER SHEET
PLANT DRAINS POND

DRAWN BY: A. PROCTOR
CHKD BY: A. FORD
APPVD BY: A. GOURLAY

DRAWING NUMBER
2-470-C0001

REVISION
3

ARCH D 36x24

Last saved by: ADAM.FORD(2022-06-17) Last Plotted: 2022-06-17
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0001.DWG

Printed on ___% Post-Consumer Recycled Content Paper

GENERAL NOTES:

1. ALL WORK SHALL BE PERFORMED IN A WORKMANLIKE MANNER AND IN ACCORDANCE WITH THE BEST RECOGNIZED TRADE PRACTICES.
2. ALL WORK SHALL COMPLY WITH APPLICABLE STATE, FEDERAL, AND LOCAL CODES AND THE PROJECT SPECIFICATIONS. ALL NECESSARY LICENSES AND/OR PERMITS SHALL BE OBTAINED BY THE CONTRACTOR AT HIS EXPENSE.
3. ENGINEER SHALL BE NOTIFIED A MINIMUM OF FORTY–EIGHT (48) HOURS IN ADVANCE OF SITE INSPECTIONS, TESTING VERIFICATIONS, AND FOR ANY OTHER PORTION OF THE WORK REQUIRING ENGINEERS SERVICES AT THE JOB SITE.
4. CONTRACTOR SHALL NOTIFY ENGINEER NOT LESS THAN SEVEN (7) DAYS PRIOR TO STARTING WORK IN ORDER THAT ENGINEER MAY TAKE NECESSARY MEASURES TO PRESERVE OF SURVEY MONUMENTS. CONTRACTOR SHALL NOT DISTURB PERMANENT SURVEY MONUMENTS WITHOUT THE CONSENT OF ENGINEER AND SHALL NOTIFY ENGINEER AND BEAR EXPENSE OF REPLACING ANY THAT MAY BE DISTURBED WITHOUT PERMISSION. REPLACEMENT SHALL BE DONE ONLY BY A TEXAS REGISTERED PROFESSIONAL SURVEYOR. WHEN A CHANGE IS MADE IN THE FINISHED ELEVATION OF THE PAVEMENT OF ANY ROADWAY IN WHICH A PERMANENT SURVEY MONUMENT IS LOCATED, CONTRACTOR SHALL, AT HIS OWN EXPENSE, ADJUST THE MONUMENT COVER TO THE NEW GRADE UNLESS OTHERWISE SPECIFIED.
5. CONTRACTOR SHALL READ AND MAKE CAREFUL EXAMINATION OF THE PLANS, SPECIFICATIONS, QUANTITIES, AND MATERIALS AND SHALL VISIT THE SITE OF THE PROPOSED CONSTRUCTION TO BECOME FAMILIAR WITH SITE CONDITIONS AND LIMITATIONS BEFORE MAKING A PROPOSAL. CONTRACTOR SHALL MAKE ANY INVESTIGATIONS NECESSARY TO DETERMINE THE EXTENT OF THE WORK REQUIRED TO CONSTRUCT THE PROJECT. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY AND ALL ERRORS RESULTING FROM FAILURE TO MAKE SUCH AN EXAMINATION. ANY INFORMATION DERIVED FROM THE MAPS, PLANS, SPECIFICATIONS, PROFILES, DRAWINGS OR FROM ENGINEER, WILL NOT RELIEVE CONTRACTOR FROM ANY RISK OR FROM FULFILLING THE TERMS OF THE CONTRACT.
6. ANY EXISTING OR NEW SITE FEATURES OR OTHER IMPROVEMENTS DAMAGED BY CONTRACTOR DURING CONSTRUCTION SHALL BE REPAIRED BY CONTRACTOR TO EQUAL OR BETTER CONDITION AT NO ADDITIONAL COST TO THE OWNER.
7. CONTRACTOR SHALL NOT INSTALL ITEMS AS SHOWN ON THE PLANS WHEN FIELD CONDITIONS ARE DIFFERENT THAN SHOWN IN THE DESIGN. SUCH CONDITIONS SHOULD BE BROUGHT TO THE ATTENTION OF THE ENGINEER. IN THE EVENT CONTRACTOR DOES NOT NOTIFY ENGINEER, CONTRACTOR ASSUMES FULL RESPONSIBILITY AND EXPENSE FOR ANY REVISIONS NECESSARY.
8. CONTRACTOR WILL BE RESPONSIBLE FOR ANY MONUMENTATION AND/OR BENCHMARKS THAT WILL BE DISTURBED OR DESTROYED BY CONSTRUCTION.
9. CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF HIS WORK FROM RAINFALL, STORM DRAINAGE, OR FLOOD SO THAT IT DOES NOT DELAY CONSTRUCTION OR DAMAGE COMPLETED WORK OR DOWNSTREAM PROPERTIES THROUGHOUT CONSTRUCTION.
10. NOTE DELETED.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR GENERAL SAFETY DURING CONSTRUCTION. ALL CONSTRUCTION PRACTICES AND PROCEDURES SHALL COMPLY WITH THE PERTINENT PROVISIONS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS (TITLE 29, CODE OF FEDERAL REGULATIONS).
12. CONTRACTOR SHALL MAINTAIN A DEBRIS FREE WORK SITE. PROVIDE TRASH RECEPTACLES FOR ALL WASTE MATERIAL INCLUDING PERSONAL WASTE SUCH AS LUNCH BAGS.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE SITE IN A NEAT AND ORDERLY MANNER THROUGHOUT THE CONSTRUCTION PROCESS. ALL MATERIALS SHALL BE STORED WITHIN APPROVED CONSTRUCTION AREAS.
14. ALL NECESSARY LICENSES AND/OR PERMITS SHALL BE OBTAINED BY THE CONTRACTOR AT HIS EXPENSE.
15. CONSTRUCTION ACCESS TO BE AT DESIGNATED LOCATIONS ONLY. CONTACT OWNER'S REP. FOR SPECIFIC INSTRUCTIONS.
16. DISPOSAL OF UNSUITABLE MATERIAL AND ITEMS DESIGNED FOR REMOVAL WITHOUT SALVAGE SHALL BE IN ACCORDANCE WITH LANDFILL (DISPOSAL) SITE REQUIREMENTS.
17. CONTRACTOR SHALL PERFORM HIS OWN SURVEY TO ESTABLISH HORIZONTAL AND VERTICAL CONTROL FOR THE PROJECT. CONTOURS AND ELEVATION INFORMATION SHOWN ARE NOT BASED ON ACTUAL SURVEY DATA.
18. WHERE NOTED ON PLANS OR DRAWINGS, COMPLY WITH THE 2014 EDITION OF THE TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT) STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES (STANDARD SPECS).
19. ANY DISCREPANCIES BETWEEN DRAWINGS AND SPECIFICATIONS SHALL BE BROUGHT TO ENGINEERS ATTENTION FOR RESOLUTION.
20. SOIL CEMENT SHALL BE IN ACCORDANCE WITH ACI 230.1R–09. SOIL CEMENT SHALL HAVE A 7–DAY UNCONFINED SOAKED COMPRESSIVE STRENGTH BETWEEN 300 TO 600 PSI AND A 28–DAY UNCONFINED SOAKED COMPRESSIVE STRENGTH BETWEEN 400 TO 1,000 PSI.

UTILITY NOTES:

1. CONTRACTOR TO USE EXTREME CAUTION NOT TO DISTURB OR DAMAGE EXISTING STORM DRAIN, PIPELINES, SITE EQUIPMENT, VALVES, MANHOLES AND ALL SUBSURFACE UTILITIES THROUGHOUT CONSTRUCTION. CONTRACTOR SHALL LOCATE ALL SURFACE UTILITY FEATURES PRIOR TO CONSTRUCTION AND SHALL PLACE VISIBLE MARKERS TO MARK UTILITY FEATURES NOT TO BE DISTURBED. IF DAMAGED THEN REPAIR AT CONTRACTORS EXPENSE.
2. CONTRACTOR SHALL NOTIFY ALL APPLICABLE UTILITY COMPANIES AND COORDINATE UTILITY LINE SPOTS AT LEAST SEVEN (7) WORKING DAYS PRIOR TO ANY DIGGING OR EXCAVATION.
4. TWO (2) WORKING DAYS PRIOR TO ANY CONSTRUCTION, CONTRACTOR MUST CONTACT LINE LOCATING SERVICES: TOLL FREE AT 1–800–277–2600 FOR LOCATION OF EXISTING UTILITIES.
5. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING UTILITY LOCATIONS AND SHALL NOTIFY THE ENGINEER IMMEDIATELY OF ANY DISCREPANCIES. ALL ELECTRICAL, TELEPHONE, CABLE TV, GAS AND OTHER UTILITY LINES, CABLES AND APPURTENANCES ENCOUNTERED DURING CONSTRUCTION THAT REQUIRE RELOCATION, SHALL BE COORDINATED WITH THAT UTILITY BE IT PRIVATE OR CITY OWNED. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION OF ALL NECESSARY UTILITY ADJUSTMENTS. CONTRACTOR MAY BE REQUIRED TO RESCHEDULE HIS ACTIVITIES TO ALLOW UTILITY CREWS TO PERFORM THEIR REQUIRED WORK.
6. ALL UNDERGROUND UTILITIES SHOWN ON THESE DRAWINGS SHOULD BE CONSIDERED APPROXIMATE ONLY AND THE CONTRACTOR MUST NOTIFY A UTILITY LOCATOR SERVICE PRIOR TO CONSTRUCTION.
7. THE INFORMATION SHOWN ON THESE DRAWINGS CONCERNING TYPE AND LOCATION OF UNDERGROUND AND OTHER UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL–INCLUSIVE. CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND AND OTHER UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. CONTRACTOR SHALL USE EXTREME CARE WHEN PERFORMING ANY DEMOLITION OR GRADING OPERATIONS IN THE PROXIMITY OF THESE EXISTING UTILITIES. ANY DAMAGE TO EXISTING UTILITIES WILL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. NOTIFY OWNER WHEN ANY UNIDENTIFIED UTILITIES ARE DISCOVERED.
8. OBTAIN WRITTEN AUTHORIZATION FROM THE OWNER'S REPRESENTATIVE AND FROM THE UTILITY OWNERS PRIOR TO INTERRUPTING ANY EXISTING UTILITY (IE: WATER, SEWER, GAS, ELECTRICAL, OR TELEPHONE).
9. CONSTRUCTION SHALL COMPLY WITH GOVERNING CODES AND REQUIREMENTS. CONTRACTOR SHALL CONDUCT ALL REQUIRED TESTS TO THE SATISFACTION OF THE UTILITY COMPANIES AND OWNERS INSPECTING AUTHORITIES.
10. CONTRACTOR SHALL COMPLY TO THE FULLEST EXTENT WITH THE LATEST STANDARDS OF OSHA DIRECTIVES, INCLUDING 29 CFR PART 1926 SUBPART P, OR ANY OTHER AGENCY HAVING JURISDICTION FOR EXCAVATION AND TRENCHING PROCEDURE. CONTRACTOR SHALL USE SUPPORT SYSTEMS, SLOPING, BENCHING AND OTHER MEANS OF PROTECTION. THIS IS TO INCLUDE, BUT NOT LIMITED FOR ACCESS AND EGRESS FROM ALL EXCAVATION AND TRENCHING.

GRADING AND DRAINAGE NOTES:

1. THE SOILS ENGINEER SHALL CERTIFY THAT THE REQUIRED INSPECTIONS AND TESTS HAVE BEEN PERFORMED AND THAT SUCH TESTS COMPLY WITH CODE.
2. EXERCISE SUFFICIENT SUPERVISORY CONTROL DURING GRADING AND CONSTRUCTION TO ENSURE COMPLIANCE WITH THE APPROVED PLANS.
3. POND EMBANKMENT FILLS SHALL BE PLACED IN MAXIMUM 8–INCH THICK LOOSE LIFTS AND COMPACTED THROUGHOUT TO AT LEAST 100% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698, "STANDARD TEST METHOD FOR LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING STANDARD EFFORT."
4. FILL AREAS SHALL BE CLEARED OF ALL VEGETATION AND DEBRIS, PROOFROLLED AND SCARIFIED, HAVE SUBDRAINS INSTALLED (IF ANY) AND APPROVED BY THE GRADING INSPECTOR AND SOILS ENGINEER PRIOR TO THE PLACING OF FILL.
5. NO ROCK OR SIMILAR MATERIAL GREATER THAN 4 INCHES IN DIAMETER SHALL BE PLACED IN THE FILL UNLESS APPROVED BY THE ENGINEER.
6. CONTRACTOR SHALL INCORPORATE ADEQUATE DRAINAGE PROCEDURES DURING THE CONSTRUCTION PROCESS TO ELIMINATE EXCESSIVE PONDING AND/OR EROSION.
7. DEGREE OF COMPACTION OR RELATIVE COMPACTION SHALL BE DETERMINED BY ASTM D698, "STANDARD TEST METHOD FOR LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING STANDARD EFFORT."
8. HAUL PERMITS, WHEN REQUIRED, MUST BE OBTAINED BY CONTRACTOR PRIOR TO WORK.
9. CONTRACTOR SHALL PREPARE SUBGRADE IN ACCORDANCE WITH THE RECOMMENDATIONS IN THE SITE GEOTECHNICAL ENGINEERING STUDY PREPARED BY RABA KISTNER CONSULTANTS DATED FEBRUARY 5, 2018, AND AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS.

GEOSYNTHETICS NOTES:

1. HDPE GEOMEMBRANE SHALL CONFORM TO GEOSYNTHETIC RESEARCH INSTITUTE (GRI) TEST METHOD GM13, "STANDARD SPECIFICATION FOR TEST METHODS, TEST PROPERTIES, AND TESTING FREQUENCY FOR HIGH DENSITY POLYETHYLENE (HDPE) SMOOTH AND TEXTURED GEOMEMBRANES."
2. GEOMEMBRANE SHALL HAVE A 60–MIL MINIMUM AVERAGE THICKNESS.
3. NONWOVEN GEOTEXTILE SHALL CONFORM TO GRI TEST METHOD GT12(a), "STANDARD SPECIFICATION FOR TEST METHODS AND PROPERTIES FOR NONWOVEN GEOTEXTILES USED AS PROTECTION (OR CUSHIONING) MATERIALS" AND/OR GRI TEST METHOD GT13(a), "STANDARD SPECIFICATION FOR TEST METHODS AND PROPERTIES FOR GEOTEXTILES USED AS SEPARATION BETWEEN SUBGRADE SOIL AND AGGREGATE."
4. NONWOVEN GEOTEXTILE USED FOR CUSHIONING/PROTECTING THE GEOMEMBRANE LINER SHALL HAVE A MINIMUM MASS/UNIT AREA OF 16 OZ/YD².
5. NONWOVEN GEOTEXTILE USED FOR SOIL SEPARATION SHALL HAVE A MINIMUM GRAB TENSILE STRENGTH OF 203 LBS AS PER ASTM D4632, "STANDARD TEST METHOD FOR GRAB BREAKING LOAD AND ELONGATION OF GEOTEXTILES."
6. GEOSYNTHETIC CLAY LINER (GCL) SHALL CONFORM TO GRI TEST METHOD GCL3, "STANDARD SPECIFICATIONS FOR TEST METHODS, REQUIRED PROPERTIES, AND TESTING FREQUENCIES OF GEOSYNTHETIC CLAY LINERS (GCL).

LEGEND:

▧	PREPARED SUBGRADE (SCARIFIED, PROOF–ROOLED, AND COMPACTED)
░	SAND
▭	REINFORCED CONCRETE
▩	NON–WOVEN GEOTEXTILE
▤	ANCHOR TRENCH FILL
▦	ROADWAY GRAVEL
▦	RIPRAP
▨	SELECT FILL
▭	SOIL RETENTION BLANKET
▒	ROADWAY GRAVEL AT PIPE–CROSSINGS
▽	SOIL CEMENT
✕✕✕	NON–WOVEN GEOTEXTILE
━━━	60 MIL HDPE TEXTURED GEOMEMBRANE
╍╍╍	GEOSYNTHETIC CLAY LAYER
—— – ——	BERM CENTERLINE
—OHU—OHU—	EXISTING ELECTRICAL LINES
—SS—SS—	EXISTING SANITARY SEWER
—W—W—	EXISTING WATER LINE
—GAS—GAS—	EXISTING GAS LINE
– – – – –	EXISTING GRADE
———	FINISHED GRADE
—— - - - ——	FREEBOARD
—— – – ——	GRADE BREAK
—P—P—	NEW PIPE
△	SURVEY CONTROL POINT
◕	SOIL BORING LOCATION
✿	EXISTING TREE
○	SURVEY MONUMENT POINT
—◀	SLOPE INDICATOR

ABBREVIATIONS:

AC	ACRES
BLD	BUILDING
BOP	BOTTOM OF POND
CC	CENTER TO CENTER
℄	CENTERLINE
COB	CONSTRUCTION OFFICE BUILDING
CPT	CORRUGATED PLASTIC TUBING
CY	CUBIC YARDS
DIA	DIAMETER
DR	DIMENSION RATIO
E	EXISTING
EA	EACH
EL	ELEVATION
ELEV.	ELEVATION
ESB	ENGINEERING SERVICES BUILDING
EW	EACH WAY
FD	FOUND
FT	FEET
HDPE	HIGH DENSITY POLYETHYLENE
HP	HIGH POINT
LCRS	LEAK COLLECTION RECOVERY SYSTEM
LF	LINEAR FEET
ML	MIL
NTS	NOT TO SCALE
O.C.	ON CENTER
PC	POINT OF CURVATURE
PD	PLANT DRAINS
PT	POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE
R	RADIUS
SIM	SIMILAR
SRB	SOIL RETENTION BLANKET
SF	SQUARE FEET
SY	SQUARE YARDS
TN	TRUE NORTH
TOC	TOP OF CONCRETE
TXDOT	TEXAS DEPARTMENT OF TRANSPORTATION
TYP	TYPICAL

ISSUE FOR CONSTRUCTION

ALEXANDER W. GOURLAY
143733
REV. 1 ONLY
5/2/22

DAVID E. MICKANEN
98944
12-17-21

NO	DATE	REVISION	DWN	CHKD	APRV
1	05-02-2022	ISSUE FOR CONSTRUCTION - POND DESIGN UPDATES	AJP	AWF	AWG
0	12-17-2021	ISSUE FOR CONSTRUCTION	AWF	DEM	DEM

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

This drawing has been prepared for the use of ENGINEER's client and may not be used, reproduced or relied upon by third parties, except as agreed by ENGINEER and its client, as required by law or for use by governmental reviewing agencies. ENGINEER accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without ENGINEER's express written consent. Do not scale this document. All measurements must be obtained from stated dimensions.

cps ENERGY
J K SPRUCE POWER PLANT

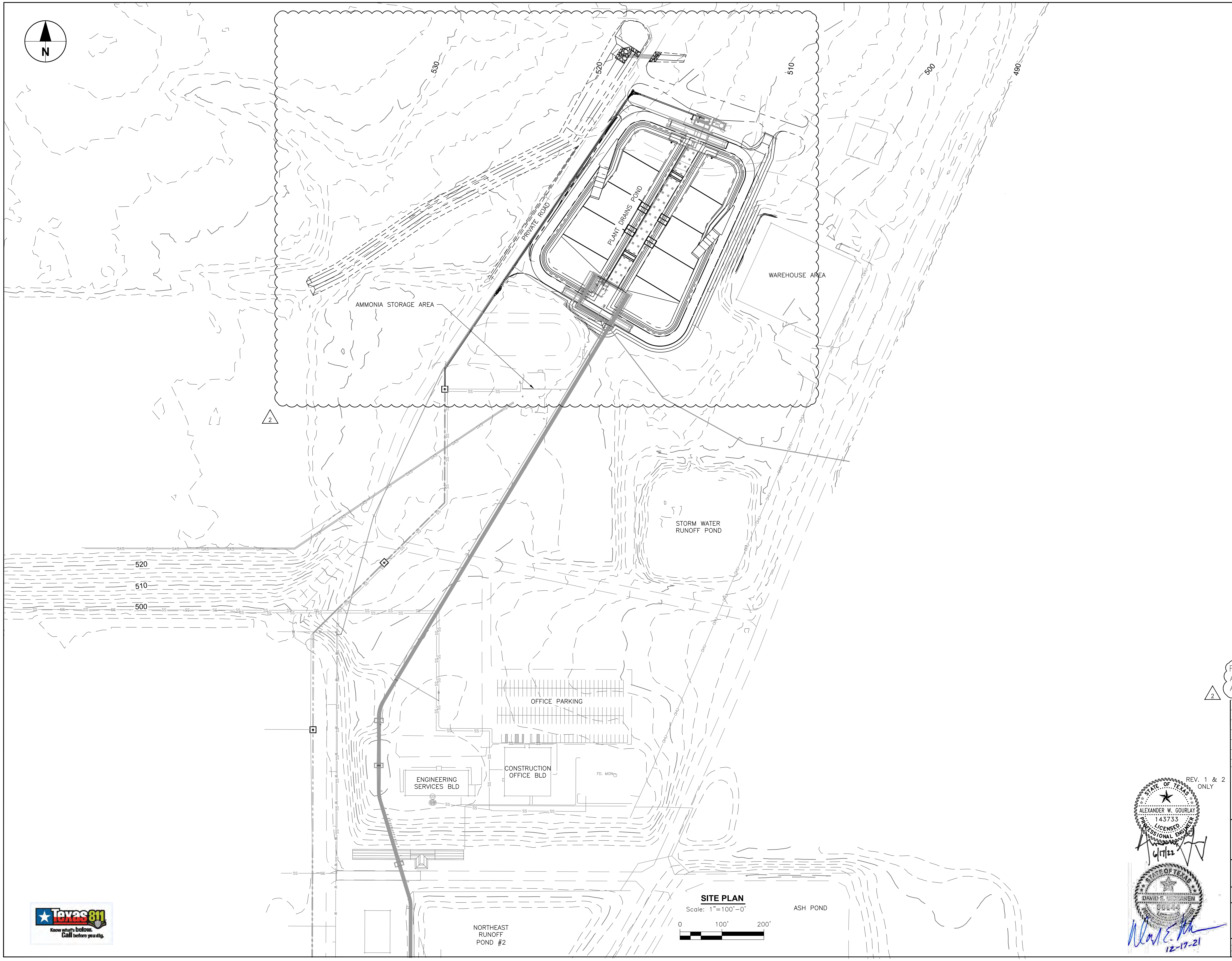
SPRUCE PLANT DRAINS PROJECT

GENERAL NOTES AND LEGEND
PLANT DRAINS POND

DRAWN BY: A. PROCTOR
CHKD BY: A. FORD
APPVD BY: A. GOURLAY
DRAWING NUMBER 2-470-C0002
REVISION 1

ARCH D 36x24

Last saved by: ADAM.FORD(2022-05-04) Last Plotted: 2022-05-04
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0002.DWG



SITE PLAN
Scale: 1"=100'-0'

Last saved by: ADAM.FORD(2022-06-24) Last Plotted: 2022-06-24
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0003.DWG

ISSUE FOR CONSTRUCTION

REVISION 2 MODIFICATIONS OF THIS DRAWING ARE RELEASED UNDER THE AUTHORITY OF ALEXANDER W. GOURLAY, TEXAS PE. 14733

2

ALEXANDER W. GOURLAY
143733
6/17/22

REV. 1 & 2 ONLY

DAVID E. MICKANEN
12-17-21

NO	DATE	REVISION	DWN	CHKD	APRV
2	06-17-2022	ISSUE FOR CONSTRUCTION - STORMWATER DIVERSION	AWF	TER	AWG
1	05-02-2022	ISSUE FOR CONSTRUCTION - POND DESIGN UPDATES	AJP	AWF	AWG
0	12-17-2021	ISSUE FOR CONSTRUCTION	AWF	DEM	DEM

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

This drawing has been prepared for the use of ENGINEER's client and may not be used, reproduced or relied upon by third parties, except as agreed by ENGINEER and its client, as required by law or for use by governmental reviewing agencies. ENGINEER accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without ENGINEER's express written consent. Do not scale this document. All measurements must be obtained from stated dimensions.

cps ENERGY
J K SPRUCE POWER PLANT

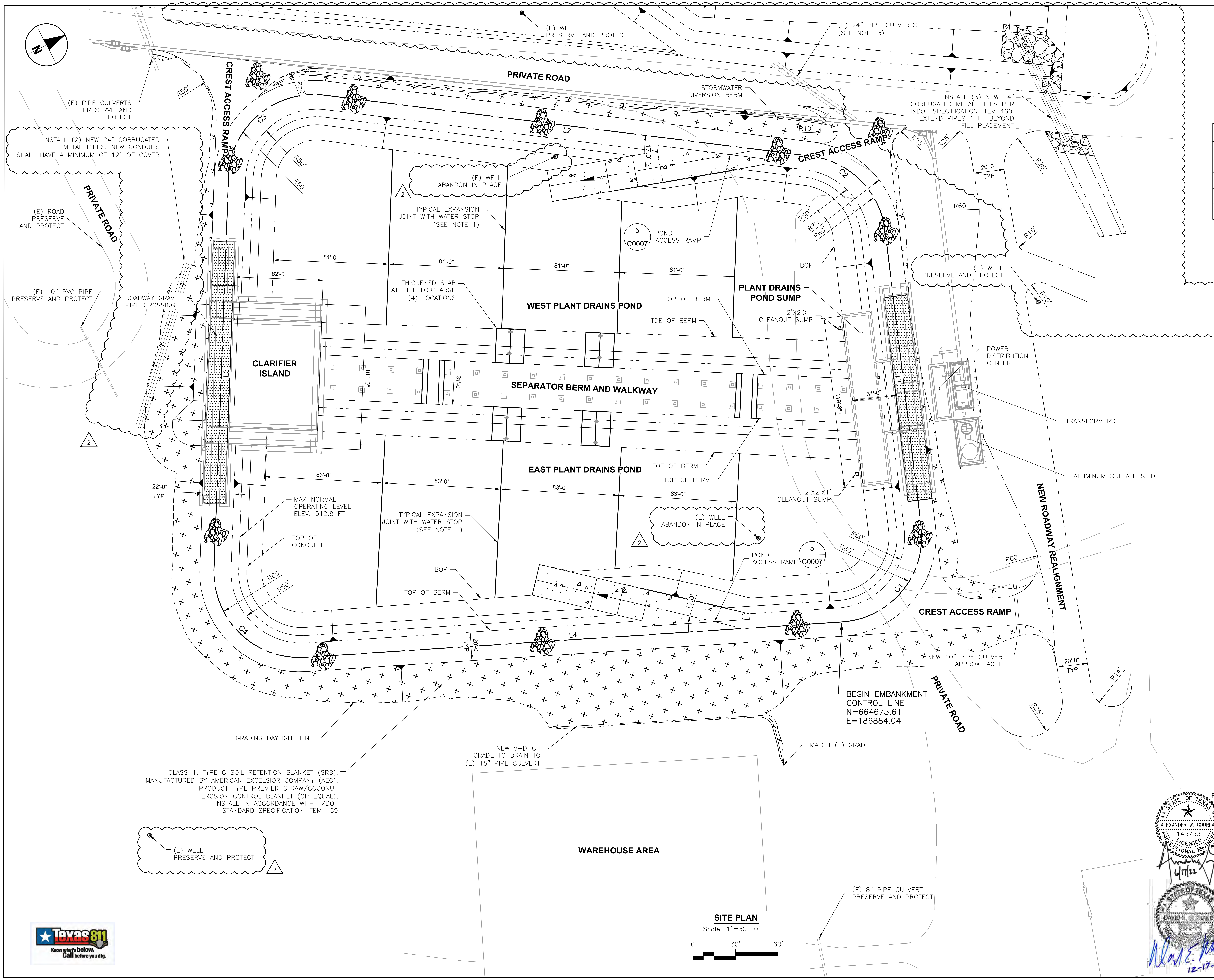
SPRUCE PLANT DRAINS PROJECT

OVERALL SITE PLAN
PLANT DRAINS POND

DRAWN BY: A. PROCTOR CHKD BY: A. FORD APPVD BY: A. GOURLAY	DRAWING NUMBER 2-470-C0003	REVISION 2

ARCH D 36x24

C:\Users\adam.fo... 20-SHEETS\Civil\PD Pond\60566130-2-470-C0003.dwg, 6/24/2022 1:35:04 PM, ARCH full bleed D (36.00 x 24.00 Inches), 1:1



SITE PLAN
Scale: 1"=30'-0'

Texas811 Know what's below. Call before you dig.

LINE TABLE		
LINE	LENGTH	BEARING
L1	209.09	N69°08'18"W
L2	343.84	S34°56'27"W
L3	275.30	S60°05'15"E
L4	377.40	N24°01'53"E

CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	TANGENT	CHORD
C1	97.57	60.00	93°10'12"	63.41	87.17
C2	79.50	60.00	75°55'15"	46.81	73.81
C3	99.51	60.00	95°01'41"	65.51	88.49
C4	100.41	60.00	95°52'52"	66.50	89.09

NOTES:
1. CONTRACTOR TO INSTALL CONTROL JOINTS ON APPROXIMATELY 30 FOOT GRID
2. CONTRACTOR TO HYDRO-EXCAVATE ANY UTILITIES ENCOUNTERED THAT ARE NOT IDENTIFIED ON THE DRAWINGS
3. CONTRACTOR TO REMOVE EXISTING CULVERTS AND BACKFILL WITH STRUCTURAL FILL. RESTORE ROAD SURFACE TO ORIGINAL CONDITIONS

2

ISSUE FOR CONSTRUCTION

REVISION 2 MODIFICATIONS OF THIS DRAWING ARE RELEASED UNDER THE AUTHORITY OF ALEXANDER W. GOURLAY, TEXAS PE. 14733

2

NO	DATE	REVISION	DWN	CHKD	APRV
2	06-17-2022	ISSUE FOR CONSTRUCTION - STORMWATER DIVERSION	AWF	TER	AWG
1	05-02-2022	ISSUE FOR CONSTRUCTION - POND DESIGN UPDATES	AJP	AWF	AWG
0	12-17-2021	ISSUE FOR CONSTRUCTION	AWF	DEM	DEM

REV. 1 & 2
ONLY

ALEXANDER W. GOURLAY
143733
6/17/22

DAVID E. [illegible]
12-17-21

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

cps ENERGY
J K SPRUCE POWER PLANT

SPRUCE PLANT DRAINS PROJECT

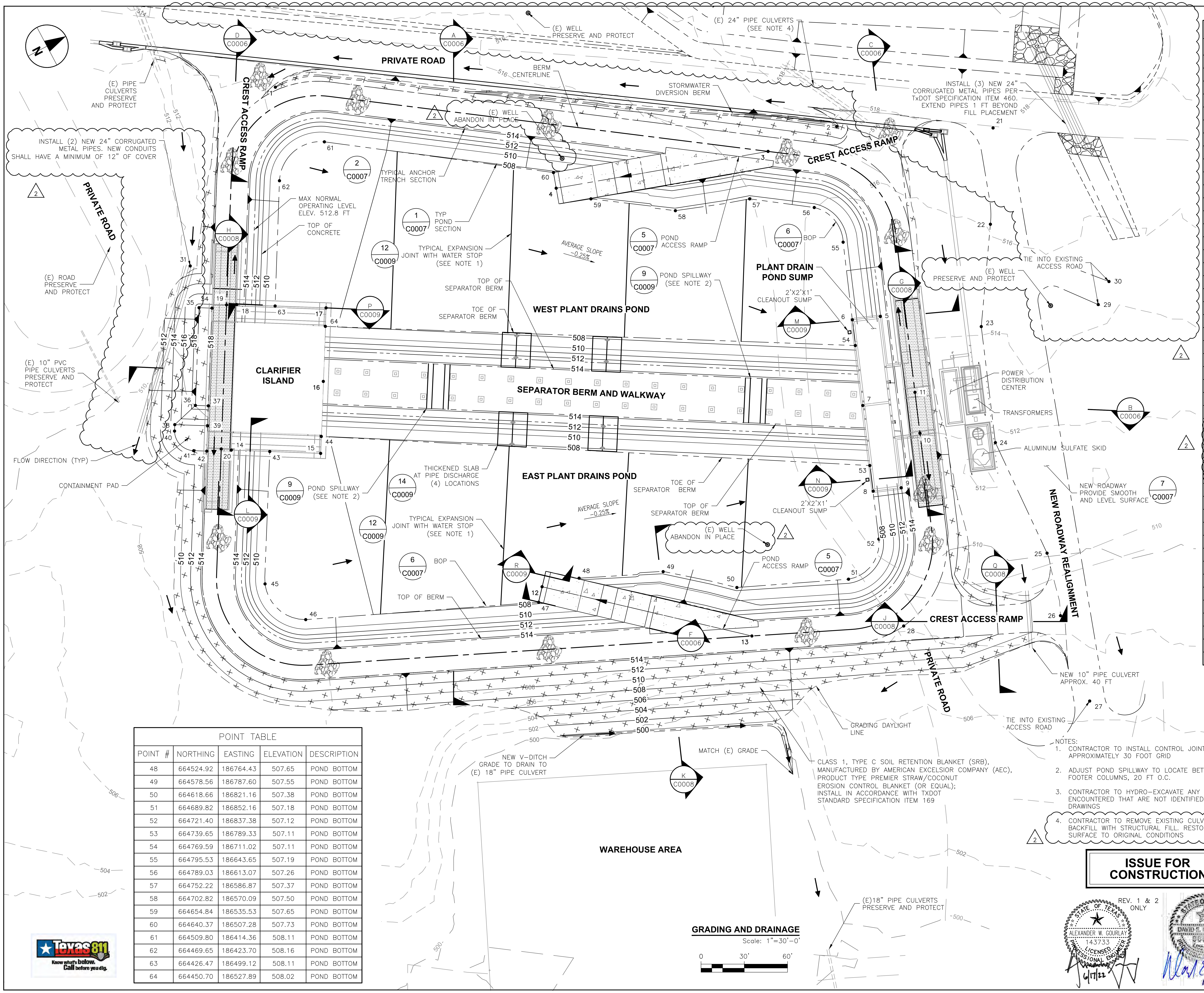
SITE PLAN
PLANT DRAINS POND

DRAWN BY: A. PROCTOR
CHKD BY: A. FORD
APPVD BY: A. GOURLAY

DRAWING NUMBER 2-470-C0004
REVISION 2

ARCH D 36x24

Last saved by: ADAM.FORD(2022-06-17) Last Plotted: 2022-06-17
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0004.DWG



GRADING AND DRAINAGE

Scale: 1"=30'-0"

0 30' 60'

POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	664497.42	186364.96	515.28	BEGIN BERM
2	664829.03	186570.61	518.61	END BERM
3	664778.85	186563.70	515.00	RAMP
4	664636.97	186517.76	507.73	RAMP
5	664794.30	186701.24	514.80	SUMP CORNER
6	664776.08	186694.30	514.80	SUMP CORNER
7	664754.77	186750.21	514.80	WALKWAY
8	664733.47	186806.12	514.80	SUMP CORNER
9	664751.69	186813.07	514.80	SUMP CORNER
10	664780.85	186785.69	519.00	PIPE CROSSING
11	664791.02	186758.99	519.00	PIPE CROSSING
12	664499.41	186757.71	507.72	RAMP
13	664612.19	186855.77	515.00	RAMP
14	664352.99	186573.37	515.00	CLARIFIER
15	664406.74	186604.29	515.00	CLARIFIER
16	664431.66	186560.98	514.80	WALKWAY
17	664457.11	186516.75	515.00	CLARIFIER
18	664403.37	186485.83	515.00	CLARIFIER
19	664397.06	186482.75	519.00	PIPE CROSSING
20	664347.18	186569.45	519.00	PIPE CROSSING
21	664924.43	186622.07	517.45	ROADWAY CL
22	664891.66	186680.27	516.30	ROADWAY TAPER
23	664852.96	186740.11	514.12	ROADWAY TAPER
24	664824.08	186815.88	511.87	ROADWAY TAPER
25	664820.02	186900.38	510.12	ROADWAY TAPER
26	664808.04	186943.09	508.54	RAMP
27	664798.33	187004.91	506.42	ROADWAY CL
28	664708.54	186898.73	514.30	RAMP
29	664931.80	186764.42	514.47	ROADWAY PT
30	664945.87	186753.77	514.88	ROADWAY PT
31	664387.35	186447.10	510.00	PIPE INVERT
32	NOT USED	NOT USED	NOT USED	NOT USED
33	NOT USED	NOT USED	NOT USED	NOT USED
34	664387.08	186480.05	518.75	PIPE COVER
35	664379.26	186475.58	518.75	PIPE COVER
36	664345.45	186534.36	518.75	PIPE COVER
37	664353.23	186538.80	518.75	PIPE COVER
38	664326.55	186539.48	514.80	CONTAINMENT PAD
39	664346.37	186550.81	514.80	CONTAINMENT PAD
40	664324.34	186543.35	514.80	CONTAINMENT PAD
41	664329.82	186561.61	514.80	CONTAINMENT PAD
42	664337.63	186566.08	514.80	CONTAINMENT PAD
43	664376.12	186586.68	508.11	POND BOTTOM
44	664412.60	186594.10	508.01	POND BOTTOM
45	664330.42	186666.39	508.17	POND BOTTOM
46	664343.81	186701.45	508.12	POND BOTTOM
47	664492.31	186766.13	507.72	POND BOTTOM

POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
48	664524.92	186764.43	507.65	POND BOTTOM
49	664578.56	186787.60	507.55	POND BOTTOM
50	664618.66	186821.16	507.38	POND BOTTOM
51	664689.82	186852.16	507.18	POND BOTTOM
52	664721.40	186837.38	507.12	POND BOTTOM
53	664739.65	186789.33	507.11	POND BOTTOM
54	664769.59	186711.02	507.11	POND BOTTOM
55	664795.53	186643.65	507.19	POND BOTTOM
56	664789.03	186613.07	507.26	POND BOTTOM
57	664752.22	186586.87	507.37	POND BOTTOM
58	664702.82	186570.09	507.50	POND BOTTOM
59	664654.84	186535.53	507.65	POND BOTTOM
60	664640.37	186507.28	507.73	POND BOTTOM
61	664509.80	186414.36	508.11	POND BOTTOM
62	664469.65	186423.70	508.16	POND BOTTOM
63	664426.47	186499.12	508.11	POND BOTTOM
64	664450.70	186527.89	508.02	POND BOTTOM

NOTES:

1. CONTRACTOR TO INSTALL CONTROL JOINTS ON APPROXIMATELY 30 FOOT GRID
2. ADJUST POND SPILLWAY TO LOCATE BETWEEN PIPE RACK FOOTER COLUMNS, 20 FT O.C.
3. CONTRACTOR TO HYDRO-EXCAVATE ANY UTILITIES ENCOUNTERED THAT ARE NOT IDENTIFIED ON THE DRAWINGS
4. CONTRACTOR TO REMOVE EXISTING CULVERTS AND BACKFILL WITH STRUCTURAL FILL. RESTORE ROAD SURFACE TO ORIGINAL CONDITIONS

2

ISSUE FOR CONSTRUCTION

REV. 1 & 2 ONLY

ALEXANDER W. GOURLAY 143733

6/17/22

DAVID E. MICKANEN

12-17-21

REVISION 2 MODIFICATIONS OF THIS DRAWING ARE RELEASED UNDER THE AUTHORITY OF ALEXANDER W. GOURLAY, TEXAS PE. 14733

2

NO	DATE	REVISION	DWN	CHKD	APRV
2	06-17-2022	ISSUE FOR CONSTRUCTION - STORMWATER DIVERSION	AWF	TER	AWG
1	05-02-2022	ISSUE FOR CONSTRUCTION - POND DESIGN UPDATES	AJP	AWF	AWG
0	12-17-2021	ISSUE FOR CONSTRUCTION	AWF	DEM	DEM

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

cps ENERGY

J K SPRUCE POWER PLANT

SPRUCE PLANT DRAINS PROJECT

GRADING AND DRAINAGE PLAN
PLANT DRAINS POND

DRAWN BY: A. PROCTOR
CHKD BY: A. FORD
APPVD BY: A. GOURLAY

DRAWING NUMBER 2-470-C0005

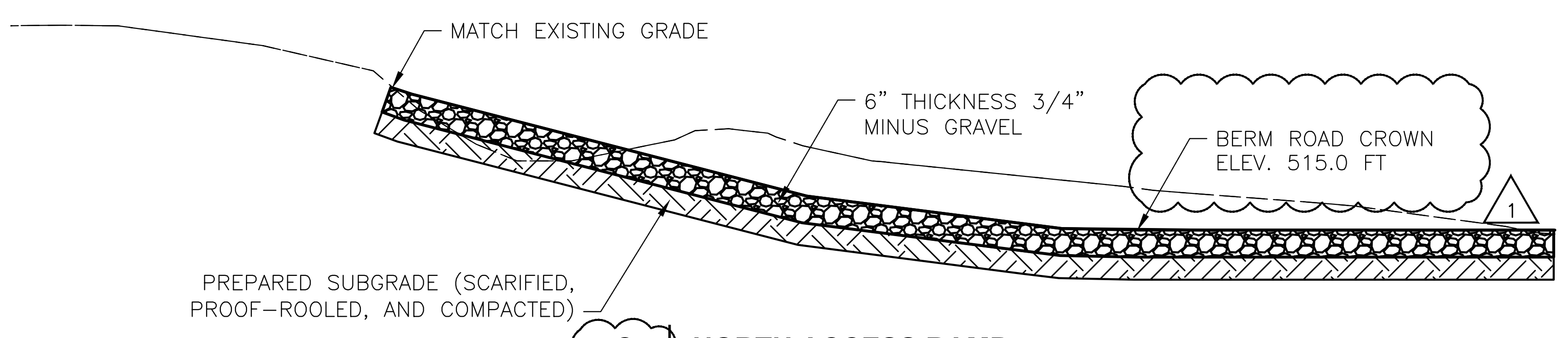
REVISION 2

ARCH D 36x24

Last saved by: ADAM.FORD(2022-06-17) Last Plotted: 2022-06-17
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0005.DWG

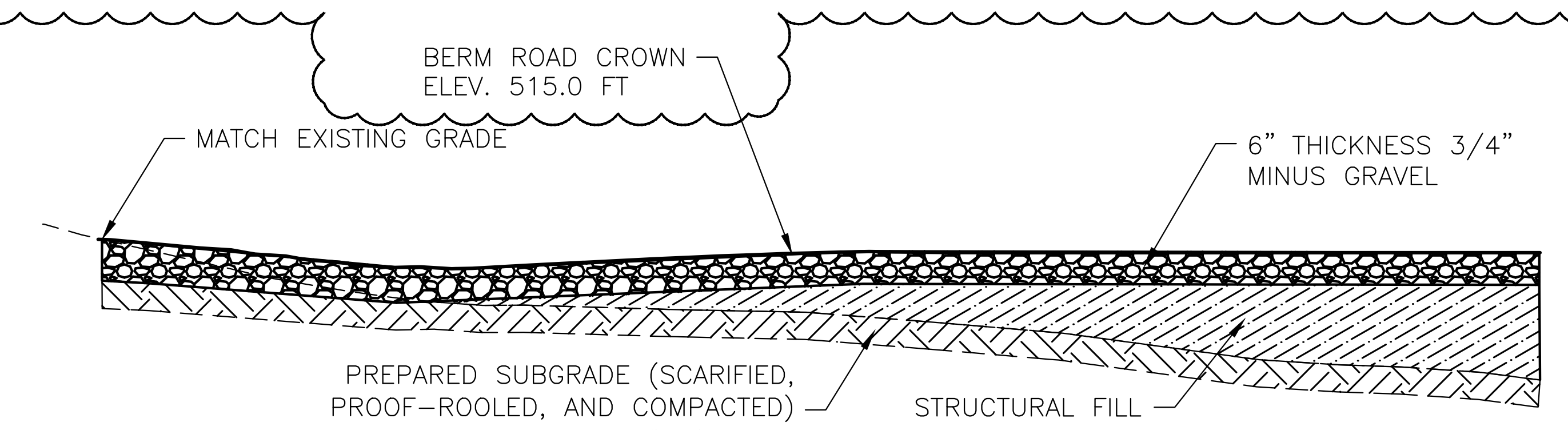
A | **EAST WEST**
C0005 | SCALE NTS – VERTICALLY EXAGGERATED

B | **SEPARATOR BERM NORTH SOUTH**
C0005 | SCALE NTS – VERTICALLY EXAGGERATED



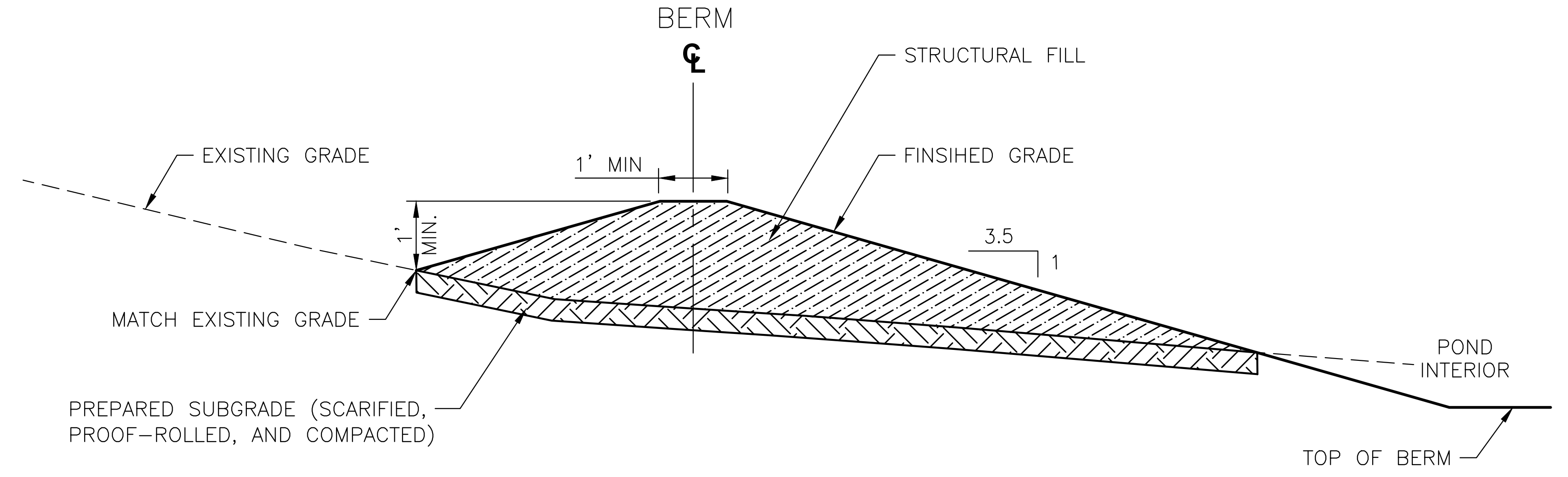
C | **NORTH ACCESS RAMP**
C0005 | SCALE NTS

1

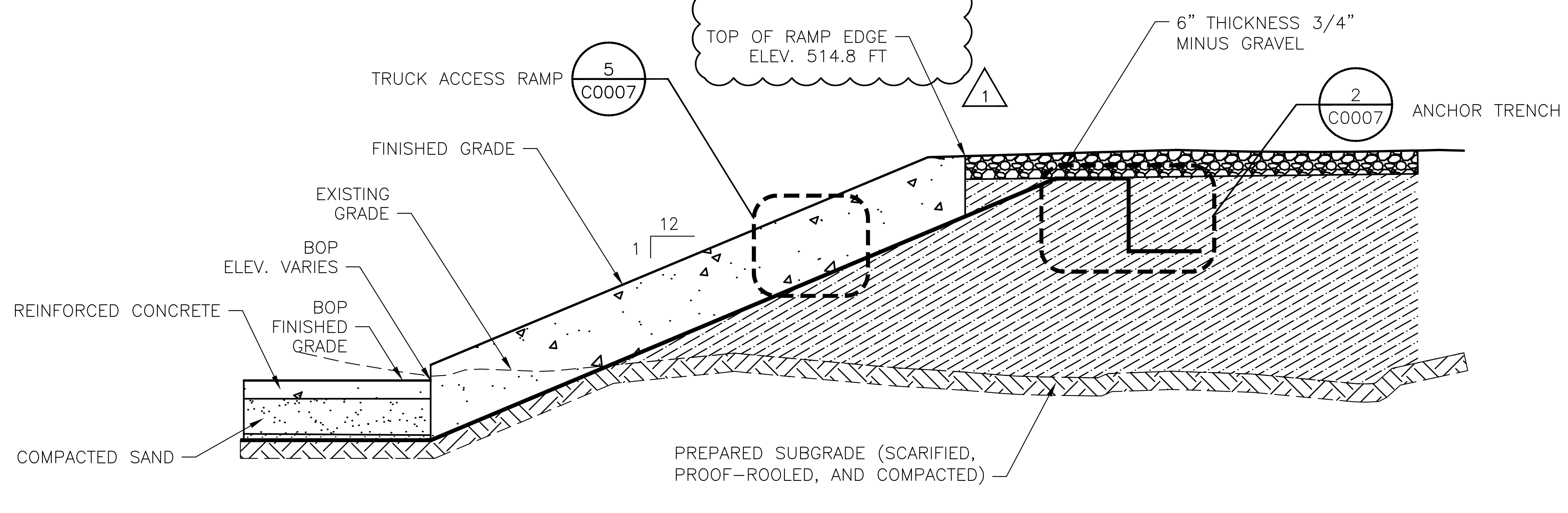


1

D | **SOUTH ACCESS RAMP**
C0005 | SCALE NTS



E | **STORMWATER DIVERSION BERM**
C0006 | SCALE NTS



F | **TRUCK ACCESS RAMP**
C0005 | SCALE NTS – VERTICALLY EXAGGERATED

1

ISSUE FOR CONSTRUCTION

NO	DATE	REVISION	DWN	CHKD	APRV
1	05-02-2022	ISSUE FOR CONSTRUCTION - POND DESIGN UPDATES	AJP	AWF	AWG
0	12-17-2021	ISSUE FOR CONSTRUCTION	AWF	DEM	DEM

AECOM PROJECT NO. 60566130 AUSTIN, TEXAS

AECOM

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

ALEXANDER W. GOURLAY
143733
REV. 1
ONLY
5/2/22

DAVID E. MICKANEN
98644
12-17-21

cps ENERGY
J K SPRUCE POWER PLANT

SPRUCE PLANT DRAINS PROJECT

SECTION AND DETAILS 01
PLANT DRAINS POND

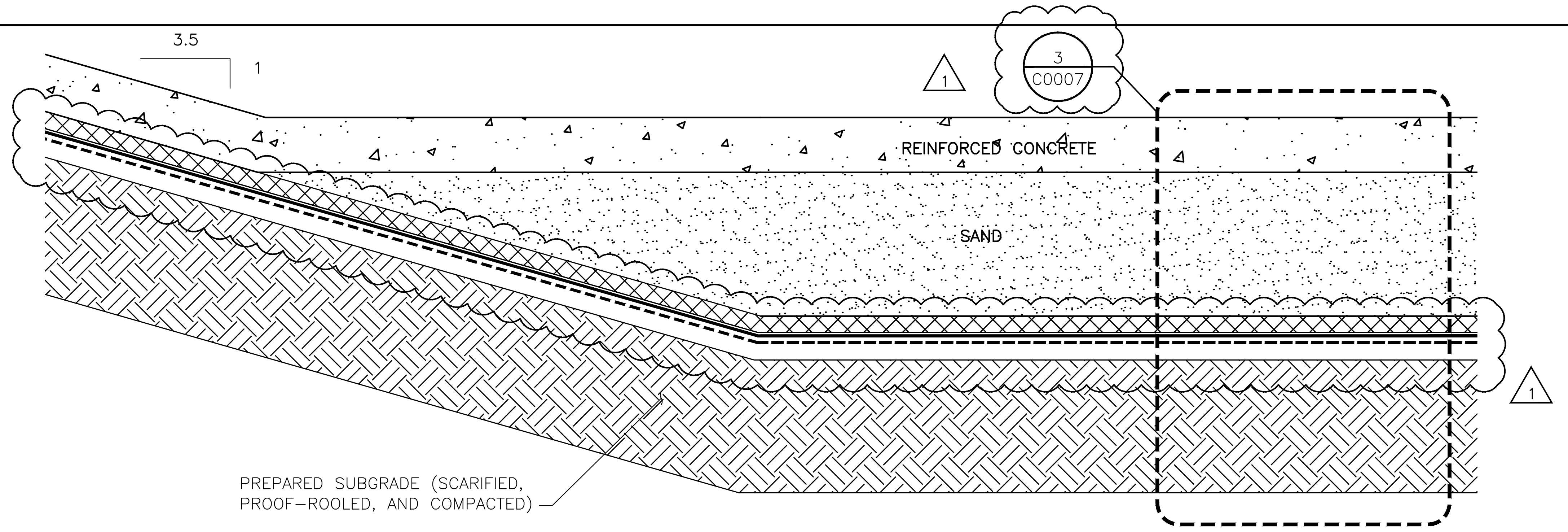
DRAWN BY: A. PROCTOR
CHKD BY: A. FORD
APPVD BY: A. GOURLAY

DRAWING NUMBER
2-470-C0006

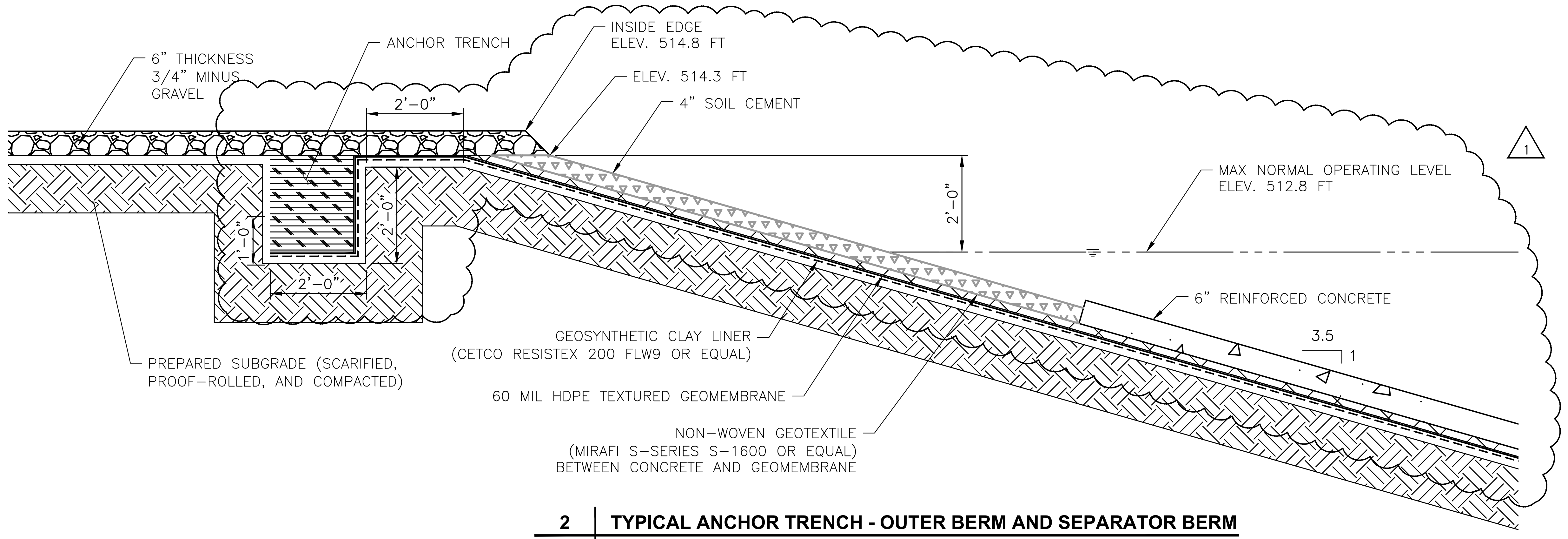
REVISION
1

ARCH D 36x24

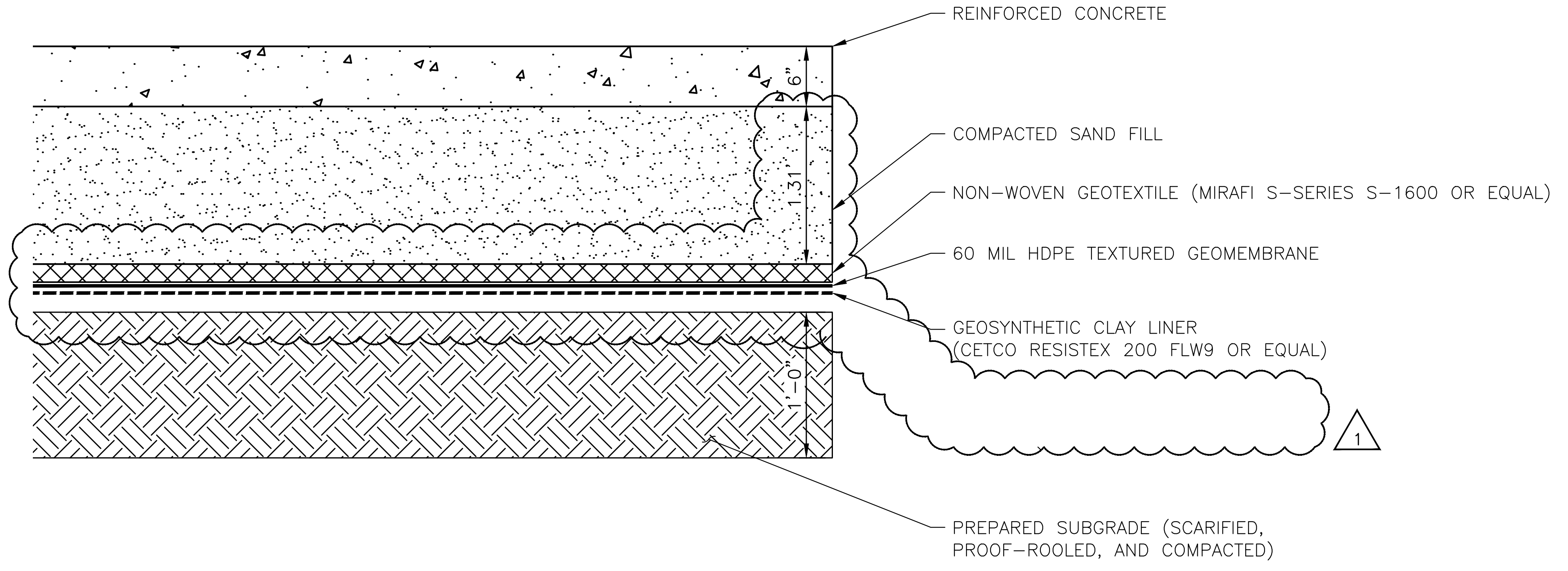
Last saved by: ADAM.FORD(2022-05-04) Last Plotted: 2022-05-04
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0006.DWG



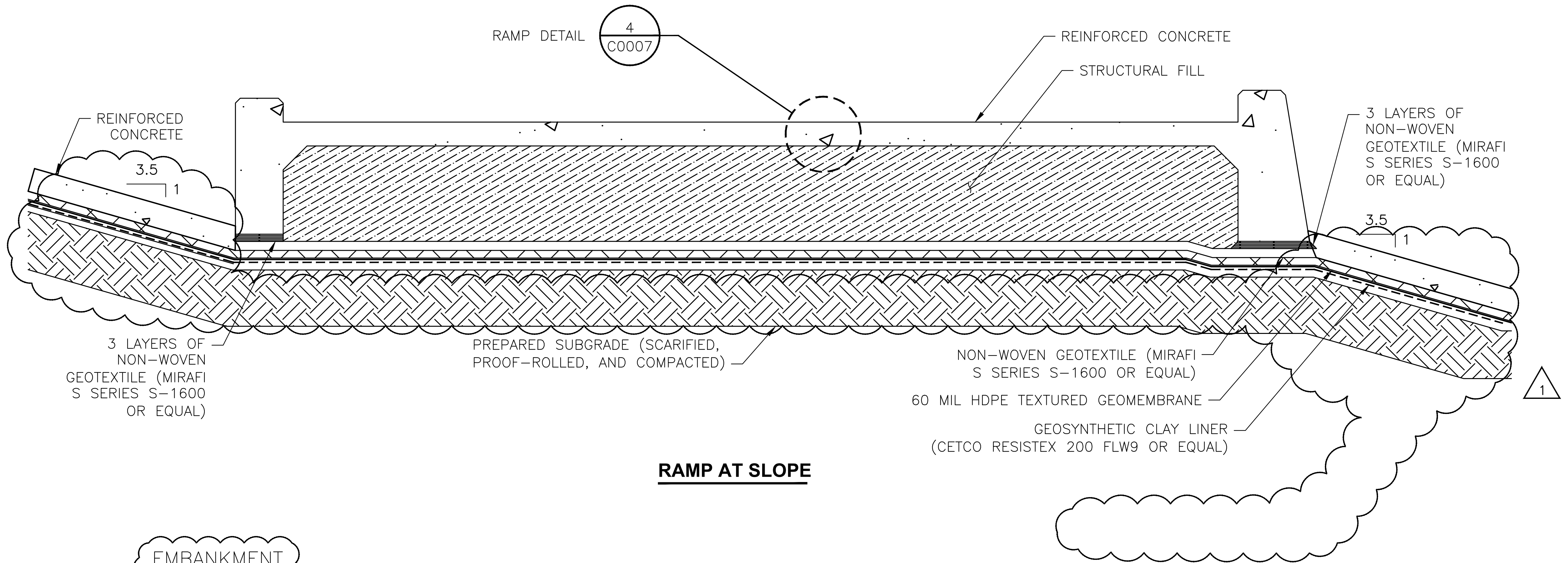
1 TYPICAL PLANT DRAINS POND SECTION
C0005
C0006
Scale NTS



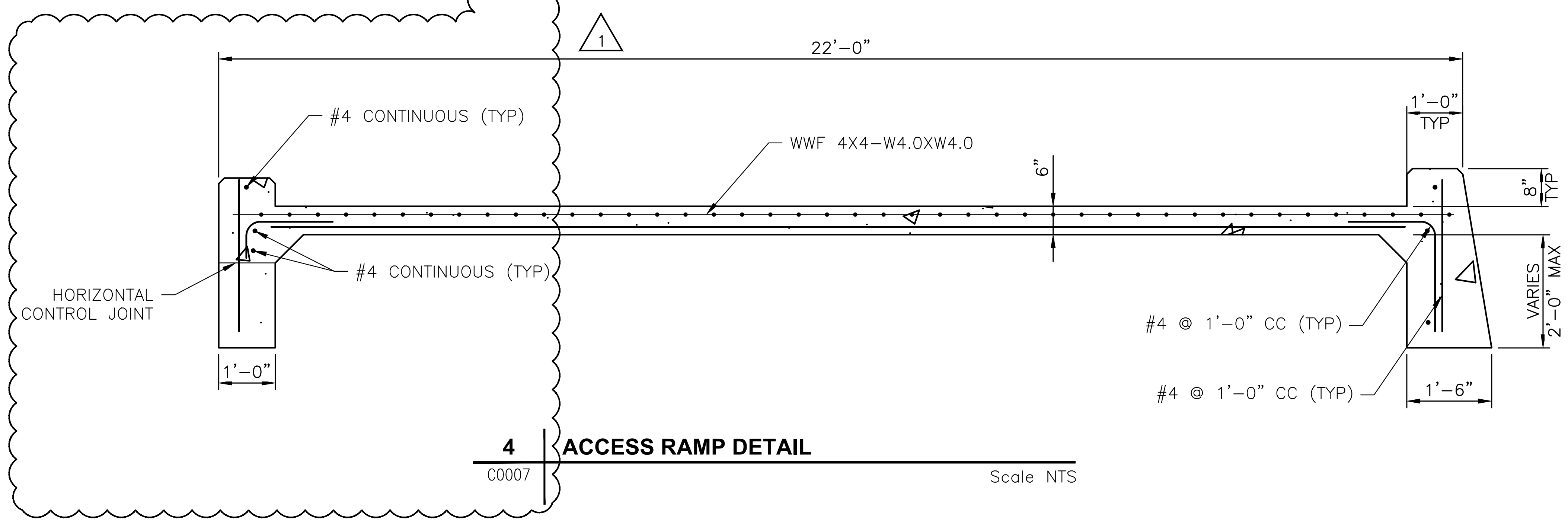
2 TYPICAL ANCHOR TRENCH - OUTER BERM AND SEPARATOR BERM
C0005
C0006
Scale NTS



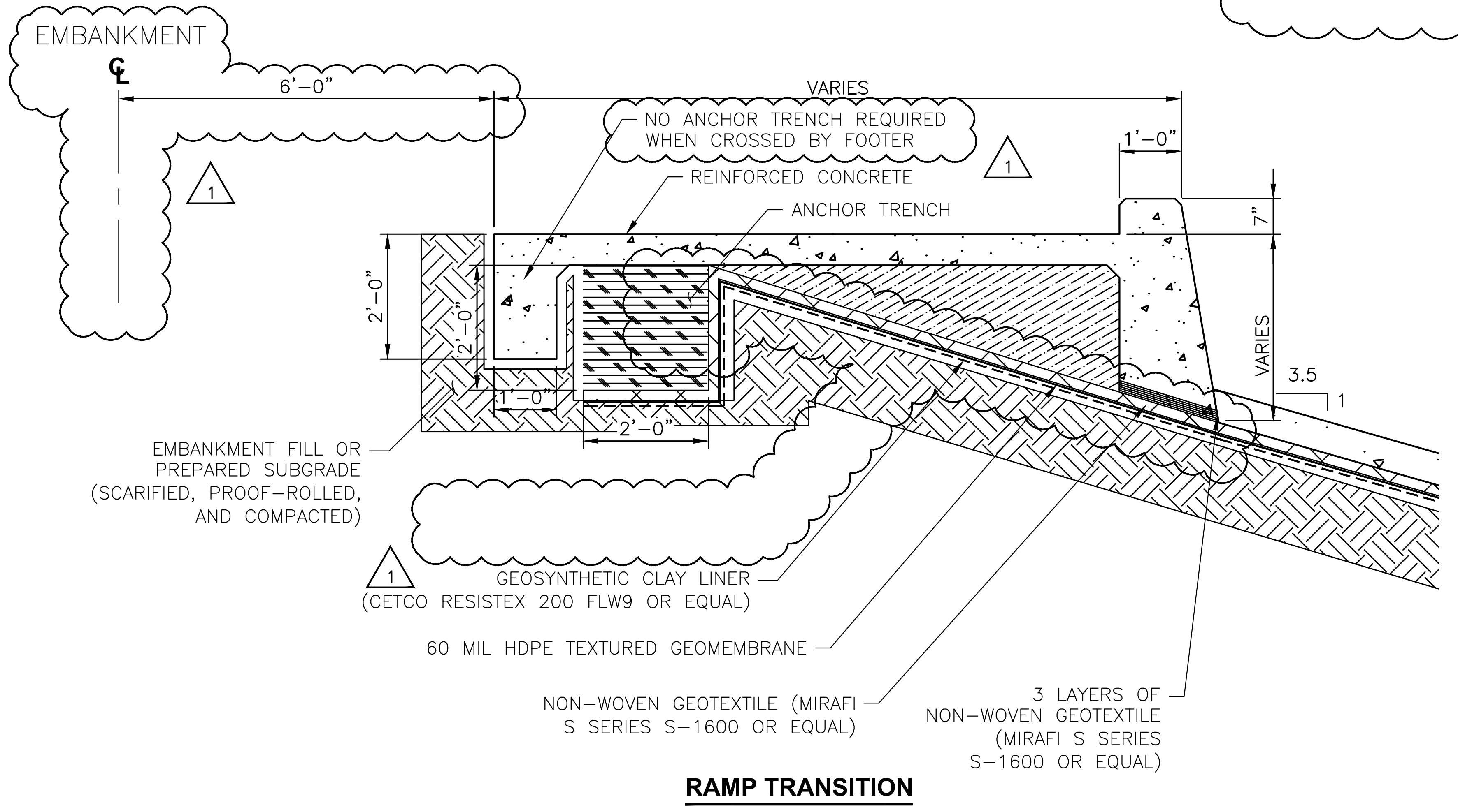
3 TYPICAL POND LINER DETAIL
C0006
C0008
C0007
Scale NTS



RAMP AT SLOPE

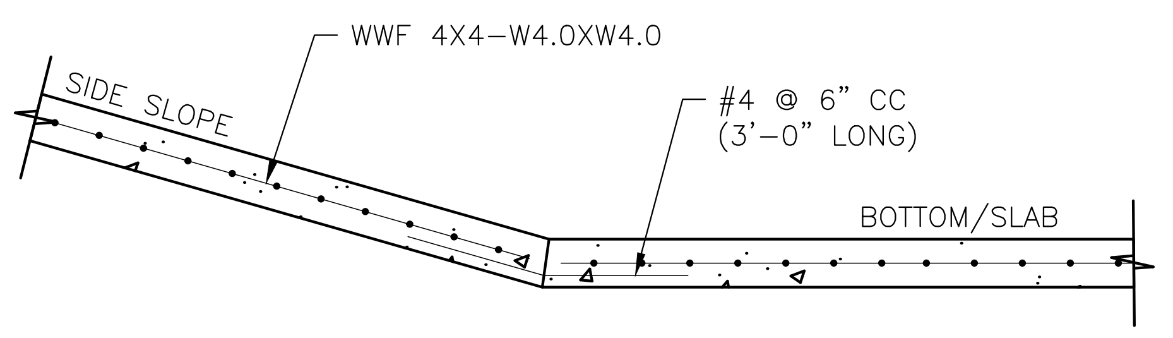


4 ACCESS RAMP DETAIL
C0007
Scale NTS



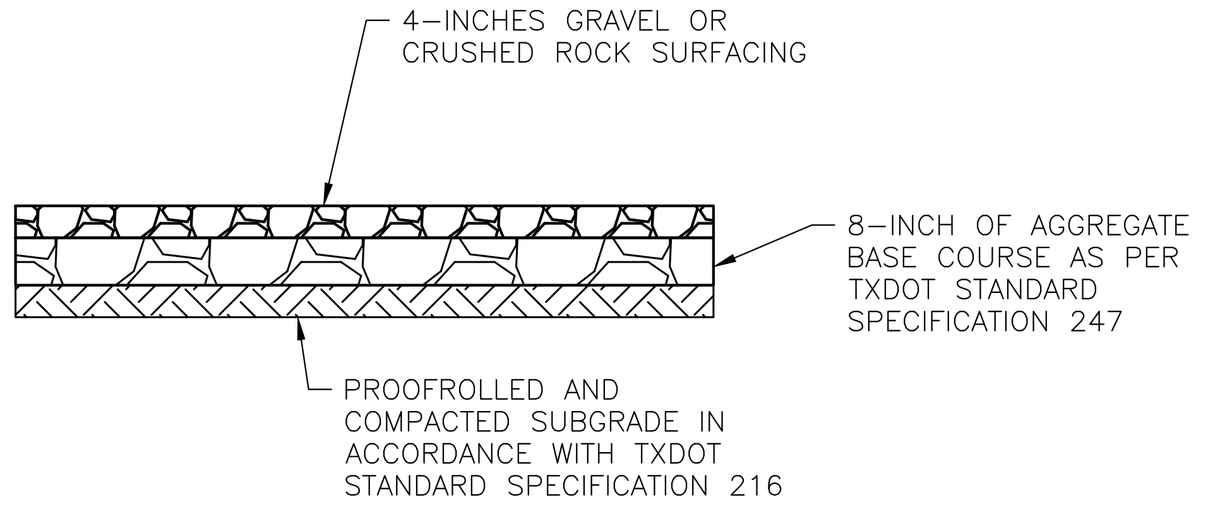
RAMP TRANSITION

5 TYPICAL TRUCK ACCESS RAMP SECTIONS
C0004
C0005
C0006
Scale NTS



6 SIDE SLOPE TIE TO BOTTOM DETAIL
C0005
Scale NTS

1



7 GRAVEL ROAD DETAIL
C0005
C0006
Scale NTS

ISSUE FOR CONSTRUCTION

ALEXANDER W. GOURLAY
143733
REV. 1 ONLY
5/2/22

DAVID E. MICKANEN
98644
12-17-21

NO	DATE	REVISION	DWN	CHKD	APRV
1	05-02-2022	ISSUE FOR CONSTRUCTION - POND DESIGN UPDATES	AJP	AWF	AWG
0	12-17-2021	ISSUE FOR CONSTRUCTION	AWF	DEM	DEM

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

This drawing has been prepared for the use of ENGINEER's client and may not be used, reproduced or relied upon by third parties, except as agreed by ENGINEER and its client, as required by law or for use by governmental reviewing agencies. ENGINEER accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without ENGINEER's express written consent. Do not scale this document. All measurements must be obtained from stated dimensions.

cps ENERGY
J K SPRUCE POWER PLANT

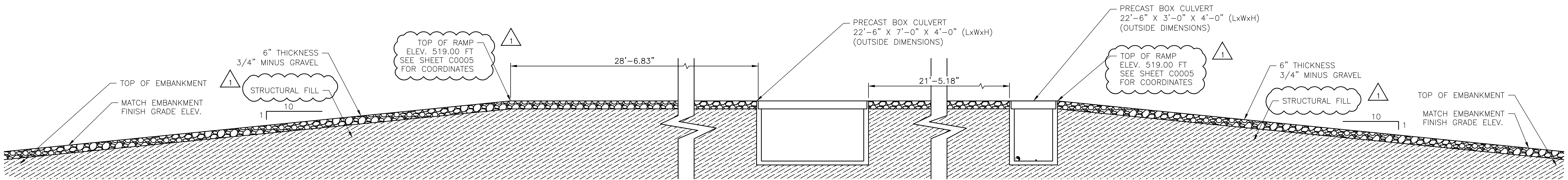
SPRUCE PLANT DRAINS PROJECT

SECTIONS AND DETAILS 02
PLANT DRAINS POND

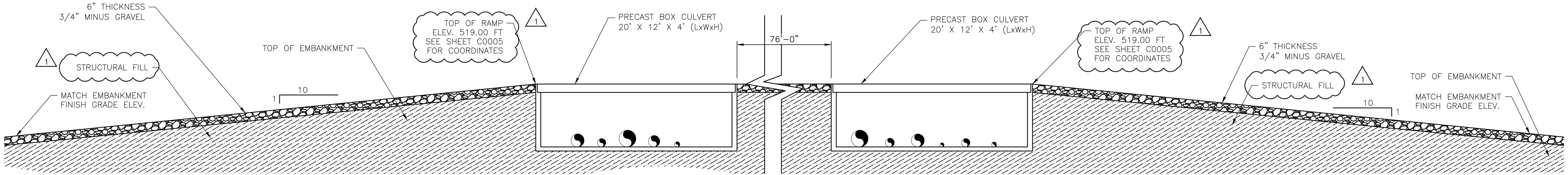
DRAWN BY: A. PROCTOR
CHKD BY: A. FORD
APPVD BY: A. GOURLAY
DRAWING NUMBER 2-470-C0007
REVISION 1
ARCH D 36x24

Last saved by: ADAM.FORD(2022-05-04) Last Plotted: 2022-05-04
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0007.DWG

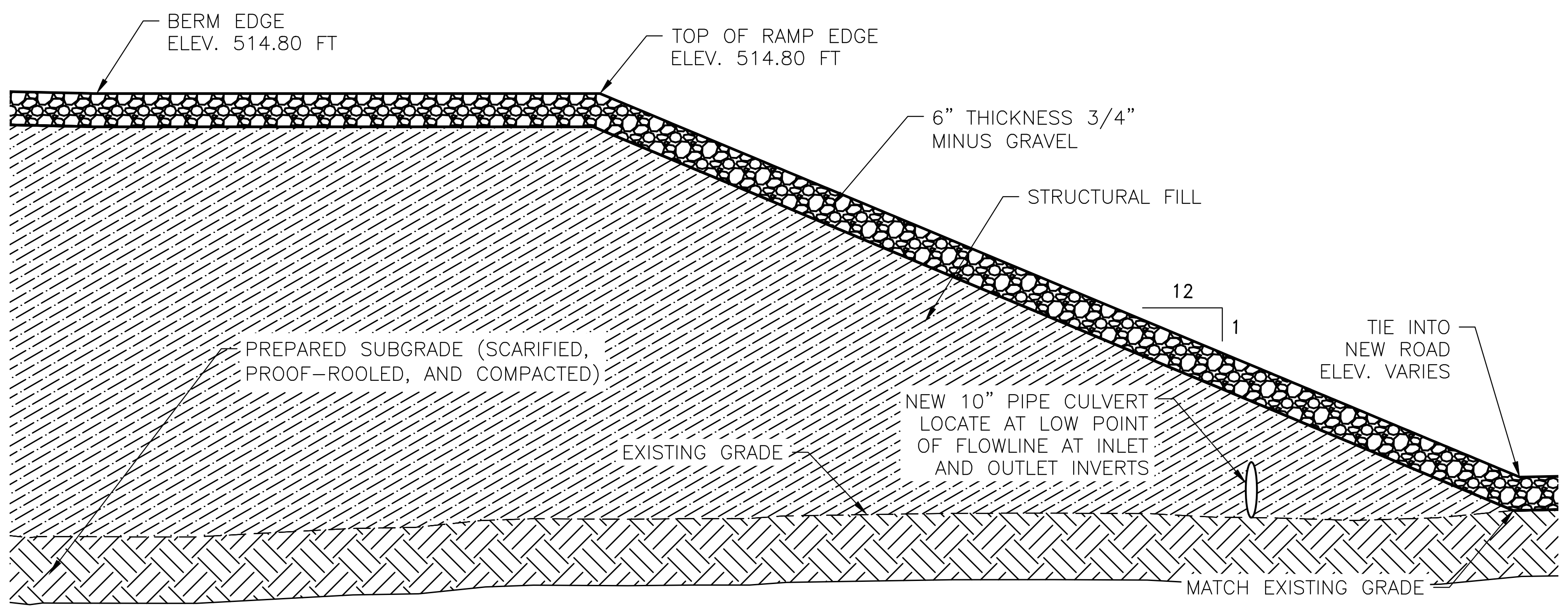
Printed on ___% Post-Consumer Recycled Content Paper



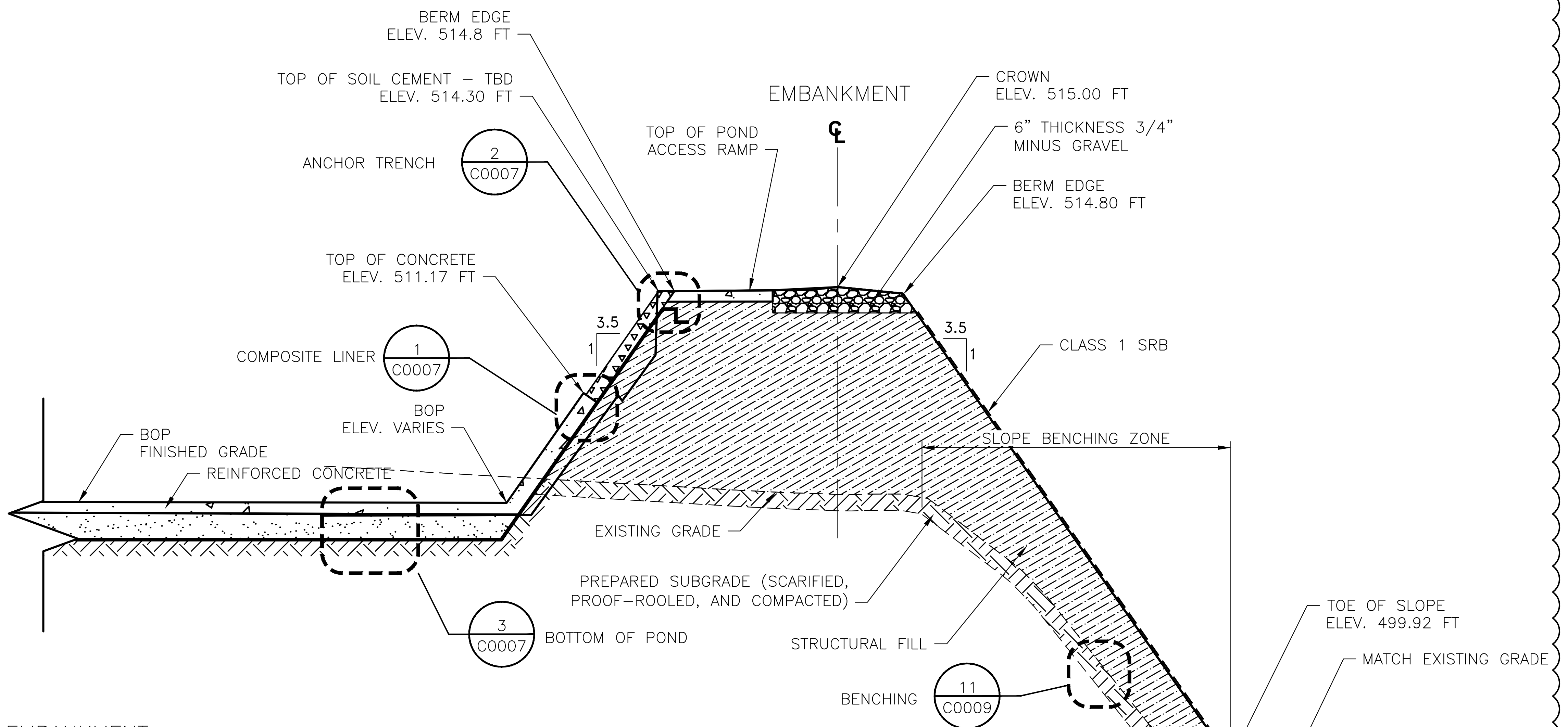
G | **ELECTRICAL CABLE TRAY AND PIPE AT CROSSING AT PLANT DRAINS POND SUMP**
C0005 | SCALE NTS



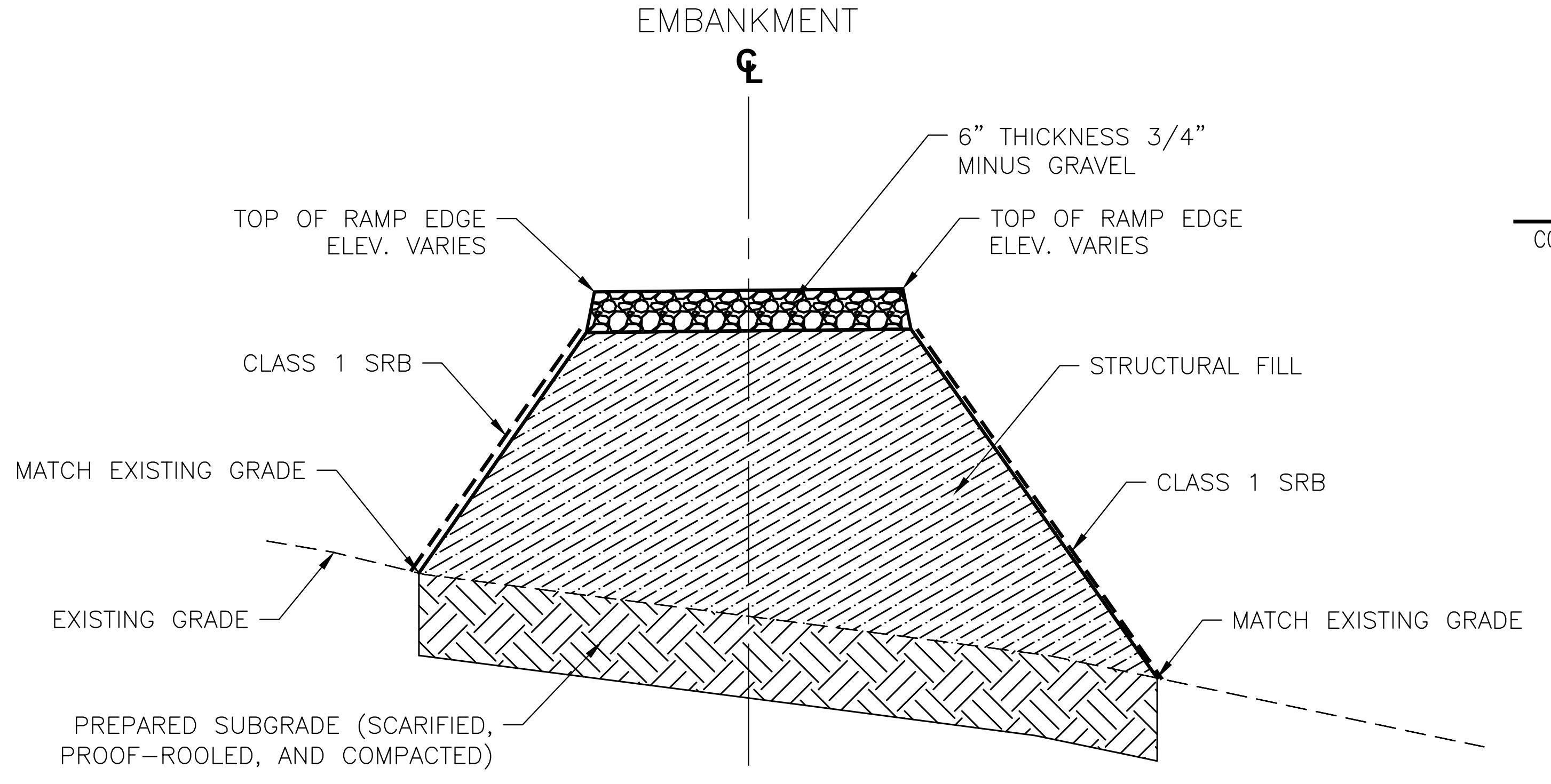
H | **PIPE CROSSING AT CLARIFIERS ISLAND**
C0005 | SCALE NTS



J | **NORTH EAST CREST ACCESS RAMP**
C0005 | SCALE NTS – VERTICALLY EXAGGERATED



K | **EAST EMBANKMENT**
C0005 | SCALE NTS – VERTICALLY EXAGGERATED



Q | **TYPICAL CREST ACCESS RAMP**
C0005 | SCALE NTS – VERTICALLY EXAGGERATED

ISSUE FOR CONSTRUCTION

NO	DATE	REVISION	DWN	CHKD	APRV
1	05-02-2022	ISSUE FOR CONSTRUCTION - POND DESIGN UPDATES	AJP	AWF	AWG
0	12-17-2021	ISSUE FOR CONSTRUCTION	AWF	DEM	DEM

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

ALEXANDER W. GOURLAY
143733
REV. 1 ONLY
5/2/22

DAVID E. MICKANEN
88644
12-17-21

cps ENERGY
J K SPRUCE POWER PLANT

SPRUCE PLANT DRAINS PROJECT

SECTIONS AND DETAILS 03
PLANT DRAINS POND

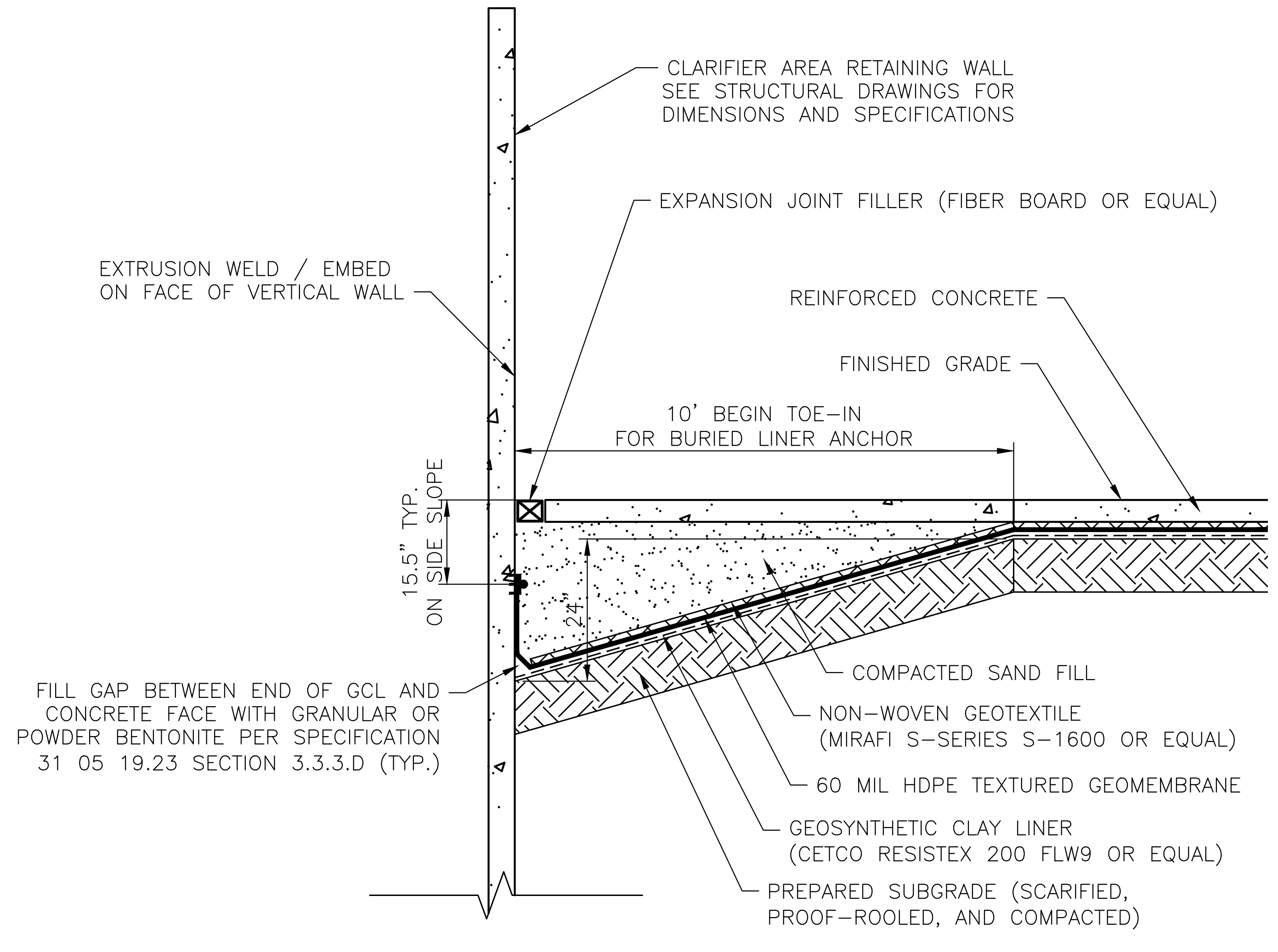
DRAWN BY: A. PROCTOR
CHKD BY: A. FORD
APPVD BY: A. GOURLAY

DRAWING NUMBER 2-470-C0008

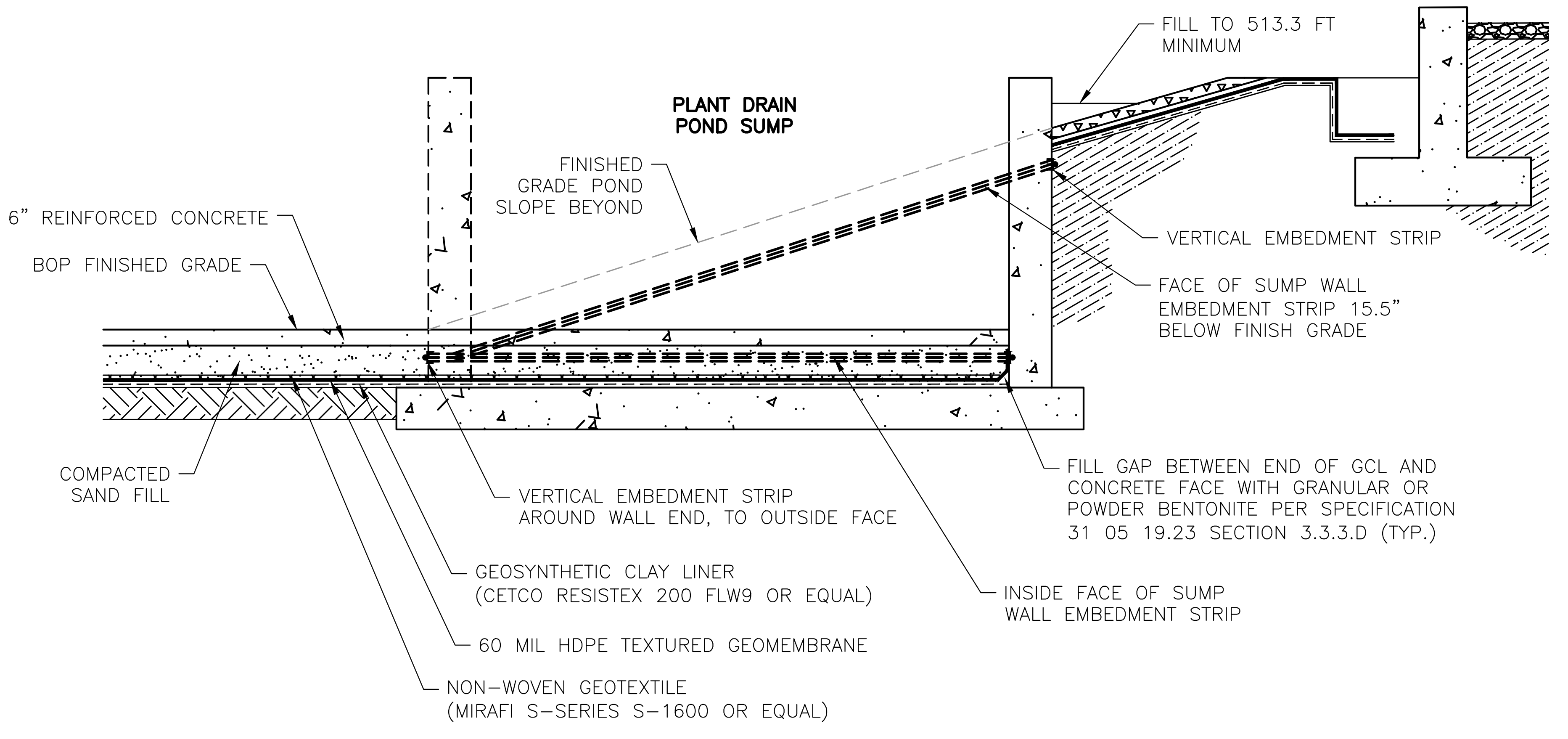
REVISION 1

ARCH D 36x24

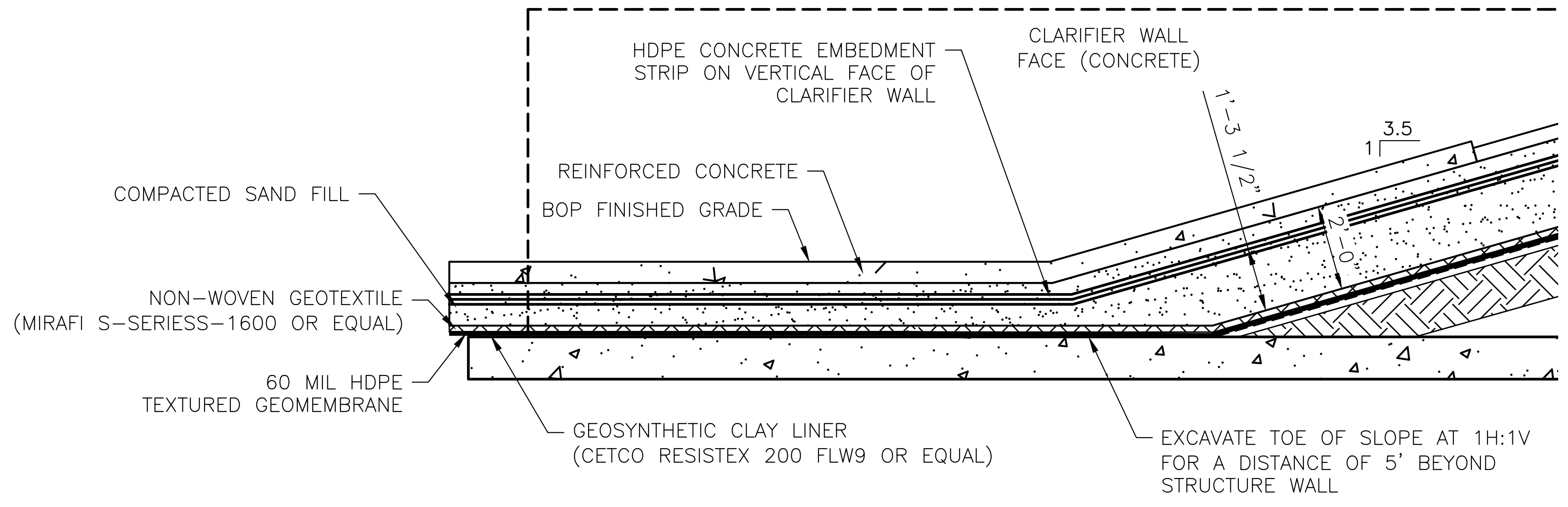
Last saved by: ADAM.FORD(2022-05-04) Last Plotted: 2022-05-04
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0008.DWG



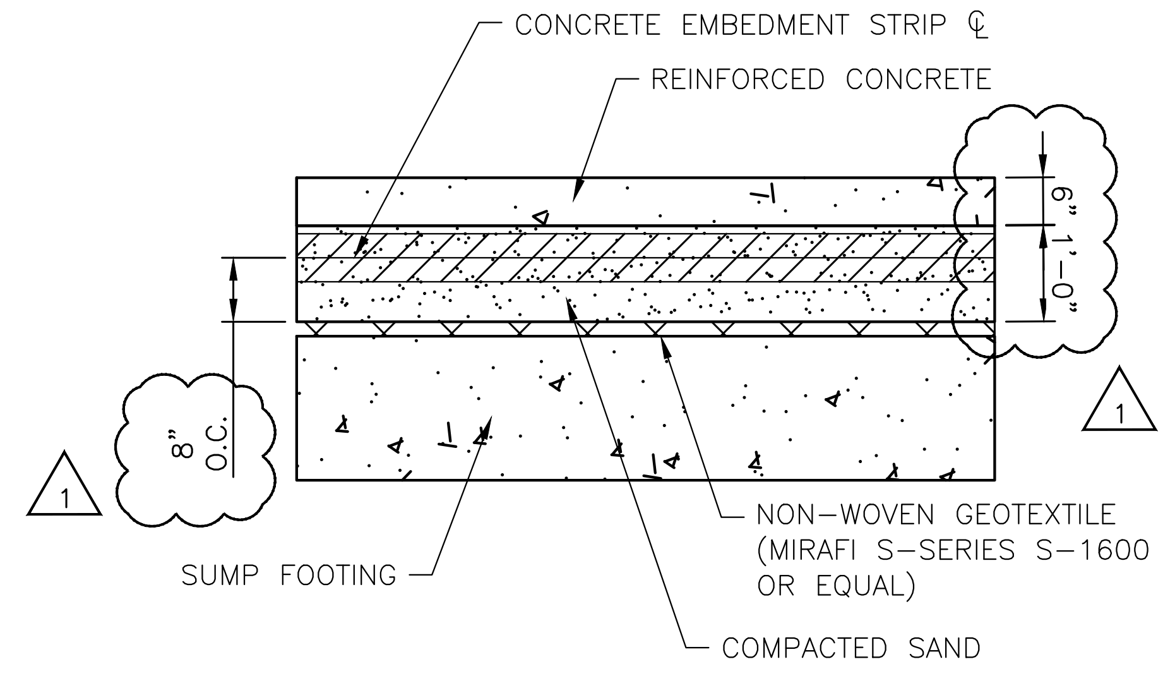
L **HDPE CONCRETE EMBEDMENT - MID-SLOPE**
C0005 SCALE NTS – VERTICALLY EXAGGERATED



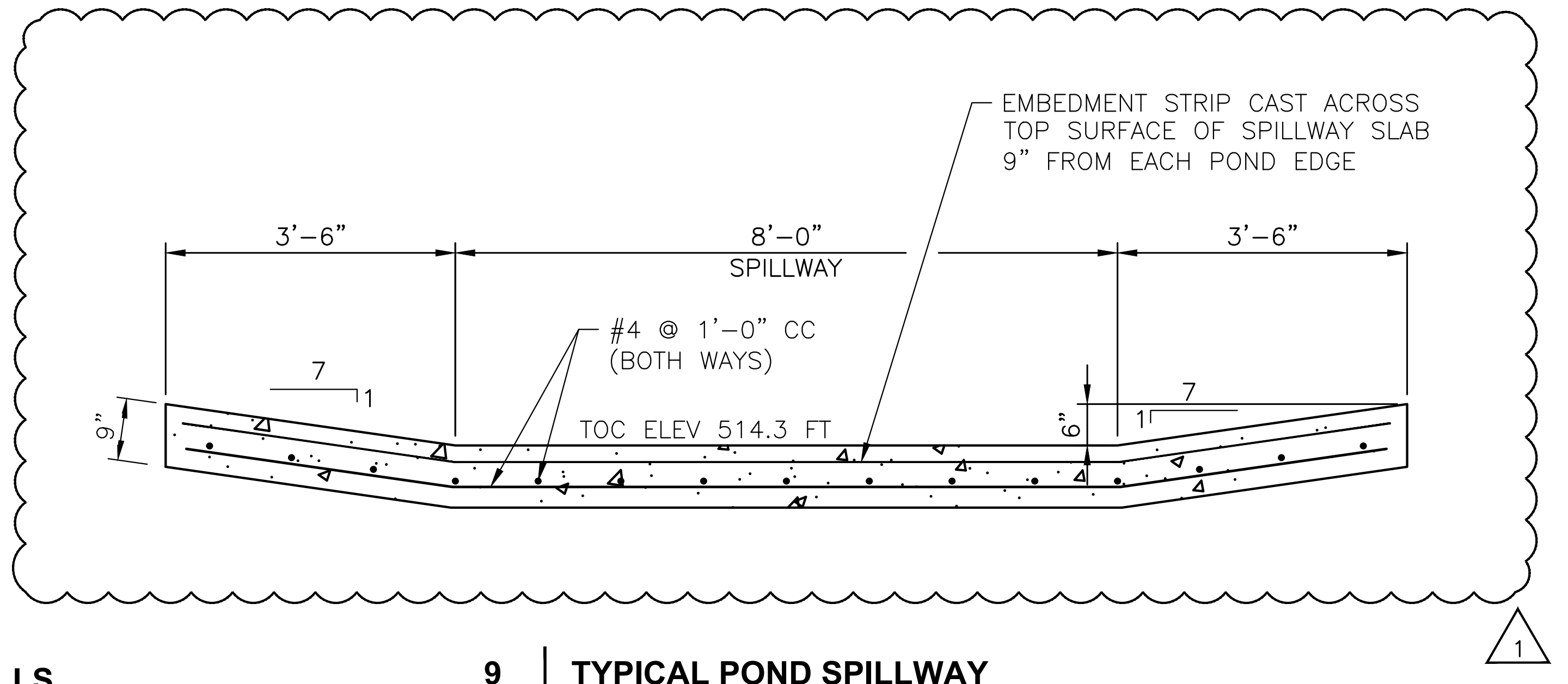
M **HDPE CONCRETE EMBEDMENT - PLANT DRAINS SUMP**
C0005 SCALE NTS – VERTICALLY EXAGGERATED



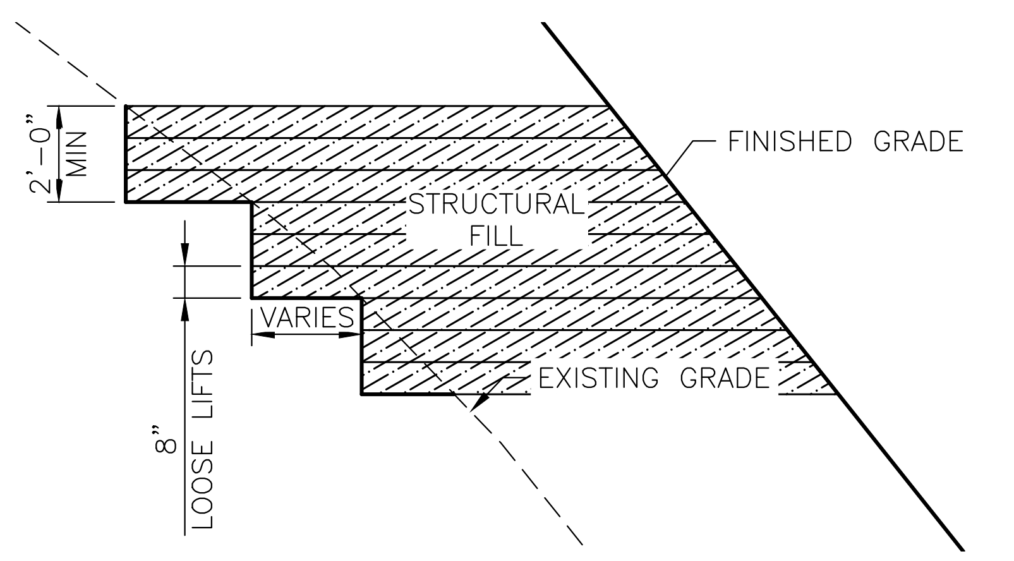
P **HDPE CONCRETE EMBEDMENT - CLARIFIER AREA**
C0005 SCALE NTS – VERTICALLY EXAGGERATED



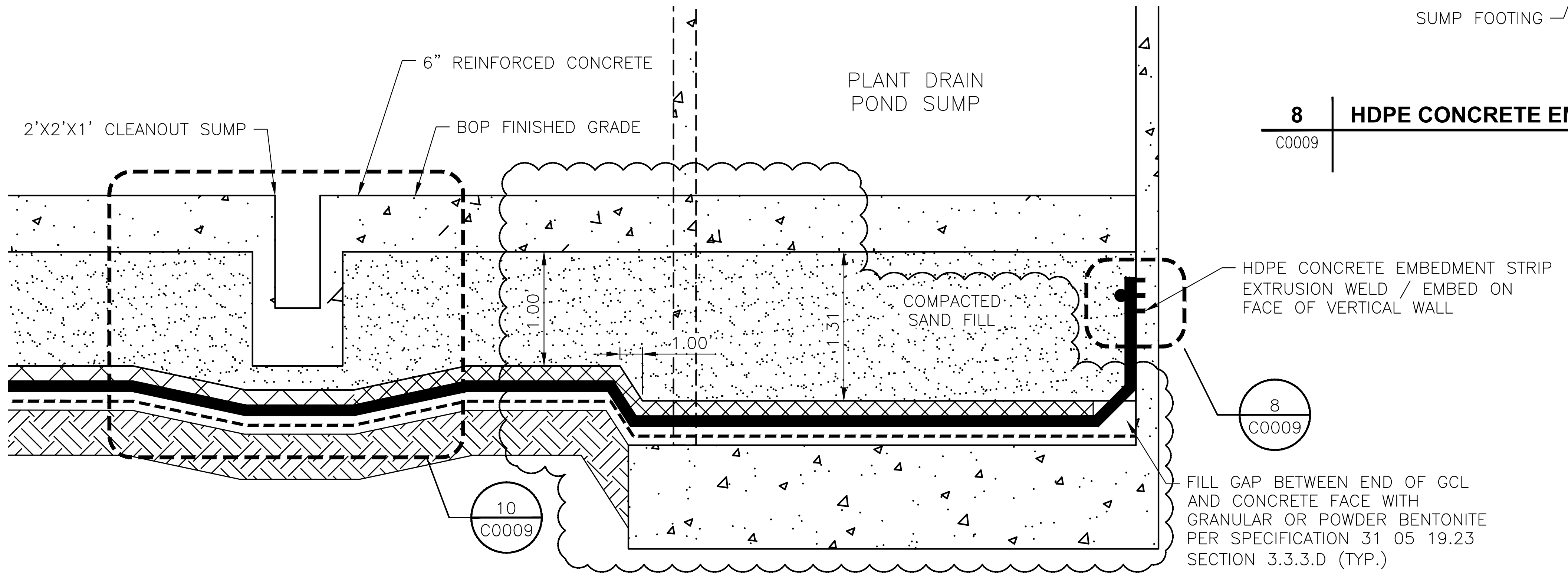
8 **HDPE CONCRETE EMBEDMENT STRIP ADJACENT TO VERTICAL WALLS**
C0009 SCALE NTS



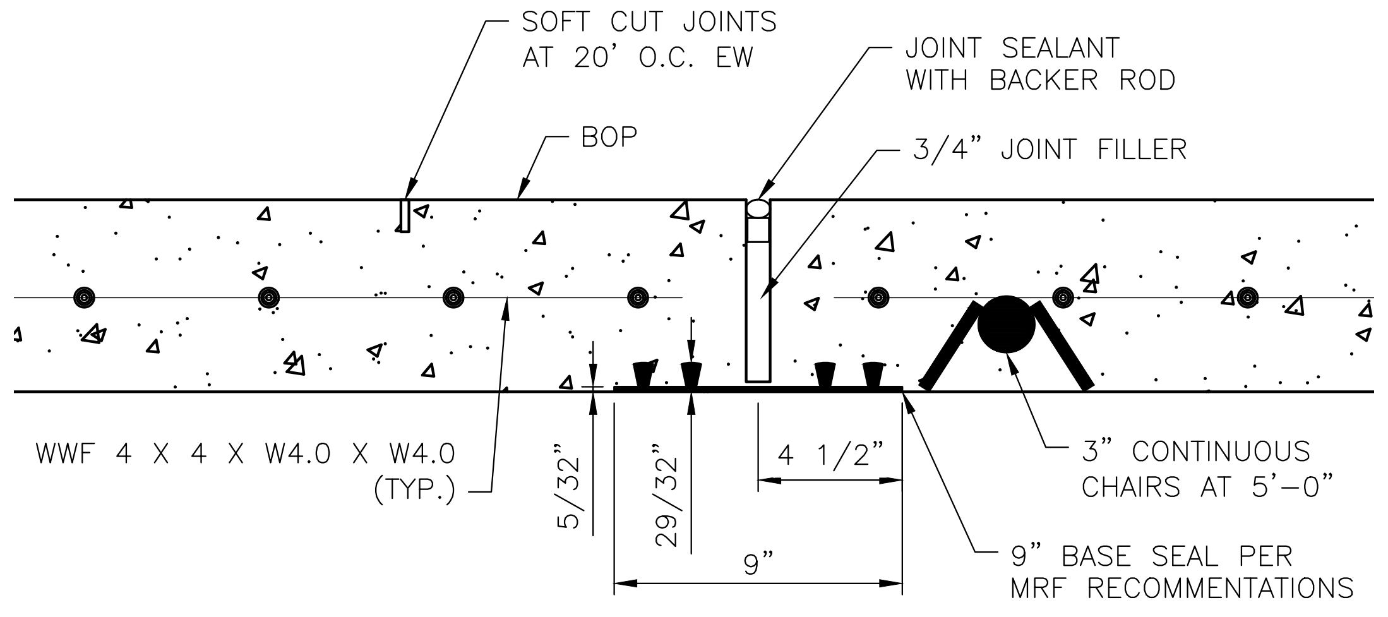
9 **TYPICAL POND SPILLWAY**
C0005
C0006 SCALE NTS



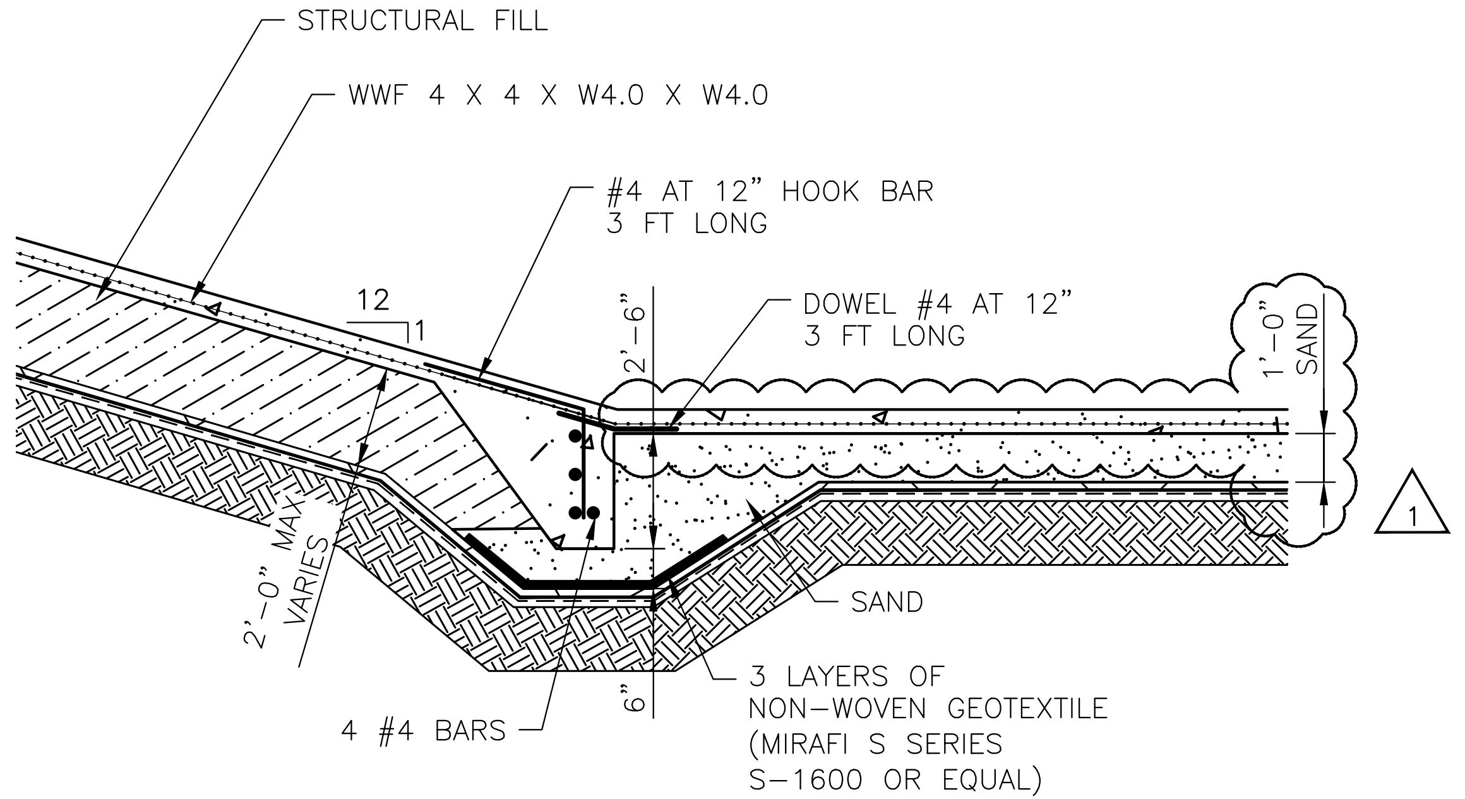
11 **TYPICAL BENCHING DETAIL**
C0008 SCALE NTS



N **CLEANOUT SUMP**
C0005 SCALE NTS – VERTICALLY EXAGGERATED

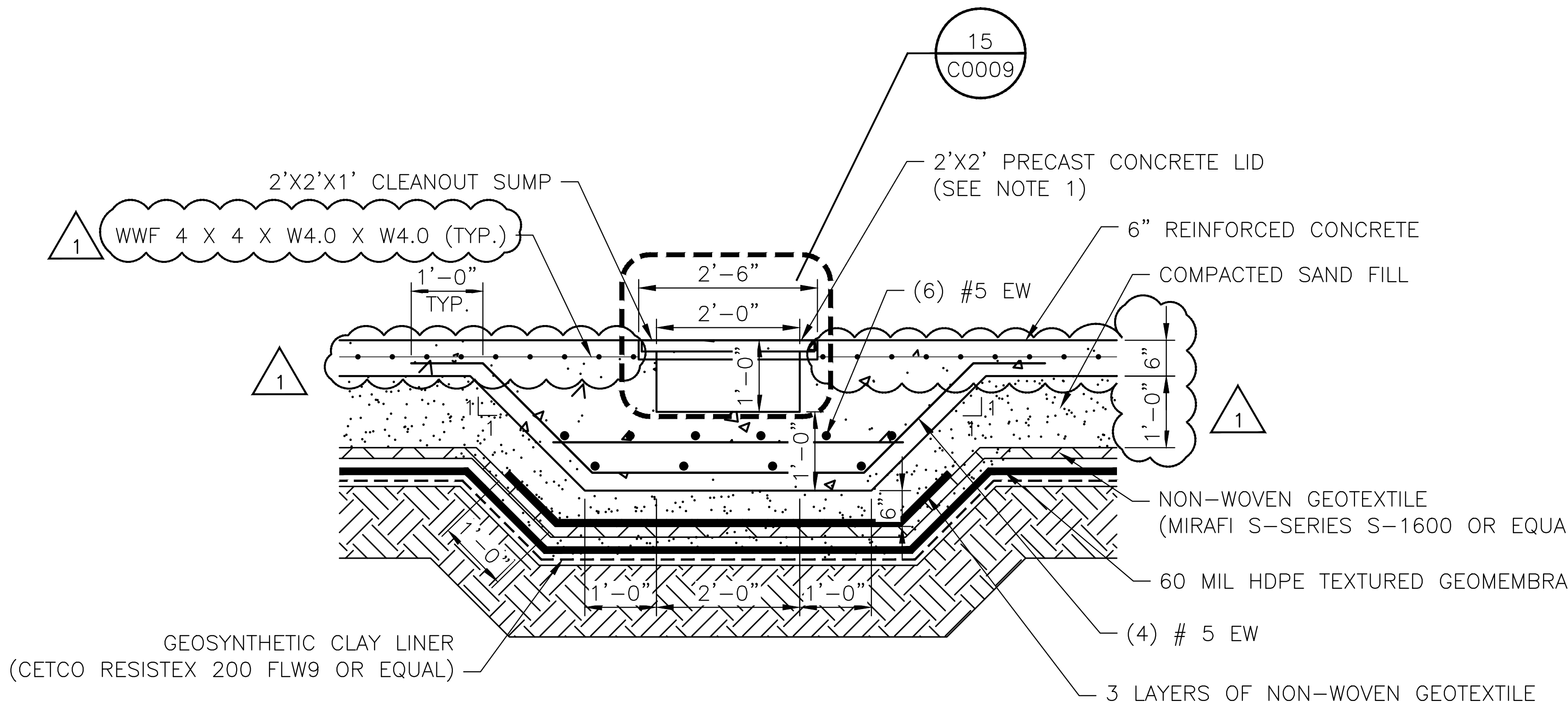


12 **REINFORCED CONCRETE WITH JOINTS DETAIL**
C0009 SCALE NTS



R **RAMP TOE DOWN AT POND BOTTOM**
C0005 SCALE NTS – VERTICALLY EXAGGERATED

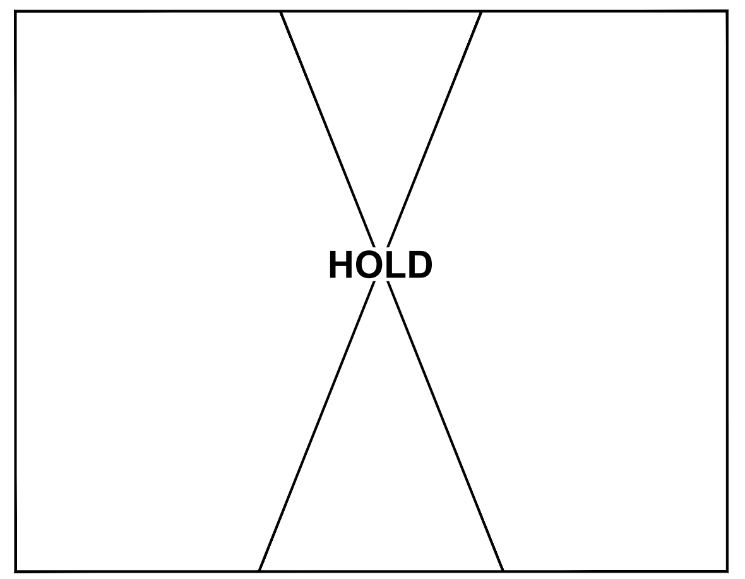
ISSUE FOR CONSTRUCTION



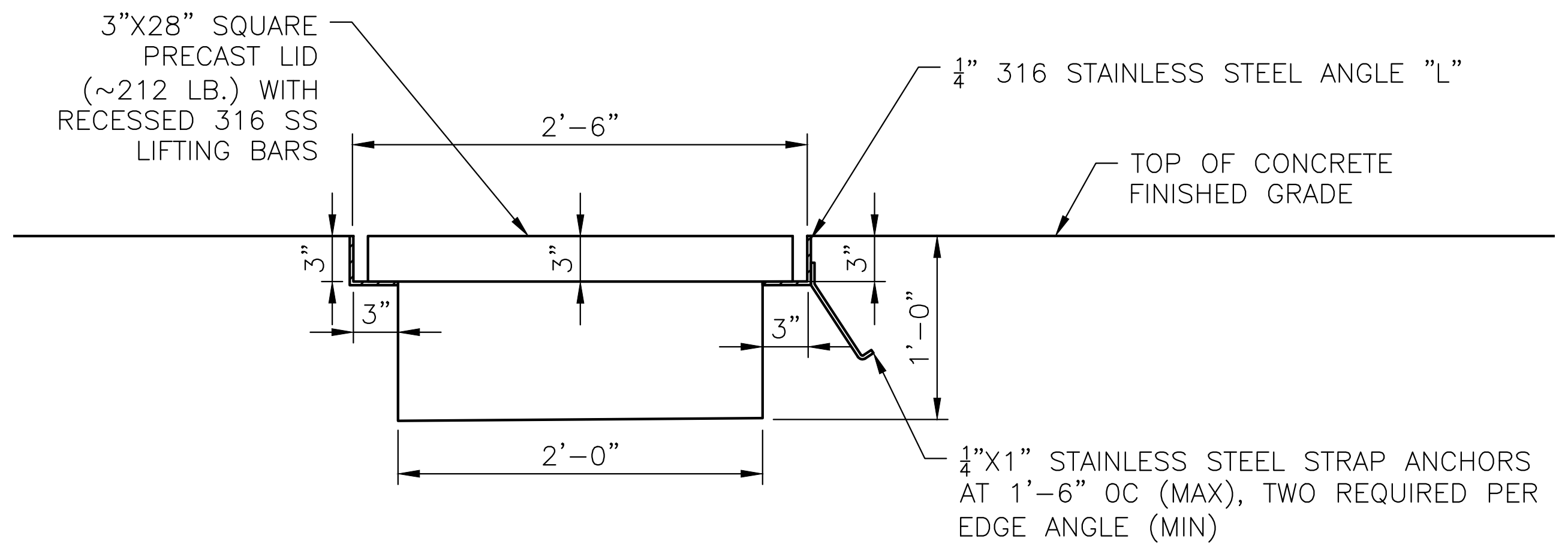
NOTES:

1. LOOSELY PLACED LID IS INTENDED TO BE REMOVED AND SLID ASIDE BY PRY BAR

10 **CLEANOUT SUMP**
C0009 SCALE NTS



14 **TYPICAL THICKENED SLAB**
C0005 SCALE NTS



15 **CLEANOUT SUMP LID DETAIL**
C0009 SCALE NTS

NO	DATE	REVISION	DWN	CHKD	APRV
1	05-12-2022	REVISED DIMENSIONS, REINFORCEMENT, AND CALLOUTS	AWF	AJP	AWG
0	05-02-2022	ISSUE FOR CONSTRUCTION - POND DESIGN UPDATES	AJP	AWF	AWG

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

ALEXANDER W. GOURLAY
143733
5/12/2022

J K SPRUCE POWER PLANT

SPRUCE PLANT DRAINS PROJECT

SECTIONS AND DETAILS 04
PLANT DRAINS POND

DRAWN BY: A. PROCTOR
CHKD BY: A. FORD
APPVD BY: A. GOURLAY
DRAWING NUMBER 2-470-C0009
REVISION 1

ARCH D 36x24

Last saved by: ADAM.FORD(2022-05-12) Last Plotted: 2022-05-12
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0009.DWG

POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	664978.34	186574.94	515.25	PIPE INVERT
2	664973.89	186665.01	515.00	PIPE INVERT
3	665000.04	186578.12	515.25	BOTTOM OF CHANNEL
4	664977.87	186564.03	515.25	BOTTOM OF CHANNEL
5	664799.89	186458.97	EXISTING	BOTTOM OF CHANNEL

NOTES:

1. CONTRACTOR TO HYDRO-EXCAVATE ANY UTILITIES ENCOUNTERED THAT ARE NOT IDENTIFIED ON THE DRAWINGS
2. CONTRACTOR TO REMOVE EXISTING CULVERTS AND BACKFILL WITH STRUCTURAL FILL. RESTORE ROAD SURFACE TO ORIGINAL CONDITIONS
3. UTILIZE POINTS 1 AND 2 FOR CULVERT ALIGNMENT
4. GRADE AREA BETWEEN SOUTH CULVERT OUTLET AND POND CULVERT INVERT TO PROVIDE A CONSTANT SLOPE. PROVIDE 3.5:1 BANKS FOR ANY EXCAVATION. MATCH NEW POND SLOPE TO BOTTOM OF CHANNEL EXCAVATION. CHANNEL CAN BE A V-DITCH. ADJUST CULVERT ALIGNMENT TO LOCATE INVERT AT BOTTOM OF POND BERM SLOPE AND MEET LOW POINT OF CHANNEL EXCAVATION

REVISION 0 MODIFICATIONS OF THIS DRAWING ARE RELEASED UNDER THE AUTHORITY OF ALEXANDER W. GOURLAY, TEXAS PE. 14733

NO	DATE	REVISION	DWN	CHKD	APRV
0	06-17-2022	ISSUE FOR CONSTRUCTION	AWF	TER	AWG

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

J K SPRUCE POWER PLANT

SPRUCE PLANT DRAINS PROJECT

STORMWATER DIVERSION PLAN
PLANT DRAINS POND

ALEXANDER W. GOURLAY
143733
6/17/22

ISSUE FOR CONSTRUCTION

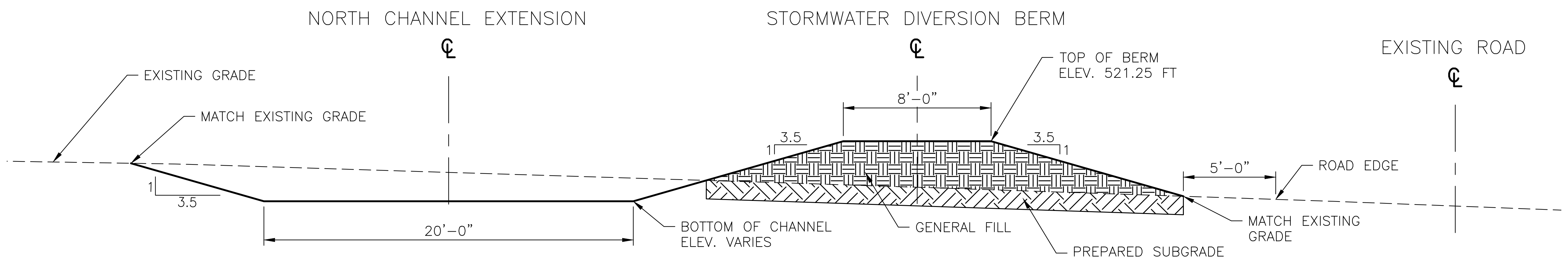
DRAWN BY: A. FORD
CHKD BY: T. RINGSMUTH
APPVD BY: A. GOURLAY

DRAWING NUMBER 2-470-C0010
REVISION 0

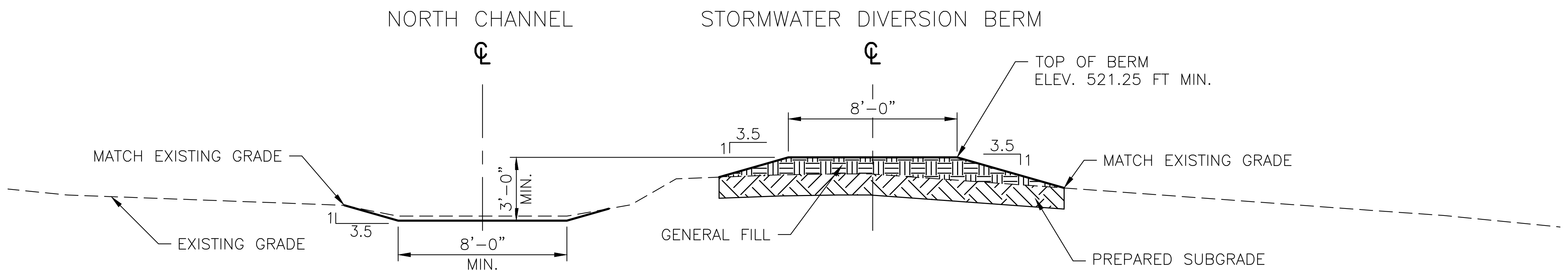
ARCH D 36x24

Last saved by: ADAM.FORD(2022-06-17) Last Plotted: 2022-06-17
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0010.DWG

S | **STORMWATER DIVERSION BERM**
C0010 | SCALE NTS

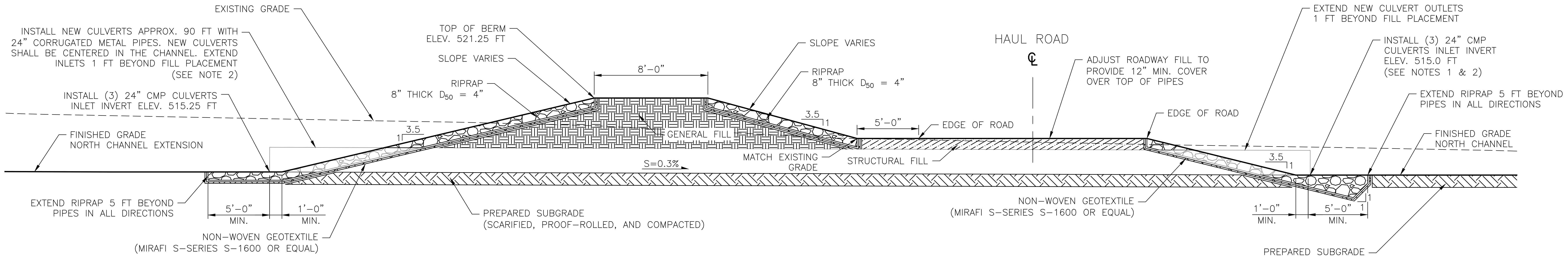


T | **NORTH CHANNEL EXTENSION**
C0010 | SCALE NTS



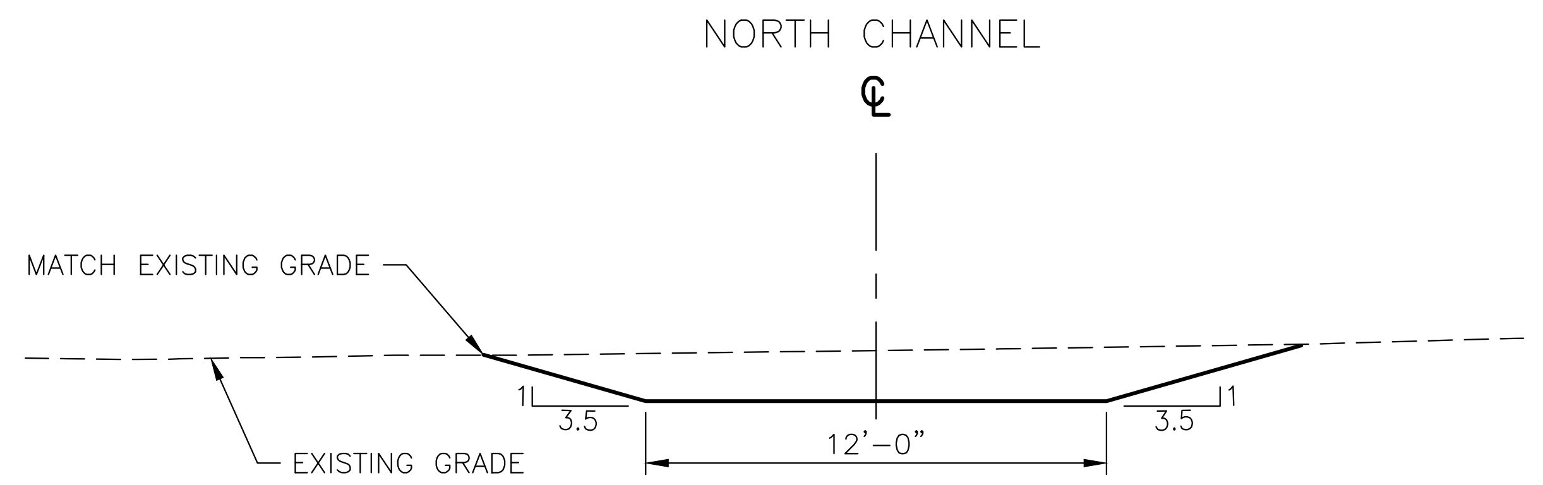
U | **NORTH CHANNEL**
C0010 | SCALE NTS

NOTE:
1. MODIFY EXISTING CHANNEL TO PROVIDE A MINIMUM BOTTOM WIDTH OF 8'-0" AND MINIMUM DEPTH OF 3'-0" BY CONSTRUCTING BERM.



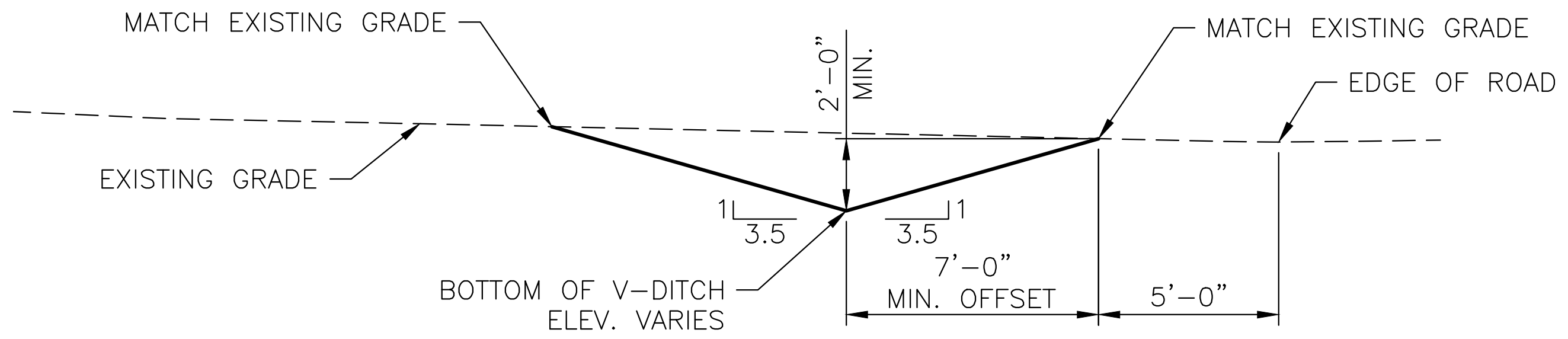
V | **CULVERT EXTENSION - UPSTREAM SIDE**
C0010 | SCALE NTS

NOTE:
1. CONTRACTOR TO SURVEY TOPOGRAPHY AT OUTLET END OF NEW CULVERTS AND VERIFY REQUIRED LENGTH TO DAYLIGHT AT GROUND ELEVATION = 515.0 FT
2. INSTALL CULVERTS PER TxDOT SPECIFICATION ITEM 460

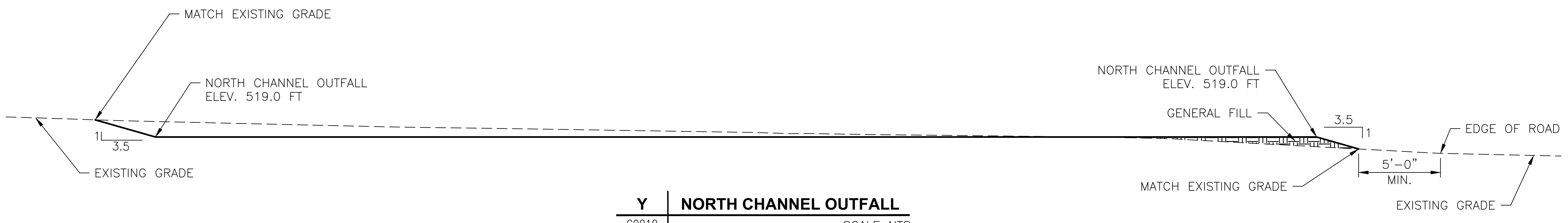


NOTE:
1. MODIFY EXISTING CHANNEL AS NEEDED TO PROVIDE POSITIVE DRAINAGE.
2. MAINTAIN EXISTING BOTTOM WIDTH. DEEPEN EXISTING CHANNEL AND MAINTAIN SLOPE TO PROVIDE POSITIVE DRAINAGE.

W | **CHANNEL EXTENSION - DOWNSTREAM SIDE**
C0010 | SCALE NTS



X | **V-DITCH - TYPICAL**
C0010 | SCALE NTS



Y | **NORTH CHANNEL OUTFALL**
C0010 | SCALE NTS

ISSUE FOR CONSTRUCTION

REVISION 0 MODIFICATIONS OF THIS DRAWING ARE RELEASED UNDER THE AUTHORITY OF ALEXANDER W. GOURLAY, TEXAS PE. 14733

ALEXANDER W. GOURLAY
143733
6/17/22

NO	DATE	REVISION	DWN	CHKD	APRV
0	06-17-2022	ISSUE FOR CONSTRUCTION	AWF	TER	AWG

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

cps ENERGY
J K SPRUCE POWER PLANT

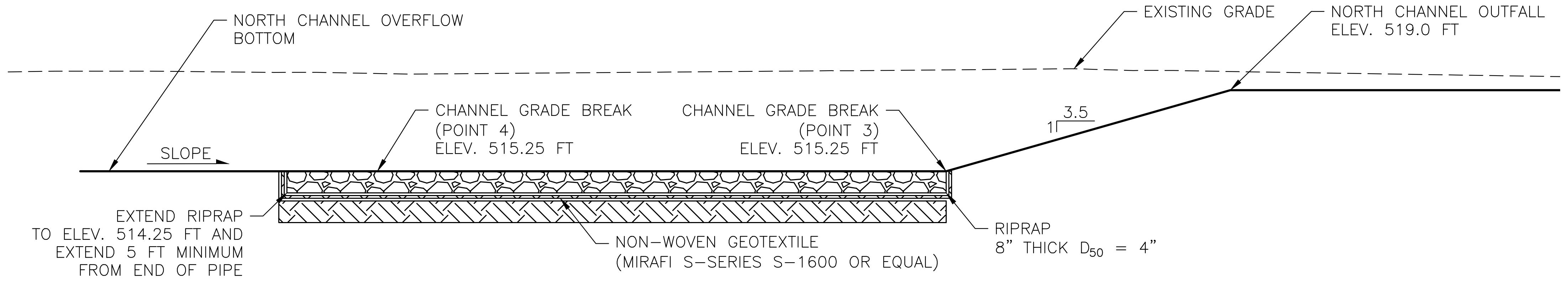
SPRUCE PLANT DRAINS PROJECT

STORMWATER DIVERSION SECTIONS AND DETAILS 01
PLANT DRAINS POND

DRAWN BY: A. FORD
CHKD BY: T. RINGSMUTH
APPVD BY: A. GOURLAY
DRAWING NUMBER 2-470-C0011
REVISION 0

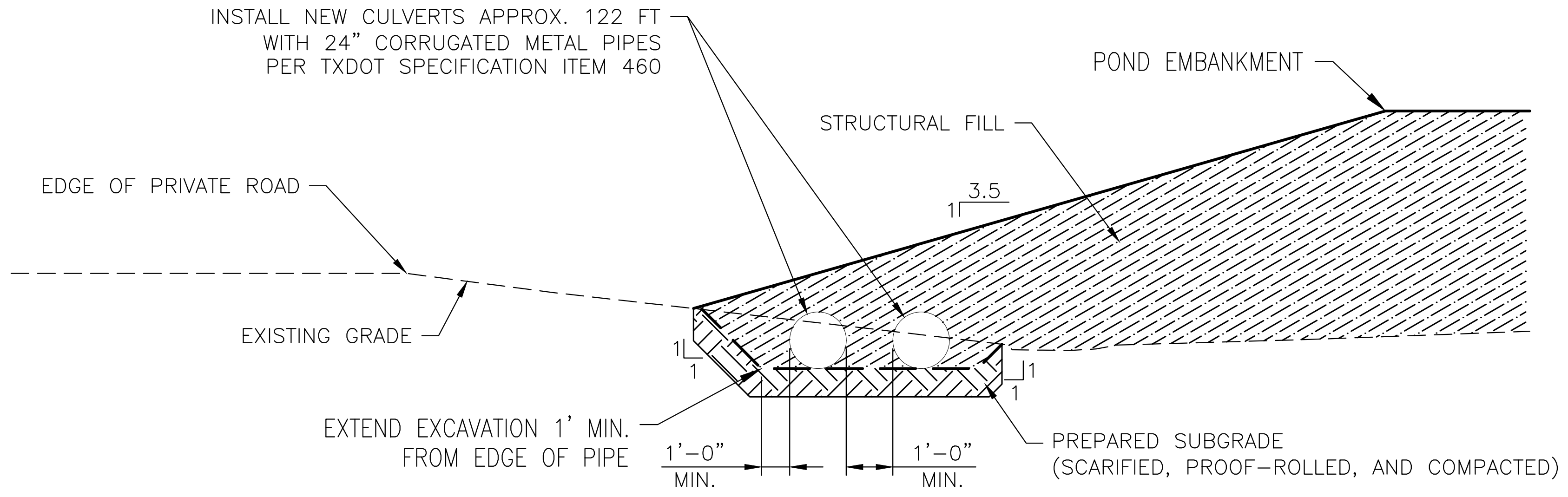
ARCH D 36x24

Last saved by: ADAM.FORD(2022-06-17) Last Plotted: 2022-06-17
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0011.DWG

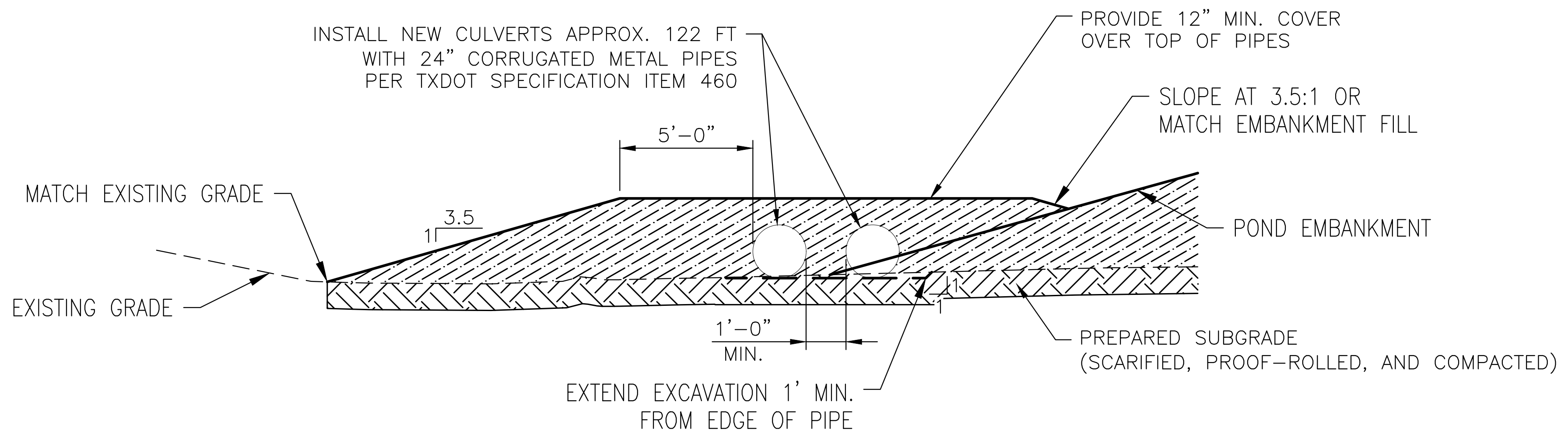


Z | END OF NORTH CHANNEL OUTFALL
C0010 SCALE NTS

AA | TYPICAL SECTION
C0010 SCALE NTS



BA | TYPICAL SECTION
C0010 SCALE NTS



CA | TYPICAL SECTION
C0010 SCALE NTS

ISSUE FOR CONSTRUCTION

REVISION 0 MODIFICATIONS OF THIS DRAWING ARE RELEASED UNDER THE AUTHORITY OF ALEXANDER W. GOURLAY, TEXAS PE. 14733

NO	DATE	REVISION	DWN	CHKD	APRV
0	06/17-2022	ISSUE FOR CONSTRUCTION	AWF	TER	AWG

AECOM PROJECT NO. 60566130 **AUSTIN, TEXAS**

AECOM TECHNICAL SERVICES, INC. TEXAS REGISTRATION NO. 3580

J K SPRUCE POWER PLANT

SPRUCE PLANT DRAINS PROJECT

STORMWATER DIVERSION SECTIONS AND DETAILS 02
PLANT DRAINS POND

ALEXANDER W. GOURLAY
143733
6/17/22

DRAWN BY: A. FORD
CHKD BY: T. RINGSMUTH
APPVD BY: A. GOURLAY
DRAWING NUMBER 2-470-C0012
REVISION 0
ARCH D 36x24

Last saved by: ADAM.FORD(2022-06-17) Last Plotted: 2022-06-17
Filename: C:\USERS\ADAM.FORD\ONEDRIVE - AECOM\CPS ENERGY\20-SHEETS\CIVIL\PD POND\60566130-2-470-C0012.DWG

Assessment of Dam Safety Report – J.T. Deely Power Plant

Attachment 2

Environmental Resources Management Southwest, Inc.
CityCentre Four
840 W. Sam Houston Pkwy. N. – Suite 600
Houston, Texas 77024
(281) 600-1000

ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS FINAL REPORT

CPS Energy
J.T. Deely Power Plant
San Antonio, Texas

Prepared for
U.S. Environmental
Protection Agency
Washington, D.C.

February 2014
Revised May 2014
Revised June 2014

CDM Smith Project No.:
93083.1801.044.SIT.DEELY

CDM Smith

Table of Contents

Section 1 Introduction, Summary Conclusions and Recommendations

Section 2 Description of the Coal Combustion Waste (CCW) Impoundment(s)

Section 3 Summary of Relevant Reports, Permits and Incidents

Section 4 Summary of History of Construction and Operation

Section 5 Field Observations

Section 6 Hydrologic/Hydraulic Safety

Section 7 Structural Stability

Section 8 Adequacy of Maintenance and Methods of Operation

Section 9 Adequacy of Surveillance and Monitoring Program

Section 10 Reports and References

Appendices

Tables

Figures

Section 1

Introduction, Summary Conclusions and Recommendations

1.1 Introduction

On December 22, 2008, the dike of a coal combustion waste (CCW) ash pond dredging cell failed at a facility owned by the Tennessee Valley Authority in Kingston, Tennessee. The failure resulted in a spill of over one billion gallons of coal ash slurry, which covered more than 300 acres, damaging infrastructure and homes. In light of the dike failure, the United States Environmental Protection Agency (USEPA) is assessing the stability and functionality of existing CCW impoundments at coal-fired electric utilities to ensure that lives and property are protected from the consequences of a failure.

This assessment of the stability and functionality of the CPS Energy J.T. Deely Power Plant ash CCW impoundments is based on a review of available documents, site assessments conducted by CDM Smith on August 27 and 28, 2012, and technical information provided subsequent to the site visit. In summary, the North and South Bottom Ash Ponds and Evaporation Basin’s embankments are classified as **SATISFACTORY** based on static and seismic engineering studies following the best professional engineering practice to support acceptable safety factors under normal loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria.

It is critical to note that the condition of the embankment(s) depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the embankment(s) will continue to represent the condition of the embankment(s) at some point in the future. Only through continued care and inspection can there be likely detection of unsafe conditions.

1.2 Purpose and Scope

CDM Smith was contracted by the USEPA to perform site assessments of selected surface impoundments. As part of this contract, CDM Smith conducted site assessments of the North and South Bottom Ash Ponds and Evaporation Pond at the J.T. Deely Power Plant (Plant) site owned by CPS Energy (CPS). These ponds are located on the east and north sides of the site. The purpose of this report is to provide the results of the assessments and evaluations of the conditions, and potential for waste release from the CCW impoundments. The Evaporation Pond receives boiler chemical cleaning waste from CPS’s J.T. Deely Power Plant and their J.K. Spruce Power Plant. Accordingly, the assessment of the Evaporation Pond is also included in a separate report by CDM Smith prepared for the J.K. Spruce Power Plant.

Site visits were conducted by CDM Smith representatives on August 27 and 28, 2012 to collect relevant information, inventory the impoundments, and perform visual assessments of the impoundments.

1.3 Conclusions and Recommendations

1.3.1 Conclusions

Conclusions are based on visual observations during site assessments on August 27 and 28, 2012 and review of technical documentation provided by CPS.

1.3.1.1 Conclusions Regarding Structural Soundness of the CCW Impoundments

A May 7, 2014 geotechnical report, prepared by Raba Kistner Consultants, Inc. (RKCI), was provided that included slope stability analyses for steady-state and seismic loading conditions of the North and South Bottom Ash Pond and Evaporation Pond embankments. The RKCI May 7, 2014 report supersedes RKCI's November 12, 2012 referenced in the CDM Smith's December 2012 "*Assessment of Dam Safety of Coal Combustion Surface Impoundments , CPS Energy, J.T. Deely Power Plant*". The RKCI May 7, 2014 report is included in **Appendix A**. The calculated factors of safety presented in the RKCI 2014, for the load conditions analyzed, met minimum required factors of safety outlined by the USACE in EM 1110-2-1902, Table 3-1 and seismic factors of safety by FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams. The RKCI 2014 report did not present analyses for liquefaction potential, end of construction, and rapid drawdown loading conditions. RKCI stated in the 2014 report that the end-of-construction condition was not evaluated due to the age of the ash ponds. RKCI also stated that both rapid drawdown and erosion failures are considered to be of very low risk due to the embankment toe elevations (above EL 490 feet) with respect to the target pool elevation (EL 485 feet) and because they would pose no risk of environmental contamination, because the pond must empty for this condition to occur.

RKCI indicated in their May 2014 report that the soils beneath the existing berms have a very low risk of experiencing liquefaction due to earthquake. In their seismic slope stability analyses, RKCI used the mapped spectral response acceleration of 0.098g from the USGS web site calculator. RKCI further indicated in their 2014 report that the applied horizontal seismic load had a 4-to-6 % probability of exceedance in 50 years. USEPA guidelines specify that the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years be used in seismic slope stability analyses. CDM Smith used USGS referenced maps, published in the 2010 ASCE-7 Standard, to determine the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years. CDM Smith found the spectral response acceleration for the Deely site to be 0.075g. Accordingly, in CDM Smith's opinion, the response acceleration employed in RKCI's seismic analyses conforms to USEPA standards.

No apparent structural damage or evidence of previous repairs was observed in the CCW impoundments during CDM Smith's site visit. From visual observations, the embankments appeared structurally sound; however high water and solids level in the North Bottom Ash Pond and Evaporation Pond prevented observation of the interior embankment slopes during CDM Smith's visual observations and site assessments.

CDM Smith agrees with RKCI's rationale regarding embankment stability for end of construction, liquefaction potential, and rapid drawdown conditions.

1.3.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of CCW Impoundments

Hydrologic/hydraulic (H & H) documentation provided by CPS included precipitation amounts for selected storm durations and return periods expected in the Calaveras Lake site area. A preliminary H & H evaluation performed by CDM Smith suggests there is enough storage capacity at current operating pool levels for the North and South Bottom Ash Ponds, and the Evaporation Pond to safely store precipitation from the FEMA recommended rainfall events (0.1 percent annual chance exceedance flood for the significant hazard potential North and South Bottom Ash Ponds and 1 percent annual chance exceedance flood for the Evaporation Pond). Based on CDM Smith's preliminary evaluation the hydrologic/hydraulic safety of the impoundments appears to be adequate.

1.3.1.3 Conclusions Regarding Adequacy of Supporting Technical Documentation

CDM Smith has the following conclusions based on our review of the documentation provided by CPS:

- The RKCI documentation of the stability analyses for the North and South Bottom Ash Ponds and Evaporation Pond is considered adequate based on the following:
    - ✓ Steady-state and seismic stability analyses for of the North and South Bottom Ash Ponds and Evaporation Pond embankments are documented.

    - ✓ RKCI provided assessments of the embankments' liquefaction potential, and structural stability applicable for end of construction and sudden drawdown loading conditions. RKCI did not analyze liquefaction potential, end of construction and sudden drawdown loading conditions. As described above, CDM Smith agrees with RKCI's rationale for not performing analyses for these loading conditions.

- The hydrologic and hydraulic supporting documentation of North and South Bottom Ash Ponds and Evaporation Pond is considered inadequate based on the following:
    - ✓ H & H documentation provided by CPS included precipitation amounts for selected storm durations and return periods expected in the Calaveras Lake site area. No documentation was provided by CPS on the ability of the impoundments to store the FEMA-recommended design floods.
    - ✓ An evaluation to determine the required IDF and of the capacity of the North and South Bottom Ash Ponds and Evaporation Pond to withstand the design hydrologic/hydraulic events, without overtopping have not been provided.

1.3.1.4 Conclusions Regarding Description of the CCW Impoundments

The record drawings and descriptions of the CCW impoundments provided by CPS representatives appear to be consistent with the visual observations by CDM Smith during site assessment.

1.3.1.5 Conclusions Regarding Field Observations

During visual observations and site assessments, CDM Smith observed an area of erosion around a fence post at the north embankment crest. Dense vegetation and trees up to 8 inches in diameter was also observed on the exterior slope of the north embankment at the North Bottom Ash Pond. No significant deficiencies were observed at the South Bottom Ash Pond and Evaporation Pond.

1.3.1.6 Conclusions Regarding Adequacy of Maintenance and Methods of Operation

Current maintenance and operation procedures appear to be generally adequate, though they are not documented. There was no existing evidence of previous spills or release of impounded liquids outside the Plant property.

1.3.1.7 Conclusions Regarding Adequacy of Surveillance and Monitoring Program

Surveillance and monitoring procedures include checking the impoundments for deficiencies and recording pool levels for both the North and South Bottom Ash Ponds twice a day. No surveillance and monitoring procedures exist for the Evaporation Pond. Instrumentation is not present for the North and South Bottom Ash Ponds or Evaporation Pond.

1.3.1.8 Conclusions Regarding Suitability for Continued Safe and Reliable Operation

Main embankments do not show evidence of unsafe conditions requiring immediate remedial efforts, although maintenance to correct deficiencies noted above is required.

CPS' operating procedures for the North and South Bottom Ash Ponds include methods of controlling the water levels in the ponds, but no formal documentation was provided to CDM Smith. There were no documented operating procedures for the Evaporation Pond.

1.3.2 Recommendations

Based on CDM Smith's visual assessment of North and South Bottom Ash Ponds and Evaporation Pond and review of documentation provided by CPS, CDM Smith offers the following recommendations for consideration.

1.3.2.1 Recommendations Regarding the Hydrologic/Hydraulic Safety

It is recommended that a qualified professional engineer determine the required IDF and evaluate the hydrologic and hydraulic capacity of the North and South Bottom Ash Ponds and Evaporation Pond to withstand design hydrologic/hydraulic events, without overtopping, as recommended by FEMA.

1.3.2.2 Recommendations Regarding the Technical Documentation for Structural Stability

None

1.3.2.3 Recommendations Regarding Field Observations

CDM Smith observed dense vegetation and trees up to 8 inches in diameter at the north embankment exterior slope of the North Bottom Ash Pond. CDM Smith recommends that trees and vegetation in the area be cut back and maintained to improve the ability to conduct a visual assessment of the slope. An area of erosion was observed in the north embankment crest of the North Bottom Ash Pond. To restore this area of erosion, it is recommended to place and compact structural fill to adjacent existing grade contours, and reseed or place armoring.

1.3.2.4 Recommendations Regarding Adequacy of Maintenance and Methods of Operation

It is recommended that vegetation on the Evaporation Pond embankments be maintained with seasonal mowing, as necessary, for animal control and surveillance and monitoring of embankments.

1.3.2.5 Recommendations Regarding Surveillance and Monitoring Program

The CPS surveillance, recording , and monitoring program for the North and South Bottom Ash Ponds, under the Texas Commission on Environmental Quality (TCEQ) for the National Pollutant Discharge Elimination System (NPDES) Permit appears to be adequate and complies with TCEQ requirements. Although the inspection program for the North and South Bottom Ash Ponds appears to be adequate, CDM Smith recommends that these inspections be documented in the future. It is recommended that CPS prepare formal surveillance and monitoring procedures for the Evaporation Pond.

1.3.2.6 Recommendations Regarding Continued Safe and Reliable Operation

Inspections should be made following periods of heavy and/or prolonged rainfall, and the occurrence of these events should be documented. Inspection procedures should be documented and inspection records should be retained at the facility for a minimum of three years. Major repairs and slope restoration should be designed by a registered professional engineer experienced with earthen dam design.

The above recommendations should be implemented to help maintain continued safe and reliable operation of the CCW impoundments.

1.4 Participants and Acknowledgment

1.4.1 List of Participants

CDM Smith representatives, Jamal Daas, P.E. and Bevin Barringer, P.E, were accompanied at all times during visual assessment by Gregg Tieken, CPS Environmental Manager.

1.4.2 Acknowledgement and Signature

CDM Smith acknowledges that the CCW impoundments referenced herein were assessed by Jamal Daas, P.E. and Bevin Barringer, P.E. Based on the documentation provided, the North and South Bottom Ash Ponds and Evaporation Pond are rated SATISFACTORY. Minor deficiencies exist that require remedial measures.

We certify that the CCW impoundments referenced herein have been assessed on August 27 and 28, 2012.

STATE OF TEXAS
JAMAL F. DAAS
112062
LICENSED
PROFESSIONAL ENGINEER

Jamal F. Daas

Jamal Daas, P.E.
Geotechnical Engineer
Texas Registration No. 1120

Bevin Barringer

Bevin Barringer, P.E.
Geotechnical Engineer

Section 2

Description of the Coal Combustion Waste (CCW) Impoundment(s)

2.1 Location and General Description

The J.T. Deely Power Plant (Plant), owned by CPS Energy (CPS) is located in Bexar County at 12940 U.S. Highway 181 South, San Antonio, Texas (Latitude: 29° 18' 25.93" N, Longitude: 98° 19' 12.71" W), as shown on **Figure 2-1**. Critical infrastructure within approximately five miles down gradient of the Plant is shown on **Figure 2-2**. The Plant site is surrounded by open grassy areas with patches of trees, as shown on **Figure 2-3**. The Plant is surrounded by CPS-owned Calaveras Lake on the west, south, and east sides. Land to the north of the Plant property boundary is rural. The Plant site is shared with the J.K. Spruce Power Plant. Both Plants are owned by CPS.

The Plant has three Coal Combustion Waste (CCW) impoundments: the North Bottom Ash and South Bottom Ash Ponds just east of the Plant units and the Evaporation Pond approximately 1 mile northeast of the Plant units as shown on Figure 2-2. All three ponds were constructed as diked impoundments. The North and South Bottom Ash Ponds share a common embankment that separates the ponds and are located between the main Plant site and Calaveras Lake. The Evaporation Pond receives boiler chemical cleaning waste from CPS's J.T. Deely Power Plant and their J.K. Spruce Power Plant. Accordingly, the assessment of the Evaporation Pond is also included in a separate report prepared by CDM Smith for the J.K. Spruce Power Plant. The Evaporation Pond is located to the north of the CPS property in an undeveloped area surrounded by trees.

The Sludge Recycle Holding (SRH pond), also located at the site, is used to store CCW from the J.K. Spruce Power Plant. The SRH Pond is located west of the South Bottom Ash Pond. The SRH Pond and the South Bottom Ash Pond share a common embankment that includes spillways. The assessment of this impoundment is included in a separate report prepared by CDM Smith for the J.K. Spruce Power Plant. Other impoundments at the site that do not store CCW include the Coal Pile Runoff Pond used to store stormwater runoff from the coal storage area, #1 Stormwater Runoff Pond used to store stormwater runoff from the Plant site, and the 5-year Landfill Runoff Pond used to store runoff from the fly ash disposal landfill and Class I landfill. The #1 Stormwater Runoff and SRH Ponds are located west of the North and South Bottom Ash Pond and share common embankments. The layout of the ponds is shown on Figure 2-3.

The North Bottom Ash Pond has a total perimeter of approximately 2,100 feet and an approximate surface area of 6 acres. The South Bottom Ash Pond has a total perimeter of approximately 2,100 feet and an approximate surface area of 7 acres. The Evaporation Pond has a total perimeter of approximately 1,800 feet and has an approximate surface area of 4.5 acres. **Table 2-1** shows a summary of the approximate size and dimensions of the impoundments.

Table 2-1 – Summary of Impoundments Approximate Dimension and Size

	Impoundment		
	North Bottom Ash Pond	South Bottom Ash Pond	Evaporation Pond
Dam Height (feet)	12	12	22
Average Crest Width (feet)	15	15	20
Length (feet)	2,100	2,100	1,800
Interior Slopes, H:V	2:1	2:1	3:1
Exterior Slopes, H:V	3:1	3:1	3:1

Note: All dimensions were obtained from construction drawings.

2.1.1 Horizontal and Vertical Datum

Project drawings provided by CPS to CDM Smith did not include reference to the horizontal datum used. Based on the coordinates shown on the drawings, the date of the drawings, and the datum in general use at the time, it is likely that the drawings were referenced to the North American Datum of 1983 (NAD 83). Elevations included on the drawings are referenced to mean sea level (MSL). Elevations noted herein are in feet and are referenced to the datum used for the project drawings, MSL, unless otherwise noted.

2.1.2 Site Geology

The J.T. Deely Electric Plant is located in southeastern Bexar County, Texas. Based on review of the USGS Topographic Map, natural ground surface elevations in the area of the Plant range from approximately El. 490 to El. 530 referenced to the North American Vertical Datum of 1988. According to the Quaternary Geologic Map of the Austin 4 x 6 Quadrangle published by the United States Geological Survey, the Plant is located on clayey sand and sandy clay decomposition residuum from the Quaternary and Tertiary Periods. These deposits consist of gray, light brown, brown, or orange clayey, fine to medium quartz sand to fine sandy silty clay with subrounded sandstone pebbles, colluviums, and small bedrock outcrops in some localized areas. According to the United States Department of Agriculture, surface soils in the area are comprised of fine sand, loamy fine sand, and sandy clay loam.

Soil boring information was provided in a report prepared by Raba Kistner Consultants, Inc. (RKCI) dated May 7, 2014. In the RKCI report, the embankment fill is described as sandy clay and clayey sand. The subgrade stratigraphy includes sandy clay and clayey sand with isolated tan and gray clay seams. The 2014 RKCI report is included in **Appendix A**.

2.2 Coal Combustion Residue Handling

The North Bottom Ash Pond receives sluiced bottom ash from Deely Units 1 & 2. The pond also receives other low-volume waste and metal cleaning waste. Ash is excavated from the pond and sold for beneficial use approximately twice a year. Boiler slag is mixed with the bottom ash and recycled. The South Bottom Ash Pond receives sluiced bottom ash from Deely Units 1 & 2. The pond also receives low-volume waste and metal cleaning waste. Approximately twice a year, ash is excavated from the pond and sold for beneficial use. During the assessment, the South Bottom Ash Pond was drained and less than half of the pond contained ash material.

The Evaporation Pond receives boiler chemical cleaning waste that is trucked to the pond. The Evaporation Pond was constructed on top of a fly ash landfill that was converted into an ash impoundment in 1996. The ash landfill and impoundment were used to store ash materials at some time in the past but no further documentation was provided regarding the nature or amount of ash materials stored. Because it is unknown if the underlying pond was used to store CCW, a full assessment was performed on the Evaporation Pond. A geotechnical engineering study, performed by Raba Kistner Consultants, Inc., dated May 2014, included four borings through the Evaporation Pond embankments and into the underlying soils. As per the investigation's boring logs, soils underlying the embankment consisted of medium dense to very dense clayey sand. It does not appear the Deely CCW impoundments were constructed over wet ash, slag, or other unsuitable materials.

CPS has indicated that the Plant does not produce flue gas desulphurization gypsum.

2.3 Size and Hazard Classification

According to the United States Army Corps of Engineers (USACE) Guidelines for Safety Inspection of Dams (1979) (ER 1110-2-106), dams are categorized per **Table 2-2.**

Table 2-2 – USACE ER 1110-2-106 Size Classification

Category	Impoundment	
	Impoundment Storage Capacity (acre-feet)	Embankment Height (feet)
Small	50 to < 1000	25 to < 40
Intermediate	1000 to < 50,000	40 to < 100
Large	> 50,000	> 100

The total storage capacity of the North Bottom Ash Pond, South Bottom Ash Pond, and Evaporation Pond is approximately 72, 84, and 99 acre-feet, respectively. Therefore, the embankments for all three impoundments are classified as small dams as defined in ER 1110-2-106. The impoundment capacities were estimated by CDM Smith based on the geometry shown on the original construction drawings provided by CPS.

It is not known if the Plant impoundments currently have an assigned Hazard Potential Classification. Based on the USEPA classification system as presented on Page 2 of the USEPA checklist (**Appendix B**) and CDM Smith's review of the site and downstream areas, recommended hazard ratings have been assigned to the impoundments as summarized in **Table 2-3**:

Table 2-3 – Recommended Impoundment Hazard Classification Ratings

Ash Pond Unit	Recommended Hazard Rating	Basis
North Bottom Ash Pond	Significant Hazard	▪ Failure or miss-operation would result in flow toward the main plant facilities resulting in damage to plant infrastructure, operations, and utilities. ▪ Loss of human life is not anticipated.
South Bottom Ash Pond	Significant Hazard	▪ Failure or miss-operation would result in flow toward the main plant facilities resulting in damage to plant infrastructure, operations, and utilities. ▪ Loss of human life is not anticipated.

Table 2-3 – Recommended Impoundment Hazard Classification Ratings (Continued)

Ash Pond Unit	Recommended Hazard Rating	Basis
Evaporation Pond	Low Hazard	▪ Failure or miss-operation would result in low economic and/or environmental losses. ▪ Losses would be limited to the owner's property ▪ Loss of human life is not anticipated.

2.4 Amount and Type of Residuals Currently Contained in the Unit(s) and Maximum Capacity

According to CPS representatives, accumulated bottom ash in the North and South Bottom Ash Ponds is removed twice a year and sold for beneficial use. The surface area of the North Bottom Ash Pond is approximately 6 acres, and liquids from the pond are returned to the Plant or discharged to Calaveras Lake. The surface area of the South Bottom Ash Pond is approximately 7 acres, and during normal operation liquids from the pond are returned to the Plant or discharged to Calaveras Lake. During the site assessment, the South Bottom Ash Pond was drained and less than half of its storage volume contained bottom ash material.

CPS did not have any information on the amount or types of CCW that may have been stored beneath the existing Evaporation Pond. The Evaporation Pond is approximately 4.5 acres, nearly full of solids, and is used to store and dewater, through evaporation, boiler chemical cleaning waste that is trucked to the pond.

2.5 Principal Project Structures

Principal structures of the North Ash Pond include the following:

- Two 12-inch-diameter, and one 8-inch-diameter welded steel inlet pipes discharging sluiced ash near the center of the pond;
- One 24-inch-diameter welded steel outlet pipe at the interior slope near the southwest corner that returns liquids from the pond to the Plant;
- An outlet structure near the interior slope at the northeast corner consisting of a 12-inch-diameter welded steel vertical pipe with riser at El. 499 and a 12-inch-diameter welded steel drain pipe with invert El. 489. The outlet pipes are partially surrounded by a steel sheet pile wall containing an opening, with a floating sorbent boom, for flow to the outlet pipes. Both pipes at the outlet structure discharge liquids to an outfall at Calaveras Lake; and
- Earthen perimeter embankments composed of sandy clay and clayey sand fill.

Principal structures of the South Ash Pond include the following:

- Two 12-inch-diameter, and one 8-inch-diameter welded steel inlet pipes discharging sluiced ash near the center of the pond;
- One 24-inch-diameter welded steel outlet pipe at the interior slope near the northwest corner that returns liquids from the pond to the Plant;

- An outlet structure near the interior slope at the southeast corner consisting of a 12-inch-diameter welded steel vertical pipe with riser at El. 499 and a 12-inch-diameter welded steel drain pipe with invert El. 489. The outlet pipes are partially surrounded by a steel sheet pile wall containing an opening, with a floating sorbent boom, for flow to the outlet pipes. Both pipes at the outlet structure discharge liquids to an outfall at Calaveras Lake; and

- Earthen perimeter embankments composed of sandy clay and clayey sand fill.

Principal structures of the Evaporation Pond include the following:

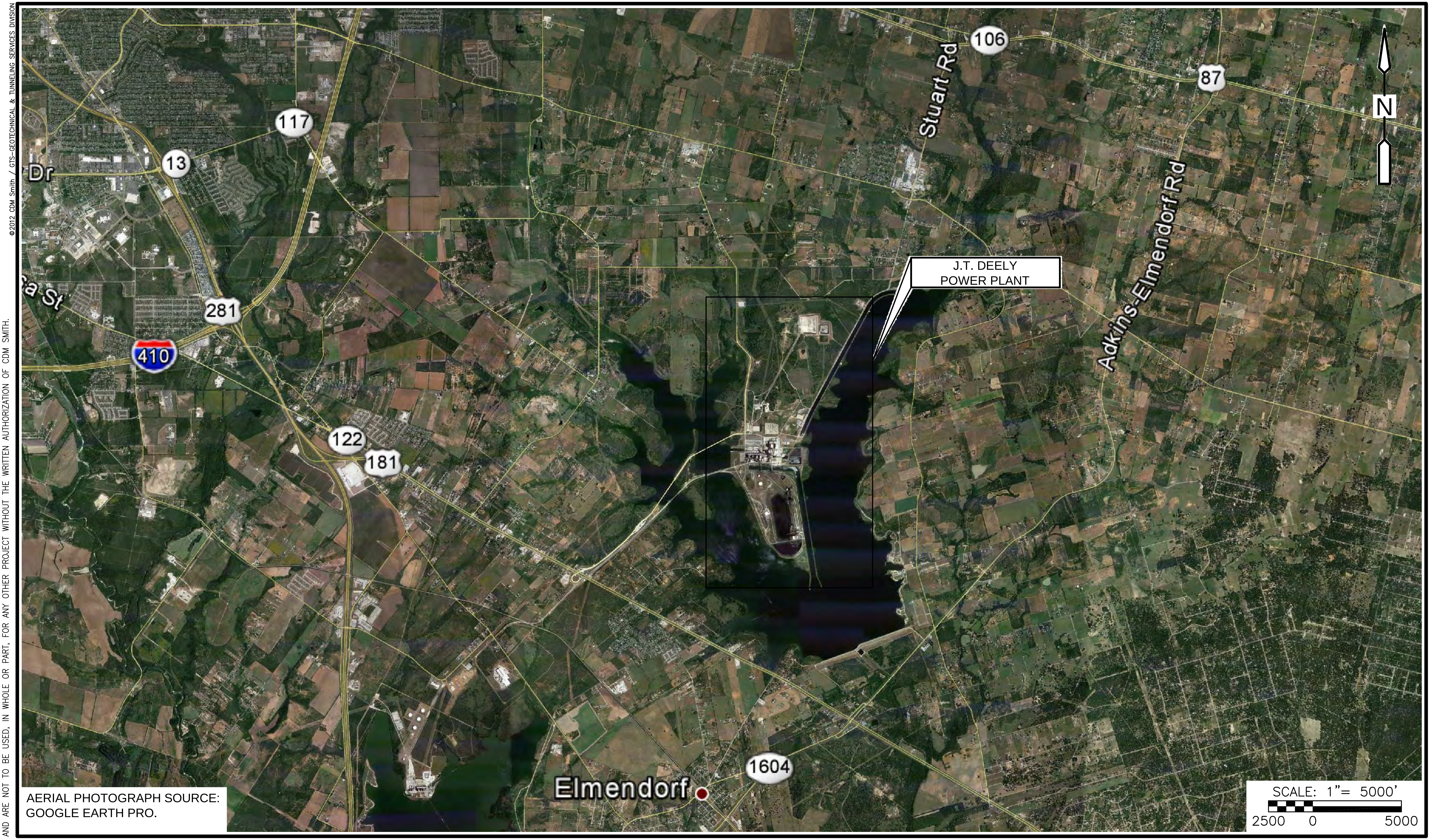
- Earthen perimeter embankments composed of sandy clay and clayey sand fill.

2.6 Critical Infrastructure within Five Miles Downgradient

Based on available topographic maps, surface drainage in the vicinity of the Plant appears to be toward Calaveras Lake. Critical infrastructure within five miles downgradient of the impoundments includes the Town of Elmendorf, TX, located just south of Calaveras Lake and approximately 3.5 miles south of the Plant. The only known infrastructure within 5 miles down gradient of the Plant included places of worship, as shown on Figure 2-1. However discharge at any of the impoundments would ultimately be contained in Calaveras Lake, due to its large size covering approximately 3,000 acres.

Due to its shared embankments with the SRH and #1 Stormwater Runoff Pond, failure or misoperation of the North and South Bottom Ash Ponds could result in discharge into the adjacent impoundments. Subsequent failure of the adjacent impoundments would likely result in flow toward the Plant facilities and would result in damage to plant infrastructure, operations, and utilities. Loss of human life is not anticipated. A breach of the impoundment embankments would most likely impact Plant property and Calaveras Lake.

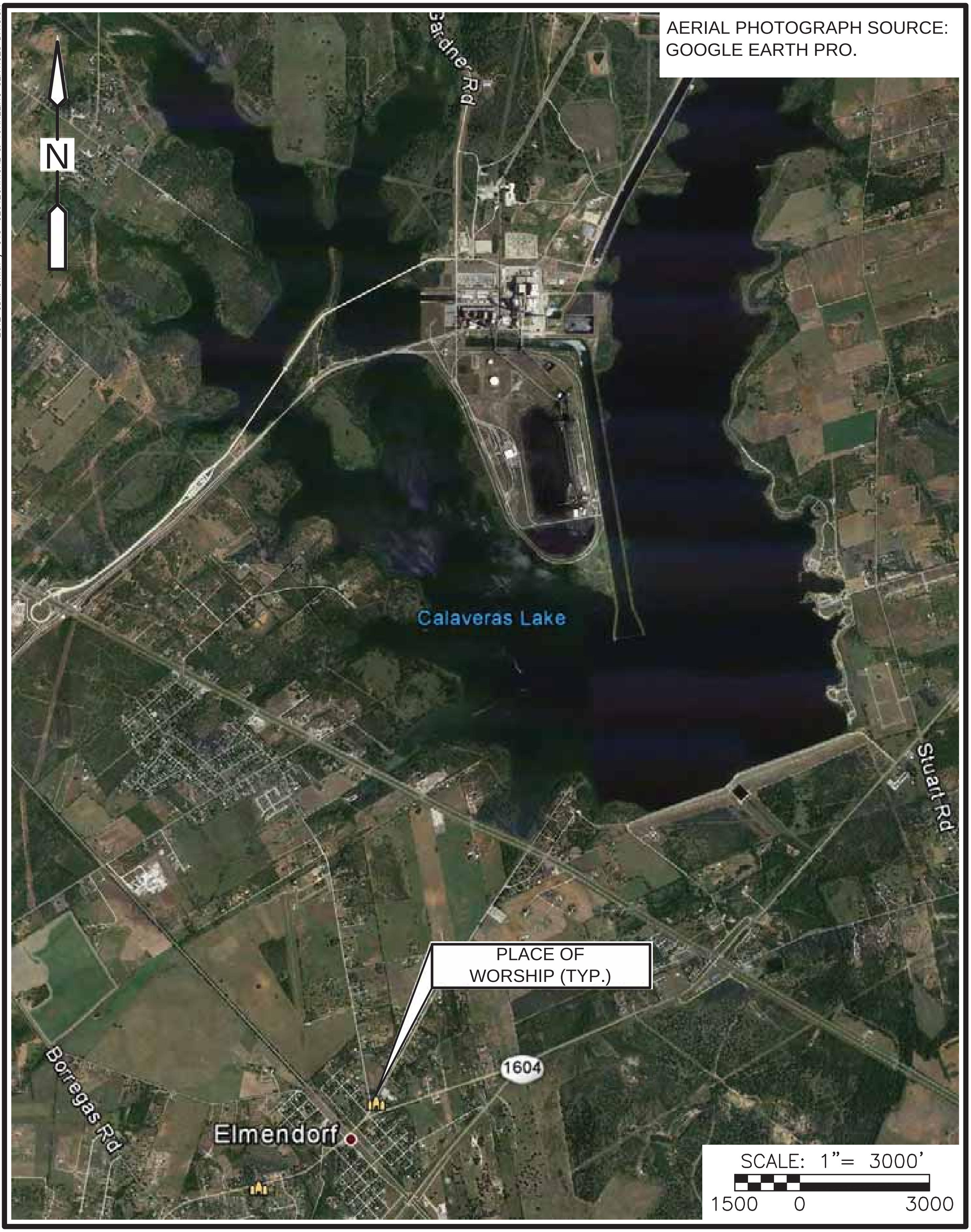
Because of its relatively remote location, failure or misoperation of the Evaporation Pond would likely result in discharge to the surrounding wooded area and eventually flow into Calaveras Lake.



AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

J.T. DEELY POWER PLANT
SAN ANTONIO, TEXAS
VICINITY MAP
FIGURE 2-1

PW:\PW_XM1\Documents\5111\93083_Deely\03 Reports and Studies\09 CADD Figures and Graphics\B001VMFG.DWG



AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

CDM
Smith

J.T. DEELY POWER STATION
SAN ANTONIO, TEXAS
CRITICAL INFRASTRUCTURE PLAN
FIGURE 2-2

AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

J.T. DEELY POWER PLANT
SAN ANTONIO, TEXAS
SITE PLAN
FIGURE 2-3

Section 3

Summary of Relevant Reports, Permits and Incidents

3.1 Summary of Reports on the Safety of the CCW Impoundments

Safety reports for the CCW impoundments were not available for CDM Smith's review during the course of this investigation. CPS indicated that to their knowledge no formal inspections of the impoundments have been performed and no safety reports prepared.

CPS representatives indicated to their knowledge there have been no known structural or operational problems associated with the CCW impoundments.

3.2 Summary of Local, State, and Federal Environment Permits

Currently, the CCW impoundments are regulated by the Texas Commission on Environmental Quality (TCEQ).

The J.T. Deely Power Plant was issued a permit by TCEQ under the National Pollutant Discharge Elimination System (NPDES) which includes outfalls for the North and South Bottom Ash Ponds. The Plant discharges liquids from the North and South Bottom Ash Ponds into Calaveras Lake under this permit. The permit, WQ0001514000, was issued on October 18, 2011 and expires on March 1, 2015. Because the Evaporation Pond does not include outlet structures, it is not included in the NPDES permit.

3.3 Summary of Spill/Release Incidents

According to CPS representatives, no releases or spills have occurred at the North and South Bottom Ash Ponds and Evaporation Pond.

Section 4

Summary of History of Construction and Operation

4.1 Summary of Construction History

4.1.1 Impoundment Construction and Historical Information

The J.T. Deely Power Plant began operation in 1977. The Plant has two coal-fired units and generates electricity with a total capacity of 800 megawatts of power.

The North and South Bottom Ash Ponds were constructed in 1977. Historical information on the North and South Bottom Ash Ponds available for review included original construction drawings provided in **Appendix C**. The North and South Bottom Ash Ponds were constructed approximately 300 feet west of Calaveras Lake, and 100 feet north of the Plant intake canal. Construction drawings show that the North and South Bottom Ash Ponds include perimeter embankments with approximately 11-foot-high, 15-foot-wide crests, with interior side slopes at 2 horizontal to 1 vertical (2H:1V) and exterior side slopes at 3H:1V. Crests were constructed to El. 500 and the bottom of the pond to El. 489. Construction documents appear to indicate the embankments were constructed with on-site excavated material however the location for the source of the embankment fill is unknown. No historical subsurface soil information in the vicinity of the North and South Bottom Ash Ponds was provided. Boring logs included in the 2014 RKCI report indicate the embankments consist of sandy clay and clayey sand fill material, and underlying native material consists of sandy clay and clayey sand with isolated tan and gray clay seams. Based on review of construction drawings, the North and South Bottom Ash Ponds are unlined.

The Evaporation Pond was constructed on top of an area that was previously used as a fly ash landfill and fly ash impoundment. Based on information provided by CPS the embankments were originally constructed sometime in the past for use as a fly ash landfill. No documentation on the original construction of the fly ash landfill was provided. In 1996 the landfill was converted into a fly ash impoundment. Construction drawings dated 1990 show the existing embankments with a crest elevation at El. 522 and bottom of the impoundment at El. 500. These construction drawings are included in Appendix C. The exterior and interior slopes are shown at 3H:1V. The crest is shown as 6 feet wide at the south embankment, 20 feet wide at the west and east embankments, and 30 feet wide at the north embankment. The 1990 construction drawings show that a 30-mil PVC liner was added to the interior slopes of the embankments. The function of the fly ash impoundment changed from storing fly ash to dewatering boiler chemical cleaning waste at some time after 1996.

4.1.2 Significant Changes/Modifications in Design since Original Construction

According to CPS representatives, significant modifications have been made to the North and South Bottom Ash embankments over the years, include adding ash and other granular material to the crest to maintain the roadway and widening the north embankment crest of the North Bottom Ash Pond. Based on survey drawings, it appears that the crests have been brought up about one foot on the North and South Bottom Ash Pond embankments. The embankment crests are currently at approximately El. 501. The north embankment of the bottom ash pond was originally constructed 15 feet wide based on construction drawings, but measured approximately 30 feet wide during the site assessment. No documentation of these modifications was provided.

According to CPS representatives, the Evaporation Pond was originally constructed as a fly ash landfill, converted into a fly ash impoundment, and then used as an evaporation pond for boiler chemical cleaning wastes. No documentation on the original construction of the fly ash landfill was provided. The only changes/modifications documented include the addition of the PVC liner shown on the 1990 construction drawings. Based on the visual observations during the site assessment, it appears the current configuration of the Evaporation Pond is consistent with the 1990 drawings.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

According to information provided by CPS no significant repairs or rehabilitation have been made to the North and South Bottom Ash Ponds, and Evaporation Pond.

4.2 Summary of Operational Procedures

4.2.1 Original Operating Procedures

The North Bottom Ash Pond has historically been used as a settling pond for sluiced bottom ash received from the Plant. Waste water streams discharged into the North Bottom Ash Pond have included:

- Bottom ash
- Low-volume waste
- Metal cleaning waste

The South Bottom Ash Pond has historically been used as a settling pond for sluiced bottom ash received from the Plant. Waste water streams discharged into the South Bottom Ash Pond have included:

- Bottom ash
- Low volume waste
- Metal cleaning waste

The fly ash impoundment underlying the Evaporation Pond had historically been used as a fly ash landfill and fly ash impoundment to store fly ash generated by the J.T. Deely and J.K. Spruce Power Plants. Recently the Evaporation Pond has been used to dewater, through evaporation, boiler chemical cleaning wastes. Waste stored in the Evaporation Pond has included:

- Fly ash
- Boiler chemical cleaning wastes

4.2.2 Significant Changes in Operational Procedures and Original Startup

No significant changes in operational procedures had been made to the North and South Bottom Ash Ponds. There was no documentation provided that indicates different.

The Evaporation Pond's function and operational procedures have changed over the years. The Evaporation Pond was constructed on top of a fly ash landfill that was converted into an ash impoundment in 1996. The ash landfill and impoundment were used to store ash materials at some time in the past but no further documentation was provided regarding the nature or amount of ash materials stored. Because it is unknown if the underlying pond was used to store CCW, a full assessment was performed on the Evaporation Pond. Currently the impoundment only receives boiler chemical cleaning wastes that are transported to the pond by truck.

4.2.3 Current CCW Impoundment Configuration

The North and South Bottom Ash Ponds and Evaporation Pond are currently configured as previously described and as shown on Figure 2-3. The approximate crest elevations of the embankments and pond areas are shown in **Table 4-1** below.

Table 4-1 – Approximate Crest Elevations and Surface Areas

Ash Pond	Approximate Crest Elevation (Feet)	Approximate Pond Surface Area (Acres)
North Bottom Ash Pond	501	6
South Bottom Ash Pond	501	7
Evaporation Pond	522	4.5

Over the life of the impoundments, ash has been excavated from the North and South Bottom Ash Pond approximately twice a year. Ash from the North Bottom Ash Pond was last excavated in April 2012 and from the South Bottom Ash Pond in August 2012. The Evaporation Pond was previously used to store fly ash, and during the site assessment solids in the impoundment were up to 0.5 to 2 feet below the crest elevation.

Under normal operating conditions, liquids are discharged into the North and South Bottom Ash Ponds through several pipes discharging near the center of the ponds. Outlet structures include a vertical outlet pipe with invert elevation El. 499 that is open during normal operations and used to maintain the water level in the ponds. Each pond also includes a drain pipe with invert elevation El. 489, that is opened to drain the ponds for periodically excavating ash. Liquids from the ponds are discharged into Calaveras Lake through outfalls located at the Plant's intake canal just south of the ponds. The North and South Bottom Ash Ponds also each include an outlet that is generally closed during normal operations, but can return liquids from the ponds to the Plant.

Under normal operating conditions boiler chemical cleaning wastes are transported by truck to the Evaporation Pond. The cleaning wastes are stored in the pond and dewatered, through evaporation, and no liquids are discharged from the impoundment.

4.2.4 Other Notable Events since Original Startup

Based on furnished information, there are no other notable events since original startup of the North and South Bottom Ash Ponds and Evaporation Pond to report at this time.

Section 5

Field Observations

5.1 Project Overview and Significant Findings (Visual Observations)

CDM Smith performed visual assessments of the impoundments at the J.T. Deely site. Impoundments assessed included the North and South Bottom Ash Ponds and the Evaporation Pond. The Bottom Ash Ponds are located between the generating units and Calaveras Lake. The Evaporation Pond is located approximately 1 mile northeast of the generating units. The perimeter embankments of the North and South Bottom Ash Ponds are each approximately 2,100 feet long, including the 700-foot-long center embankment that separates the two ponds, and approximately 12 feet high. The perimeter embankments of the Evaporation Pond are approximately 1,800 feet long and approximately 22 feet high. The assessments were completed following the general procedures and considerations contained in Federal Emergency Management Agency's (FEMA's) Federal Guidelines for Dam Safety (April 2004) to make observations concerning settlement, movement, erosion, seepage, leakage, cracking, and deterioration. A Coal Combustion Dam Inspection Checklist and Coal Combustion Waste (CCW) Impoundment Inspection Form, developed by USEPA, were completed for each of the aforementioned impoundments. Copies of these forms are included in Appendix B. Photograph locations are shown on **Figures 5-1** through **5-4**, and photographs are included in **Appendix D**. Photograph locations were logged using a handheld GPS device. The photograph coordinates are listed in Appendix D.

CDM Smith visited the Plant on August 27 and 28, 2012, to conduct visual assessments of the impoundments. The weather was generally sunny with daytime high temperatures up to 100 degrees Fahrenheit. The daily total precipitation prior to the site visit is shown in **Table 5-1**. The data were obtained from the National Oceanic and Atmospheric Administration (NOAA) station at the San Antonio Stinson Municipal Airport, approximately 9 miles west of the Plant.

Table 5-1 – Approximate Precipitation Prior to Site Visit

Date of Site Visit – August 27 and 28, 2012		
Day	**Date**	**Precipitation (inches)**
Monday	August 26	0
Sunday	August 25	0
Saturday	August 24	0
Friday	August 23	0
Thursday	August 22	0
Wednesday	August 21	0
Tuesday	August 20	0
Monday	August 19	2.05
Total	**(August 19 - 26, 2012)**	**2.05**
Total	**Month Prior to Site Visit (July 26 – August 26, 2012)**	**2.38**

Note: Precipitation data from NOAA. Station Location: San Antonio Stinson Municipal Airport. Lat. 28.3389; Lon. -98.472; EL.571 feet.

5.2 North Bottom Ash Pond

At the time of the assessment, the North Bottom Ash Pond contained bottom ash and liquids with approximately 2 feet of freeboard. An overview of the photographs taken at the North Bottom Ash Pond during the CDM Smith site assessment is included on Figure 5-1. Photographs of the pond outfalls are included on Figure 5-3.

5.2.1 Crest

The crest of the North Bottom Ash Pond appeared to be in satisfactory condition (Photographs 1, 10, 29, and 42). The crest was approximately 15 feet wide at all embankments except the north embankment where the crest measured approximately 30 feet wide. The crest of the embankments consists of compacted granular soils and gravel and is exposed to minimal vehicle traffic. An area of erosion near a fence post was observed at the north embankment crest (Photographs 5 and 52). Wood support poles for overhead powerlines are located in the crest of the north embankment (Photograph 1). No depressions or evidence of settlement were observed on the crest.

5.2.2 Interior Slopes

Due to the water level in the North Bottom Ash Pond during the assessment, only the upper 2 feet of the interior slopes were visible (Photographs 3, 12, 27, and 40). Based on construction drawings, the interior slopes were constructed at 2H:1V. The interior slopes were measured at approximately 3H:1V near the top of the embankment and included a layer of ash material (Photograph 28). Small areas of erosion into ash were observed on the interior slope at the east, south, and west embankments (Photographs 17, 23, 38, and 43) and an area of loose ash was observed on the east embankment interior slope (Photograph 14). Vegetation covered some portions of the interior slopes that were visible (Photographs 6, 12, 32, and 35). Visible portions of interior slopes did not include riprap or other armoring.

5.2.3 Exterior Slopes

Exterior slopes of the North Bottom Ash Pond appear to be in fair condition (Photographs 15, 30, 39, and 49). Due to the terrain and vegetation on the exterior slope of the north embankment, the slope was only visible from the embankment crest (Photograph 50). A few small trees and brush less than 8 inches in diameter were observed on the exterior slope of the north embankment (Photographs 47 and 48). The exterior slopes of the west and east embankments are approximately 3H:1V and covered in grassy vegetation approximately 3 inches tall (Photographs 16 and 39). The south embankment is shared with the South Bottom Ash Pond and is covered in ash material with sparse vegetation consisting primarily of grass and brush, approximately 2 feet high. Some areas of minor erosion into the ash material (Photographs 24, 25, and 26) were observed. The #1 Stormwater Runoff Pond is located at the west embankment exterior toe and the SRH Pond is located at the exterior toe of the southwest corner (Photograph 37).

5.2.4 Inlet Piping

Three inlet pipes discharge liquids near the center of the North Bottom Ash Pond; two 12-inch-diameter welded steel and one 8-inch-diameter welded steel pipe (Photographs 18 and 33).

5.2.5 Outlet Structures

The outlet structure located near the interior slope of the northeast corner consists of a 12-inch-diameter welded steel vertical outlet pipe and a 12-inch-diameter welded steel drain pipe. The outlet pipes are partially surrounded by a steel sheet pile wall containing an opening, with a floating sorbent boom (Photographs 7 and 11). The outlet pipes discharge liquids from the North Bottom Ash Pond to outfalls at the Plant intake canal (Photographs 85, 86, 87, and 88). A 24-inch-diameter welded steel outlet pipe at the interior slope near the southwest corner returns liquids from the pond to the Plant (Photograph 34).

5.3 South Bottom Ash Pond

At the time of the assessment, the South Bottom Ash Pond was drained. CCW had been recently excavated from the pond, leaving approximately 9 feet of freeboard. An overview of the photographs taken at the South Bottom Ash Pond during the CDM Smith site assessment is included on Figure 5-2. Photographs of the pond outfalls are included on Figure 5-3.

5.3.1 Crest

The crest of the South Bottom Ash Pond appeared to be in satisfactory condition (Photographs 29, 56, 65, and 73). All embankment crests were approximately 15 feet wide and consists of compacted granular soils and gravel and is exposed to minimal vehicle traffic. A clarifier structure associated with the adjacent SRH Pond was located on the west embankment crest (Photograph 78). The west embankment crest included two spillways connecting the SRH and South Bottom Ash Ponds (Photographs 75, 76, 77, 79, 80, and 81). No depressions or evidence of settlement were observed on the crest.

5.3.2 Interior Slopes

Interior slopes appeared to be in fair condition (Photographs 30, 59, 66, and 70). Based on construction drawings, the interior slopes were constructed at 2H:1V. The north embankment is shared with the North Bottom Ash Pond and is covered in ash material (Photograph 22). Vegetation is sparse, consisting primarily of grass and brush, approximately 2 feet high (Photographs 24, 25, 26, 59, 64, 70, and 84). Some areas of minor erosion into the ash material (Photographs 24, 25, and 26) were observed. A stockpile of CCW was observed on the east embankment interior slope (Photograph 57). Visible portions of interior slopes were not protected by riprap or other armoring.

5.3.3 Exterior Slopes

Exterior slopes of the South Bottom Ash Pond appear to be in fair condition (Photographs 27, 58, 62, and 74). The exterior slopes of the east and south embankments are approximately 3H:1V and covered in grassy vegetation approximately 3 inches tall (Photograph 63). The north embankment exterior slope is shared with the North Bottom Ash Pond and is covered in ash material with sparse vegetation consisting of grass and brush, approximately 2 feet high. Some areas of minor erosion were observed on the exterior slope, in the ash material (Photograph 23). The SRH Pond is located at the west embankment exterior slope and is covered with ash and other granular material (Photographs 74, 81, and 82). A drainage ditch is located at the south embankment exterior toe (Photograph 67).

5.3.4 Inlet Piping

Three inlet pipes discharge liquids near the center of the South Bottom Ash Pond; two 12-inch-diameter welded steel and one 8-inch-diameter welded steel pipe (Photograph 71). The piping was being replaced during the site assessment (Photograph 68).

5.3.5 Outlet Structures

The outlet structure near the interior slope of at the southeast corner consists of a 12-inch-diameter welded steel vertical outlet pipe and a 12-inch-diameter steel drain pipe. The outlet pipes are partially surrounded by a steel sheet pile wall containing an opening, with a floating sorbent boom, for flow to the outlet pipes (Photograph 61). The outlet pipes discharge liquids from the South Bottom Ash Pond to outfalls at the Plant intake canal (Photographs 85, 86, 87, and 89). A 24-inch-diameter welded steel outlet pipe at the interior slope near the northwest corner returns liquids from the pond to the Plant (Photograph 83).

5.4 Evaporation Pond

At the time of the assessment, the Evaporation Pond contained solids and boiler chemical cleaning wastes that were being dewatered in the impoundment with approximately 2 feet of freeboard. An overview of the photographs taken at the Evaporation Pond during the CDM Smith site assessment is included in Figure 5-4.

5.4.1 Crest

The embankment crest of the Evaporation Pond appeared to be in satisfactory condition (Photographs 90, 100, 108, and 114). The crest was approximately 15 feet wide at all embankments except the north embankment where the crest measured approximately 50 feet wide. The crest of the embankment consists of a compacted gravel drive and grass. The surface is exposed to minimal vehicle traffic. No depressions or evidence of settlement were observed on the crest.

5.4.2 Interior Slopes

Due to the level of solids and water in the Evaporation Pond during the assessment, only the upper 0.5 to 2 feet of the interior slopes were visible (Photographs 91, 101, 102, 106, and 115). Vegetation covered some portions of the west and south embankment interior slopes (Photographs 111, 115, and 120). Ash and other solid material extend up to the crest near the southeast corner interior slope and on the east embankment interior slope (Photographs 91 and 122). Visible portions of interior slopes did not include riprap or other armoring.

5.4.3 Exterior Slopes

The exterior slopes appear to be in satisfactory condition and are covered in grassy vegetation approximately 2 feet high and a few small trees and bushes with diameters less than 6 inches in diameter (Photographs 93, 98, 109, and 119). Areas of loose soil were observed at the east embankment exterior slope (Photographs 92, 94, and 96) and an animal burrow was observed in the west embankment exterior slope (Photograph 110). An area of exposed soil was observed at the south embankment exterior slope (Photograph 117). Based on construction drawings, the exterior slopes are 3H:1V at all embankments, though slopes measured in the field ranged from 3H:1V to 4H:1V (Photographs 97 and 118). Trees up to 12 inches in diameter were located at the toe of all embankments (Photographs 95, 105, 112, and 119).

AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

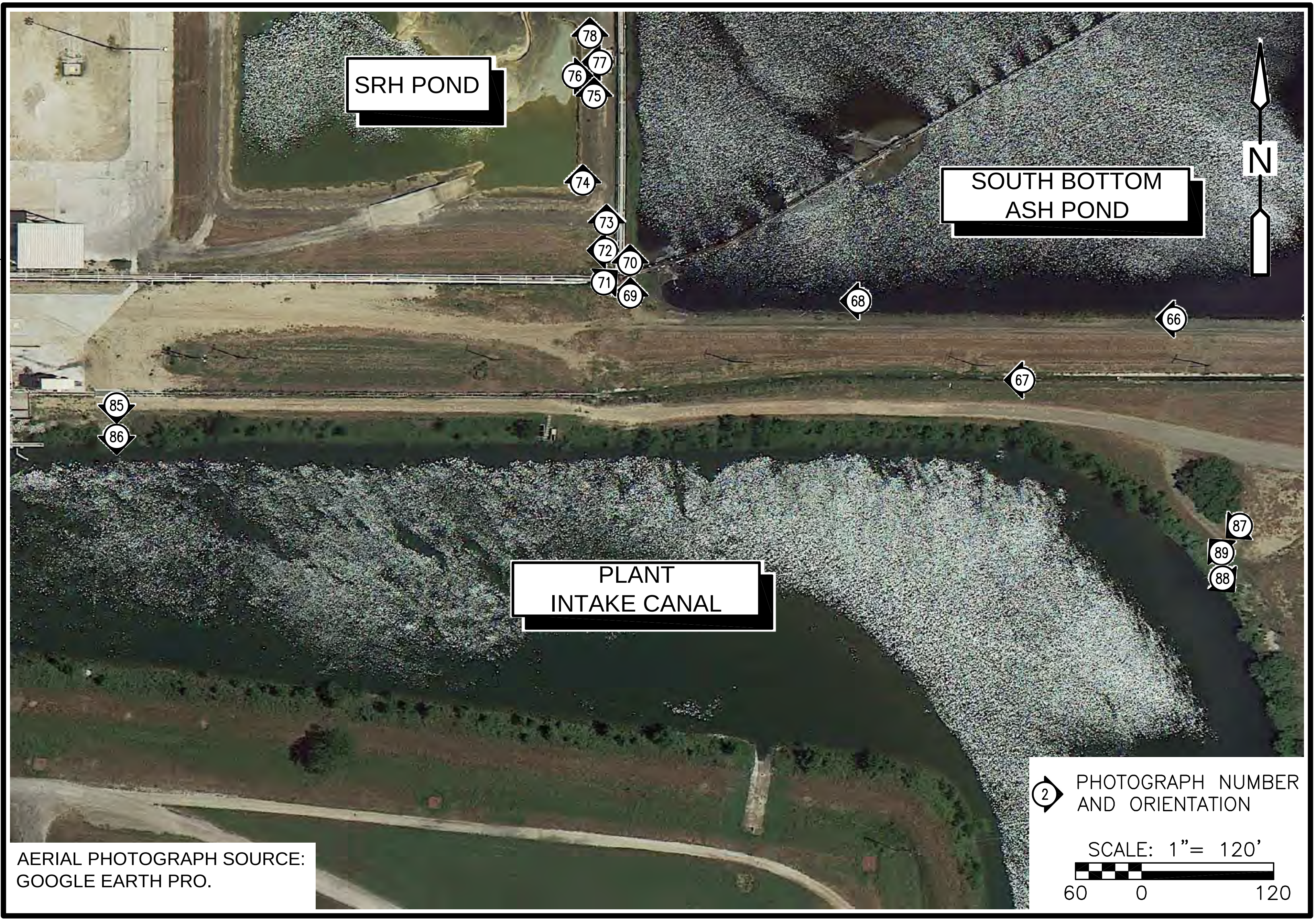
CDM Smith

J.T. DEELY POWER PLANT
SAN ANTONIO, TEXAS
NORTH BOTTOM ASH POND
FIGURE 5-1

AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

CDM Smith

J.T. DEELY POWER PLANT
SAN ANTONIO, TEXAS
SOUTH BOTTOM ASH POND
FIGURE 5-2



AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

CDM Smith

J.T. DEELY POWER PLANT
SAN ANTONIO, TEXAS
ASH POND OUTFALLS
FIGURE 5-3

AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

CDM Smith

J.T. DEELY POWER PLANT
SAN ANTONIO, TEXAS
EVAPORATION POND
FIGURE 5-4

Section 6

Hydrologic/Hydraulic Safety

6.1 Impoundment Hydraulic Analysis

Because they are off-channel impoundments, coal combustion waste impoundments are not classified as dams by the TCEQ. TCEQ regulates coal combustion waste impoundments as industrial waste impoundments and provides recommendations for construction, operation, and maintenance of all nonhazardous surface impoundments in "Technical Guideline No. 4, Topic: Nonhazardous Industrial Solid Waste Surface Impoundments", dated June 12, 2009. The guidelines include the Hydrologic/hydraulic recommendation that surface water diversion dikes with a minimum height equal to two (2) feet above the 100-year flood water elevation should be constructed around industrial solid waste surface impoundments located within the 100-year flood plain. Industrial solid waste impoundments located above the 100-year flood water elevation should include surface water diversion dikes that are, at a minimum, capable of diverting all rainfall runoff from a 24-hour, 25-year storm.

FEMA guidance, as described in "*Selecting and Accommodating Inflow Design Floods for Dams; FEMA P-94 /August 2013*", recommends hydrologic design of impoundments to consider discharge and storage capacities, reservoir regulation plans, land requirements, and wind/wave effects. FEMA guidelines recommend site-specific hydrologic design for high hazard impoundments which take into consideration the inflow design flood (IDF). FEMA recommends that dams with a low hazard potential be designed for a 1-percent annual chance of exceedance flood (average return frequency of no less than once in 100 years) and that dams with a significant hazard potential be designed for a 0.1-percent annual chance of exceedance flood (average return frequency of no less than once in 1,000 years).

The North and South Bottom Ash Ponds were classified as significant hazard impoundments and the Evaporation Pond was classified as a low hazard impoundment. Documentation provided by CPS included Turnkey Contract Documents prepared by Black & Veatch and dated December 31, 1987. These documents included precipitation amounts for selected storm durations and return periods expected in the Calaveras Lake area. Black & Veatch reported a precipitation of 7.75 inches for a 24-hour, 25-year storm, and precipitation ranging from 3.35 inches to 9.92 inches for 100-year storms ranging in duration from ½ hour to 24 hours. No documentation was provided by CPS on the site-specific IDF.

The drainage area contributing to the North and South Bottom Ash Ponds, and the Evaporation Pond appears to be limited to the surface area of the impoundments. A preliminary evaluation performed by CDM Smith suggests there is enough storage capacity under current operating pool levels for the North and South Bottom Ash Ponds to safely store precipitation from a 0.1-percent annual chance exceedance (1,000-year) flood. A preliminary evaluation performed by CDM Smith suggests there is enough storage capacity under current operating pool levels for the Evaporation Pond to safely store precipitation from a 1-percent annual chance exceedance (100-year) flood.

6.2 Adequacy of Supporting Technical Documentation

The hydrologic and hydraulic supporting documentation of the North and South Bottom Ash Ponds, and the Evaporation Pond is considered inadequate based on the following:

- H & H documentation provided by CPS included precipitation amounts for selected storm durations and return periods expected in the Calaveras Lake site area. No documentation was provided by CPS on the ability of the impoundments to store the FEMA-recommended design floods.

- An evaluation to determine the required IDF and of the capacity of the North and South Bottom Ash Ponds, and Evaporation Pond to withstand the design hydrologic/hydraulic events, without overtopping have not been provided.

6.3 Assessment of Hydrologic/Hydraulic Safety

Hydrologic and hydraulic safety of the North and South Bottom Ash Ponds and Evaporation Pond is considered adequate based on the following:

- CDM Smith's preliminary evaluation of the CCW impoundments suggests the North and South Bottom Ash Ponds and the Evaporation Pond have adequate storage capacity, based on normal operating conditions, to store the recommended floods.

It should be noted that during visual observations and site assessments, no signs of plugged, collapsed, or blocked pipes, or other detrimental conditions were observed.

Section 7

Structural Stability

7.1 Supporting Technical Documentation

The available information regarding slope stability of the North and South Bottom Ash Ponds and the Evaporation Pond consists of a report titled "Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas", prepared by Raba Kistner Consultants, Inc., (RKCI) and dated May 7, 2014. The RKCI May 2014 report supersedes RKCI's November 12, 2012 report referenced in CDM Smith's December 2012 "Assessment of Dam Safety of Coal Combustion Surface Impoundments , CPS Energy, J.T. Deely Power Plant". RKCI's 2014 report included slope stability analyses for steady-state and seismic loading conditions of the North and South Bottom Ash Pond and Evaporation Pond embankments. The calculated factors of safety presented in the RKCI 2014 report, for the load conditions analyzed, met minimum required factors of safety outlined by the USACE in EM 1110-2-1902, Table 3-1 and seismic factors of safety by *FEMA Federal Guidelines for Dam Safety*, *Earthquake Analyses and Design of Dams*. The RKCI 2014 report did not present analyses for liquefaction potential, end-of-construction, and rapid drawdown loading conditions. RKCI stated in the 2014 report that the end-of-construction condition was not evaluated due to the age of the ash ponds. RKCI also stated that both rapid drawdown and erosion failures are considered to be of very low risk due to the embankment toe elevations (above EL 490 feet) with respect to the target pool elevation (EL 485 feet) and because they would pose no risk of environmental contamination, because the pond must empty for this condition to occur. The RKCI 2014 report is included in Appendix A. A summary of the RKCI 2014 analyses is provided in the following sections.

7.1.1 Stability Analyses and Load Cases

TCEQ recommendations related to embankment stability of coal ash impoundments are included in "Technical Guideline No. 4, Topic: Nonhazardous Industrial Solid Waste Surface Impoundments", dated June 12, 2009. TCEQ's Technical Guideline No. 4 recommends all permanent earthen dikes that are used to retain waste or waste waters above ground level should have a top width of at least eight (8) feet and side slopes that are not steeper than one (1) foot vertical to three (3) feet horizontal. TCEQ's recommended factor of safety against dike slope failure is at least 1.4. In situations where a backup system is not used for potential catastrophic failure of the dikes, TCEQ recommends a minimum factor of safety of 1.5.

Procedures established by the United States Army Corps of Engineers (USACE), the United States Bureau of Reclamation, the Federal Energy Regulatory Commission, and the Natural Resources Conservation Service are generally accepted engineering practice. Minimum required factors of safety outlined by the USACE in EM 1110-2-1902, Table 3-1 and seismic factors of safety by FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams (pgs. 31, 32 and 38, May 2005) are provided in **Table 7-1**.

Table 7-1 - Recommended Minimum Safety Factors

Load Case	Minimum Required Factor of Safety
Steady-State Condition at Normal Pool or Maximum Storage Pool Elevation	1.5
Rapid Drawdown Condition from Normal Pool Elevation	1.3
Maximum Surcharge Pool	1.4
End of Construction	1.3
Seismic Condition at Normal Pool Elevation	1.0
Liquefaction	1.3

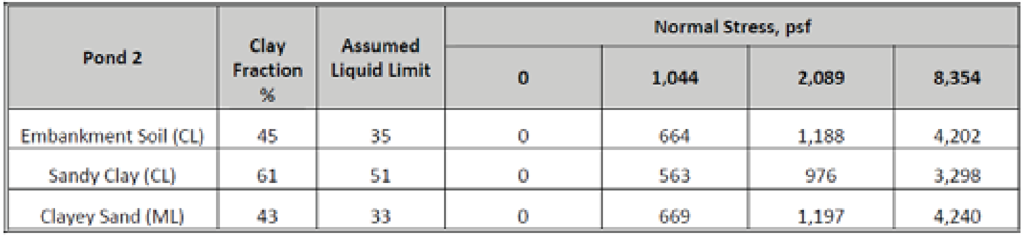
RKCI performed slope stability analyses for each of the embankments at the North and South Bottom Ash Ponds (Sections E, F, G, H, I and N) and all four of the Evaporation Pond embankments (Sections A, B, C, and D). Slope stability analyses were performed for steady-state seepage conditions at normal pool and maximum storage pool elevations, using effective stress analyses and for seismic conditions using total stress analyses. Analyses were performed with two feet of freeboard, and pond water levels at the top of the crest, corresponding to normal pool and maximum surcharge loading conditions, respectively. Seismic design parameters used in the seismic slope stability analyses included the mapped spectral response acceleration for an earthquake with a (0.098g) applied horizontal seismic load. RKCI indicated in their 2014 report that the applied horizontal seismic load had a 4-to-6 % probability of exceedance in 50 years. USEPA guidelines specify that the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years be used in seismic slope stability analyses. CDM Smith used USGS referenced maps, published in the 2010 ASCE-7 Standard, to determine the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years. CDM Smith found the spectral response acceleration for the Deely site to be 0.075g.

According to the 2014 RKCI report, rapid drawdown load conditions were not analyzed for slope stability, because the impoundments would have to be emptied for this condition to occur. The end-of-construction condition was not analyzed because the ponds have been in place for many years. According to information provided by RKCI, slope stability analyses for liquefaction conditions were not performed because liquefaction is very unlikely at the site due to the subsurface conditions and low seismic hazard level at the Plant site. As described in Section 1, CDM Smith agrees with RKCI's rationale for not performing these analyses.

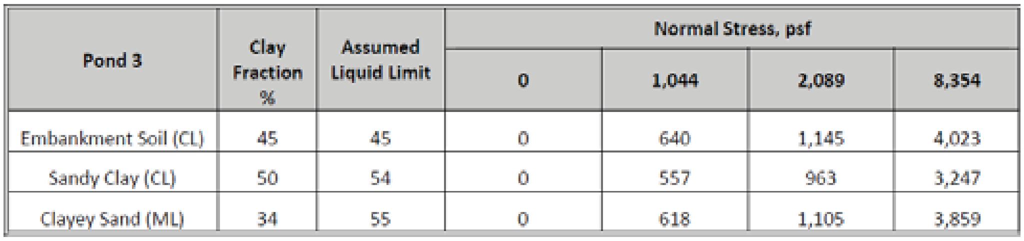
7.1.2 Design Parameters and Dam Materials

CPS provided RKCI with field survey drawings for the embankments analyzed. According to the RKCI report, Pape Dawson Engineers, Inc. (PDE) spot-checked the existing embankments and surveyed cross-sections where the existing conditions did not closely resemble the earlier survey data. RKCI performed test soil borings at the embankment crests of the North and South Bottom Ash Ponds and Evaporation Pond. Seven borings were performed at the North and South Bottom Ash Ponds and four were performed at the Evaporation Pond. Soil and groundwater information obtained from these test borings were used in RKCI's slope stability analyses. The soil properties and strength parameters used in RKCI's steady-state seepage and seismic slope stability analyses are included in **Tables 7-2** and **7-3**, respectively. RKCI refers to the North and South Bottom Ash Ponds as Pond 2, and the Evaporation Pond as Pond 3.

Table 7-2 - Soil Parameters Used in RKCI's Steady-State Slope Stability Analyses



Pond 2	Clay Fraction %	Assumed Liquid Limit	Normal Stress, psf			
			0	1,044	2,089	8,354
Embankment Soil (CL)	45	35	0	664	1,188	4,202
Sandy Clay (CL)	61	51	0	563	976	3,298
Clayey Sand (ML)	43	33	0	669	1,197	4,240



Pond 3	Clay Fraction %	Assumed Liquid Limit	Normal Stress, psf			
			0	1,044	2,089	8,354
Embankment Soil (CL)	45	45	0	640	1,145	4,023
Sandy Clay (CL)	50	54	0	557	963	3,247
Clayey Sand (ML)	34	55	0	618	1,105	3,859

Source: RKCI May 7, 2014 report, "Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas"

Table 7-3 - Soil Parameters Used in RKCI's Seismic Slope Stability Analyses

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)
Embankment Fill	120	350	20
Clayey Sand	120	400	20
Clayey Sand Below Water Table	57.6	400	20
Sandy Clay	120	500	20
Sandy Clay Below Water Table	57.6	500	20

Source: RKCI May 7, 2014 report, "Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas"

According to the RKCI report, soil parameters (drained cohesion and drained friction angle) for steady-state seepage analyses were selected based on consolidated undrained triaxial compression test results at four different normal stresses and published correlations. The strength parameters selected for the seismic analyses were based on unconfined compressive strength results and experience with similar soils.

7.1.3 Uplift and/or Phreatic Surface Assumptions

According to the 2014 RKCI report, steady-state seepage analyses were performed for each profile using finite element groundwater module within SLIDE, a software program developed by RocScience. The seepage analyses were performed for each embankment cross-section with water levels at the embankment crests. Results of the seepage analyses were used for the steady-state seepage and seismic slope stability analyses.

7.1.4 Factors of Safety and Base Stresses

A summary of safety factors computed for the different cases of the North and South Bottom Ash Ponds (Sections E, F, G, H, I, J, and N) and Evaporation Pond (Sections A, B, C, and D) is included in **Table 7-4**.

A factor of safety of 1.2 was calculated for the exterior slope of cross-section G. RKCI addressed the low factor of safety for cross-section G in their report stating the slope failure surface was relatively shallow and did not appear to threaten the pond. The analysis was rerun considering deeper slope failure surfaces and achieved a factor of safety of 1.4. The factor of safety of 1.4 for Section G is below the minimum factor of safety recommended by the USACE for long-term, steady-state normal pool conditions. Calculated factors of safety for all other cross-sections analyzed, other than Section G, were greater than USACE specified minimum factors of safety. Based on furnished information, there are no other notable events since original startup of the North and South Bottom Ash Ponds. During the site assessment by CDM Smith, no significant deficiencies were observed at the South Bottom Ash Pond and Evaporation Pond. Based on the history free notable events and CDM Smith's observations, it is likely that the slope is stable under the conditions it has experienced. Therefore, the calculated factor of safety for Section G of the North Bottom Ash Pond, that is lower than the required factor of safety, is likely not of significant concern.

Table 7-4, Computed Factors of Safety for Various Stability Conditions

Embankment Cross-Section		Factor of Safety Steady-State Stability Analyses(1)		Required Safety Factor	Factor of Safety Factor of Safety(2)		Required Safety Factor	Factor of Safety Seismic Stability Analyses		Required Safety Factor
		Interior Slope	Exterior Slope		Interior Slope	Exterior Slope		Interior Slope	Exterior Slope	
North and South Bottom Ash Ponds	E	>2	>2	1.5	>2	>2	1.4	>2	>2	1.0
	F	>2	>2		>2	>2		>2	>2	
	G	>2	1.2/1.4(3)		>2	1.4		>2	1.9	
	H	>2	>2		>2	>2		>2	>2	
	I	>2	1.8		>2	>2		>2	>2	
	J	>2	>2		>2	>2		>2	>2	
	N	>2	1.6		>2	>2		>2	>2	
Evaporation Pond	A	>2	>2		>2	>2		>2	>2	
	B	>2	>2		>2	>2		>2	>2	
	C	>2	1.5		>2	>2		>2	>2	
	D	>2	1.9		>2	>2		>2	>2	

Source: RKCI May 7, 2014 report, "Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas".

1. Normal Pool
2. Maximum Surcharge
3. See discussion in Section 7.1.4.

7.1.5 Liquefaction Potential

CDM Smith was not provided documentation on liquefaction analysis. RKCI stated that liquefaction is very unlikely at the site due to the subsurface soil and groundwater conditions, and seismic conditions at the Plant site. As reported by RKCI, there is less than a 0.1% chance of an earthquake with magnitude of 5.0 or greater in 50 years. Because the site contains significant quantities of relatively stiff clay, RKCI believes the soils beneath the existing embankments have a very low risk of experiencing liquefaction due to an earthquake. Available subsurface information indicates the soils below the embankments consist of fill underlain by medium dense to very dense sandy soils and/or very stiff sandy clay. The liquefaction susceptibility of the dense sandy soils and the stiff clay is generally considered to be low.

7.1.6 Critical Geological Conditions

According to the Quaternary Geologic Map of the Austin 4 x 6 Quadrangle published by the United States Geological Survey, geology in the vicinity of the Plant consists of gray, light brown, brown, or orange clayey, fine to medium quartz sand to fine sandy silty clay with subrounded sandstone pebbles, colluviums, and small bedrock outcrops in some localized areas. According to the United States Department of Agriculture, surface soils in the area are comprised of fine sand, loamy fine sand, and sandy clay loam.

7.2 Adequacy of Supporting Technical Documentation

Existing conditions and visual observations yield a satisfactory rating for structural stability of both the North and South Bottom Ash Ponds, and Evaporation Pond based on the following:

- Steady-state and seismic stability analyses for of the North and South Bottom Ash Ponds and Evaporation Pond embankments are documented.

- RKCI provided assessments of the embankments’ liquefaction potential, and structural stability applicable for end of construction and sudden drawdown loading conditions. RKCI did not analyze liquefaction potential, end of construction and sudden drawdown loading conditions. As described above, CDM Smith agrees with RKCI’s rationale for not performing analyses for these loading conditions.

- In their seismic slope stability analyses, RKCI used the mapped spectral response acceleration of 0.098g from the USGS web site calculator. Using USGS referenced maps, published in the 2010 ASCE-7 Standard, CDM Smith determined the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years to be 0.075g. Accordingly, in CDM Smith’s opinion, the response acceleration employed in RKCI’s seismic analyses conforms to USEPA standards.

7.3 Assessment of Structural Stability

Based on the review of the stability analyses and visual observations made during the site visit, CDM Smith considers the condition rating to be satisfactory for structural stability of the North and South Bottom Ash Ponds and Evaporation Pond.

During CDM Smith’s visual observations and site assessments of the North Bottom Ash Pond and Evaporation Pond, the high water and solids level in the impoundments prevented observation of the interior slopes.

Section 8

Adequacy of Maintenance and Methods of Operation

8.1 Operating Procedures

During normal operating procedures the North and South Bottom Ash Ponds receive sluiced bottom ash, low volume waste, and metal cleaning waste from the J.T. Deely Power Plant. Liquids are discharged near the center of each impoundment. Within both ponds, an outlet structure includes a vertical outlet pipe with invert elevation at El. 499 that typically maintains approximately 2 feet of freeboard. A drain pipe near the vertical outlet is closed during normal operating procedures, but is opened to drain the ponds for cleaning. The drain pipe has an invert elevation at El. 489. A metal sheet pile wall with an opening surrounds the outlet pipes. During the site assessment a floating sorbent boom was observed across the opening in the sheet pile wall.

A second drain pipe is located on the embankment opposite the outlet structures in both ponds. This second drain pipe is closed during normal operating procedures, but can be opened to transfer liquids from the ponds to the Plant. Settled solids are periodically excavated from the North and South Bottom Ash Pond and sold for beneficial use. During the site assessment the North Bottom Ash Pond contained water and ash material, and the South Bottom Ash Pond was drained for cleaning out ash and replacing inlet piping. According to CPS representatives, the target pool level in the Ash Pond is at least 2 feet of freeboard. Liquids from the North and South Bottom Ash Pond are discharged into Calaveras Lake through an outfall just south of the ponds.

During normal operating procedures, the Evaporation Pond receives boiler chemical cleaning wastes generated by the J.T. Deely Power Plant and J.K. Spruce Power Plant that are trucked to the pond. The wastes are dewatered through evaporation. No liquids are discharged from the Evaporation Pond. During the site assessment, ash material and other solids extended up to 0.5 to 2 feet below the crest.

8.2 Maintenance of the Dam and Project Facilities

CPS indicated during the site assessment by CDM Smith on August 27 and 28, 2012, that visual inspections are performed for the North and South Bottom Ash Ponds twice a day when water level readings are measured. These inspections are only documented if irregularities are observed. No formal inspections of the Evaporation Pond are performed.

Regular maintenance operations include mowing adjacent to the North and South Bottom Ash Ponds and Evaporation Pond.

8.3 Assessment of Maintenance and Methods of Operations

8.3.1 Adequacy of Operating Procedures

Based on CDM Smith's visual observations and review of documents provided by CPS, operating procedures appear to be generally adequate for the impoundments. There is no readily available indication that suggests that the North and South Bottom Ash Ponds and Evaporation Pond primary purposes are not being accomplished.

8.3.2 Adequacy of Maintenance

Based on CDM Smith's visual observations and review of documents provided by CPS, maintenance of the North and South Bottom Ash Ponds and the Evaporation Pond appear to be generally adequate. Maintenance issues at the North Bottom Ash Pond included minor areas of erosion into ash on the west embankment interior slope, and trees and vegetation on the north embankment exterior slope. Maintenance issues on the shared divider embankment between the North Bottom Ash Pond and the South Bottom Ash Pond included minor areas of slope erosion into ash. Maintenance issues on the exterior slopes of the Evaporation Basin included areas of loose soil and exposed soil, and an animal burrow.

Section 9

Adequacy of Surveillance and Monitoring Program

9.1 Surveillance Procedures

CPS is required by Texas Commission on Environmental Quality (TCEQ) under National Pollutant Discharge Elimination System (NPDES) Permit No. WQ0001514000 to monitor discharge of wastewater into Calaveras Lake. Surveillance procedures should be in accordance with the TCEQ – NPDES Permit.

CPS indicated that they do a general inspection of the North and South Bottom Ash Ponds twice a day and notes are made if any irregularities of the embankments are observed. There are no known surveillance procedures other than measuring water levels and checking for deficiencies at both the North and South Bottom Ash Ponds. Water levels are measured and recorded twice a day for the North and South Bottom Ash Ponds. Water levels are measured from a reference level at the invert elevation of the vertical outlet pipes at El. 499 at both of the ponds. Water level documentation from August 2012 is included in Appendix C.

According to CPS, no surveillance procedures exist for the Evaporation Pond.

9.2 Instrumentation Monitoring

The North and South Bottom Ash Ponds and Evaporation Pond embankments do not have an instrumentation monitoring system to monitor structural stability, seepage, or ground displacement. As previously mentioned, water levels in the North and South Bottom Ash Ponds are measured manually twice a day. Water levels are not monitored in the Evaporation Pond.

9.3 Assessment of Surveillance and Monitoring Program

9.3.1 Adequacy of Inspection Programs

Based on the documents reviewed by CDM Smith and visual observations during the site assessment, the inspection program appears to be adequate for the North and South Bottom Ash Ponds, though the inspections should be documented in the future. Inspection programs do not exist for the Evaporation Pond and are inadequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

The CPS surveillance program for the North and South Bottom Ash Ponds is considered adequate. The CPS surveillance program for Evaporation Pond is considered inadequate.

Section 10

Reports and References

The following is a list of reports and drawings that were provided by CPS and were used during the preparation of this report and the development of the conclusions and recommendations presented herein.

1. J.T. Deely Unit 1 Construction Drawings by Black & Veatch Consulting Engineers, dated 1974.
2. Turnkey Contract Documents Volume 4 by Utility Engineering Corporation, dated December 31, 1987,
3. J.K. Spruce Unit 1 Construction Drawings by Utility Engineering Corporation, dated 1989.
4. J.T. Deely/J.K. Spruce Construction Drawings by Frank Tobar, dated 1990.
5. Daily water level readings recorded between August 1, 2012 and August 16, 2012.
6. Raba Kistner Consultants, Inc. Geotechnical Engineering Study, Ash Pond Berms – Spruce/Deely Generation Units, dated November 20, 2012.
7. Raba Kistner Consultants, Inc. Geotechnical Engineering Study, Ash Pond Berms – Spruce/Deely Generation Units, dated May 7, 2014.

Appendix A

RKCI Geotechnical Engineering Study

RABA KISTNER

GEOTECHNICAL ENGINEERING STUDY

FOR

ASH POND BERMS - SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

RABA KISTNER CONSULTANTS

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

Project No. ASA12-098-00 (Revised)
May 7, 2014

Mr. Eric R. Olson
CPS Energy
c/o Mr. Steven Dean, P.E.
Pape-Dawson Engineers, Inc.
555 East Ramsey
San Antonio, Texas 78216

RE: Geotechnical Engineering Study
Ash Pond Berms – Spruce/Deely Generation Units
San Antonio, Texas

Dear Mr. Dean:

Raba Kistner Consultants Inc. (RKCI) is pleased to submit the revised report of our Geotechnical Engineering Study for the above-referenced project. This study was performed in accordance with RKCI Proposal No. PSA12-168-00 (3rd Revision), dated October 4, 2012, and comments provided in a conference call on April 17, 2014. The purpose of this study was to drill borings within the existing ash pond berms, to perform laboratory testing to classify and characterize subsurface conditions, and to prepare an engineering report presenting slope stability analyses for the existing berms.

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.

R. Blake Wright

R. Blake Wright, E.I.T.
Graduate Engineer

STATE OF TEXAS
ERIC J. NEUNER
116311
LICENSED
PROFESSIONAL ENGINEER
5/7/2014

Eric J. Neuner, P.E.
Manager, San Antonio Engineering

RBW/JAF/EJN

Attachments

Copies Submitted: Above (4)

GEOTECHNICAL ENGINEERING STUDY

For

ASH POND BERMS – SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

Prepared for

PAPE-DAWSON ENGINEERS, INC.
San Antonio, Texas

Prepared by

RABA KISTNER CONSULTANTS, INC.
San Antonio, Texas

PROJECT NO. ASA12-098-00 (Revised)

May 7, 2014

RABAKISTNER

TABLE OF CONTENTS

TABLE OF CONTENTS

ATTACHMENTS

Appendix A (Field Data)

Appendix B (Laboratory Test Results)

Appendix C (Slope Stability Analyses)

Appendix D (Seismic Analyses)

INTRODUCTION

Raba Kistner Consultants Inc. (RKCI) has completed the authorized subsurface exploration and slope stability analyses for the existing ash pond berms at the Spruce/Deely Generation Units in San Antonio, Texas. This report briefly describes the procedures utilized during this study and presents our findings along with our recommendations for maintaining the existing ash pond berms.

PROJECT DESCRIPTION

The structures being considered in this study include the existing ash pond berms located at the Spruce/Deely Generation Units, which is operated by CPS Energy. Specifically, three ponds were studied and are denoted on the Boring Location Map, Figure 1. Our understanding of the slope profile at each berm, as well as the existing site topography, is based on several drawings provided to us on September 14, November 1, 2012, and May 6, 2014 by Mr. Steven Dean, P.E., with Pape-Dawson Engineers, Inc.

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 existing ash pond berms at the Spruce/Deely Generation Units .

The geotechnical properties of the soils encountered in this study involve variability. This variability includes some spatial variability; however, the spatial variability appears to occur over relatively short distances. It is important to note that berms differ from other types of structures, such as drilled piers or driven piles, in that the performance of the berm involves local, not average, soil conditions.[1] 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 all slope stability analyses. We believe that the combination of observed conditions and probable failure modes justifies this approach.

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.

---

[1] Focht, J.A. Jr. and Focht, J.A. III, "Factor of Safety and Reliability in Geotechnical Engineering, Discussion and Closure", ASCE JGGE Vol. 127 No. 8, pp.700-721, August 2001.

The recommendations submitted in this report are based on the data obtained from 14 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.

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.

BORINGS AND LABORATORY TESTS

Subsurface conditions at the site were evaluated by 14 borings drilled at the locations shown on the Boring Location Map, Figure A-1. These locations are approximate and distances were measured using a recreational-grade, hand-held GPS locator; tape; angles; pacing; etc. Ground surface elevations were estimated from the topography depicted on the above-referenced drawings provided by Mr. Dean. The estimated 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 No.	Ground Surface Elevation (ft, MSL)	Boring Bottom Elevation (ft, MSL)
B-1	522	472
B-2	523	473
B-3	522	472
B-4	523	473
B-5	501	461
B-6	500	460
B-7	500	470
B-8	501	461
B-9	499	469
B-10	496	456
B-11	496	466
B-12	500	470
B-13	496	456
B-14	501	461

The borings were drilled using a truck-mounted drilling rig. During drilling operations, the following samples were collected:

Type of Sample	Number Collected
Split-Spoon (with Standard Penetration Test)	126
Undisturbed Shelby Tube	28

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 following tests:

Type of Test	Number Conducted
Natural Moisture Content	151
Atterberg Limits	29
Percent Passing a No. 200 Sieve	33
Direct Shear	2
Consolidated-Undrained ($\overline{\text{CU}}$) Triaxial	10
Unconfined Compression	17
Dry Unit Weight	17

With the exception of the $\overline{\text{CU}}$ 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 A-2 through A-15. A key to classification terms and symbols used on the logs is presented on Figure A-16. The results of the laboratory and field testing are also tabulated on Figure B-1 for ease of reference.

Standard penetration test results are noted as “blows per ft” on the boring logs and Figure B-1, 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 B-1.

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.

pH TESTING

Seepage from the ash ponds would most likely result in an increase pH in the embankment soils. As a part of our laboratory study, we evaluated the collected soil samples using a phenolphthalein solution. We customarily screen for pH in order to prevent chemical burns to our laboratory staff, who typically work with the samples bare-handed.

No reaction to the phenolphthalein solution was noted in any of the samples tested. This would indicate that all samples tested had a pH value of less than 8.

$\overline{\text{CU}}$ TESTS

Multi-stage $\overline{\text{CU}}$ tests were used to measure both total and effective soil strength parameters of harvested samples from the project site. During $\overline{\text{CU}}$ testing, each stage was subjected to a range of effective consolidation pressure.

The following table presents the results of our multi-stage $\overline{\text{CU}}$ tests:

Boring No.	Depth (ft)*	Effective		Total		Stress Path	
		Friction Angle, ϕ' (degrees)	Cohesion, c' (psf)	Friction Angle, ϕ (degrees)	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Cohesion, c (psf)
B-2	13-15	18.6	1,350	20.2	1,390	19.1	1,310
B-3	18-20	21.7	1,130	22.7	1,220	25.9	1,060
B-5	8-10	28.0	730	30.0	1,020	29.5	720
B-7	8-10	28.3	2,040	-	-	36.2	560
B-9	8-10	33.6	0.0	38.6	0.0	24.0	1,070
B-12	8-10	27.2	1,160	34.9	1,090	31.3	860

*Depth below the top of berm surface elevation existing at the time of our field study.

DIRECT SHEAR TESTS

Direct shear tests were performed on two samples collected during drilling operations. The results of these tests are presented in the table below:

Boring No.	Depth (ft)	Apparent Cohesion (psf)	Phi (degrees)
B-3	28.5 - 30	62	27
B-5	38.5 – 40	72	34

LIQUID DENSITY TESTS

Three one-gallon liquid samples were collected at the site on April 22, 2014. These samples were collected from the Evaporation Pond, North Bottom Ash Pond, and the North SRH Pond. The densities of these liquids are presented in the following table:

Sample Location	Density (pcf)
Evaporation Pond	61.0
North Bottom Ash Pond	60.6

Sample Location	Density (pcf)
North SRH Pond	60.7

FLY ASH SPECIFIC GRAVITY TESTING

Two samples of fly ash sludge were collected at the site on April 22, 2014 to calculate the specific gravity of the fly ash. The calculated specific gravities are presented in the table below:

Sample Location	Specific Gravity
North Bottom Ash Pond	2.59
South Bottom Ash Pond	2.60

MOISTURE-DENSITY TESTING

The density of the at surface material in the dry portions of the ponds was measured on April 22, 2014 using a nuclear density gauge. The results of these tests are presented in the tables below:

Pond	Sample Location	Wet Density (pcf)	Moisture Content (%)	Dry Density (pcf)
Evaporation Pond	West Edge of Pond	94.2	33.3	70.7
		92.9	40.0	66.4
		92.0	31.1	70.2
		95.2	31.5	72.4
		92.6	35.5	68.4
		94.4	34.5	70.2
North Bottom Ash Pond	East and Southeast Edge of Pond	106.3	18.0	90.1
		111.2	19.0	93.4
		107.3	24.2	86.4
		112.9	17.9	95.8
		110.7	21.5	91.1
		107.6	24.9	86.2
South Bottom Ash Pond	Center of Pond	118.0	18.0	100.0
		122.2	16.3	105.1
		119.5	16.2	102.9
		114.6	19.2	96.2
		106.7	23.6	86.4
		115.5	17.7	98.1

GENERAL SITE CONDITIONS

SITE DESCRIPTION

The project site is a tract of developed land located at the Spruce/Deely Generation Units , which is operated by CPS Energy. The ash ponds considered in this study are located east and northeast of the existing main power plant facility. The entire facility is bounded to the west, south, and east by Calaveras Lake. The topography generally slopes downward toward Calaveras Lake. CPS maintains the Calaveras Lake at a target pool elevation of Elevation 485 feet 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 the rain event.

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

The subsurface stratigraphy at this site varies from pond to pond, and berm to berm. However, the embankment fill soils typically consist of sandy clay or clayey sand. It is difficult to distinguish between these two soil types in the berms because the percent passing a No. 200 sieve ranges within about 10 percentage points higher and lower than 50%. The subgrade stratigraphy is also generally composed of interbedded sandy clay and clayey sand. There were also isolated tan and gray clay seams encountered in our borings. 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. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual, which vary within a relatively narrow combined range of Plasticity Index and -200 values.

GROUNDWATER

The depth to groundwater was measured in all borings except Boring B-1. The groundwater level in Boring B-1 could not be measured due to the introduction of drilling fluids in this boring.

Upon completion of the drilling operations, groundwater levels ranged from 11 to 17 ft below the existing ground surface in the borings drilled for Ponds 1 and 2. Groundwater levels ranged from 40 to 42 ft below the existing ground surface in the borings drilled for Pond 3 (with the exception of Boring B-1).

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. Fluctuations in groundwater levels are possible due to variations in rainfall and surface water run-off.

EARTHEN BERMS

DESIGN CONSIDERATIONS

The existing berms should meet three important criteria: they should be resistant to the forces of erosion, should exhibit a suitable slope stability design allowable factor of safety with respect to long-term, short-term, and sudden drawdown conditions, as well as performance type scenarios such as underseepage. The berm structure must meet these criteria so that the calculated risk of failure is consistent with criteria established by the USACE guidelines.

Probable failure modes

Our review of the site and expected conditions for the Calaveras Power Plant ash ponds indicates that the following major modes of failure could affect the berms:

- Slope stability
- Underseepage
- Embankment Seepage

The following sections address each of these failure modes, as well as slope erosion and liquefaction.

Slope Stability Based on our review of available data and our visual observations during drilling, the existing embankments exhibit slopes ranging from about 3:1 (horizontal:vertical) or flatter, while a few limited areas exhibit slopes of about 2.5:1.

In general, slopes flatter than 3:1 would be expected to exhibit the required factors of safety for a normal (non-flood) seepage condition with the area water table near Elevation 485 feet.

Underseepage We generally consider underseepage to be a very low risk for the existing berms. Underseepage consists of water flowing beneath the embankment as a result of water seeping out of the ash ponds. The principal failure mechanism related to underseepage occurs when the upward force of the water equals or exceeds the buoyant weight of the soil. This does not appear likely to occur at this project site.

Berm Seepage Embankment seepage consists of water flowing through the berm as a result of seepage through the berm. The principal failure mechanism related to embankment seepage occurs when the horizontal force of the water equals or exceeds the effective shear strength of the soil. This mode of failure is not expected to occur at this project site.

Slope Erosion The existing embankments are generally composed of cohesive soils, while the underlying soils are generally composed of cohesive soils with layers semi-cohesive soils. It appears that the existing embankments were constructed using the soils available at the project site. These materials are generally considered acceptable to good materials to use when constructing berms, dams 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.

Liquefaction Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soils most susceptible to liquefaction are clean, loose, saturated, uniformly graded, and fine-grained sands. Empirical evidence indicates that loose silty sands are also potentially liquefiable. When seismic ground shaking occurs, the soil is subjected to cyclic shear stresses that can cause excess hydrostatic pressures to develop. If excess hydrostatic pressures reach the effective confining stress from the overlying soil, the sand may undergo deformations. If the sand undergoes virtually unlimited deformation without developing significant resistance, it is said to have liquefied, and if the sand consolidates or vents to the surface during and following liquefaction, ground settlement may occur.

The soils contain significant quantities of clay, and are relatively dense. Even when groundwater is present, the berms have a very low potential for liquefaction during earthquake events, particularly since the USGS online resources indicate there is less than 0.1 percent chance of experiencing a magnitude 5.0 or greater earthquake at this site during a 50 year period. In addition, calculations performed using the Seed and Idriss method indicate the most susceptible tested sample must experience a ground acceleration in excess of 0.44g before liquefaction will occur. Based on these findings, RKCI believes the soils beneath the existing berms have a very low risk of experiencing liquefaction due to an earthquake.

SLOPE STABILITY

This section presents our slope stability analyses performed for this study. In general, the procedures described in USACE EM 1110-2-1902 *Slope Stability* were followed. As such, our analysis focused on embankment stability, settlement, interior drainage, and slope protection.

The slope configurations analyzed, method of analysis, loading conditions, and soil properties used in the analyses are discussed in the following paragraphs.

Minimum Factor of Safety

For a given slope configuration, the forces that “drive” slope failure (including gravity, groundwater seepage pressure, and possible excess pore water pressures from external loading conditions) are compared to the slope’s resistance to failure, which is a function of dewatering controls and internal shear strength (cohesion and internal angle of friction) of both the foundation soils and the fill soils utilized for construction of the embankment.

The USACE has specified minimum safety factors against slope failure with respect to loading conditions. The minimum acceptable factors of safety for berms at end of construction, rapid drawdown, and steady state conditions, provided in Table 3-1 on Page 3-2 of EM 1110-2-1902, are listed in the following table. The minimum safety factor against slope failure during an earthquake is customarily assumed to be a calculated value greater than 1.0 where the risk of loss of life is low and the structure is not deemed critical in nature (hospitals, emergency services, etc.)

Condition	Required Factor of Safety
End of Construction	1.3
Sudden Drawdown	1.1 to 1.3
Long Term (Steady Seepage)	1.4
Earthquake	Greater than 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.

Slope Configurations

At the time this technical report was prepared, field surveys drawings of the existing berms had been performed by Pape Dawson Engineers, Inc. As a part of their work, we understand that Pape Dawson spot-checked the existing berms, and only provided surveyed cross-sections where the existing condition did not closely resemble the original drawings. As such, we have provided the original design geometry for the purposes of our study for the select berms. Figure C-1 shows the profiles that were surveyed and those that are based on the design drawings.

We recognized four general soil conditions along the length of the alignment that may be considered as worst-case boundary conditions. As such, four cases were analyzed based on these boundary conditions.

Method of Analysis

The slope stability analyses for this study were conducted with the aid of a computer using the program SLIDE developed by RocScience. The SLIDE computer program randomly generates trial failure surfaces and evaluates the factor of safety for each trial surface. The program allows a large number of potential shear surfaces to be investigated to determine the critical failure surface for each of the analyzed slope configurations.

The portions of the program used in this study employed both the Morgenstern-Price and Spencer computational methods. These methods were used to make calculations of the stability of slopes where non-circular failure surfaces were permitted. In each case, the computed factor of safety is the ratio of the forces resisting movement to the driving forces. A factor of safety of 1.0 or less implies the slope is unstable, while a factor of safety greater than 1.0 implies the slope is stable.

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.

Liquid/Sludge Loads Based on the results of the density testing performed on the samples collected on April 22, 2014, we have included additional loads on the analyses conducted for the "dry side" 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 sludge and/or liquid in the ponds. The increase in the pressure due to this material is modeled in our analysis.

These loads were not applied to the "pond side" analyses due to the increase in factors of safety from this loading condition.

End of Construction The short-term (undrained) loading condition models the slope immediately following construction. For this loading condition, the pore pressures developed during construction have not had the opportunity to dissipate. We did not analyze this condition since the berms have been in place for many years.

Steady State Seepage The long term (drained), steady-state seepage loading condition was analyzed. This loading condition models the ash ponds with 2 ft of freeboard along the berm crest and assumes that the berm soils are fully saturated and a condition of steady state seepage occurs through the embankment. For this loading condition, effective stress soil parameters were used in the analysis.

Maximum Pool The analyses for "Maximum Pool" consider those given for "Steady State" but assume that the pond is completely full.

The maximum pool condition represents a more severe condition than an assumed steady state analysis with the pond level 2 ft below the top of the embankment. Provided the analyses meet the relevant criteria for slope stability and seepage, a separate steady state analysis for normal operating conditions is not required.

Sudden Drawdown from Design Flood Stage This condition represents the situation when the water within the pond is drained at such a rapid rate that the saturated berm soils do not have time to drain. Consequently, excess pore water pressures result in the soil. We did not model this condition since it would pose no risk of environmental contamination, because the pond must be empty for this condition to occur.

SOIL PARAMETERS

Drained soil parameters (drained cohesion and drained friction angle) were selected for each soil stratum based on the laboratory and field test data collected during our study as well as correlations published by Stark and Hussain (2010)[2]. The fully softened soil strength envelopes were compared to the stress path strength envelopes developed from the $\overline{\text{CU}}$ tests performed for this study. With the possible exception of the multi-stage $\overline{\text{CU}}$ test performed on a sandy clay sample harvested from Boring B-2 at 13 to 15 feet, all of the stress path strength envelopes developed from the $\overline{\text{CU}}$ tests exceeded the Stark and Hussain fully softened soil strength envelopes. We assumed that soil behavior was represented by the fully softened soil condition, and also evaluated Profile D using both the relevant fully softened soil strength envelope and the stress path strength envelope developed from the referenced $\overline{\text{CU}}$ test. We did not employ the residual strength soil properties since we found no evidence of pre-existing failure surfaces, and are unaware of any prior slope failures in the berm slopes. For purposes of our slope stability analyses, we have assigned the material properties presented in the following table.

Drained Fully Softened Shear Stresses from Equations Developed by Stark and Hussain (2010)

North and South SRH Ponds	Clay Fraction %	Assumed Liquid Limit	Normal Stress, psf				Equivalent Upper-Bound Soil Parameters	
			0	1,044	2,089	8,354	c (psf)	Phi (degrees)
Embankment Soil (CL)	47	42	0	647	1,158	4,075	186	25.0
Sandy Clay (CL)	52	52	0	561	972	3,281	202	20.2
Clayey Sand (ML)	36	33	0	669	1,197	4,240	183	25.9

---

[2] Stark, T.D. and M. Hussain, "Shear Strength in Pre-existing Landslides," *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, 136(7), July, 2010, pp. 957-962.

North and South Bottom Ash Ponds	Clay Fraction %	Assumed Liquid Limit	Normal Stress, psf				Equivalent Upper-Bound Soil Parameters	
			0	1,044	2,089	8,354	c (psf)	Phi (degrees)
Embankment Soil (CL)	45	35	0	664	1,188	4,202	184	25.7
Sandy Clay (CL)	61	51	0	563	976	3,298	202	20.3
Clayey Sand (ML)	43	33	0	669	1,197	4,240	183	25.9

Evaporation Pond	Clay Fraction %	Assumed Liquid Limit	Normal Stress, psf				Equivalent Upper-Bound Soil Parameters	
			0	1,044	2,089	8,354	c (psf)	Phi (degrees)
Embankment Soil (CL)	45	45	0	640	1,145	4,023	186	24.7
Sandy Clay (CL)	50	54	0	557	963	3,247	202	20.0
Clayey Sand (ML)	34	55	0	618	1,105	3,859	187	23.7

The tables obtained from Stark and Hussain can be used to estimate equivalent c-phi linear shear strength parameters that have been traditionally used in slope stability analyses. These values are also tabulated in the three tables presented above. Please note that the c-phi values tend to overestimate the available soil shear strength at low overburden pressures. The Stark and Hussain values correctly predict the likelihood of shallow surface sloughs for clay soils, but the calculated results for the deeper failures contemplated in this study should be essentially the same using either soil model.

Results of Analyses

The following table contains a summary of the results from our slope stability analyses for each loading condition and slope configuration. In general, the point where a potential slide surface was permitted to intersect was not allowed to occur within 3 ft of the relevant top of slope. This limitation was intended to reduce the occurrence of "non-critical" failure surfaces from 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 at the end of this memorandum in Appendix C. The "a" series figures show the critical failure surface on the "dry side" of each berm, while the "b" series figures show the critical failure surface on the "pond side" of each berm.

Computed Factors of Safety for North and South SRH Ponds					
Slope Profile	**End of Construction**	**Steady State on Pond Side**	**Steady State on Dry Side**	**Maximum Pool on Pond Side**	**Maximum Pool on Dry Side**
J	N/A	> 2	> 2	> 2	> 2
K	N/A	> 2	> 2	> 2	> 2
L	N/A	> 2	> 2	> 2	> 2
M	N/A	> 2	1.7	> 2	1.6

Computed Factors of Safety for North and South Bottom Ash Ponds					
Slope Profile	**End of Construction**	**Steady State on Pond Side**	**Steady State on Dry Side**	**Maximum Pool on Pond Side**	**Maximum Pool on Dry Side**
E	N/A	> 2	> 2	> 2	> 2
F	N/A	> 2	> 2	> 2	> 2
G	N/A	1.8	1.3	> 2	1.4
H	N/A	> 2	> 2	> 2	> 2
I	N/A	1.8	1.6	> 2	1.5
N	N/A	1.9	1.6	> 2	1.6

Computed Factors of Safety for the Evaporation Pond					
Slope Profile	**End of Construction**	**Steady State on Pond Side**	**Steady State on Dry Side**	**Maximum Pool on Pond Side**	**Maximum Pool on Dry Side**
A	N/A	2	> 2	> 2	> 2
B	N/A	> 2	> 2	> 2	> 2
C	N/A	> 2	1.5	> 2	> 2
D	N/A	> 2	1.9	> 2	> 2

SEEPAGE ANALYSIS

We performed steady-state seepage analyses for each slope profile using the finite element groundwater module within SLIDE. Our seepage analyses were performed assuming that the soil properties observed in our borings exhibited a 5:1 ratio of permeability (horizontal:vertical) with the assumed permeability values presented in the following table.

Soil	Assumed Permeability, cm/second	
	Horizontal	Vertical
Clay	$1\text{x}10^{-7}$	$2\text{x}10^{-8}$
Sandy Clay	$1\text{x}10^{-6}$	$2\text{x}10^{-7}$
Clayey Sand	$1\text{x}10^{-4}$	$2\text{x}10^{-5}$

EARTHQUAKE ANALYSES

Each berm profile was also evaluated for earthquake conditions utilizing a design spectral acceleration of 0.098g. The assumed seismic force was calculated using the USGS web site calculator; in general, these analyses are considered to be very conservative since the nearest documented active fault is roughly 385 miles from the project site. A probabilistic assessment of the likelihood of the project site experiencing a magnitude 5 or larger earthquake within a 50 year period was also performed. This assessment indicated that the probability of occurrence was only 4 to 6 percent, which is considerably less than the 10 percent required by USEPA regulations. Graphical representations of these analyses are presented in Appendix D. The "a" series figures show the critical failure surface on the "dry side" of each berm, while the "b" series figures show the critical failure surface on the "pond side" of each berm.

Quasi-static analyses were performed, with soil behavior modeled using total stress soil strength values. The assumed values of shear strength used in our models consisted of both a cohesion intercept and angle of internal friction, with the cohesion intercept values chosen based on the unconfined compressive strength testing performed for this study as well as prior area experience. The strength values chosen are considered lower bound for the soils encountered at the project site.

The soil properties utilized for these analyses are presented in the following table:

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)
Embankment Fill	120	350	20
Clayey Sand	120	400	20
Clayey Sand Below Water Table	57.6	400	20
Sandy Clay	120	500	20
Sandy Clay Below Water Table	57.6	500	20

Results of Quasi-Static (Seismic) Analyses

Global stability analyses were also performed for each slope analyzed for steady state conditions. The results of our analyses are summarized below and are graphically presented in Appendix D at the end of this report.

Computed Factors of Safety for North and South SRH Ponds					
Slope Profile	End of Construction	Steady State on Pond Side	Steady State on Dry Side	Maximum Pool on Pond Side	Maximum Pool on Dry Side
J	N/A	> 2	> 2	> 2	> 2
K	N/A	> 2	> 2	> 2	> 2
L	N/A	> 2	> 2	> 2	> 2
M	N/A	> 2	1.7	> 2	1.6

Computed Factors of Safety for North and South Bottom Ash Ponds					
Slope Profile	End of Construction	Steady State on Pond Side	Steady State on Dry Side	Maximum Pool on Pond Side	Maximum Pool on Dry Side
E	N/A	> 2	> 2	> 2	> 2
F	N/A	> 2	> 2	> 2	> 2
G	N/A	> 2	1.9	> 2	1.9
H	N/A	> 2	> 2	> 2	> 2
I	N/A	> 2	> 2	> 2	> 2
N	N/A	> 2	> 2	> 2	> 2

Computed Factors of Safety for the Evaporation Pond					
Slope Profile	End of Construction	Steady State on Pond Side	Steady State on Dry Side	Maximum Pool on Pond Side	Maximum Pool on Dry Side
A	N/A	> 2	> 2	> 2	> 2
B	N/A	> 2	> 2	> 2	> 2
C	N/A	> 2	1.5	> 2	> 2
D	N/A	> 2	1.9	> 2	> 2

RESULTS

In general, the global stability analyses for steady state conditions resulted in calculated factors of safety in excess of 2 for both long term and earthquake conditions. Three sections exhibited calculated factors of safety of less than 2, and one section (“G”) exhibited a calculated factor of safety of 1.2 for the “dry” slope. Review of Figure C-8a revealed that the critical failure surface for this analysis was relatively thin and did not appear to threaten the ash pond reservoir. A second analysis of this section was then performed, with the top of the assumed surfaces limited to intersecting the ground surface at the top of slope of the “wet” slope or farther from the “dry” slope. Surfaces in this portion of the berm would not threaten containment of the ash pond's contents. The results of this analysis are presented on Figure C-8c, and indicate the calculated factor of safety for this analysis was 1.4.

Global stability analyses for the assumed earthquake conditions resulted in calculated factors of safety that exceeded 1.5 in the evaluated cases. These results indicate that pond failures due to seismic forces do not pose a significant threat to the ash ponds at this site.

CONCLUSIONS

The existing berms were constructed of lean sandy clays and/or clayey sands over competent sandy clays and clayey sands. Liquefaction is considered a very low risk issue at this site. The results of our seepage analyses indicate that no significant risk of an erosion or piping-type failure beneath the ash pond embankments exists. The results of our earthquake analyses indicate that no significant risk of embankment failure due to seismic forces exists at this site. Global stability analyses of steady state conditions indicate that acceptable calculated factors of safety were obtained for reasonable failure surfaces through the embankments at this site, even though the analyses were performed using fully softened soil strength envelopes that were lower than $\overline{CU}$ tests indicate are available at the project site.

The end-of-construction condition was not evaluated due to the age of the ash ponds, and both rapid drawdown and erosion failures are considered to be of very low risk due to the embankment toe elevations (above EL 490 feet) with respect to the target pool elevation (EL 485 feet). We do not consider embankment seepage or underseepage to pose a significant risk to the berm based on both the long-term performance of the berms and the results of the seepage analyses, which was indirectly confirmed by the pH testing performed on all of the harvested soil samples. The results of our slope stability analyses indicate that all of the berm slopes meet or exceed both USEPA and USACE criteria for stability under steady state (long term) and seismic (earthquake) conditions.

* * * * * * * * * * * * * * * * * *

The following appendices are attached and complete this report:

Field Data	Appendix A
Laboratory Test Results	Appendix B
Slope Stability Analyses	Appendix C
Seismic Analyses	Appendix D

APPENDIX A

FIELD DATA

RABA KISTNER CONSULTANTS

Raba Kistner Consultants, Inc.
12821 West Golden Lane
San Antonio, Texas 78249
P 210 :: 699 :: 9090
F 210 :: 699 :: 6426
www.rkci.com
TBPE Firm Number 3257

SOURCE: 2011 Aerial Photograph Provided by the City of San Antonio (COSA)

BORING & MONITORING WELL LOCATION MAP

ASH POND BERMS - SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

REVISIONS:

No.	DATE	DESCRIPTION

PROJECT No.:	ASA12-098-00
ISSUE DATE:	10/10/2012
DRAWN BY:	CCL
CHECKED BY:	RBW
REVIEWED BY:	GLB

FIGURE

A-1

LOG OF BORING NO. B-1

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

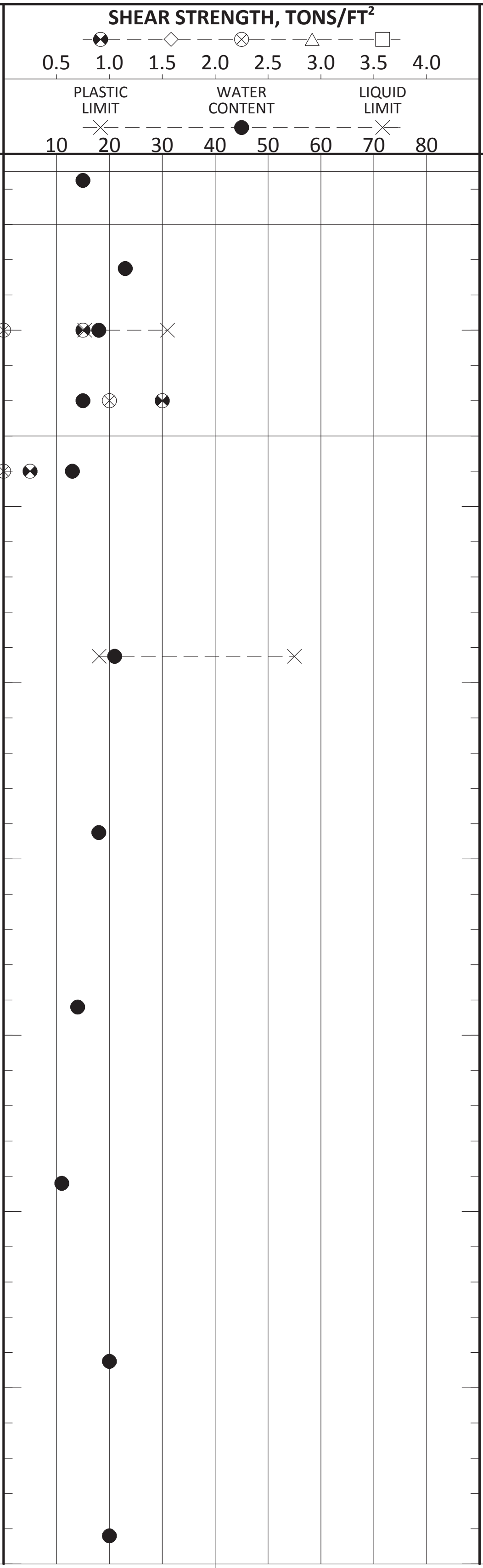
DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32477; W 98.31464

SURFACE ELEVATION: 522 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
BASE MATERIAL (6 in.) FILL MATERIAL: SAND, Medium Dense, Tan	11			
FILL MATERIAL: CLAY, Sandy, Firm, Reddish-Tan, with gray mottling	7			50
		106	16	
		110		
SAND, Clayey, Medium Dense to Very Dense, Tan to Gray		112		40
-with a tan and gray clay seam from 13 to 15 ft	16		37	
-switched to mud rotary at 15 ft				
	22			
	50/11"			
	50/11"			43
	49			
	50/11"			

DEPTH, FT: 5, 10, 15, 20, 25, 30, 35



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.7 ft	**DEPTH TO WATER:** N/A	**PROJ. No.:**	ASA12-098-00
DATE DRILLED: 10/15/2012	**DATE MEASURED:** 10/15/2012	**FIGURE:**	A-2a

LOG OF BORING NO. B-1

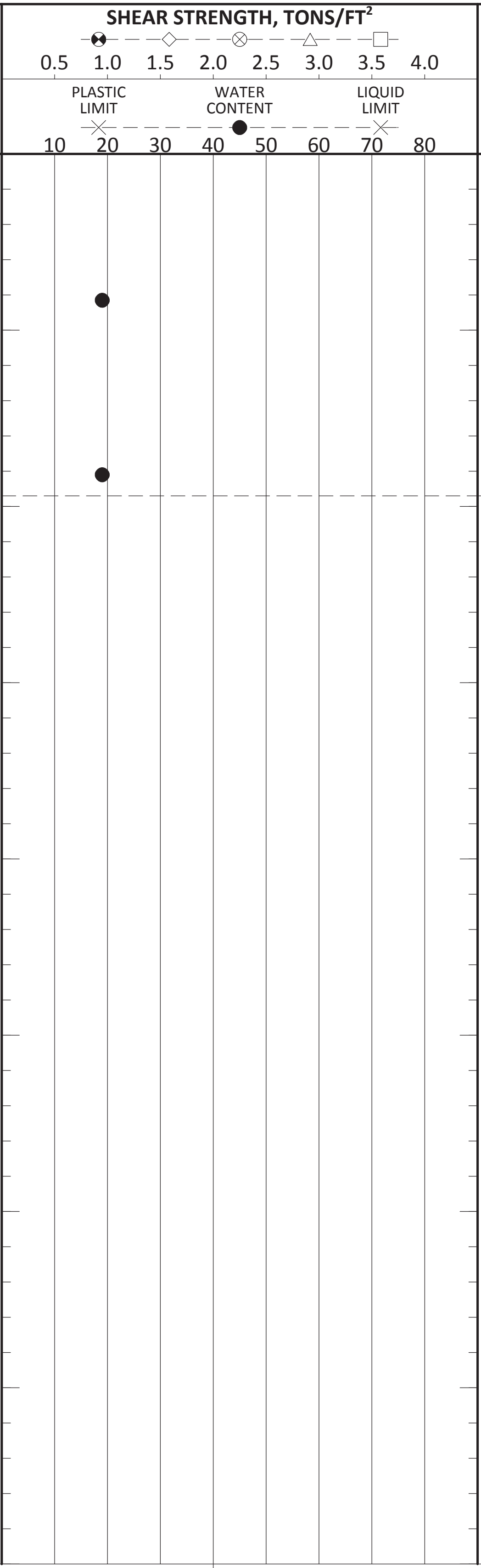
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32477; W 98.31464

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 522 ft	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
			SAND, Clayey, Medium Dense to Very Dense, Tan to Gray *(continued)*				
45		☒		50/9"			
		☒		50/8"			
50							
55							
60							
65							
70							
75							



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.7 ft	**DEPTH TO WATER:**	N/A	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/15/2012	**DATE MEASURED:**	10/15/2012	**FIGURE:**	A-2b

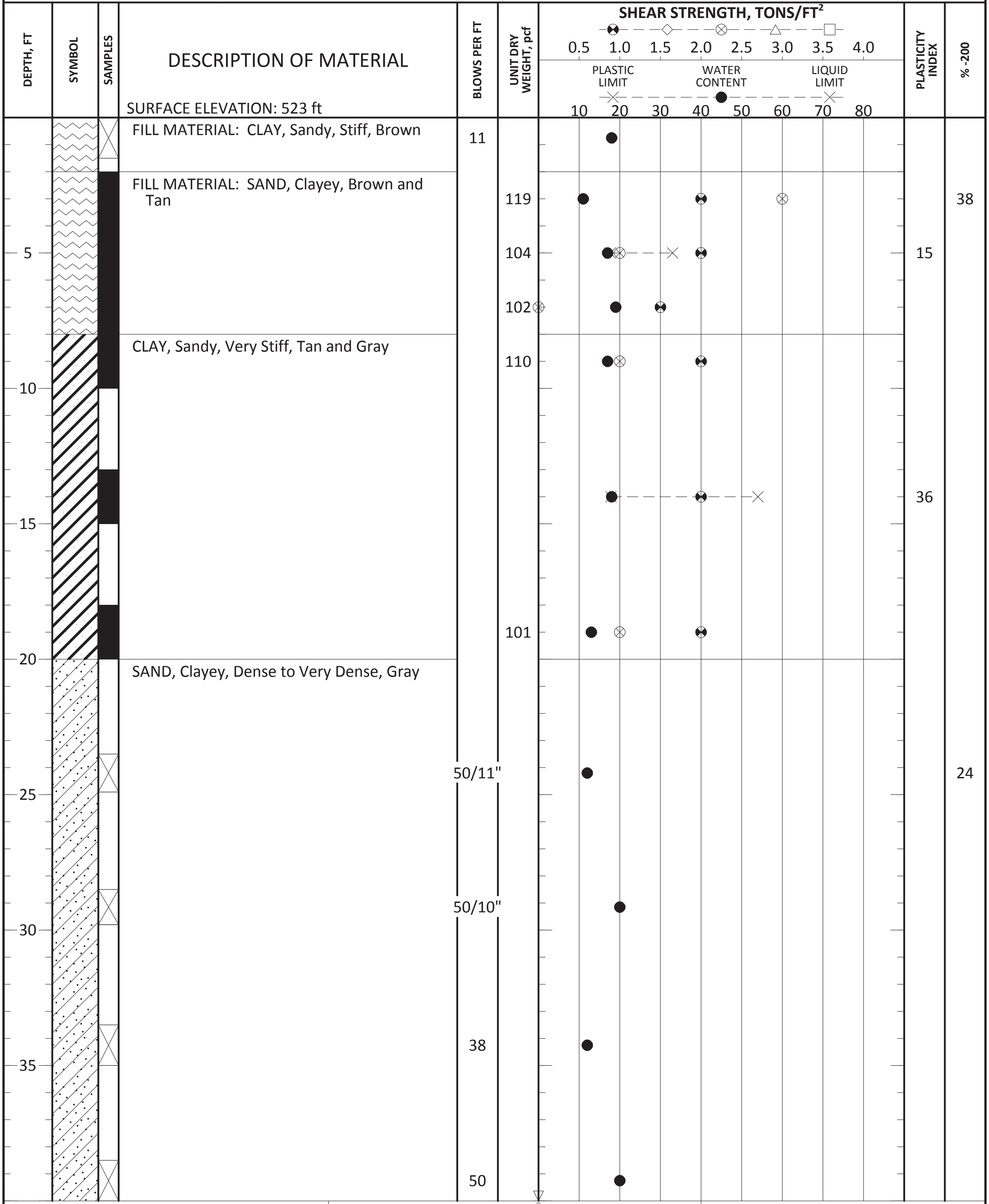
LOG OF BORING NO. B-2

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32378; W 98.31541



DESCRIPTION OF MATERIAL SURFACE ELEVATION: 523 ft	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: CLAY, Sandy, Stiff, Brown	11			
FILL MATERIAL: SAND, Clayey, Brown and Tan		119		38
		104	15	
		102		
CLAY, Sandy, Very Stiff, Tan and Gray		110		
			36	
		101		
SAND, Clayey, Dense to Very Dense, Gray	50/11"			24
	50/10"			
	38			
	50			

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	40 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/16/2012	**DATE MEASURED:**	10/16/2012	**FIGURE:**	A-3a

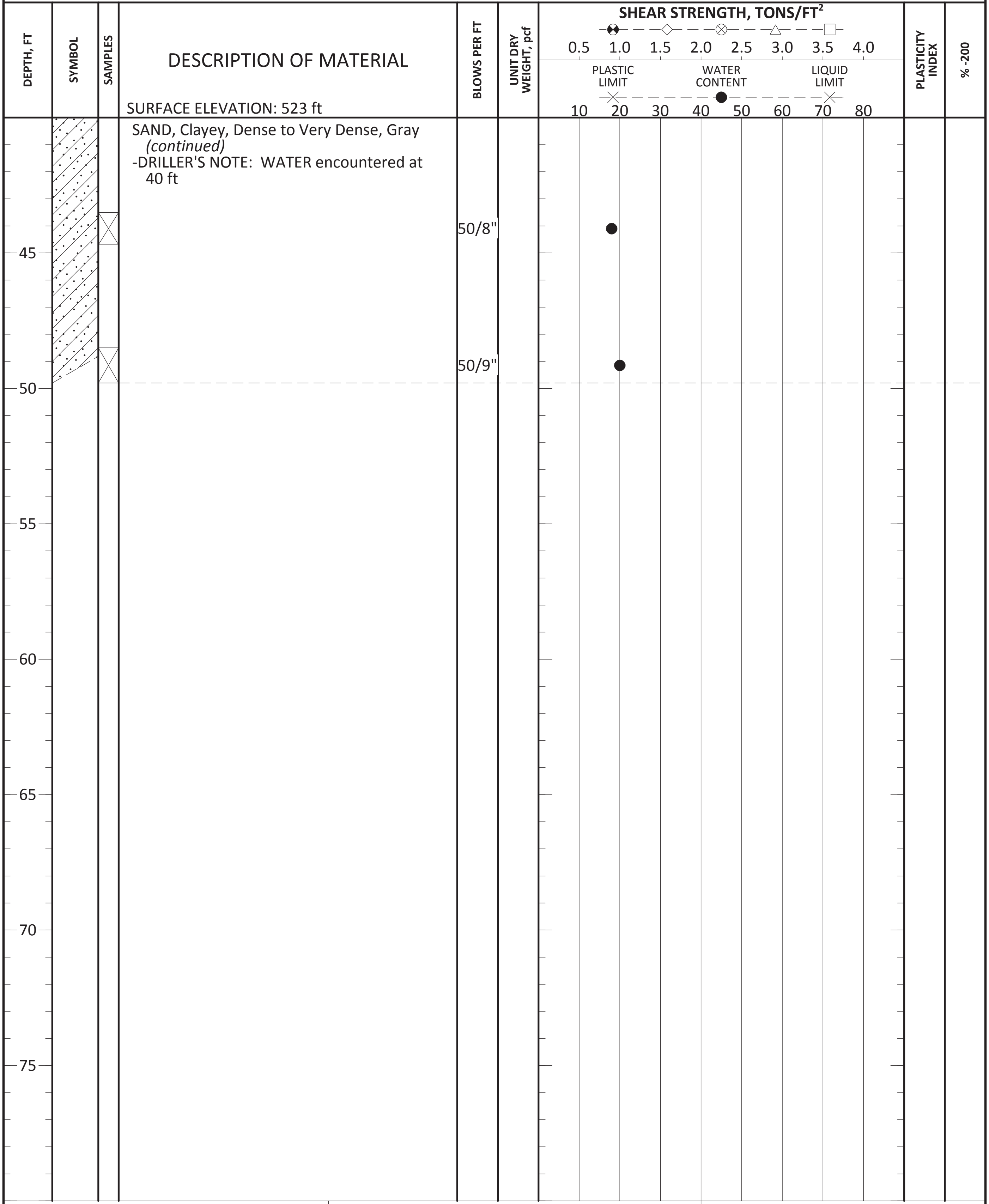
LOG OF BORING NO. B-2

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32378; W 98.31541



SAND, Clayey, Dense to Very Dense, Gray *(continued)*
-DRILLER'S NOTE: WATER encountered at 40 ft

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	40 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/16/2012	**DATE MEASURED:**	10/16/2012	**FIGURE:**	A-3b

LOG OF BORING NO. B-3

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

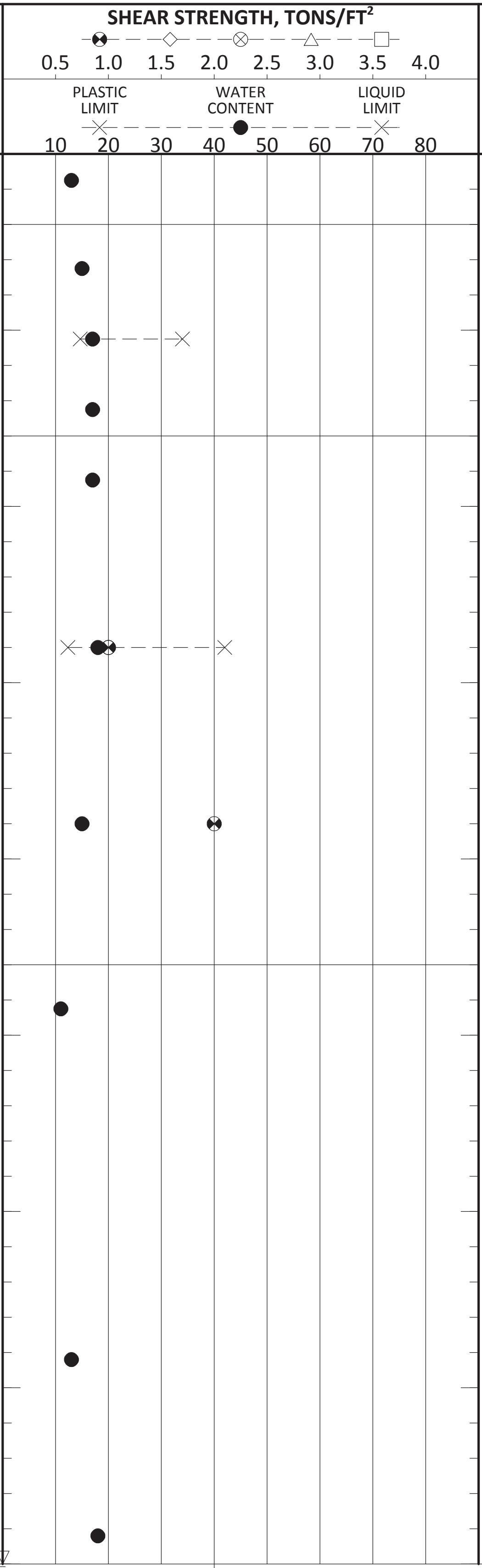
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32401; W 98.31406

SURFACE ELEVATION: 522 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Medium Dense, Brown, with gravel (road material)	24			
FILL MATERIAL: SAND, Clayey, Medium Dense, Tan	12			
	11		19	
	19			41
CLAY, Sandy, Stiff to Very Stiff, Tan and Gray	14			
		112	30	
SAND, Clayey, Dense to Very Dense, Tan to Gray	46			47
	50			
	50/11"			
-DRILLER'S NOTE: WATER encountered at 39 ft	50/11"			33



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.8 ft
DATE DRILLED: 10/15/2012
DEPTH TO WATER: 40 ft
DATE MEASURED: 10/15/2012
PROJ. No.: ASA12-098-00
FIGURE: A-4a

LOG OF BORING NO. B-3

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

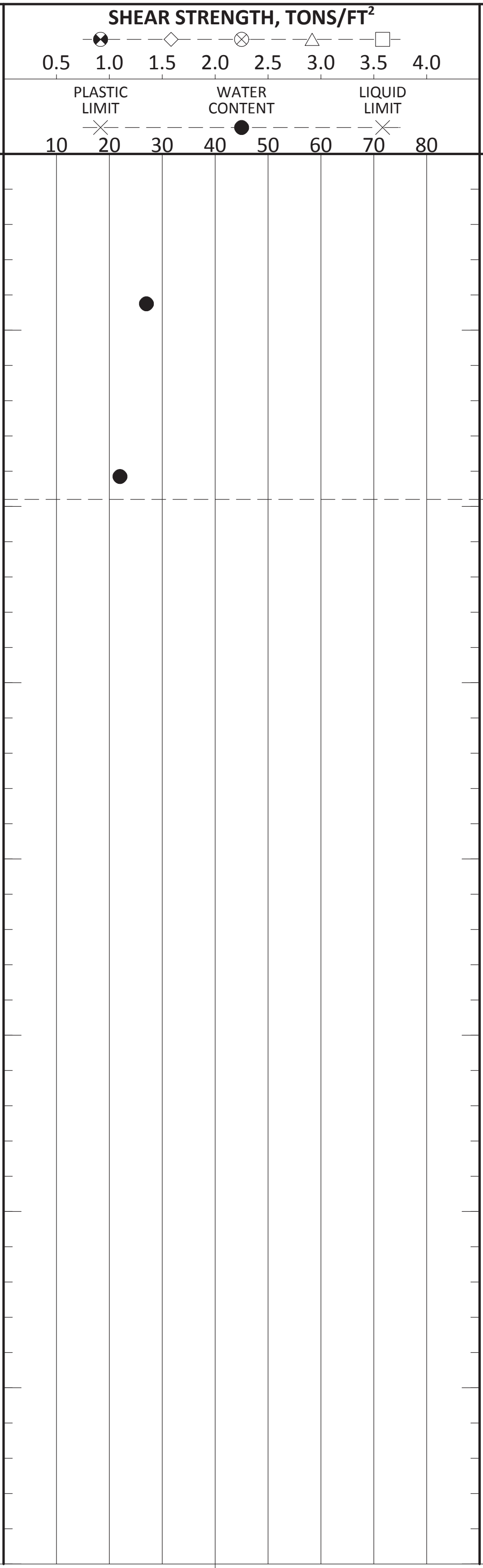
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32401; W 98.31406

SURFACE ELEVATION: 522 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	▨		SAND, Clayey, Dense to Very Dense, Tan to Gray *(continued)*				
45	▨	☒	-with a tan and gray clay seam from 43 to 45 ft	38			
50	▨	☒		50/10"			



Depth scale: 45, 50, 55, 60, 65, 70, 75

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	40 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/15/2012	**DATE MEASURED:**	10/15/2012	**FIGURE:**	A-4b

LOG OF BORING NO. B-4

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

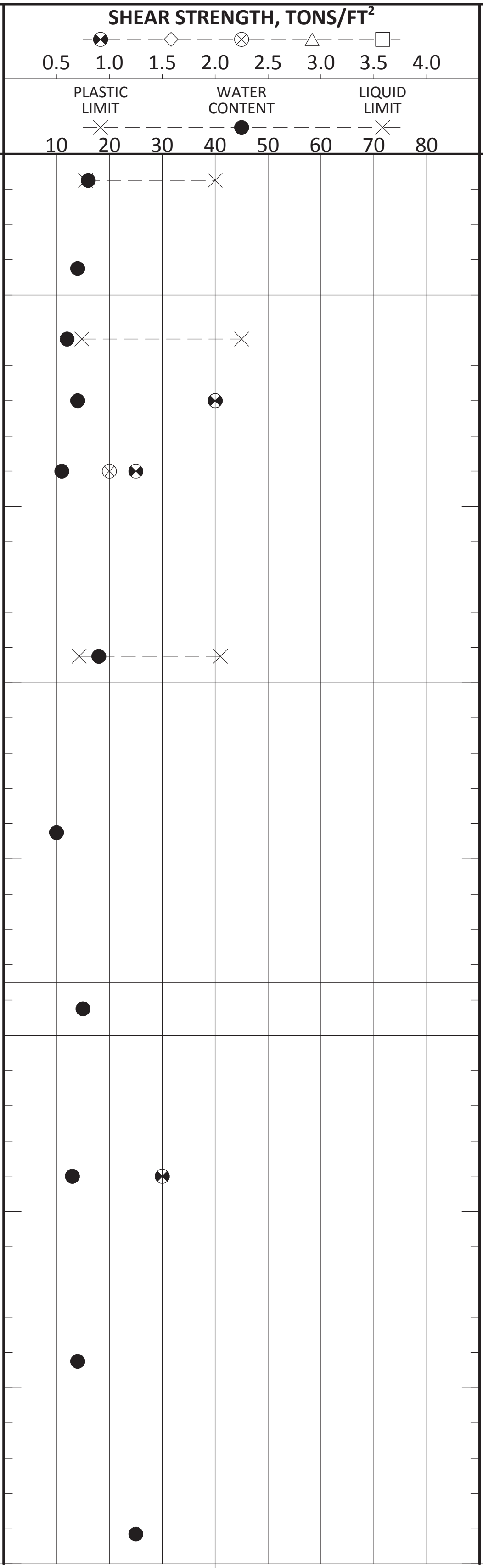
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32322; W 98.31478

SURFACE ELEVATION: 523 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	FILL MATERIAL: CLAY, Sandy, Firm, Brown	7		25	
		5			54
5	FILL MATERIAL: CLAY, Sandy, Stiff to Very Stiff, Tan and Brown	14		30	
			113		
			110		
10					
		26		27	
15	SAND, Clayey, Dense, Brown				
		49			
20					
	CLAY, Very Stiff, Reddish-Tan	24			
25	SAND, Clayey, Dense to Very Dense, Tan and Gray, with intermittent clay seams				
			97		32
30					
		50			
35					
		50/10"			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	42 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/16/2012	**DATE MEASURED:**	10/16/2012	**FIGURE:**	A-5a

LOG OF BORING NO. B-4

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

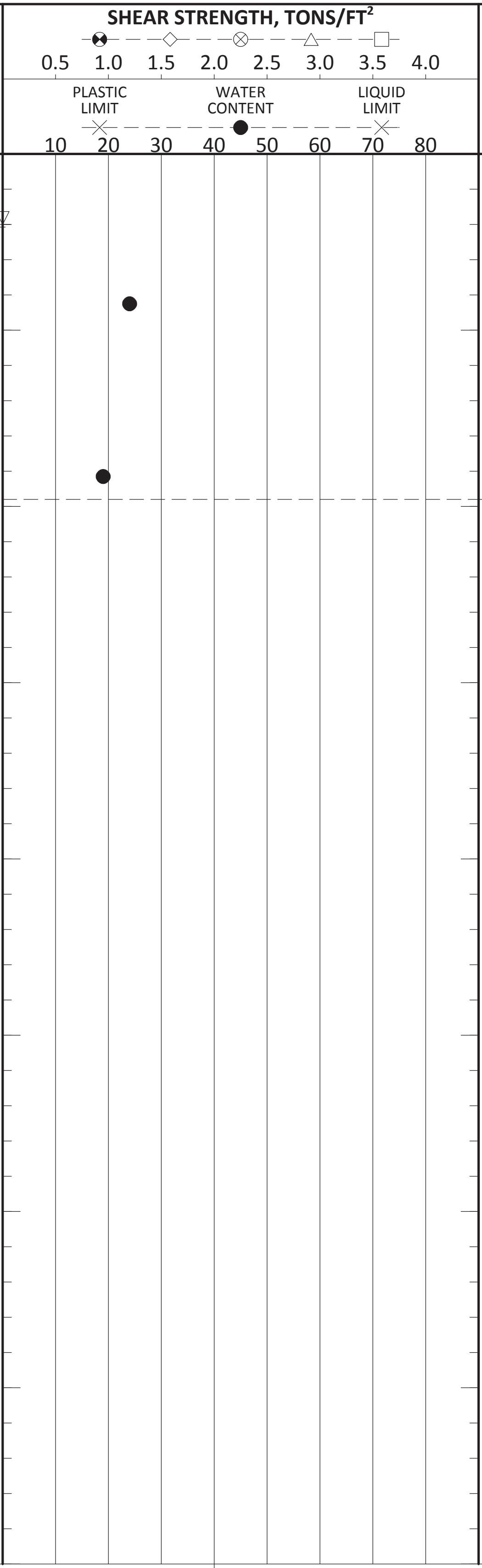
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32322; W 98.31478

SURFACE ELEVATION: 523 ft

DEPTH, FT	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
40–49.8		SAND, Clayey, Dense to Very Dense, Tan and Gray, with intermittent clay seams *(continued)* -DRILLER'S NOTE: WATER encountered at 42 ft				
43.5–45	☒		50			
48.5–49.8	☒		50/9"			23



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.8 ft
DATE DRILLED: 10/16/2012
DEPTH TO WATER: 42 ft
DATE MEASURED: 10/16/2012
PROJ. No.: ASA12-098-00
FIGURE: A-5b

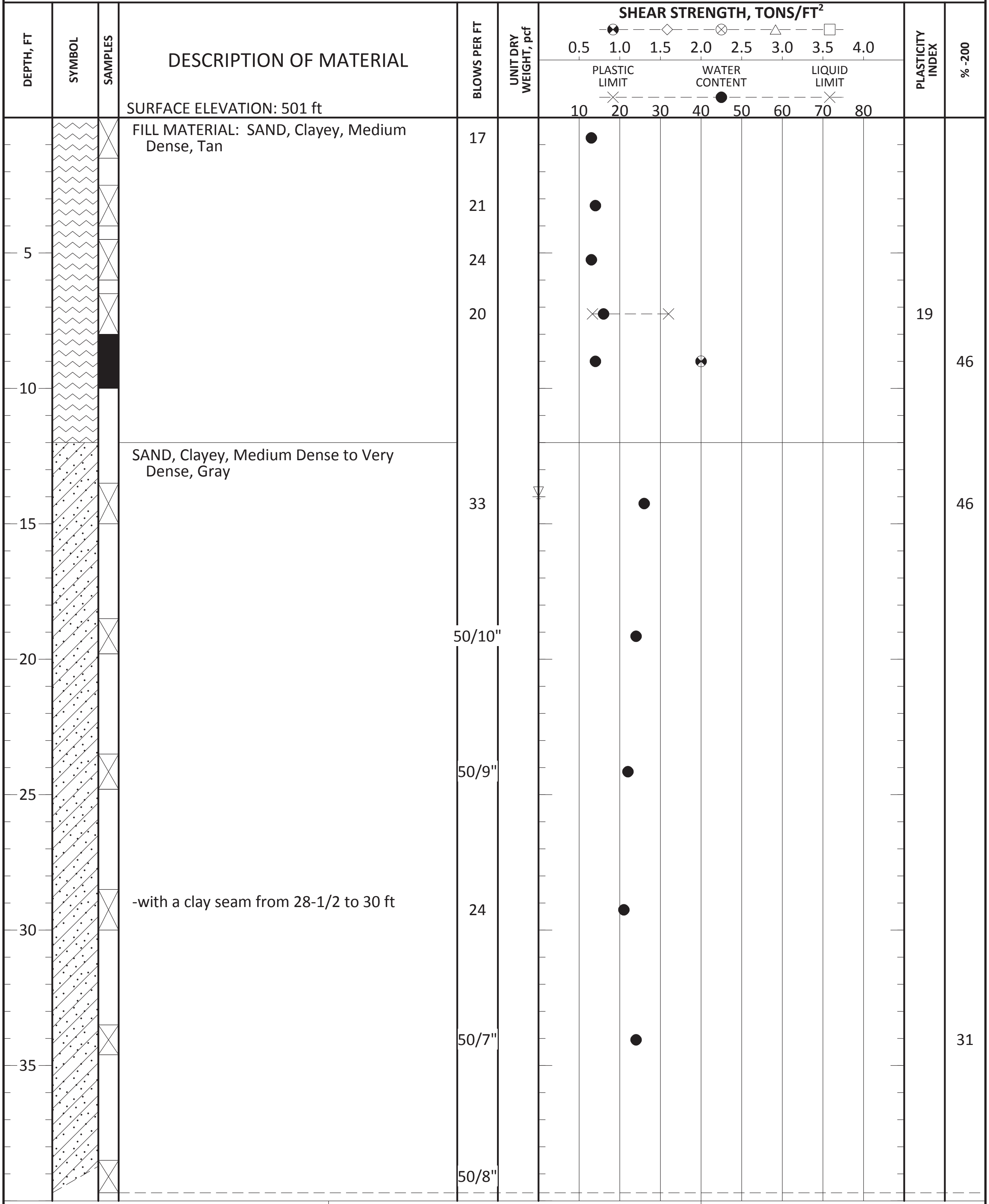
LOG OF BORING NO. B-5

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30947; W 98.31590



Description of Material	Blows per ft	Plasticity Index	% -200
FILL MATERIAL: SAND, Clayey, Medium Dense, Tan	17		
	21		
	24		
	20	19	
			46
SAND, Clayey, Medium Dense to Very Dense, Gray	33		46
	50/10"		
	50/9"		
-with a clay seam from 28-1/2 to 30 ft	24		
	50/7"		31
	50/8"		

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	39.7 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/17/2012	**DATE MEASURED:**	10/17/2012	**FIGURE:**	A-6

LOG OF BORING NO. B-6

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

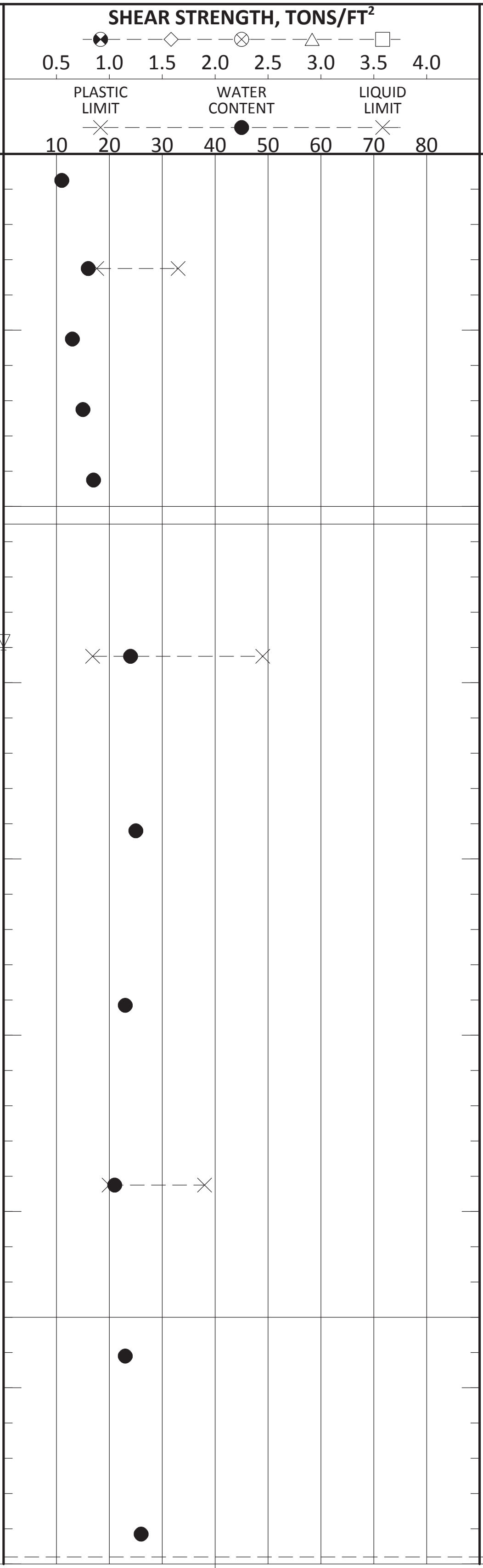
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30837; W 98.31790

SURFACE ELEVATION: 500 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: CLAY, Sandy, Stiff to Very Stiff, Tan	15			
	14		15	
	24			50
	19			
	21			
GRAVEL, Tan				
CLAY, Sandy, Firm to Hard, Tan and Gray				
-DRILLER'S NOTE: WATER encountered at 14 ft	7		32	
	50/11"			51
	50/10"			
	38		18	
SAND, Clayey, Very Dense, Gray	50/8"			
	50/10"			29



DEPTH DRILLED:	39.8 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/18/2012	**DATE MEASURED:**	10/18/2012	**FIGURE:**	A-7

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-7

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

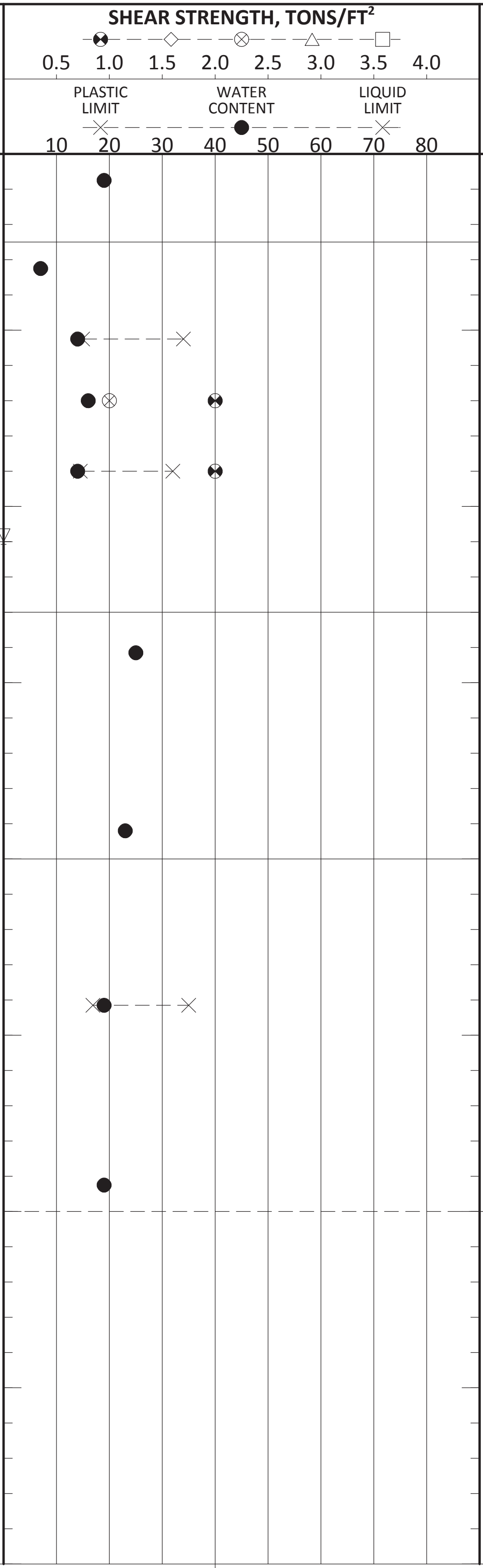
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30899; W 98.31660

SURFACE ELEVATION: 500 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Clayey, Medium Dense, Brown	10			
FILL MATERIAL: CLAY, Sandy, Very Stiff, Tan and Gray	29			
	22		19	
		115		
			17	
-DRILLER'S NOTE: WATER encountered at 11 ft				
SAND, Clayey, Very Dense, Tan and Gray	50/9"			47
	50/11"			
CLAY, Sandy, Hard, Tan and Gray	50/9"		18	
	47			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	30.0 ft	**DEPTH TO WATER:**	11 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/16/2012	**DATE MEASURED:**	10/16/2012	**FIGURE:**	A-8

LOG OF BORING NO. B-8

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

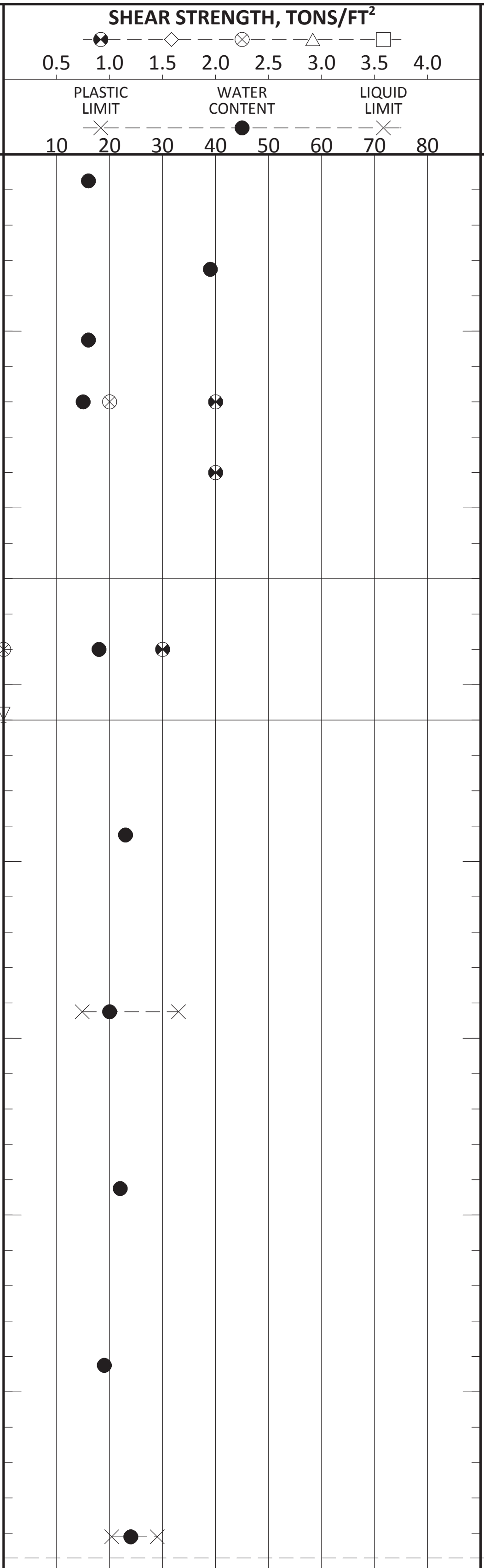
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30884; W 98.31510

SURFACE ELEVATION: 501 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Clayey, Loose to Medium Dense, Brown and Tan	25			
	14		NP	
	7			39
-with a tan and gray clay seam from 6 to 8 ft		113		
CLAY, Sandy, Very Stiff, Tan and Gray				
		111		
SAND, Clayey, Medium Dense to Dense, Tan and Gray -DRILLER'S NOTE: WATER encountered at 16 ft				
	25			47
	10		18	
	25			
-with a tan and gray clay seam from 33 to 35 ft	38			52
	50/8"		9	



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 39.7 ft	**DEPTH TO WATER:** 16 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED: 10/19/2012	**DATE MEASURED:** 10/19/2012	**FIGURE:**	A-9

LOG OF BORING NO. B-9

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

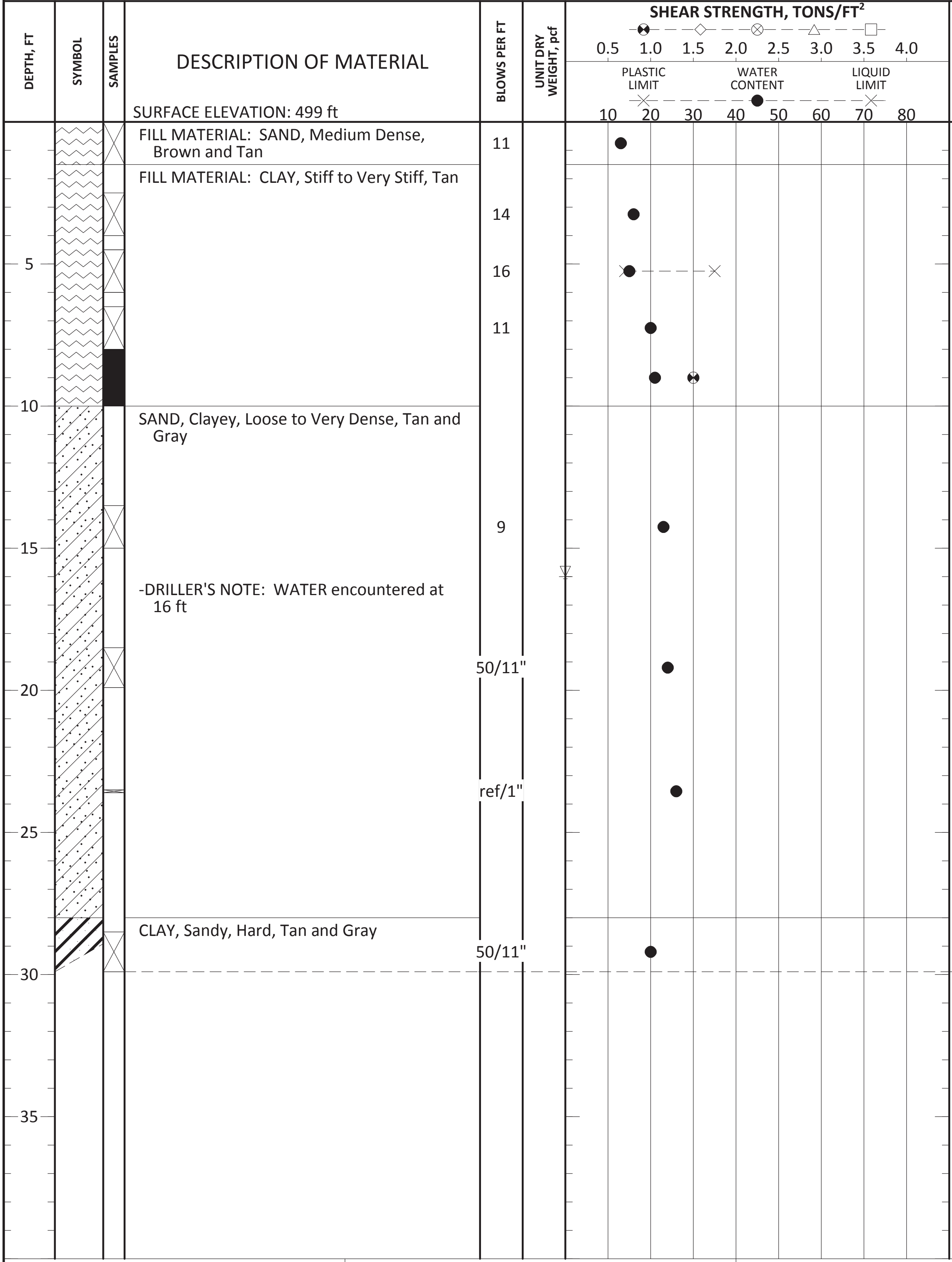
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30802; W 98.31601

SURFACE ELEVATION: 499 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Medium Dense, Brown and Tan	11			
FILL MATERIAL: CLAY, Stiff to Very Stiff, Tan	14			
	16		21	
	11			
SAND, Clayey, Loose to Very Dense, Tan and Gray	9			49
-DRILLER'S NOTE: WATER encountered at 16 ft				
	50/11"			
	ref/1"			
CLAY, Sandy, Hard, Tan and Gray	50/11"			62



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	29.9 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/17/2012	**DATE MEASURED:**	10/17/2012	**FIGURE:**	A-10

LOG OF BORING NO. B-10

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

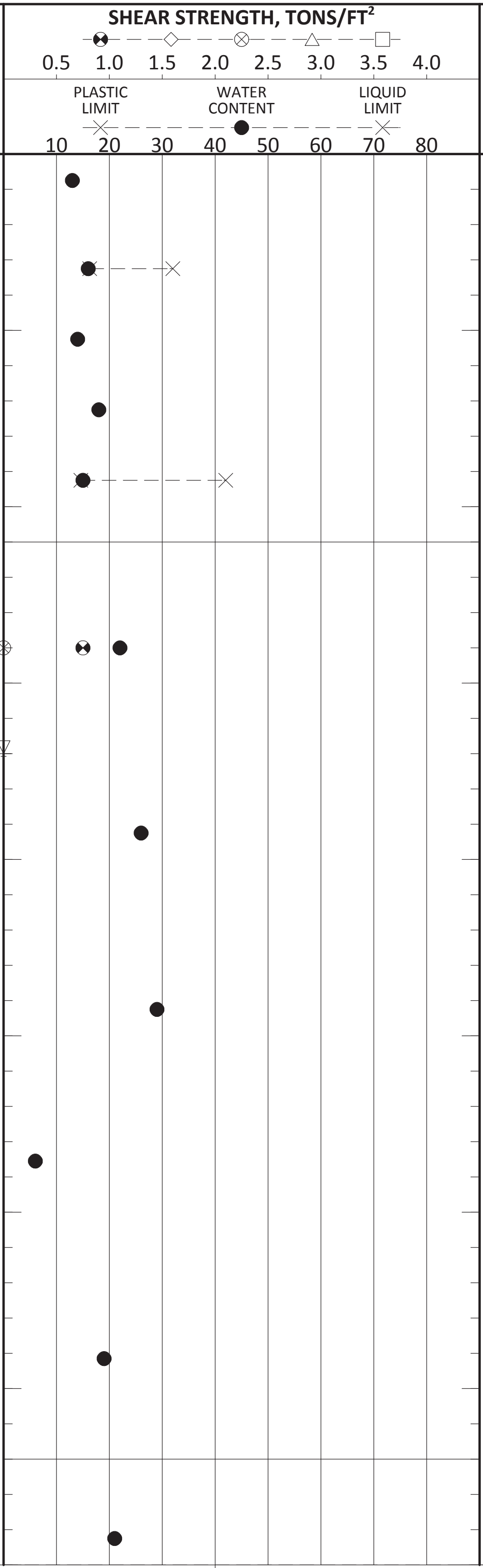
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30769; W 98.31855

SURFACE ELEVATION: 496 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: CLAY, Sandy, Very Stiff, Tan	16			
	16		16	
	19			
	24			
	19		27	
SAND, Clayey, Medum Dense to Very Dense, Tan and Gray, with intermittent clay seams		97		41
-DRILLER'S NOTE: WATER encountered at 17 ft				
	38			
	17			
	ref/1"			
	50/9"			42
CLAY, Very Stiff, Dark Gray				
	26			



DEPTH, FT: 5, 10, 15, 20, 25, 30, 35

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	40.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/17/2012	**DATE MEASURED:**	10/17/2012	**FIGURE:**	A-11

LOG OF BORING NO. B-11

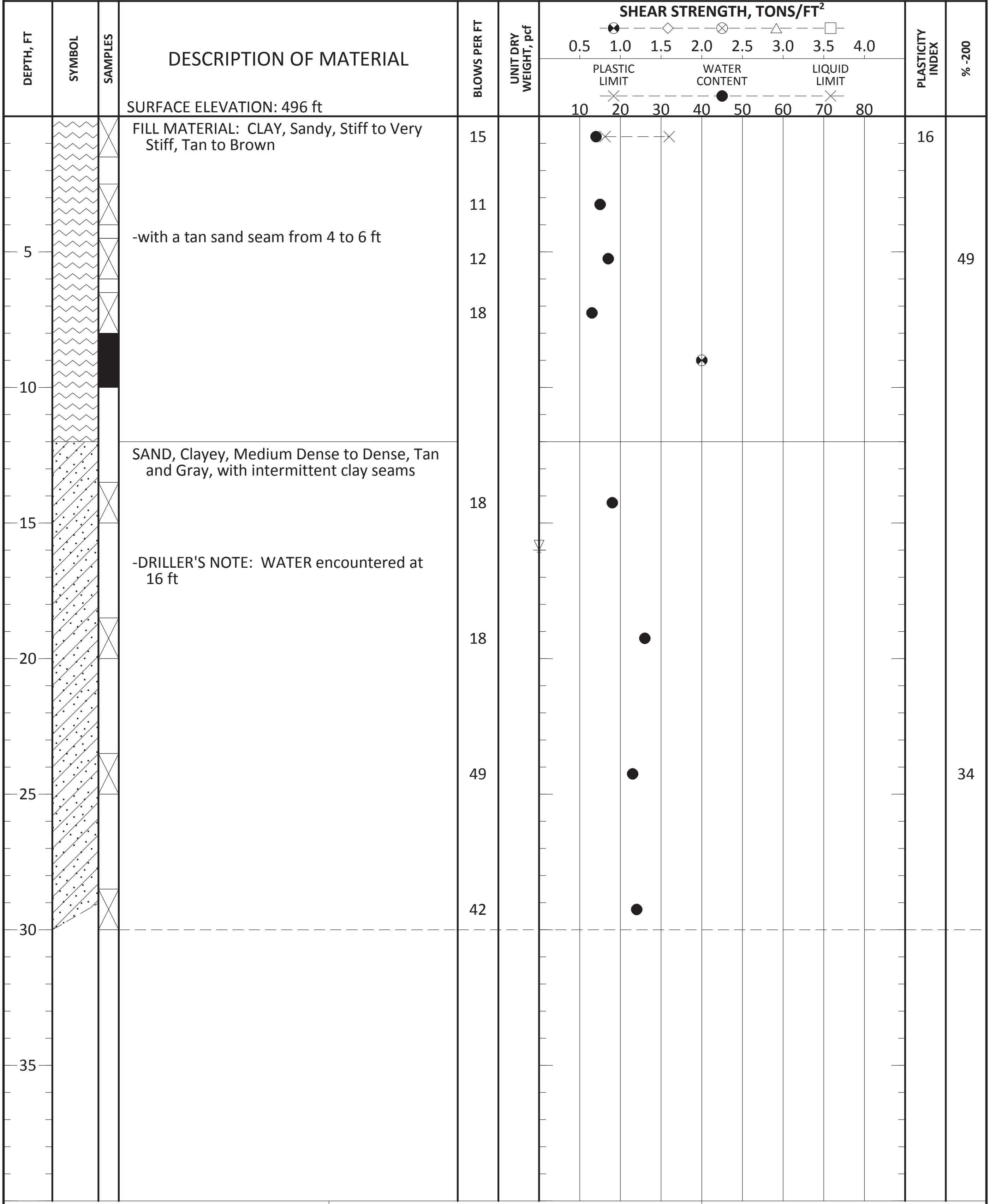
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30737; W 98.31744

SURFACE ELEVATION: 496 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: CLAY, Sandy, Stiff to Very Stiff, Tan to Brown	15		16	
	11			
-with a tan sand seam from 4 to 6 ft	12			49
	18			
SAND, Clayey, Medium Dense to Dense, Tan and Gray, with intermittent clay seams	18			
-DRILLER'S NOTE: WATER encountered at 16 ft				
	18			
	49			34
	42			

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 30.0 ft
DATE DRILLED: 10/18/2012
DEPTH TO WATER: 16 ft
DATE MEASURED: 10/18/2012
PROJ. No.: ASA12-098-00
FIGURE: A-12

LOG OF BORING NO. B-12

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

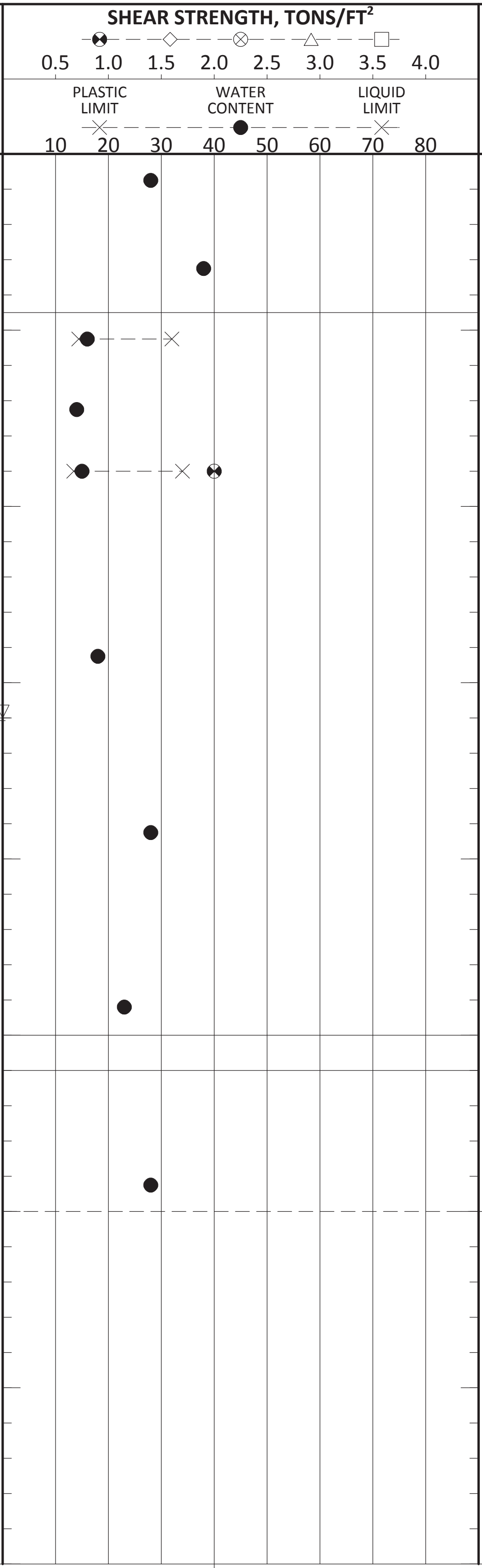
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30757; W 98.31509

SURFACE ELEVATION: 500 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Clayey, Loose to Medium Dense, Brown, with gravel	23			46
	6			
CLAY, Sandy, Firm to Hard, Tan to Brown	8		18	
	27			
			21	
	18			
-DRILLER'S NOTE: WATER encountered at 16 ft				
	24			
	50/11"			51
SANDSTONE, Hard, Gray				
SAND, Clayey, Medium Dense, Tan and Gray	11			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 30.0 ft
DATE DRILLED: 10/17/2012
DEPTH TO WATER: 16 ft
DATE MEASURED: 10/17/2012
PROJ. No.: ASA12-098-00
FIGURE: A-13

LOG OF BORING NO. B-13

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

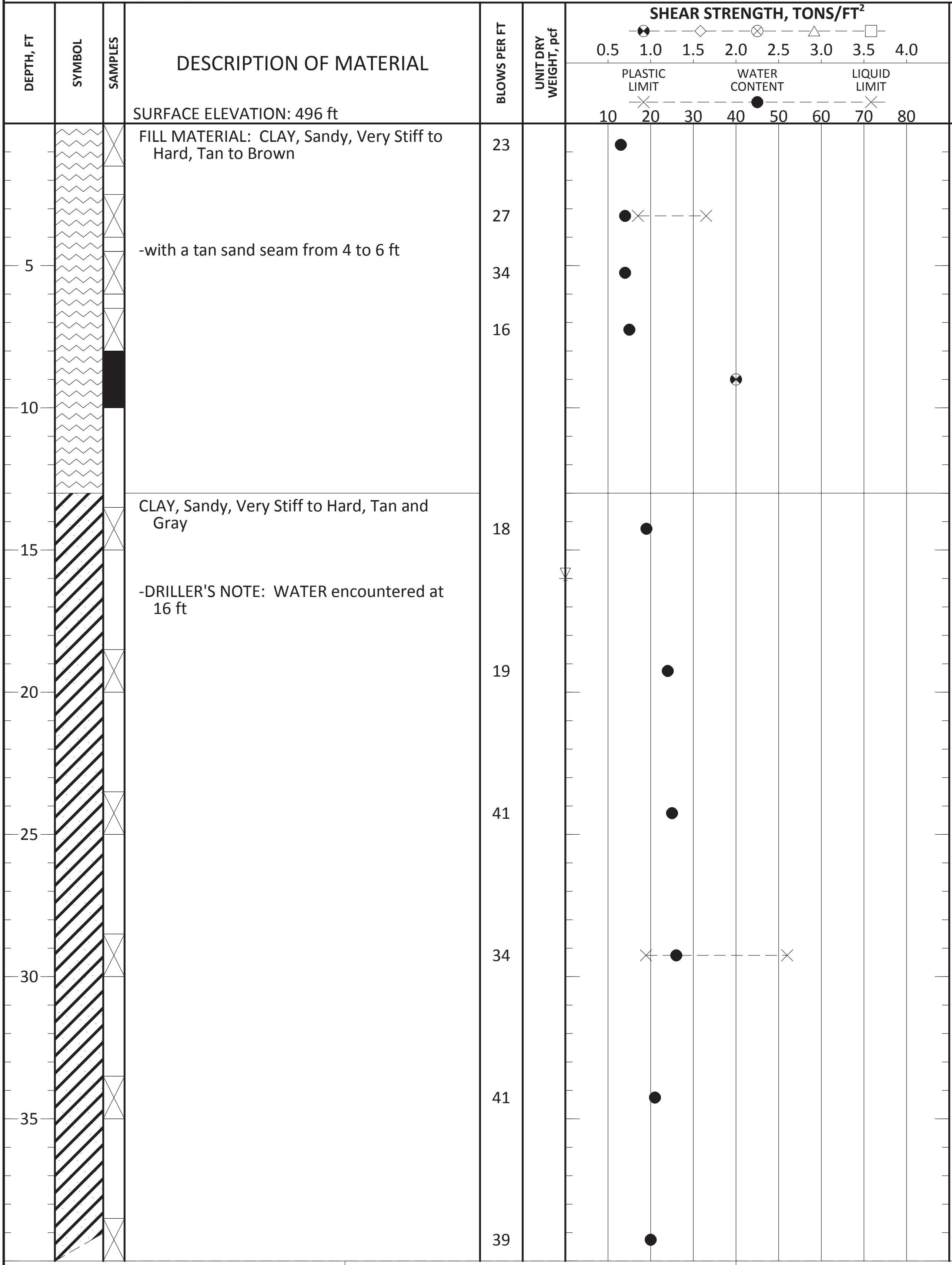
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30715; W 98.31792

SURFACE ELEVATION: 496 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: CLAY, Sandy, Very Stiff to Hard, Tan to Brown	23			
	27		16	
-with a tan sand seam from 4 to 6 ft	34			43
	16			
CLAY, Sandy, Very Stiff to Hard, Tan and Gray	18			
-DRILLER'S NOTE: WATER encountered at 16 ft				
	19			53
	41			
	34		33	
	41			
	39			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	40.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/18/2012	**DATE MEASURED:**	10/18/2012	**FIGURE:**	A-14

LOG OF BORING NO. B-14

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

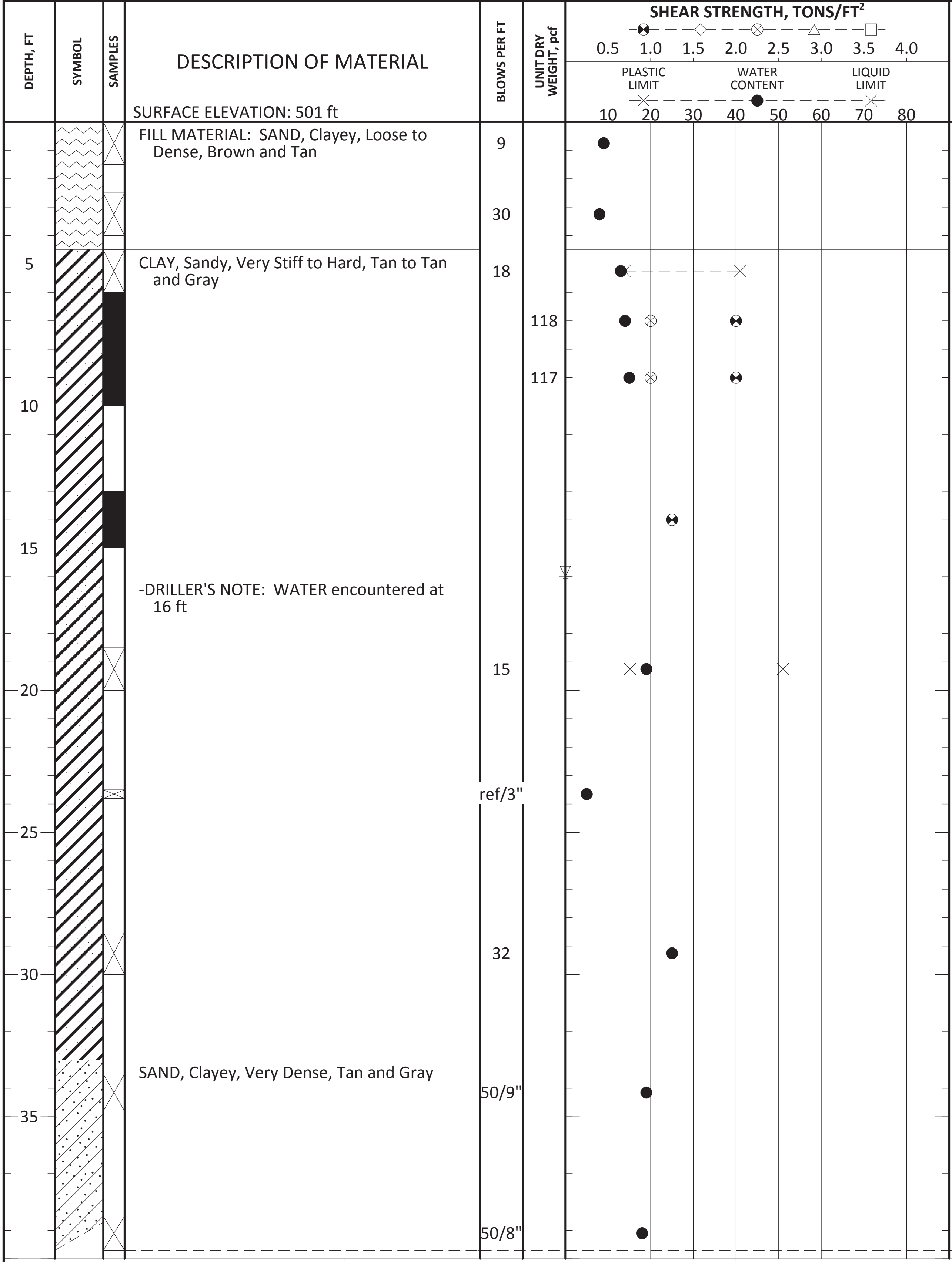
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30684; W 98.31590

SURFACE ELEVATION: 501 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Clayey, Loose to Dense, Brown and Tan	9			
	30			46
CLAY, Sandy, Very Stiff to Hard, Tan to Tan and Gray	18		27	
		118		
		117		
-DRILLER'S NOTE: WATER encountered at 16 ft				
	15		36	
	ref/3"			
	32			72
SAND, Clayey, Very Dense, Tan and Gray	50/9"			
	50/8"			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	39.7 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/19/2012	**DATE MEASURED:**	10/19/2012	**FIGURE:**	A-15

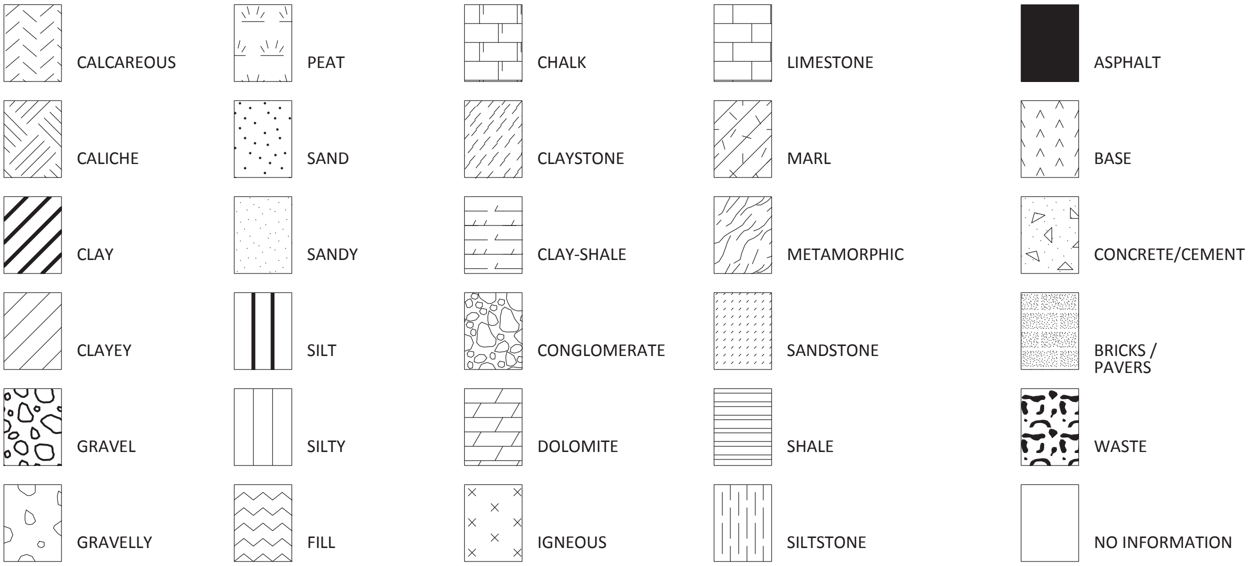
KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

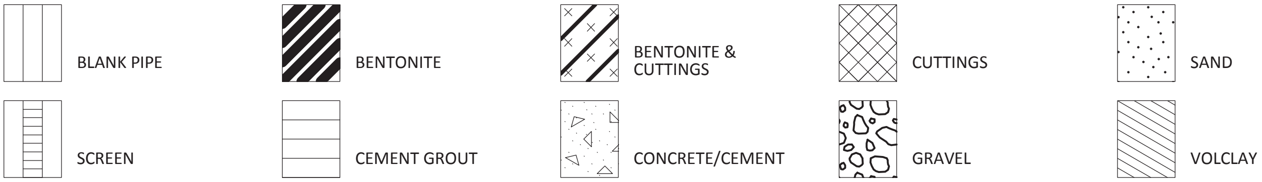
SOIL TERMS

ROCK TERMS

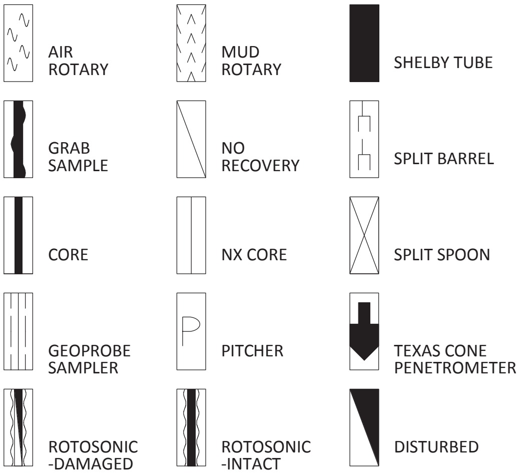
OTHER



WELL CONSTRUCTION AND PLUGGING MATERIALS



SAMPLE TYPES



STRENGTH TEST TYPES

⊗	POCKET PENETROMETER
◇	TORVANE
⊗	UNCONFINED COMPRESSION
△	TRIAXIAL COMPRESSION UNCONSOLIDATED-UNDRAINED
□	TRIAXIAL COMPRESSION CONSOLIDATED-UNDRAINED

NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. ASA12-098-00

FIGURE A-16a

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

Penetration Resistance Blows per ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE STRENGTH

Resistance Blows per ft	Consistency	Cohesion TSF
0 - 2	Very Soft	0 - 0.125
2 - 4	Soft	0.125 - 0.25
4 - 8	Firm	0.25 - 0.5
8 - 15	Stiff	0.5 - 1.0
15 - 30	Very Stiff	1.0 - 2.0
> 30	Hard	> 2.0

PLASTICITY

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

ABBREVIATIONS

B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
BTEX = Total BTEX
TPH = Total Petroleum Hydrocarbons
ND = Not Detected
NA = Not Analyzed
NR = Not Recorded/No Recovery
OVA = Organic Vapor Analyzer
ppm = Parts Per Million

Qam, Qas, Qal = Quaternary Alluvium
Qat = Low Terrace Deposits
Qbc = Beaumont Formation
Qt = Fluviatile Terrace Deposits
Qao = Seymour Formation
Qle = Leona Formation
Q-Tu = Uvalde Gravel
Ewi = Wilcox Formation
Emi = Midway Group
Mc = Catahoula Formation
El = Laredo Formation
Kknm = Navarro Group and Marlbrook Marl
Kpg = Pecan Gap Chalk
Kau = Austin Chalk

Kef = Eagle Ford Shale
Kbu = Buda Limestone
Kdr = Del Rio Clay
Kft = Fort Terrett Member
Kgt = Georgetown Formation
Kep = Person Formation
Kek = Kainer Formation
Kes = Escondido Formation
Kew = Walnut Formation
Kgr = Glen Rose Formation
Kgru = Upper Glen Rose Formation
Kgrl = Lower Glen Rose Formation
Kh = Hensell Sand

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.

APPENDIX B

LABORATORY TEST RESULTS

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

FILE NAME: ASA12-098-00.GPJ 11/20/2012

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	11	15								
	2.5 to 4.0	7	23						50		
	4.0 to 6.0		18	31	15	16	CL	106		0.27	UC
	6.0 to 8.0		15					110		1.09	UC
	8.0 to 10.0		13					112	40	0.39	UC
	13.5 to 15.0	16	21	55	18	37	CH				
	18.5 to 20.0	22	18								
	23.5 to 24.9	50/11"	14								
	28.5 to 29.9	50/11"	11						43		
	33.5 to 35.0	49	20								
	38.5 to 39.9	50/11"	20								
	43.5 to 44.8	50/9"	19								
	48.5 to 49.7	50/8"	19								
B-2	0.0 to 1.5	11	18								
	2.0 to 4.0		11					119	38	2.59	UC
	4.0 to 6.0		17	33	18	15	CL	104		0.79	UC
	6.0 to 8.0		19					102		0.28	UC
	8.0 to 10.0		17					110		0.98	UC
	13.0 to 15.0		18	54	18	36	CH			2.00	PP
	18.0 to 20.0		13					101		0.65	UC
	23.5 to 24.9	50/11"	12						24		
	28.5 to 29.8	50/10"	20								
	33.5 to 35.0	38	12								
	38.5 to 40.0	50	20								
	43.5 to 44.7	50/8"	18								
	48.5 to 49.8	50/9"	20								
B-3	0.0 to 1.5	24	13								
	2.5 to 4.0	12	15								
	4.5 to 6.0	11	17	34	15	19	CL				
	6.5 to 8.0	19	17						41		
	8.5 to 10.0	14	17								
	13.0 to 15.0		18	42	12	30	CL	112		0.73	UC
	18.0 to 20.0		15							2.00	PP
	23.5 to 25.0	46	11						47		
	28.5 to 30.0	50									
	33.5 to 34.9	50/11"	13								
	38.5 to 39.9	50/11"	18						33		
	43.5 to 45.0	38	27								
	48.5 to 49.8	50/10"	22								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

FILE NAME: ASA12-098-00.GPJ 11/20/2012

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-4	0.0 to 1.5	7	16	40	15	25	CL				
	2.5 to 4.0	5	14						54		
	4.5 to 6.0	14	12	45	15	30	CL				
	6.0 to 8.0		14					113		1.96	UC
	8.0 to 10.0		11					110		0.71	UC
	13.5 to 15.0	26	18	41	14	27	CL				
	18.5 to 20.0	49	10								
	23.5 to 25.0	24	15								
	28.0 to 30.0		13					97	32	1.50	PP
	33.5 to 35.0	50	14								
	38.5 to 39.8	50/10"	25								
	43.5 to 45.0	50	24								
	48.5 to 49.8	50/9"	19						23		
B-5	0.0 to 1.5	17	13								
	2.5 to 4.0	21	14								
	4.5 to 6.0	24	13								
	6.5 to 8.0	20	16	32	13	19	CL				
	8.0 to 10.0		14						46	2.00	PP
	13.5 to 15.0	33	26						46		
	18.5 to 19.8	50/10"	24								
	23.5 to 24.8	50/9"	22								
	28.5 to 30.0	24	21								
	33.5 to 34.6	50/7"	24						31		
	38.5 to 39.7	50/8"									
B-6	0.0 to 1.5	15	11								
	2.5 to 4.0	14	16	33	18	15	CL				
	4.5 to 6.0	24	13						50		
	6.5 to 8.0	19	15								
	8.5 to 10.0	21	17								
	13.5 to 15.0	7	24	49	17	32	CL				
	18.5 to 19.9	50/11"	25						51		
	23.5 to 24.8	50/10"	23								
	28.5 to 30.0	38	21	38	20	18	CL				
	33.5 to 34.7	50/8"	23								
	38.5 to 39.8	50/10"	26						29		
B-7	0.0 to 1.5	10	19								
	2.5 to 4.0	29	7								
	4.5 to 6.0	22	14	34	15	19	CL				
	6.0 to 8.0		16					115		1.37	UC

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

FILE NAME: ASA12-098-00.GPJ 11/20/2012

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-7	8.0 to 10.0		14	32	15	17	CL			2.00	PP
	13.5 to 14.8	50/9"	25						47		
	18.5 to 19.9	50/11"	23								
	23.5 to 24.8	50/9"	19	35	17	18	CL				
	28.5 to 30.0	47	19								
B-8	0.0 to 1.5	25	16								
	2.5 to 4.0	14	39			NP					
	4.5 to 6.0	7	16						39		
	6.0 to 8.0		15					113		0.78	UC
	8.0 to 10.0									2.00	PP
	13.0 to 15.0		18					111		0.39	UC
	18.5 to 20.0	25	23						47		
	23.5 to 25.0	10	20	33	15	18	CL				
	28.5 to 30.0	25	22								
	33.5 to 35.0	38	19						52		
	38.5 to 39.7	50/8"	24	29	20	9	CL				
B-9	0.0 to 1.5	11	13								
	2.5 to 4.0	14	16								
	4.5 to 6.0	16	15	35	14	21	CL				
	6.5 to 8.0	11	20								
	8.0 to 10.0		21							1.50	PP
	13.5 to 15.0	9	23						49		
	18.5 to 19.9	50/11"	24								
	23.5 to 23.6	ref/1"	26								
	28.5 to 29.9	50/11"	20						62		
B-10	0.0 to 1.5	16	13								
	2.5 to 4.0	16	16	32	16	16	CL				
	4.5 to 6.0	19	14								
	6.5 to 8.0	24	18								
	8.5 to 10.0	19	15	42	15	27	CL				
	13.0 to 15.0		22					97	41	0.23	UC
	18.5 to 20.0	38	26								
	23.5 to 25.0	17	29								
	28.5 to 28.6	ref/1"	6								
	33.5 to 34.8	50/9"	19						42		
	38.5 to 40.0	26	21								
B-11	0.0 to 1.5	15	14	32	16	16	CL				
	2.5 to 4.0	11	15								
	4.5 to 6.0	12	17						49		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

FILE NAME: ASA12-098-00.GPJ 11/20/2012

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-11	6.5 to 8.0	18	13								
	8.0 to 10.0									2.00	PP
	13.5 to 15.0	18	18								
	18.5 to 20.0	18	26								
	23.5 to 25.0	49	23						34		
	28.5 to 30.0	42	24								
B-12	0.0 to 1.5	23	28						46		
	2.5 to 4.0	6	38								
	4.5 to 6.0	8	16	32	14	18	CL				
	6.5 to 8.0	27	14								
	8.0 to 10.0		15	34	13	21	CL			2.00	PP
	13.5 to 15.0	18	18								
	18.5 to 20.0	24	28								
	23.5 to 24.9	50/11"	23						51		
	28.5 to 30.0	11	28								
B-13	0.0 to 1.5	23	13								
	2.5 to 4.0	27	14	33	17	16	CL				
	4.5 to 6.0	34	14						43		
	6.5 to 8.0	16	15								
	8.0 to 10.0									2.00	PP
	13.5 to 15.0	18	19								
	18.5 to 20.0	19	24						53		
	23.5 to 25.0	41	25								
	28.5 to 30.0	34	26	52	19	33	CH				
	33.5 to 35.0	41	21								
	38.5 to 40.0	39	20								
B-14	0.0 to 1.5	9	9								
	2.5 to 4.0	30	8						46		
	4.5 to 6.0	18	13	41	14	27	CL				
	6.0 to 8.0		14					118		1.10	UC
	8.0 to 10.0		15					117		1.15	UC
	13.0 to 15.0									1.25	PP
	18.5 to 20.0	15	19	51	15	36	CH				
	23.5 to 23.8	ref/3"	5								
	28.5 to 30.0	32	25						72		
	33.5 to 34.8	50/9"	19								
	38.5 to 39.7	50/8"	18								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASA12-098-00

FIGURE B-1d

PROJECT NO. ASA12-098-00

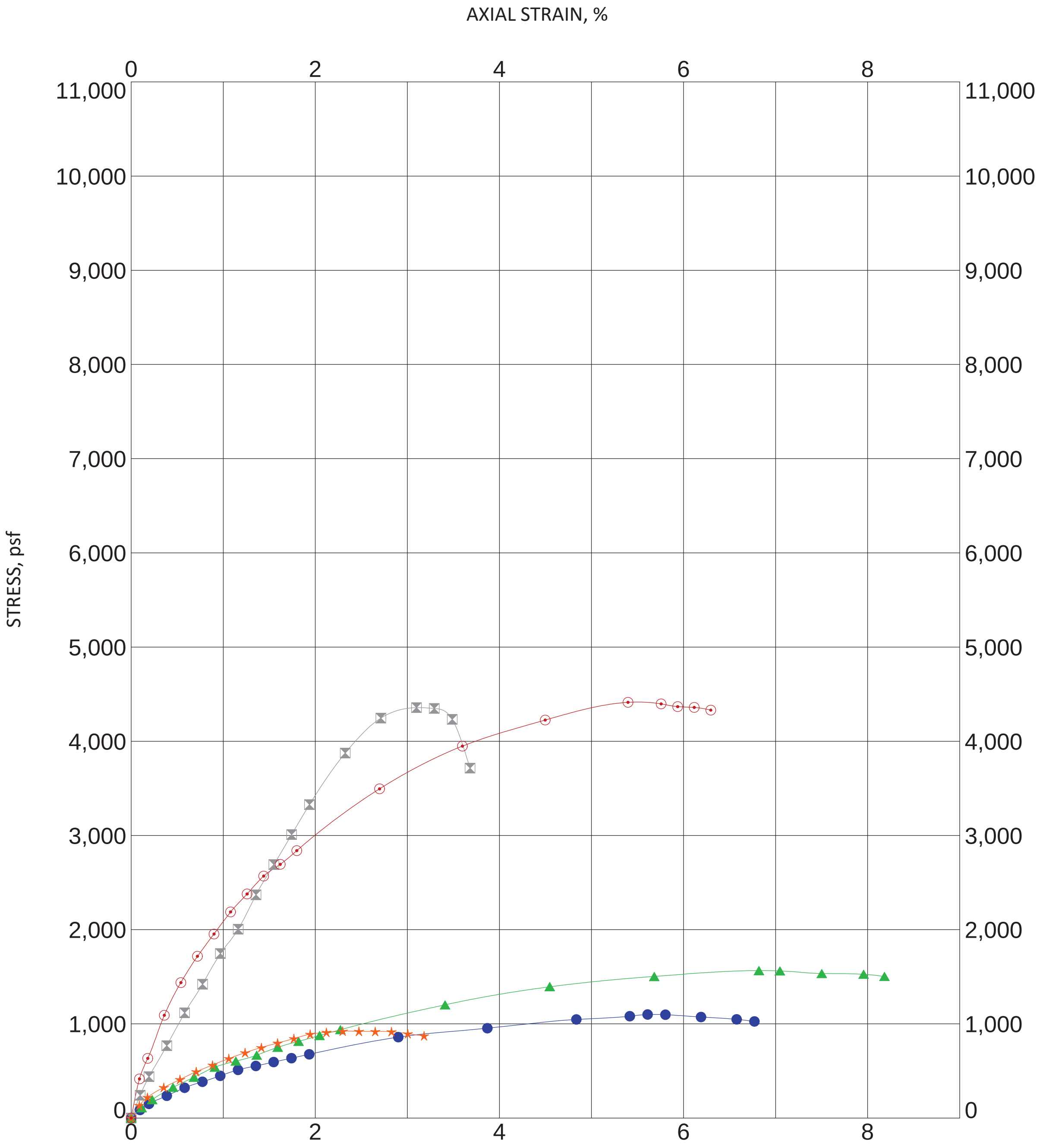


FIGURE B-2

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● B-1	4 ft		0.3	5.6	16	106.0	17.7
⧗ B-1	6 ft		1.1	3.1		109.9	15.4
▲ B-1	8 ft		0.4	6.8		111.8	13.2
★ B-10	13 ft		0.2	2.3		97.4	24.5
⊙ B-14	6 ft		1.1	5.4		117.9	13.6

RABA KISTNER

TBPE Firm Registration No. F-3257

12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

UNCONFINED COMPRESSION

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

PROJECT NO. ASA12-098-00

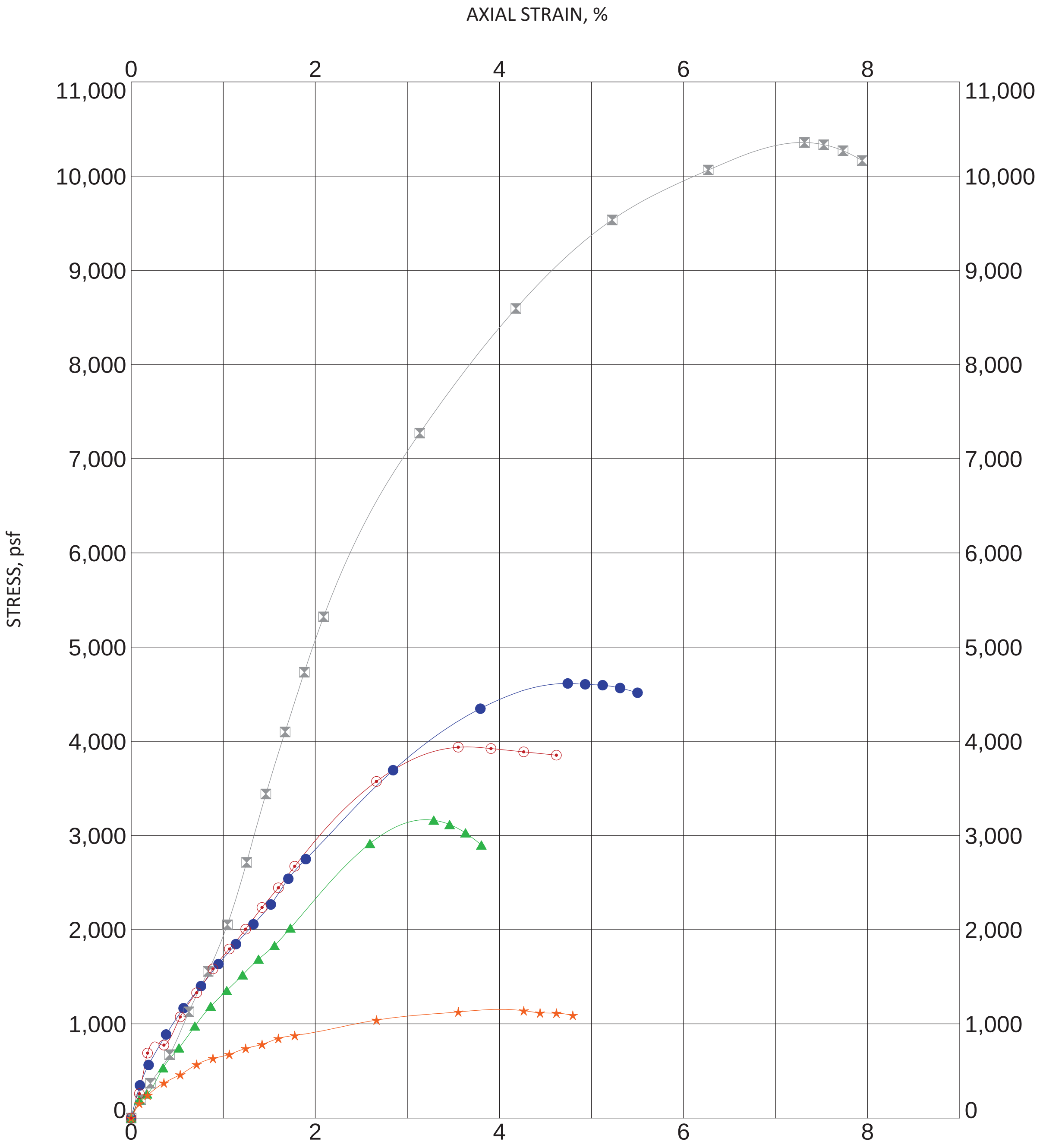


FIGURE B-3

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● B-14	8 ft		1.2	4.7		116.9	14.7
⧗ B-2	2 ft		2.6	7.3		119.3	10.9
▲ B-2	4 ft		0.8	3.3	15	104.0	16.6
★ B-2	6 ft		0.3	4.3		102.1	19.0
⊙ B-2	8 ft		1.0	3.6		110.3	16.9

RABA KISTNER
TBPE Firm Registration No. F-3257

12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

UNCONFINED COMPRESSION

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

PROJECT NO. ASA12-098-00

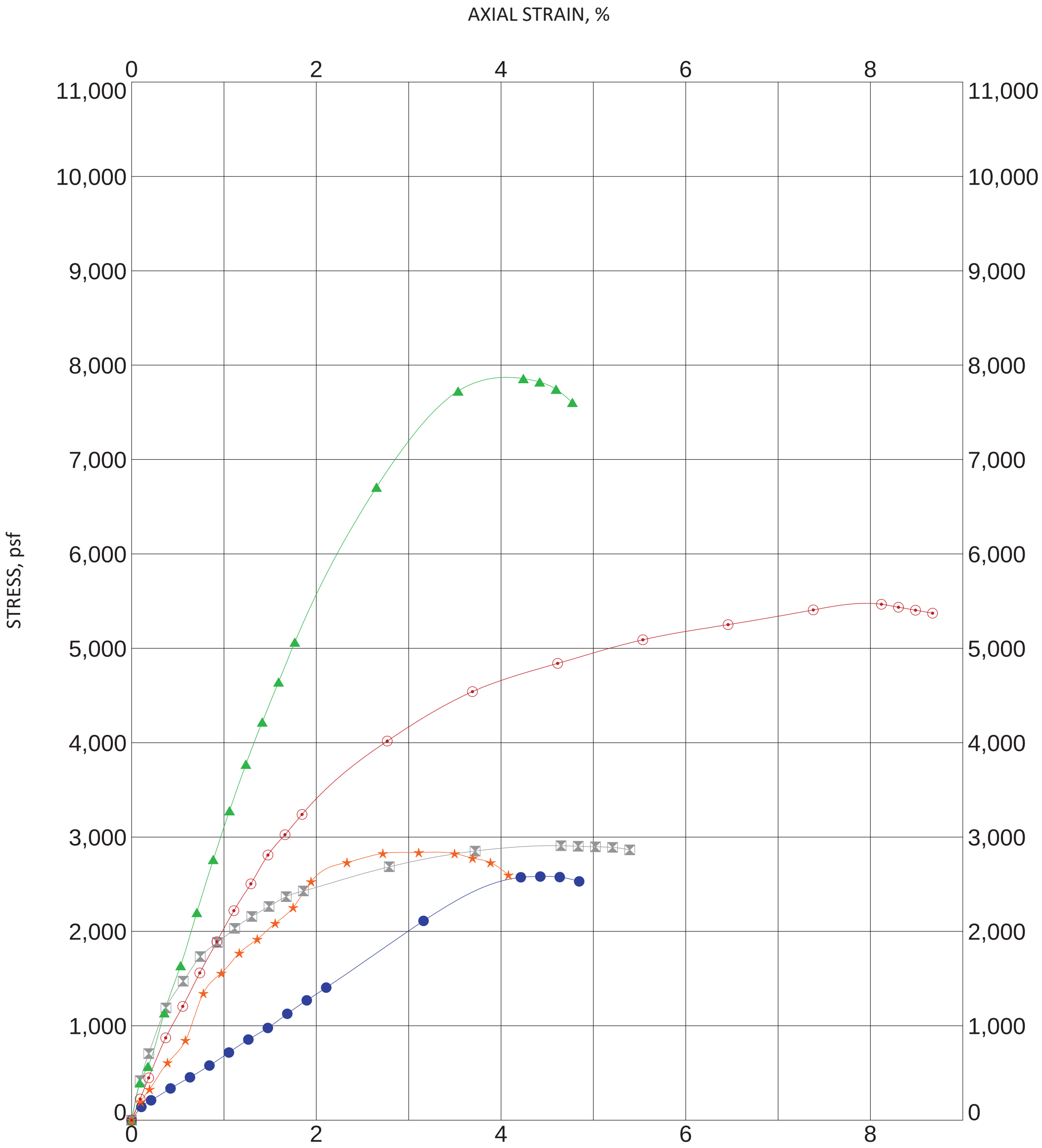


FIGURE B-4

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● B-2	18 ft		0.6	4.4		100.8	13.0
⧗ B-3	13 ft		0.7	4.7	30	112.2	17.6
▲ B-4	6 ft		2.0	4.2		113.1	14.3
★ B-4	8 ft		0.7	3.1		109.8	10.6
⊙ B-7	6 ft		1.4	8.1		115.1	15.7

RABA KISTNER
TBPE Firm Registration No. F-3257

12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

UNCONFINED COMPRESSION

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

PROJECT NO. ASA12-098-00

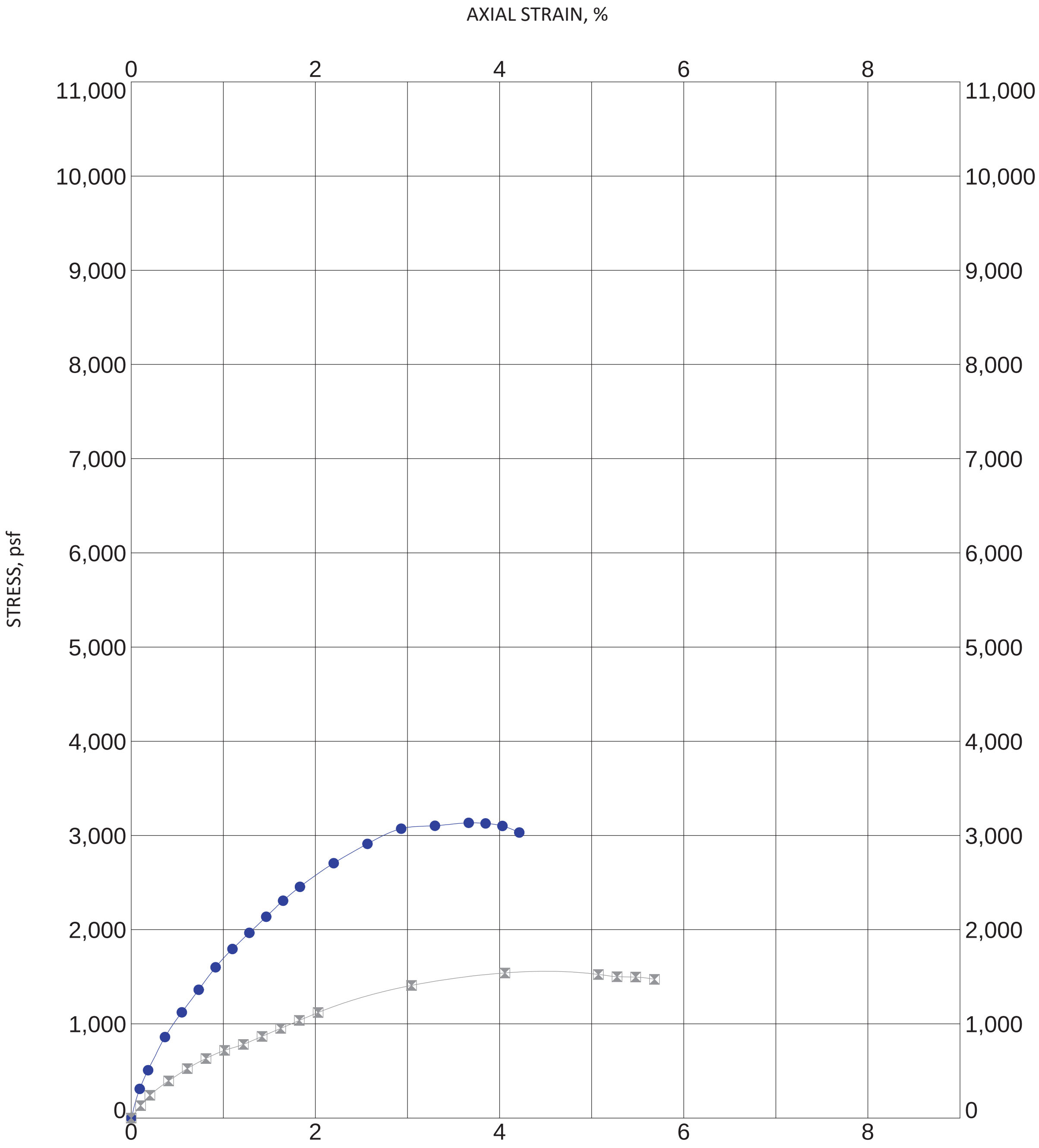


FIGURE B-5

Specimen Identification	Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● B-8 6 ft		0.8	3.7		112.6	15.1
⧗ B-8 13 ft		0.4	4.1		110.8	18.1

RABA KISTNER
TBPE Firm Registration No. F-3257

12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

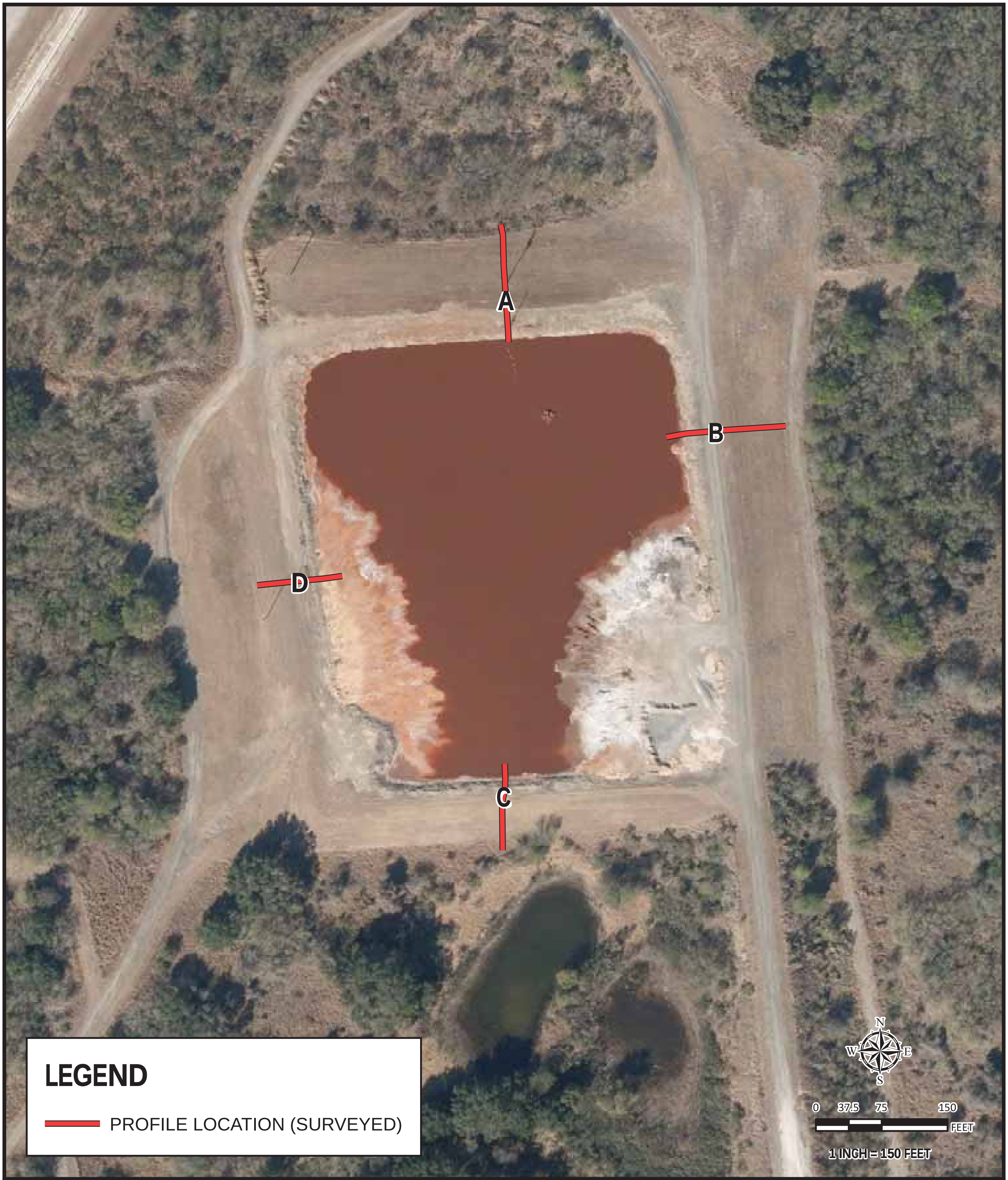
UNCONFINED COMPRESSION

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

R-K UNCONFINED COMPRESSION ASA12-098-00.GPJ RKCI.GDT 11/20/12

APPENDIX C

SLOPE STABILITY ANALYSES



RABA KISTNER CONSULTANTS

Raba Kistner Consultants, Inc.
12821 West Golden Lane
San Antonio, Texas 78249
P 210 :: 699 :: 9090
F 210 :: 699 :: 6426
www.rkci.com
TBPE Firm Number 3257

SOURCE: 2011 Aerial Photograph Provided by the City of San Antonio (COSA)

SLOPE PROFILE LOCATION MAP

ASH POND BERMS - SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

REVISIONS:

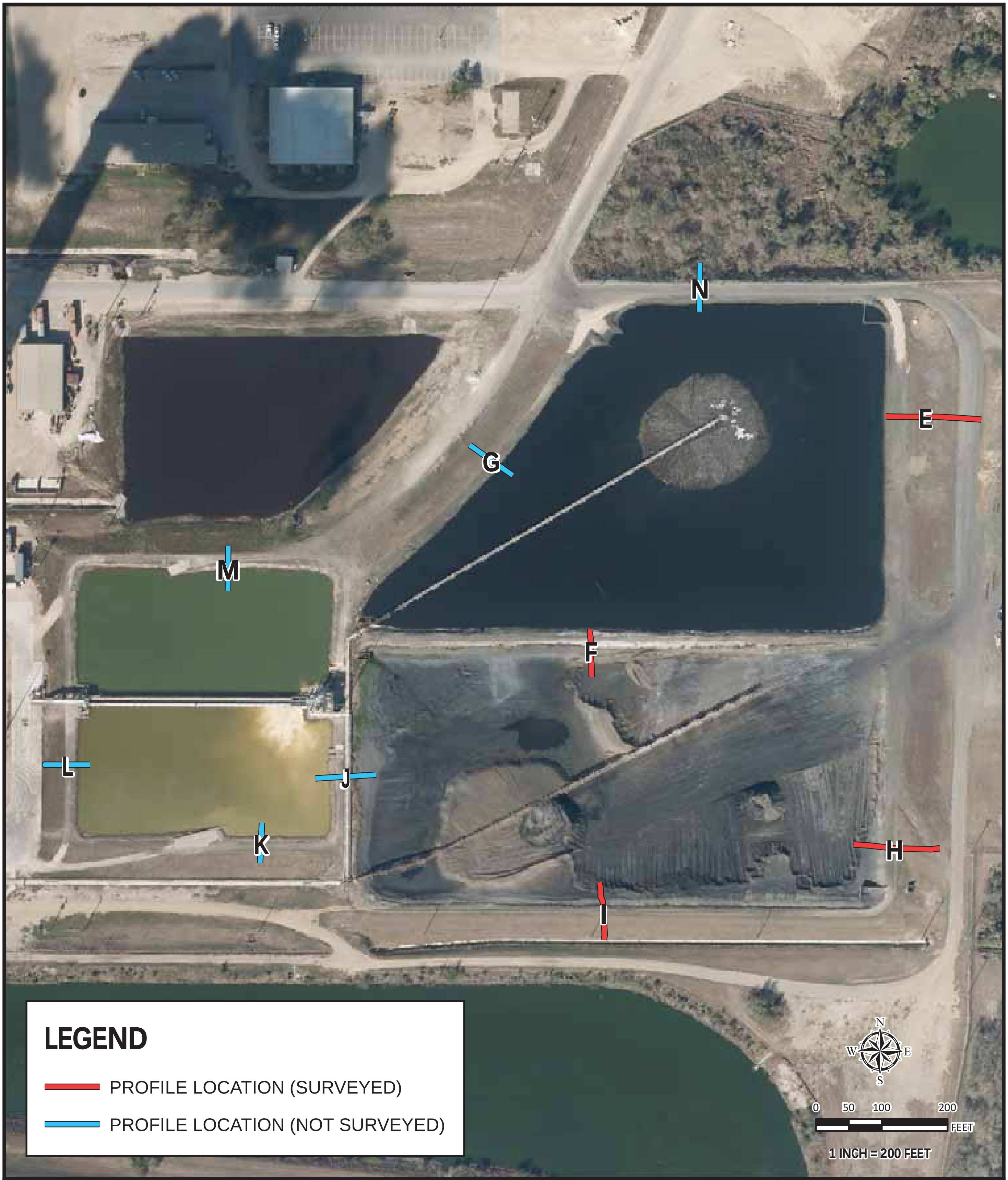
No.	DATE	DESCRIPTION

PROJECT No.:
ASA12-098-00

ISSUE DATE:	11/08/2012
DRAWN BY:	CCL
CHECKED BY:	RBW
REVIEWED BY:	GLB

FIGURE

C-1a



RABA KISTNER CONSULTANTS

Raba Kistner Consultants, Inc.
12821 West Golden Lane
San Antonio, Texas 78249
P 210 :: 699 :: 9090
F 210 :: 699 :: 6426
www.rkci.com
TBPE Firm Number 3257

SOURCE: 2011 Aerial Photograph Provided by the City of San Antonio (COSA)

SLOPE PROFILE LOCATION MAP

ASH POND BERMS - SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

REVISIONS:

No.	DATE	DESCRIPTION

PROJECT No.:
ASA12-098-00

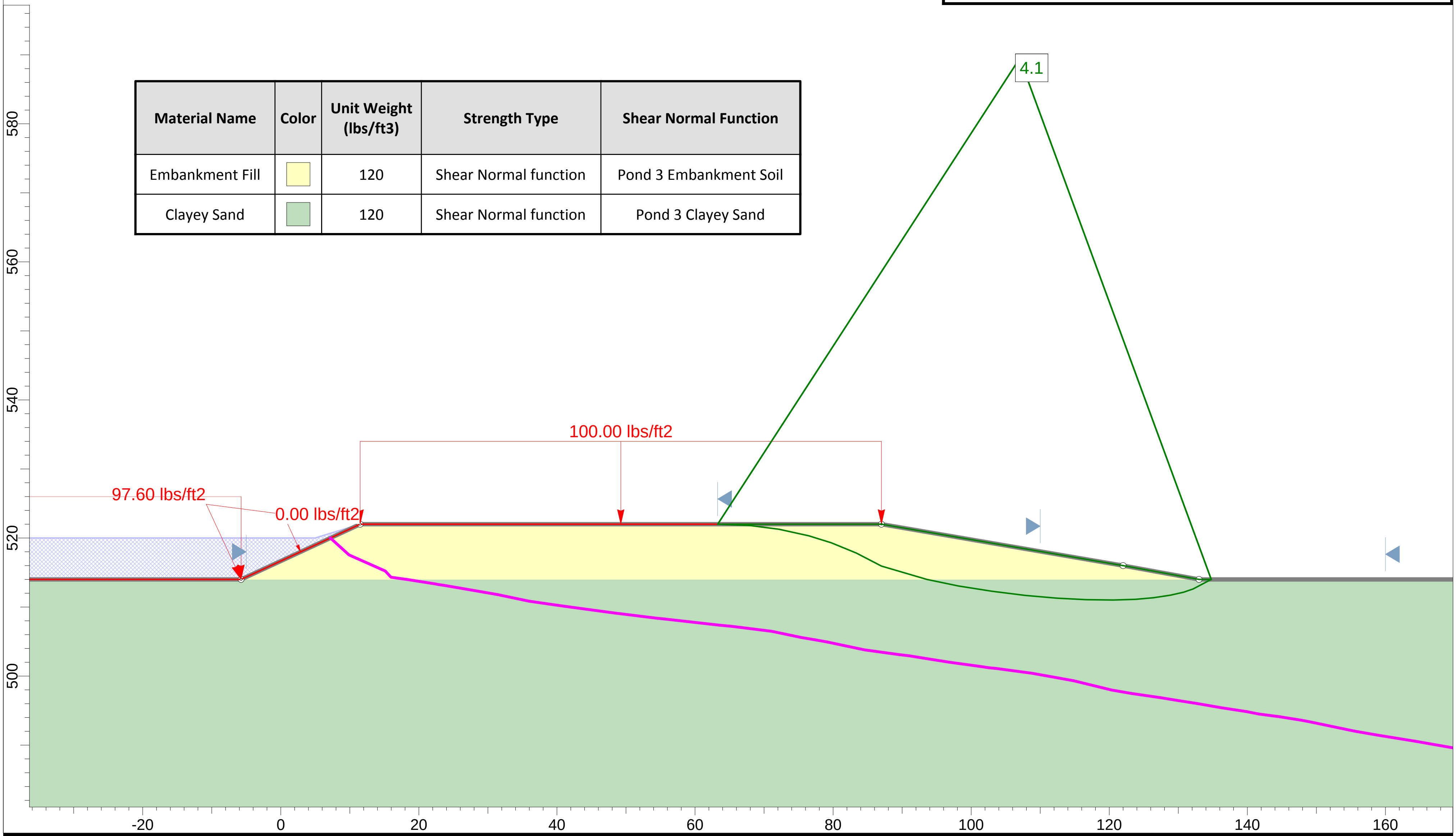
ISSUE DATE:	11/20/2012
DRAWN BY:	CCL
CHECKED BY:	RBW
REVIEWED BY:	GLB

FIGURE

C-1b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



Profile "A" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

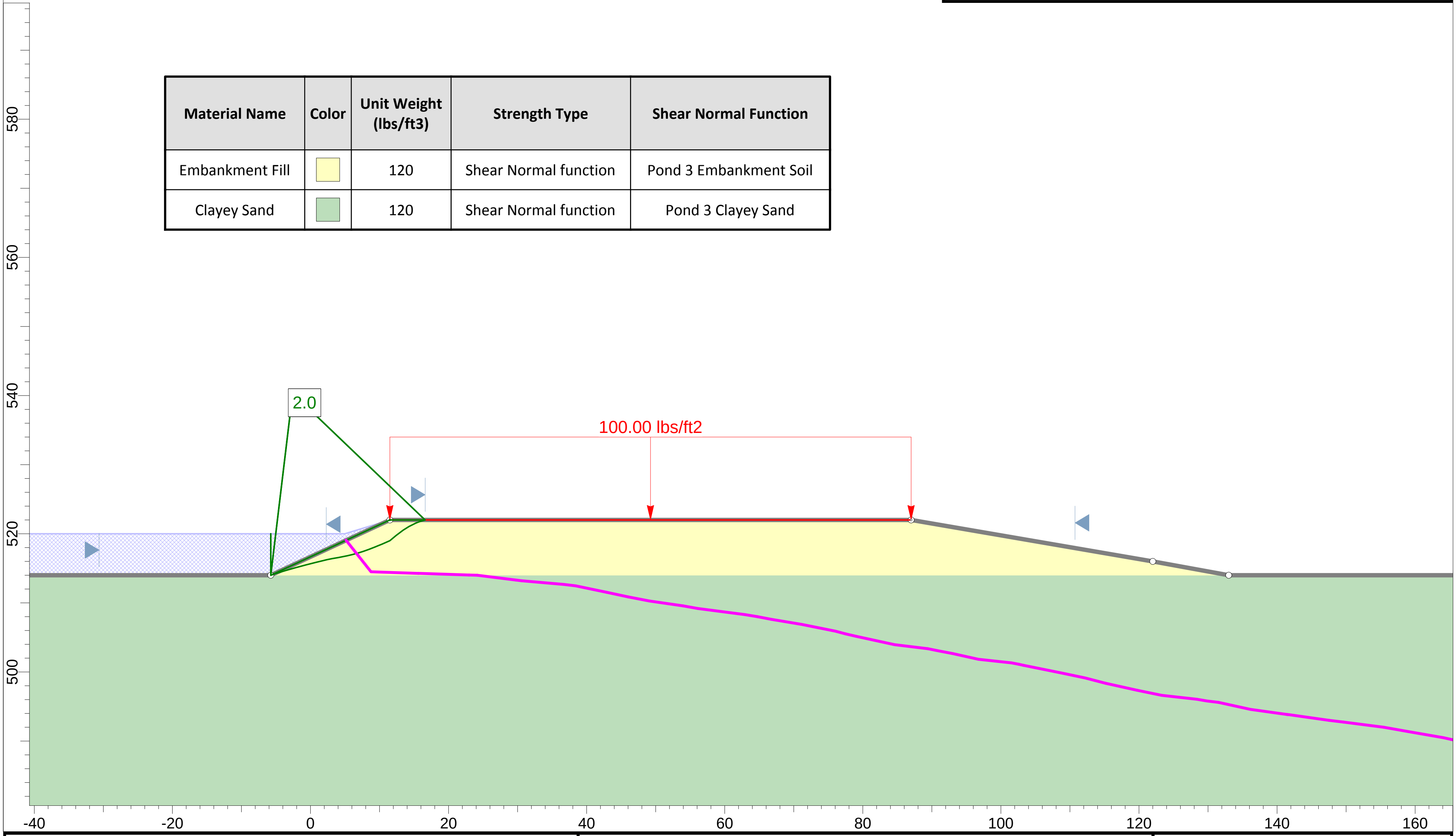
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-2a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



Profile "A" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

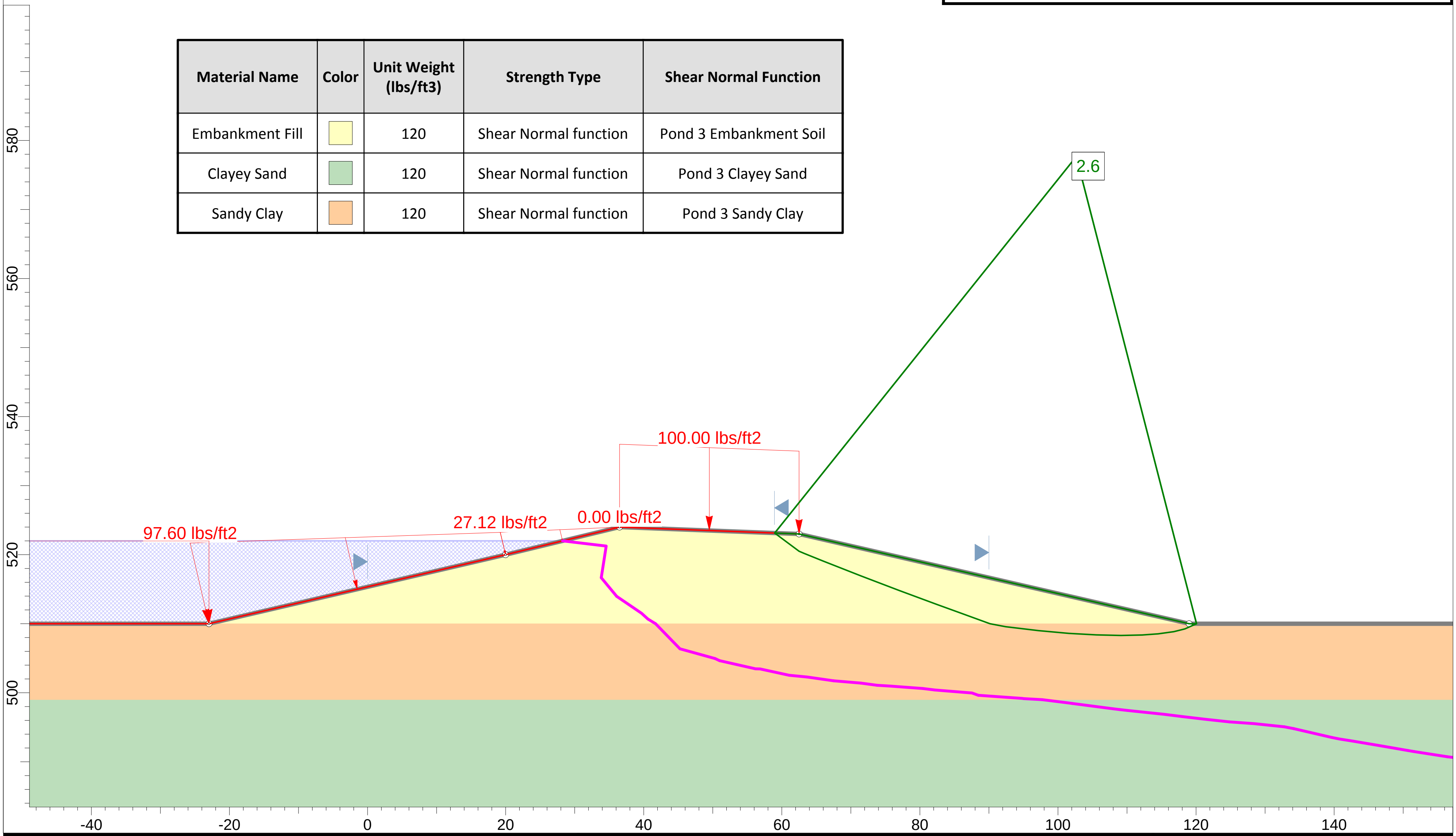
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-2b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

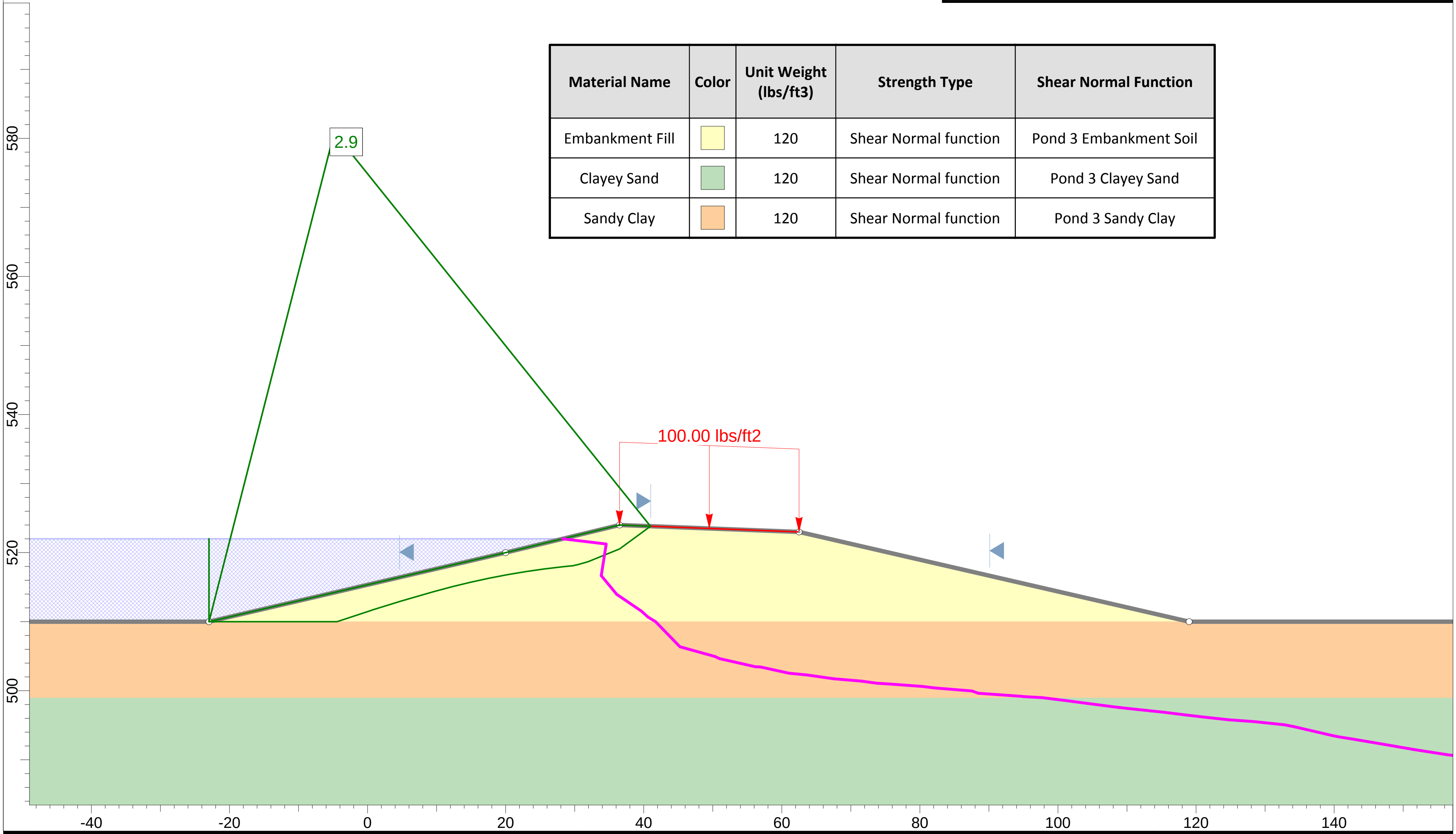


Profile "B" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-3a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

Profile "B" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

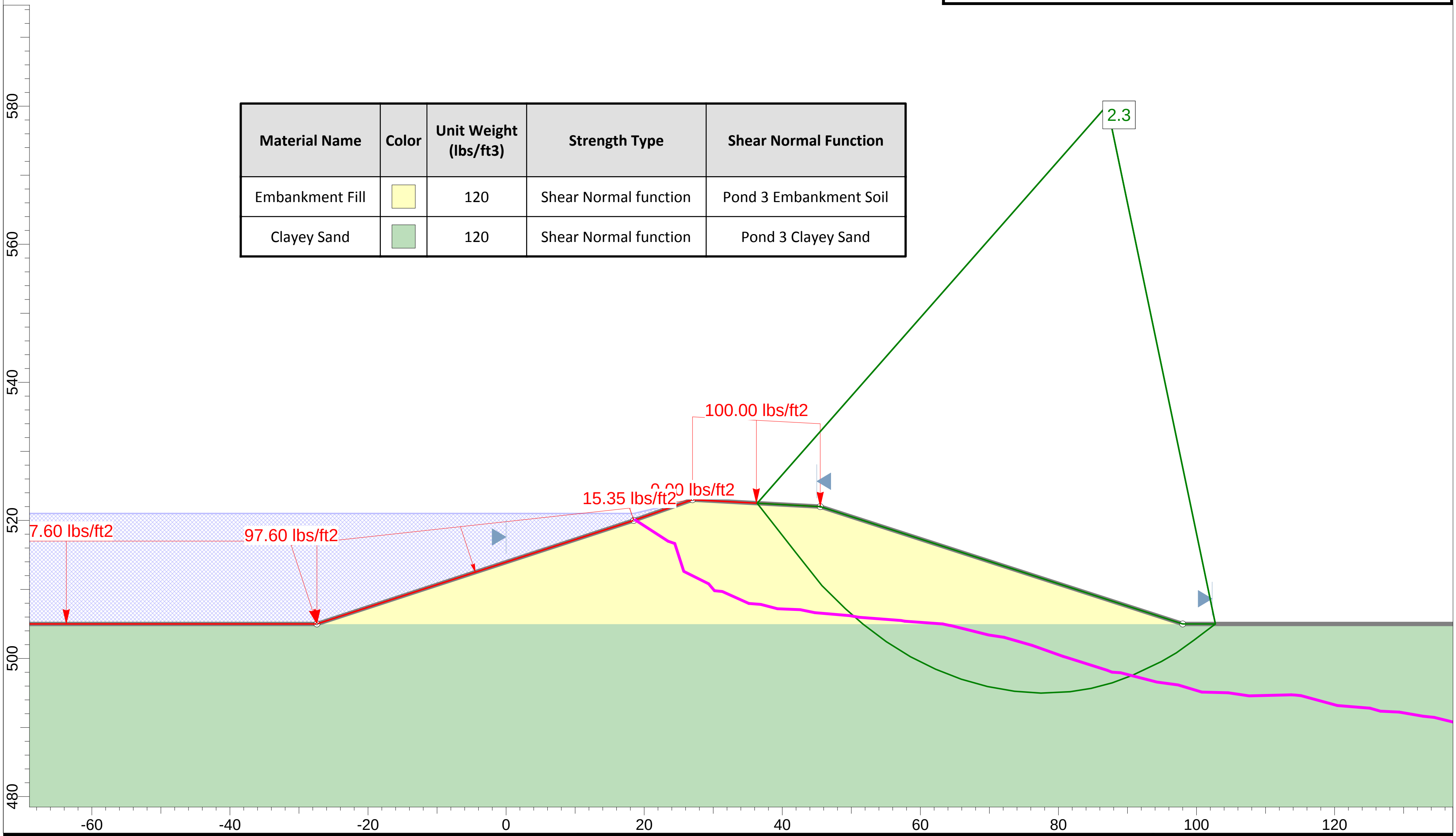
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-3b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



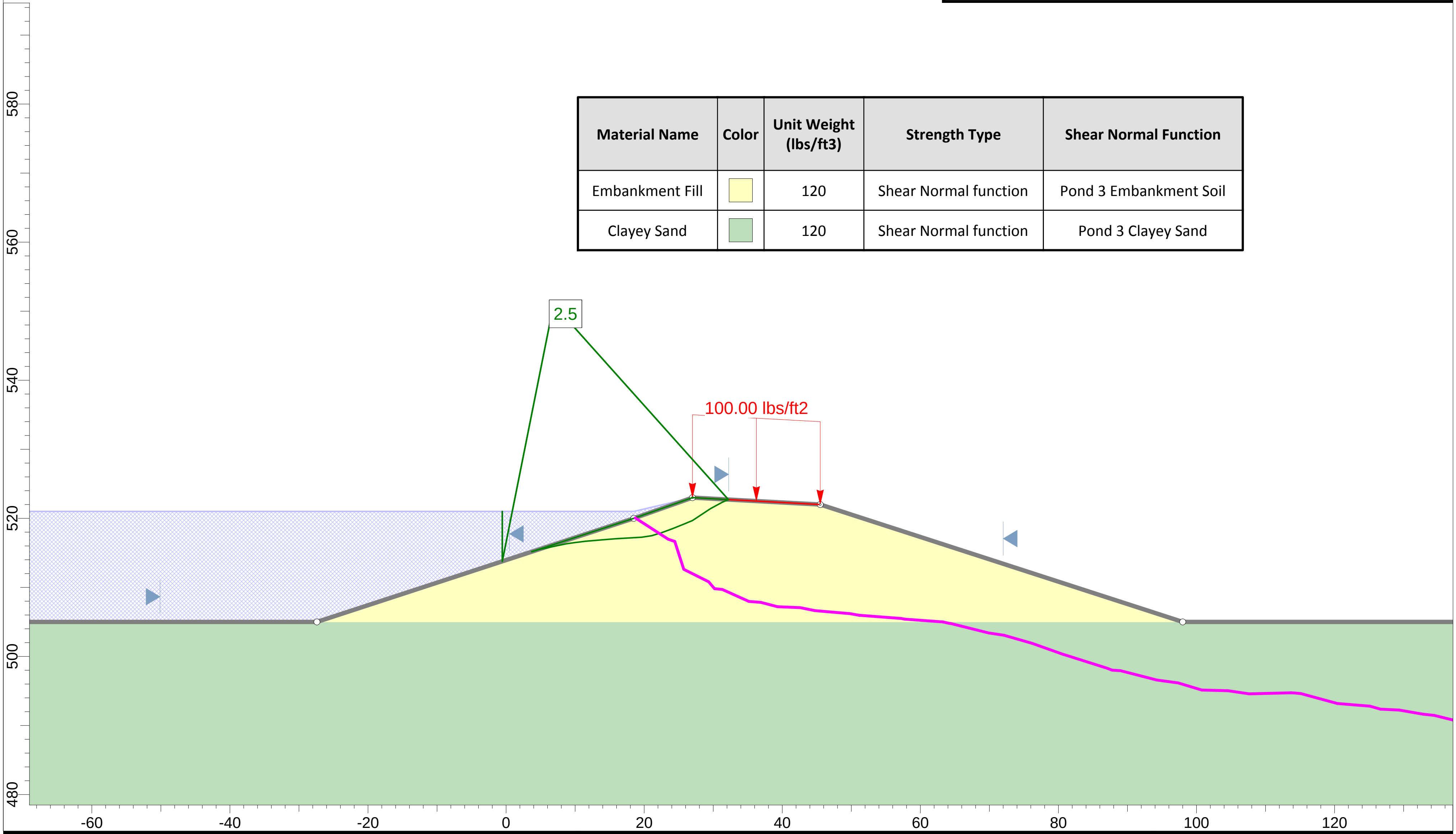
Profile "C" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-4a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



Profile "C" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

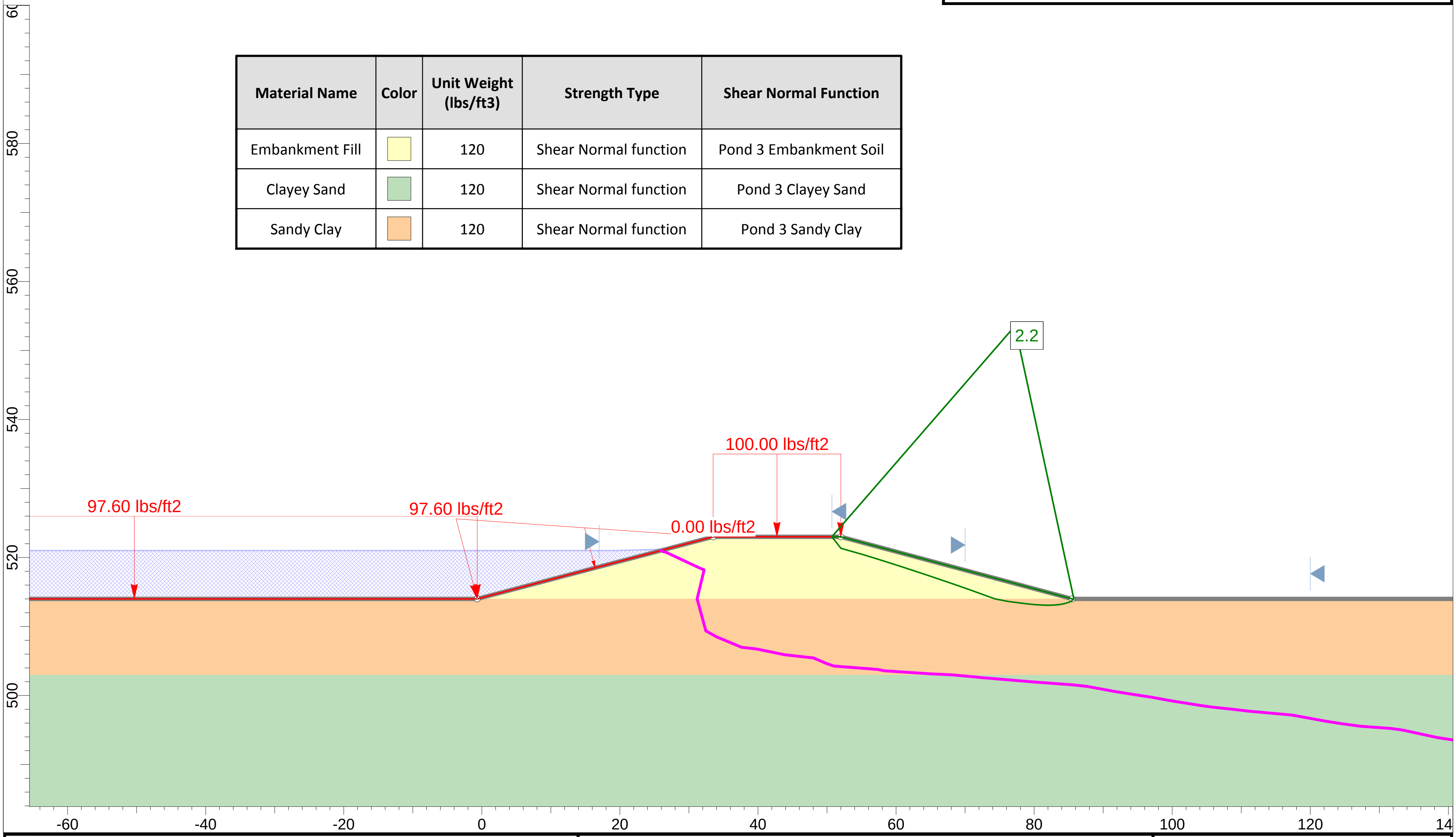
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-4b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay



Profile "D" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

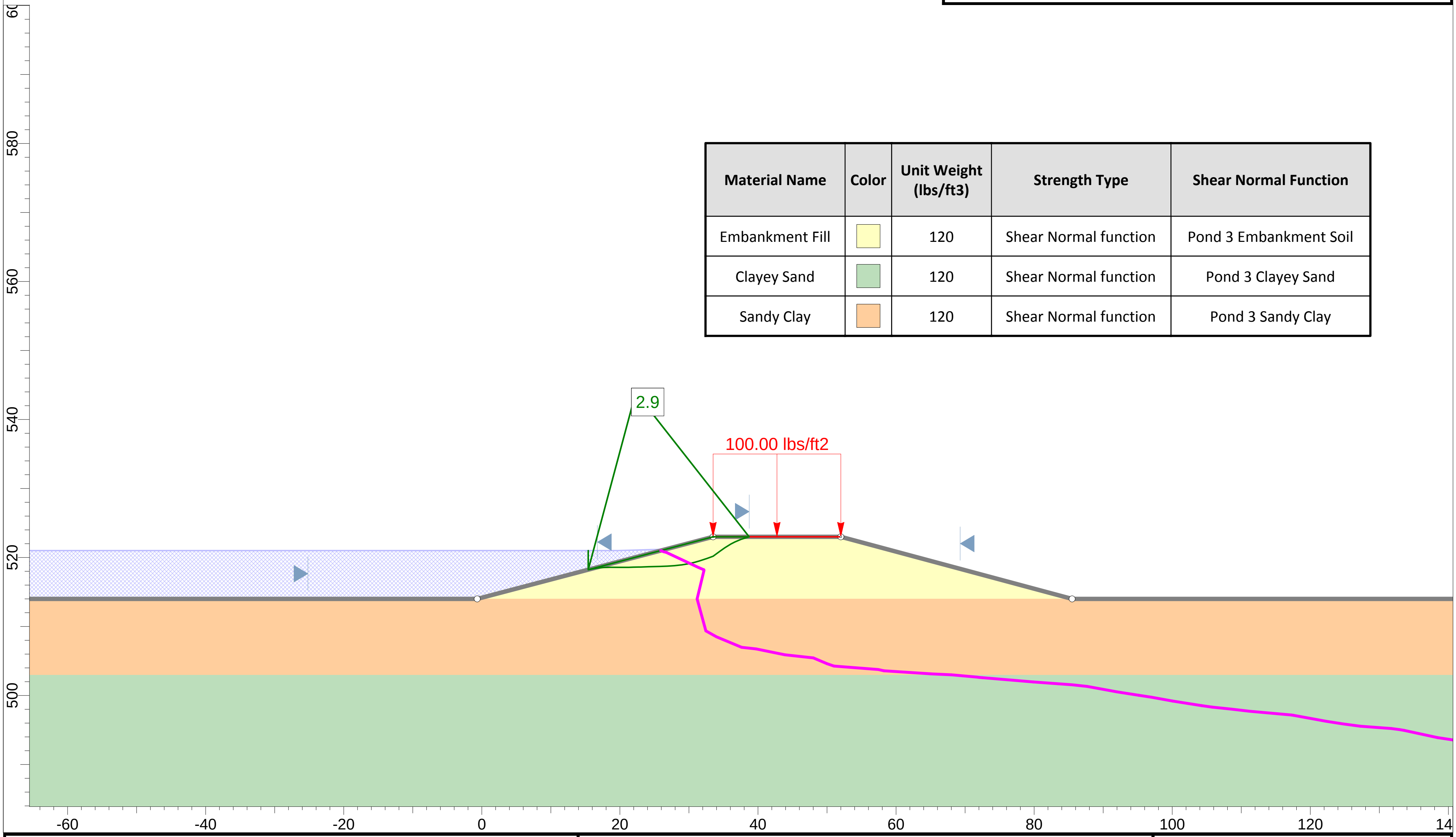
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-5a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

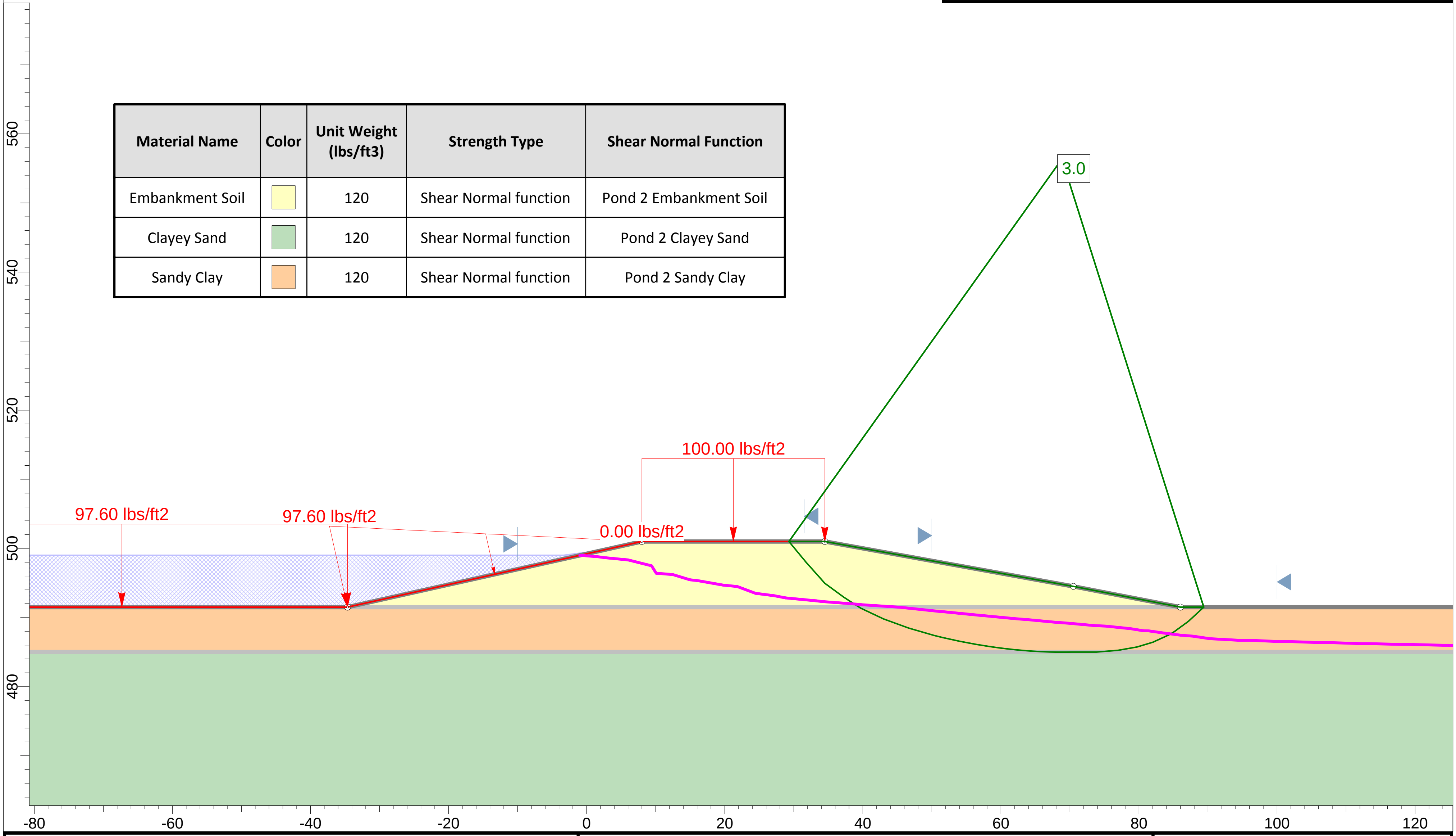


Profile "D" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-5b

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Soil	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

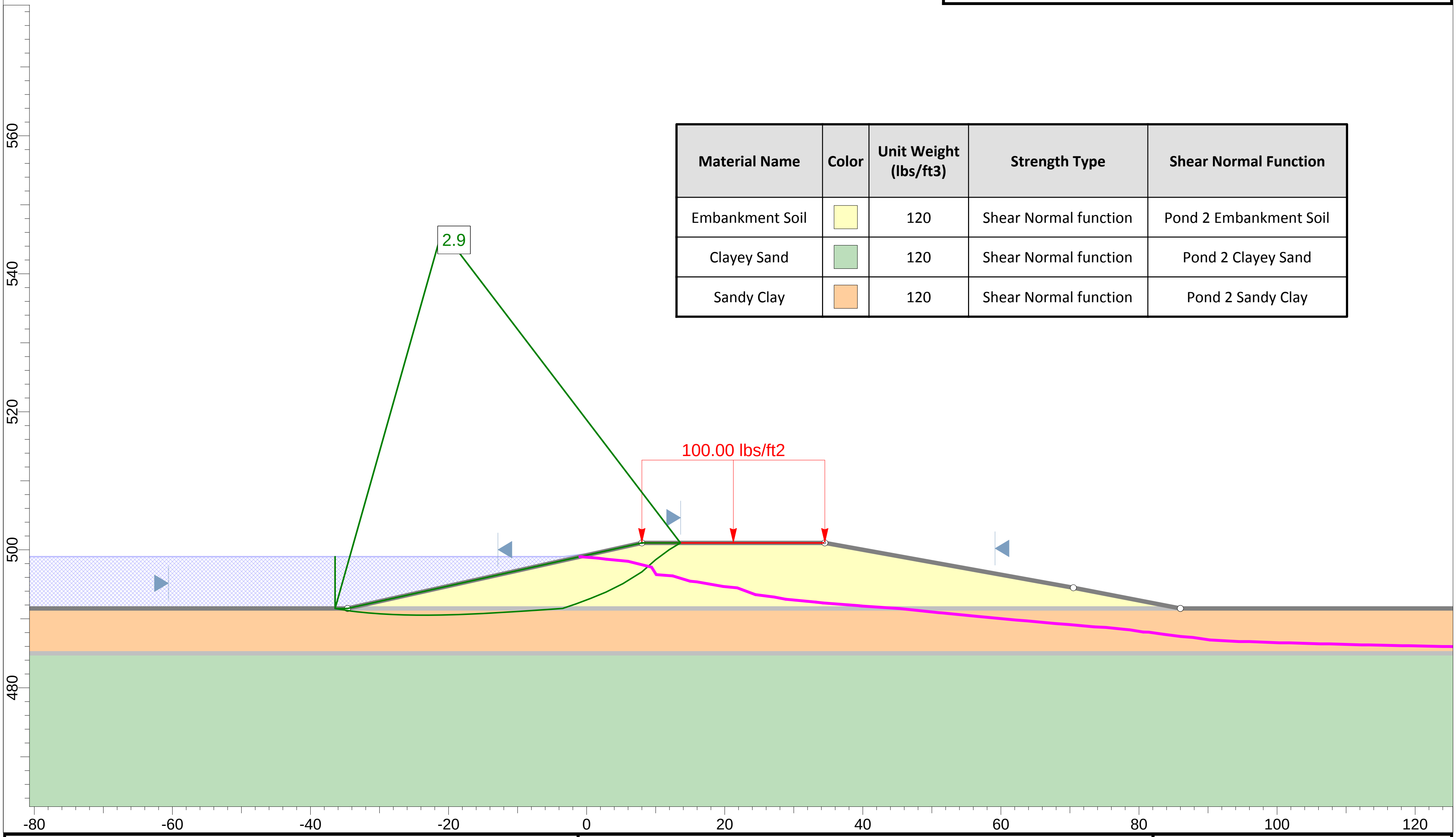
Profile "E" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-6a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Soil	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

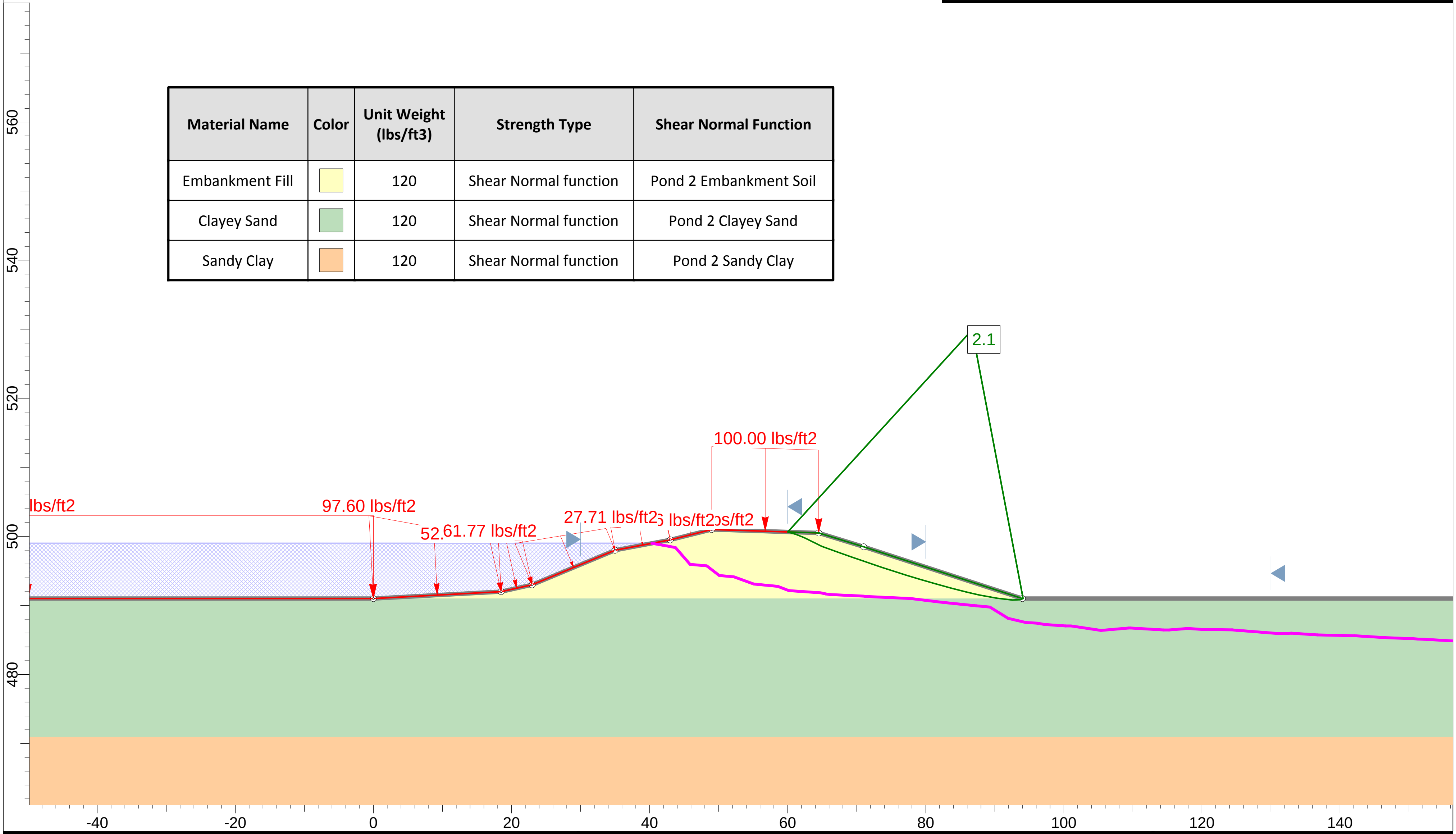
Profile "E" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-6b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay



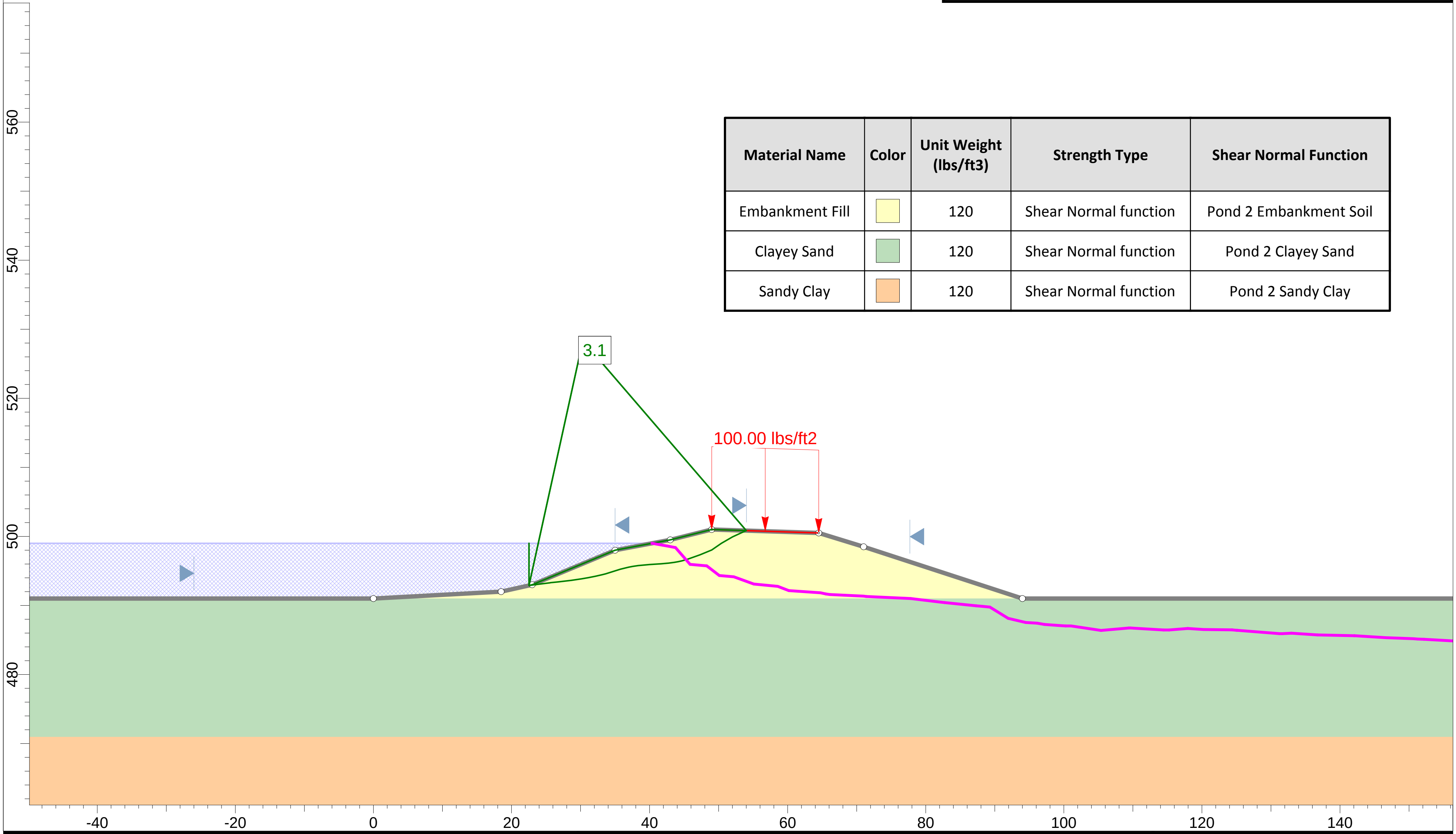
Profile "F" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-7a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

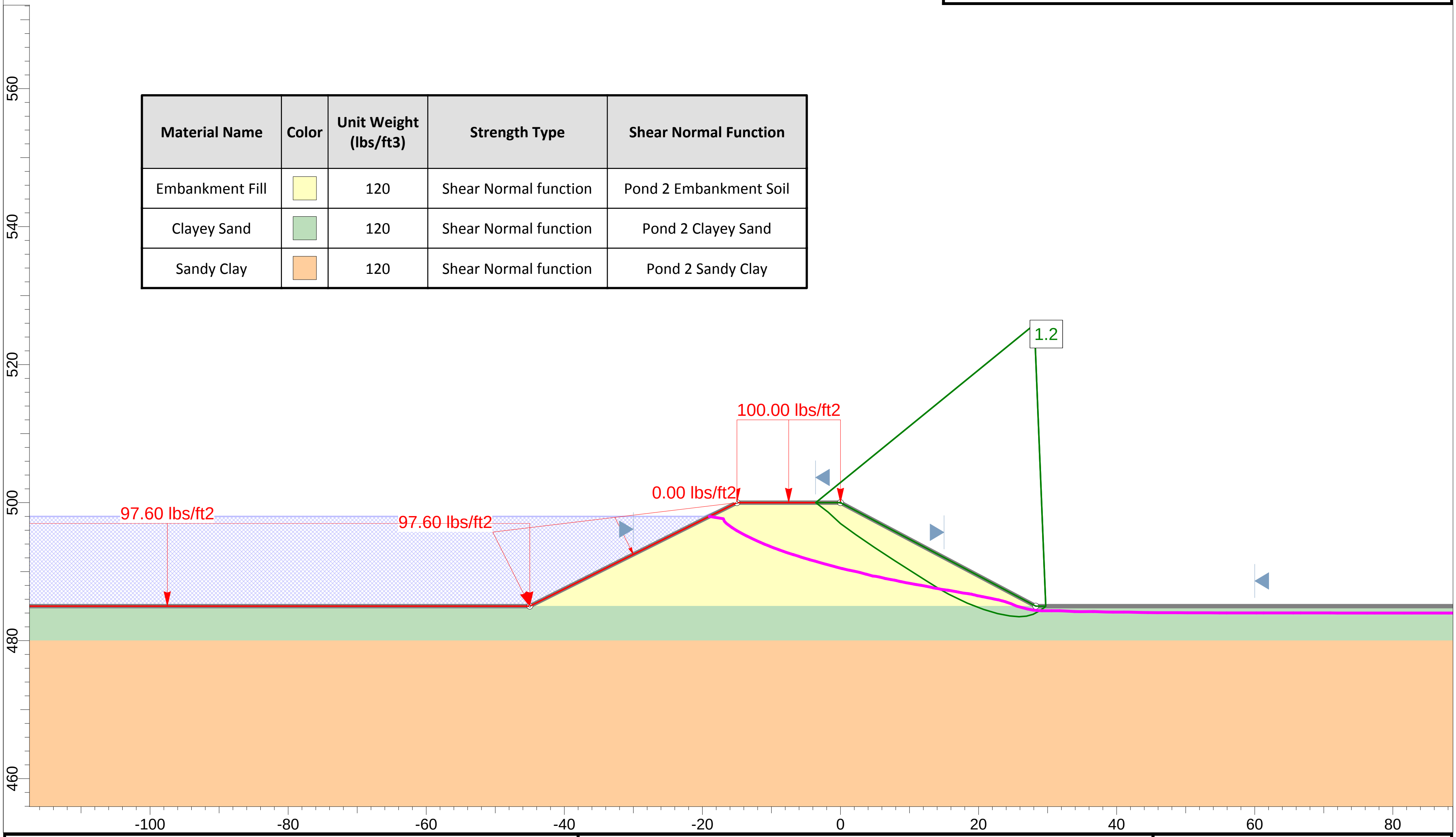
Profile "F" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-7b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay



Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

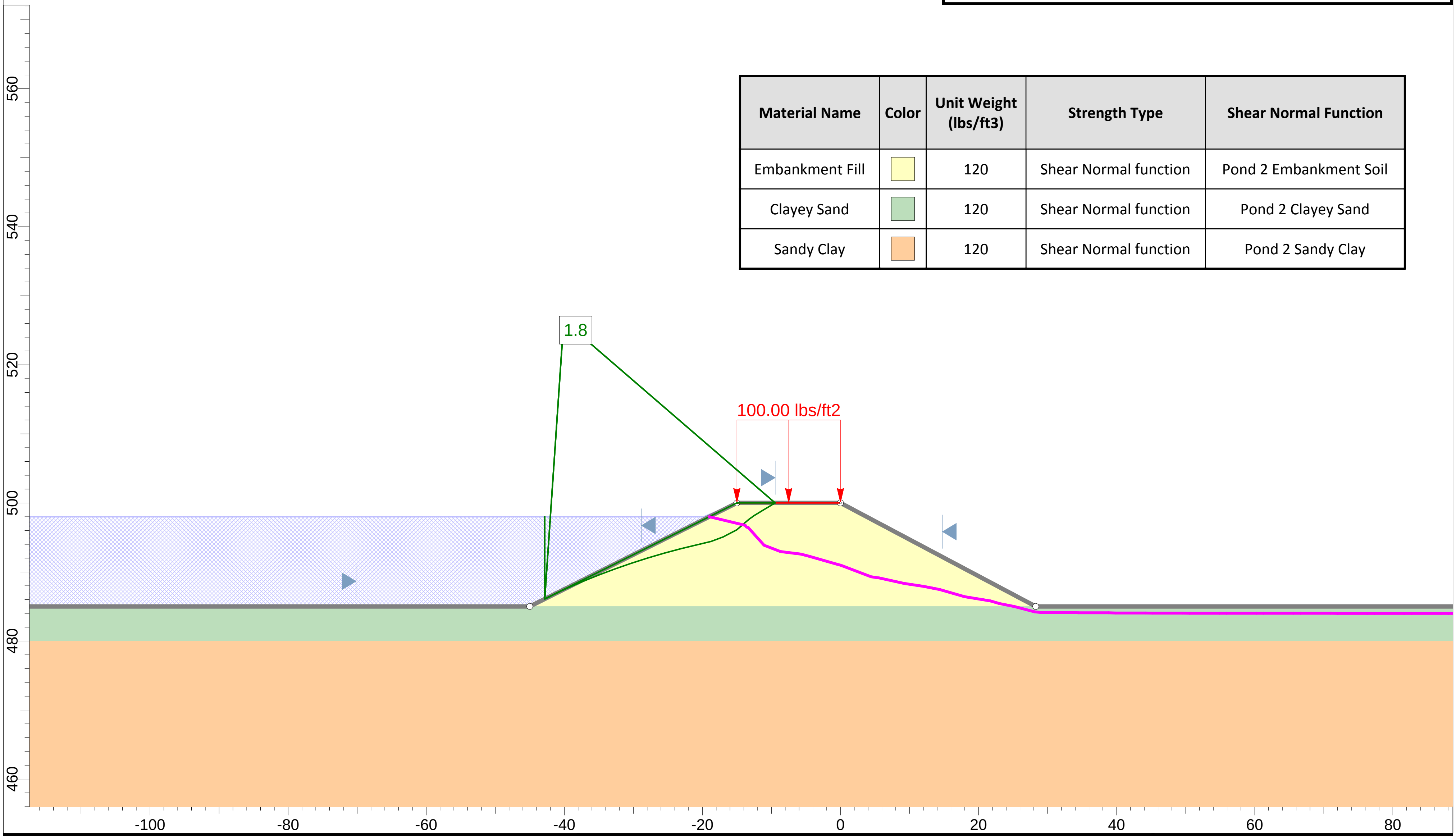
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-8a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay



Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

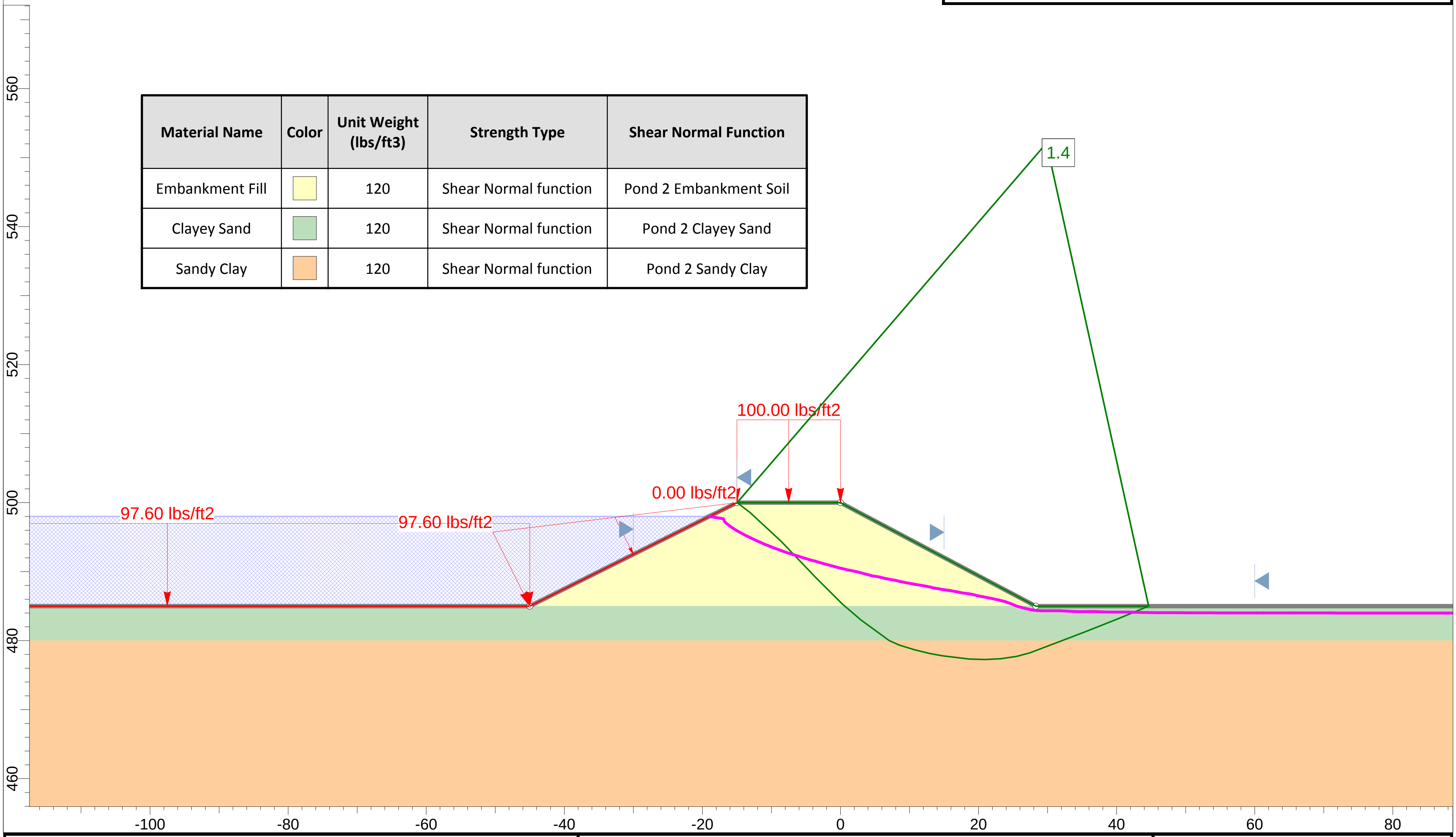
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-8b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

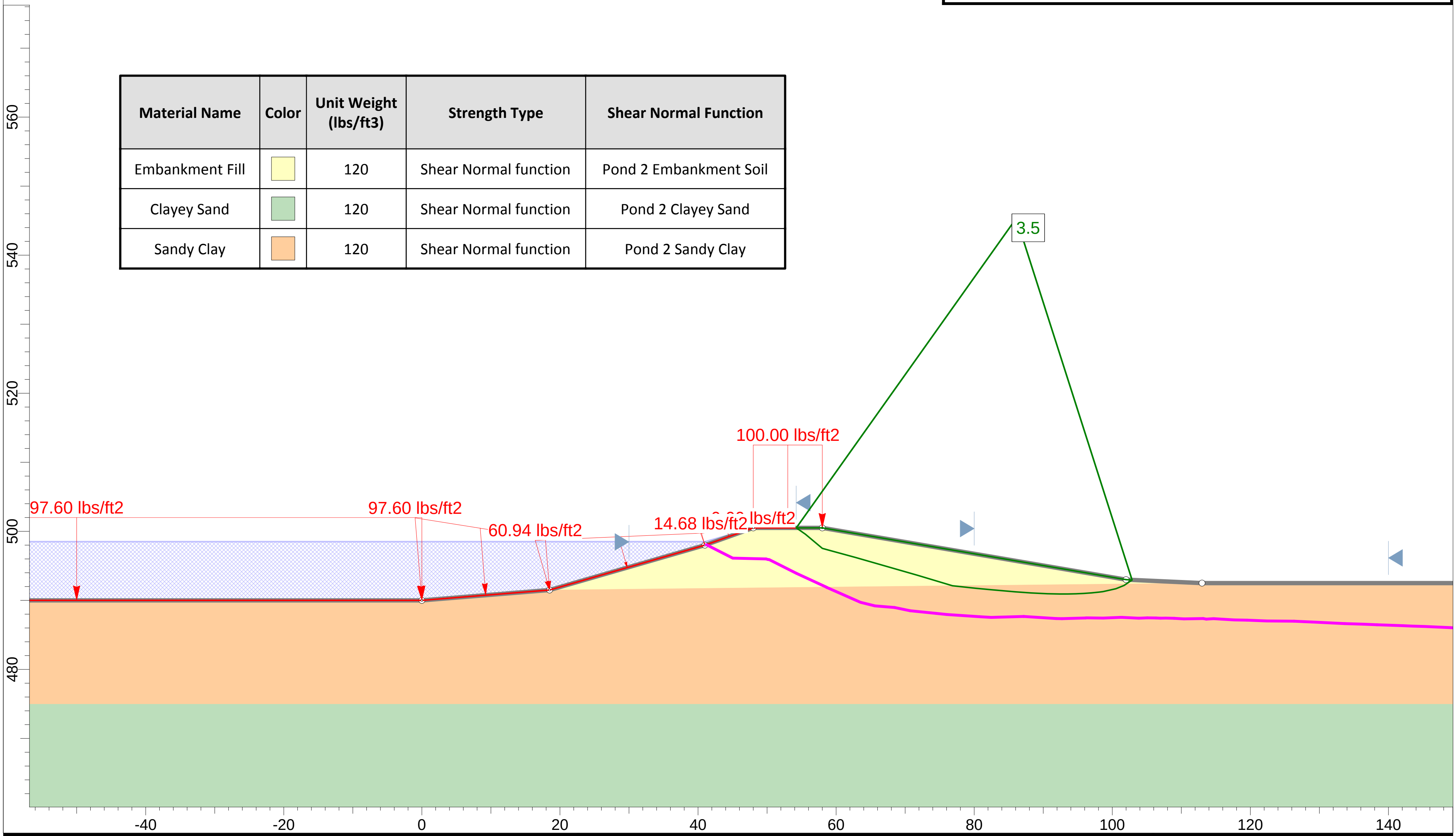


Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-8c

Global Stability Analysis



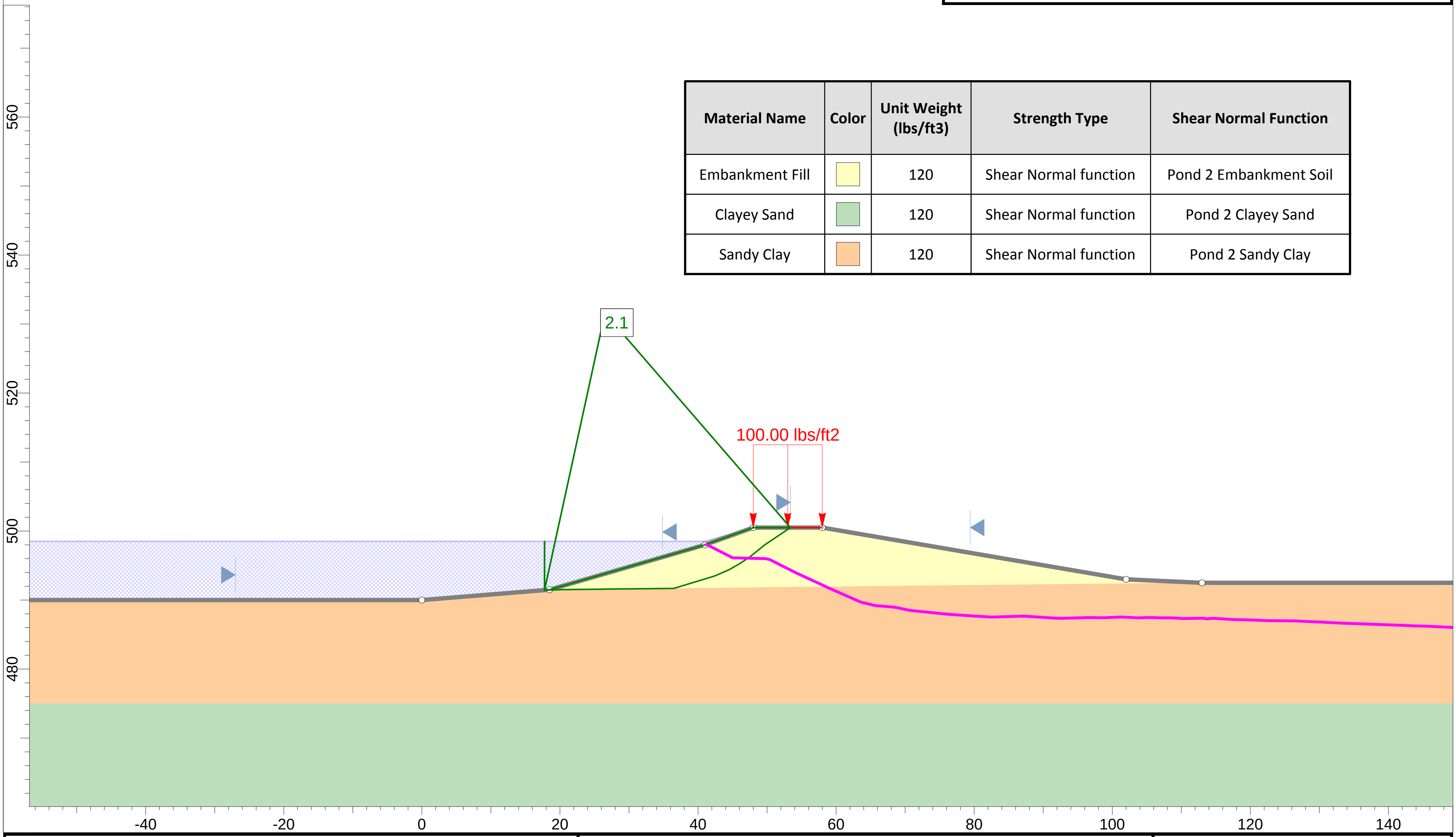
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "H" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-9a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

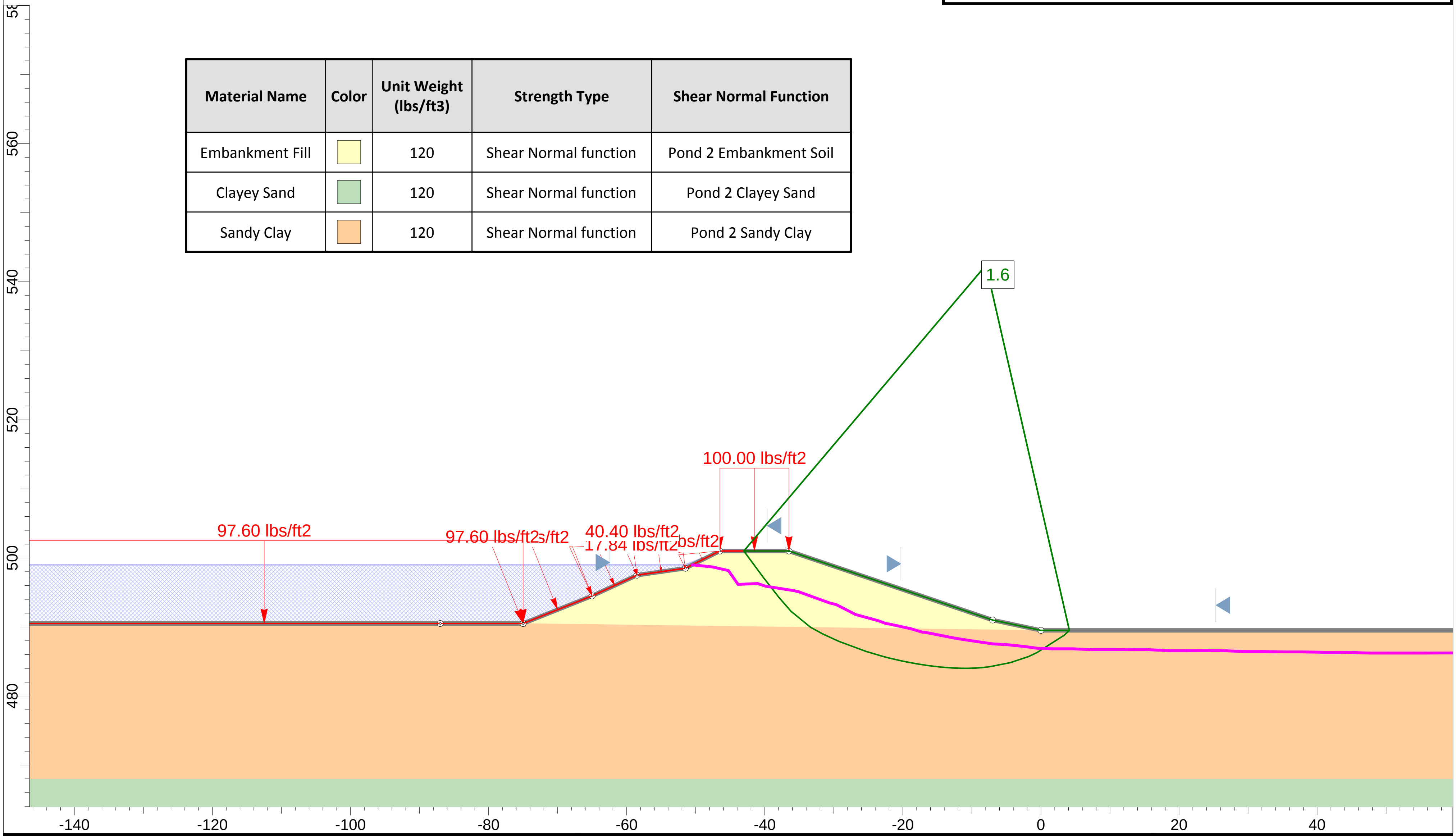
Profile "H" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-9b

RABA KISTNER CONSULTANTS

Global Stability Analysis



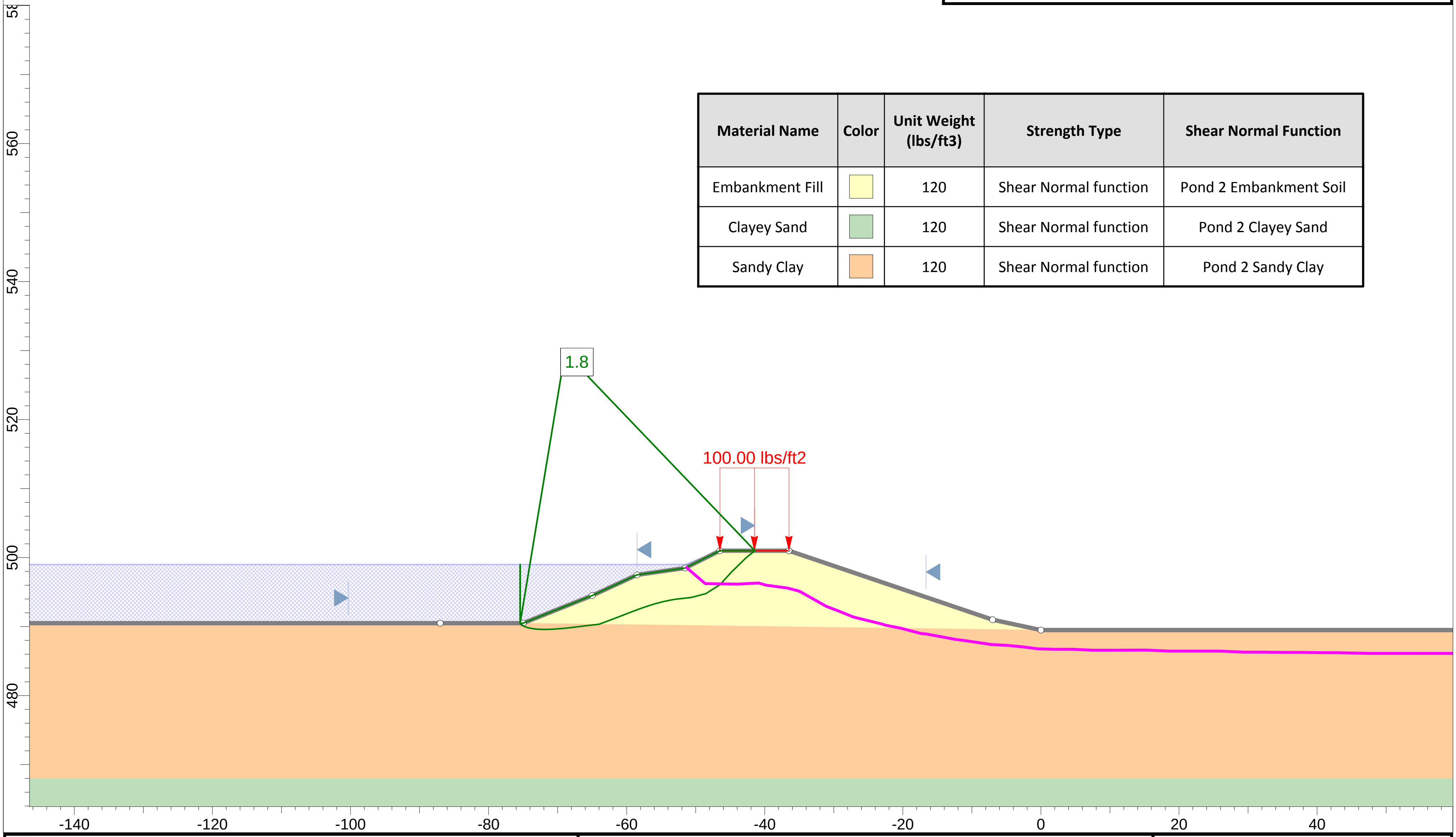
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "I" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-10a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "I" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

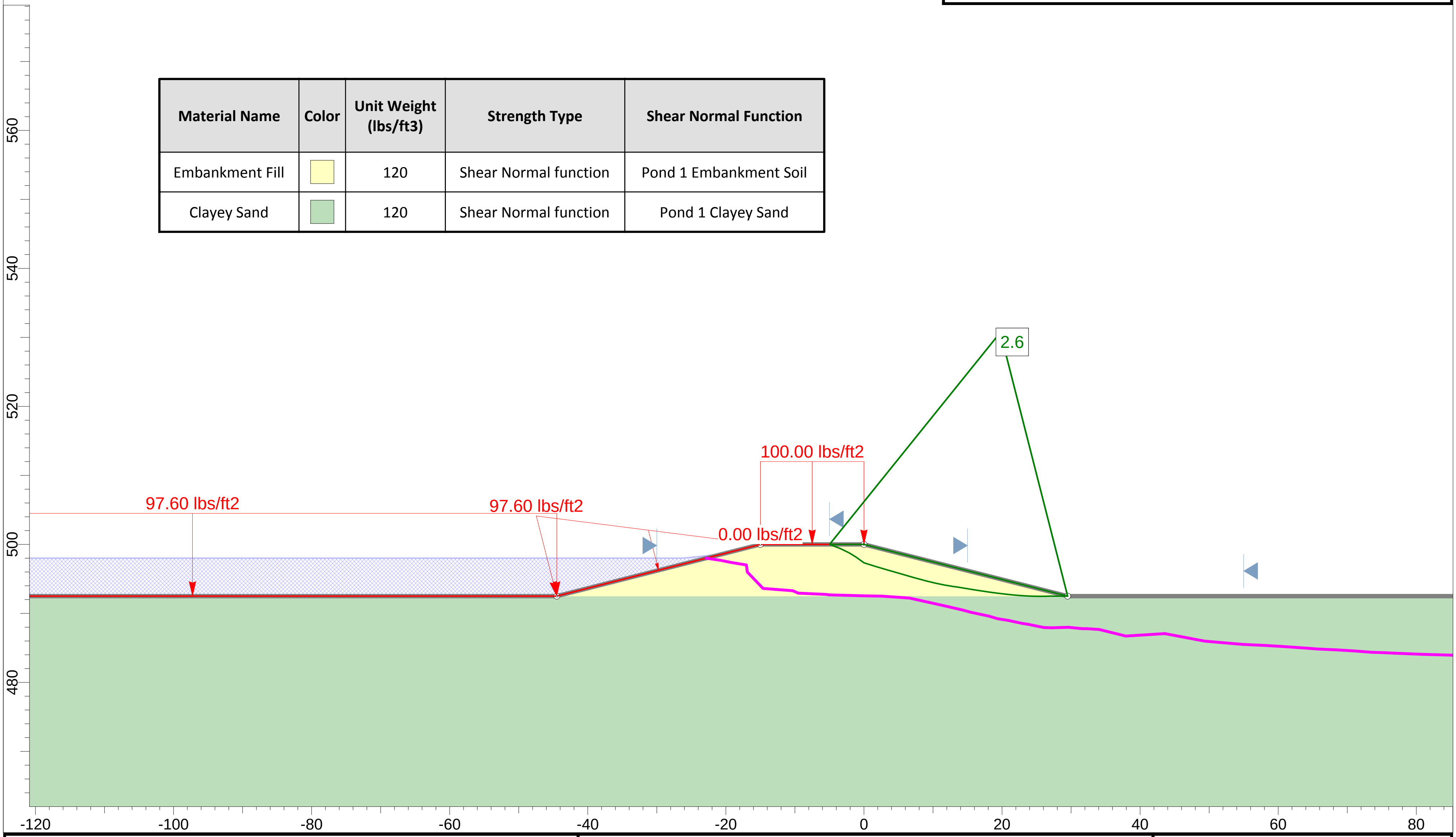
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-10b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand



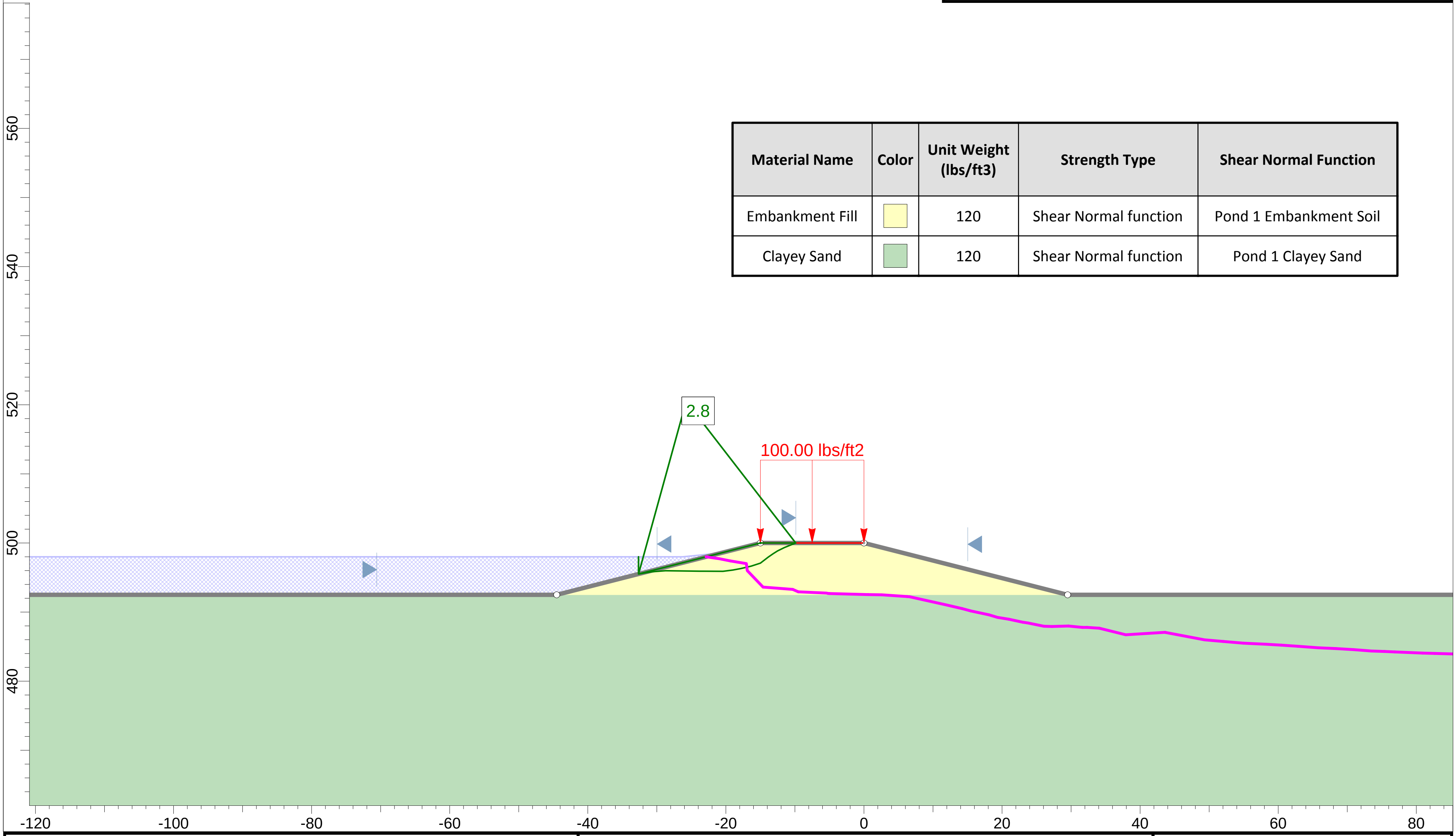
Profile "J" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-11a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand

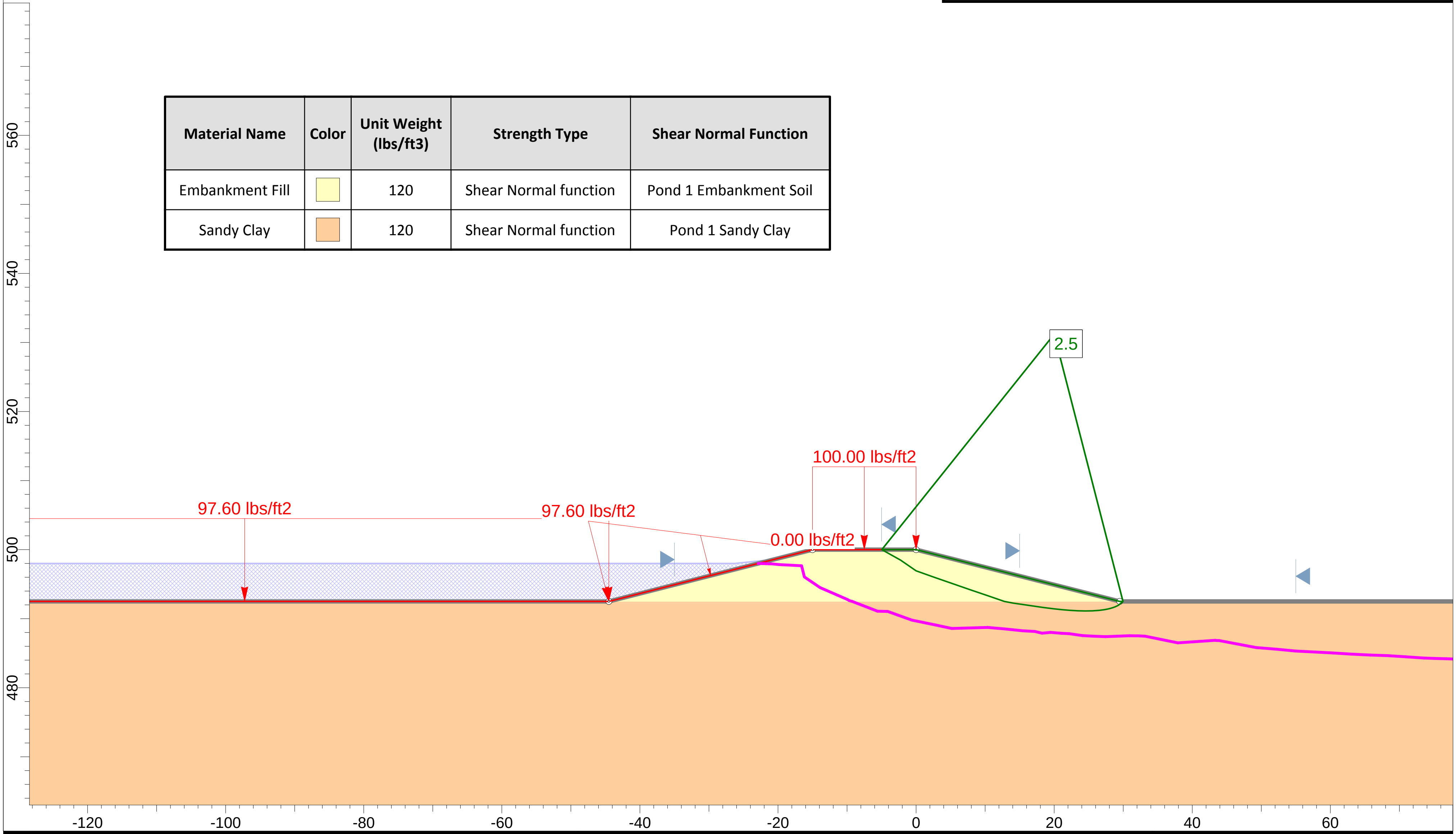
Profile "J" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-11b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



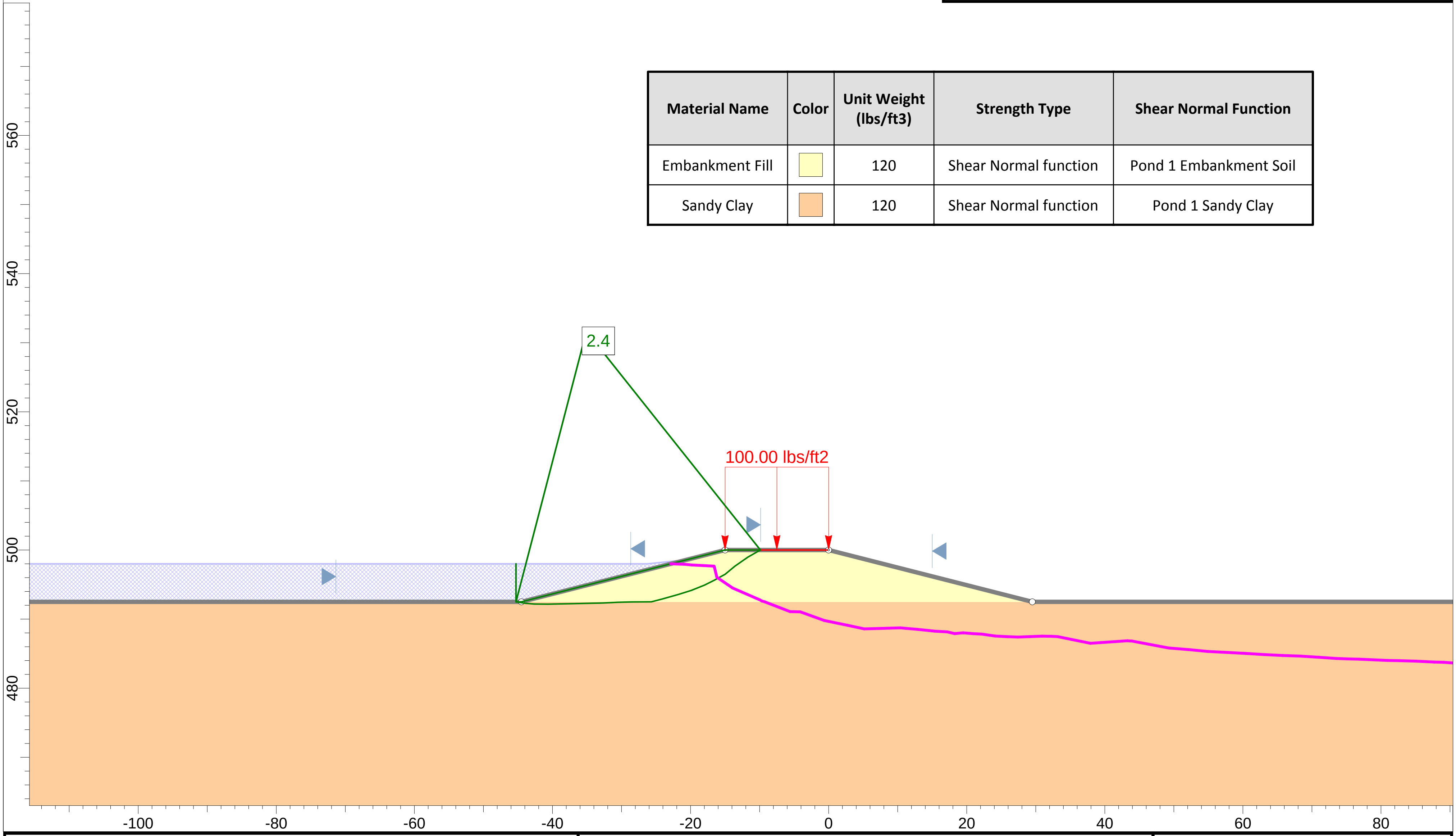
Profile "K" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-12a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



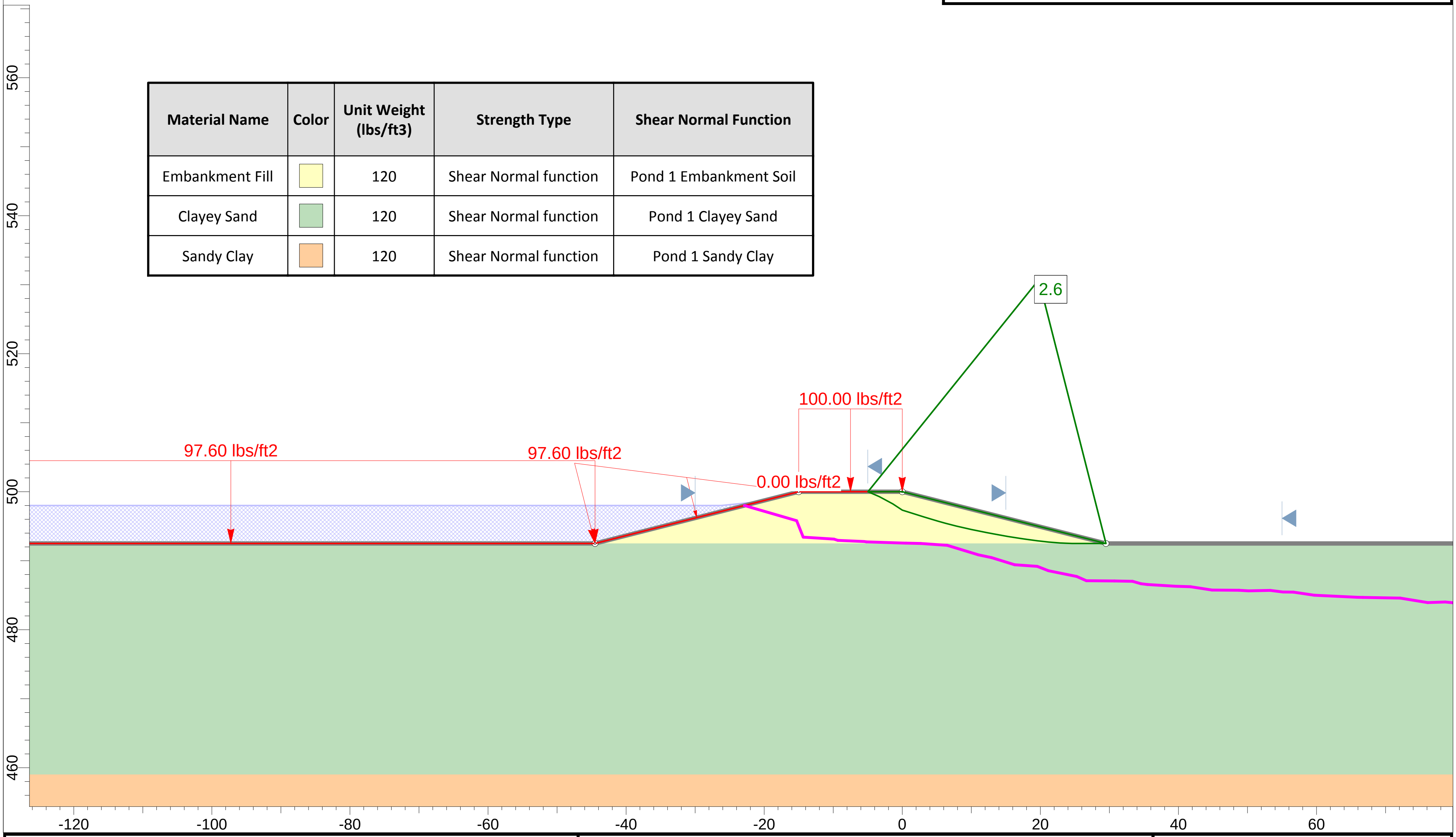
Profile "K" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-12b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay

Profile "L" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

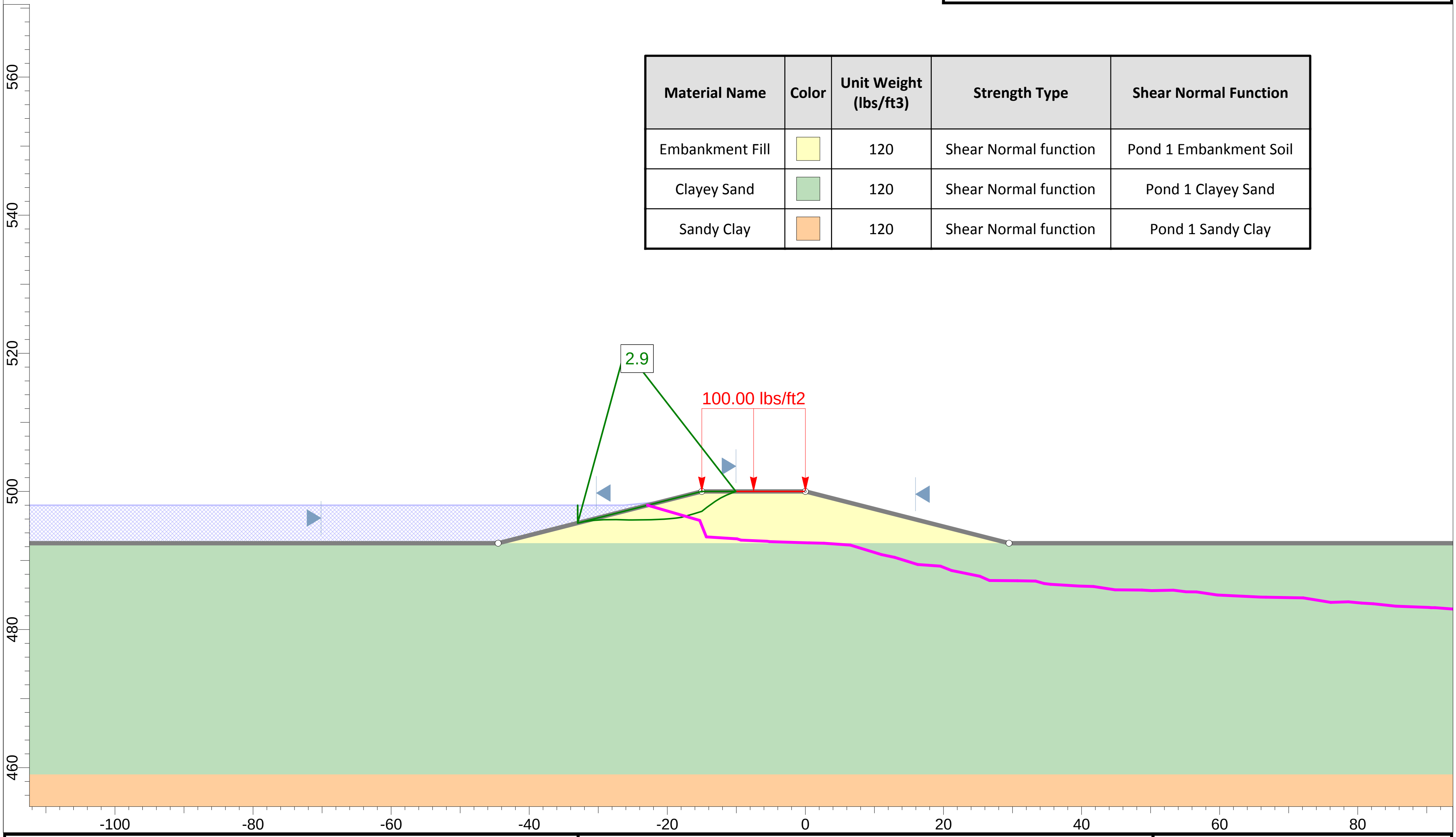
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-13a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



Profile "L" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

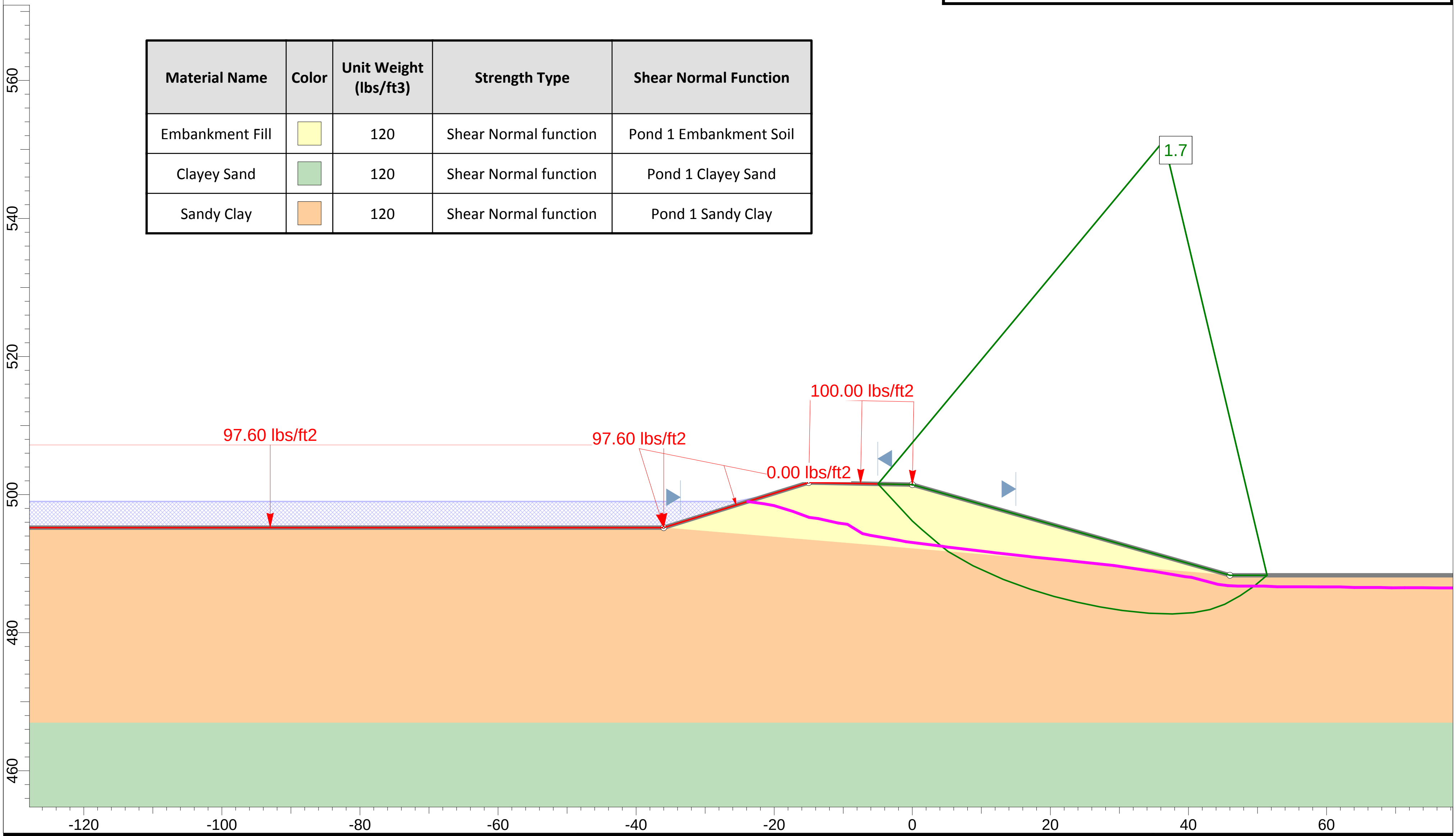
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-13b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



Profile "M" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

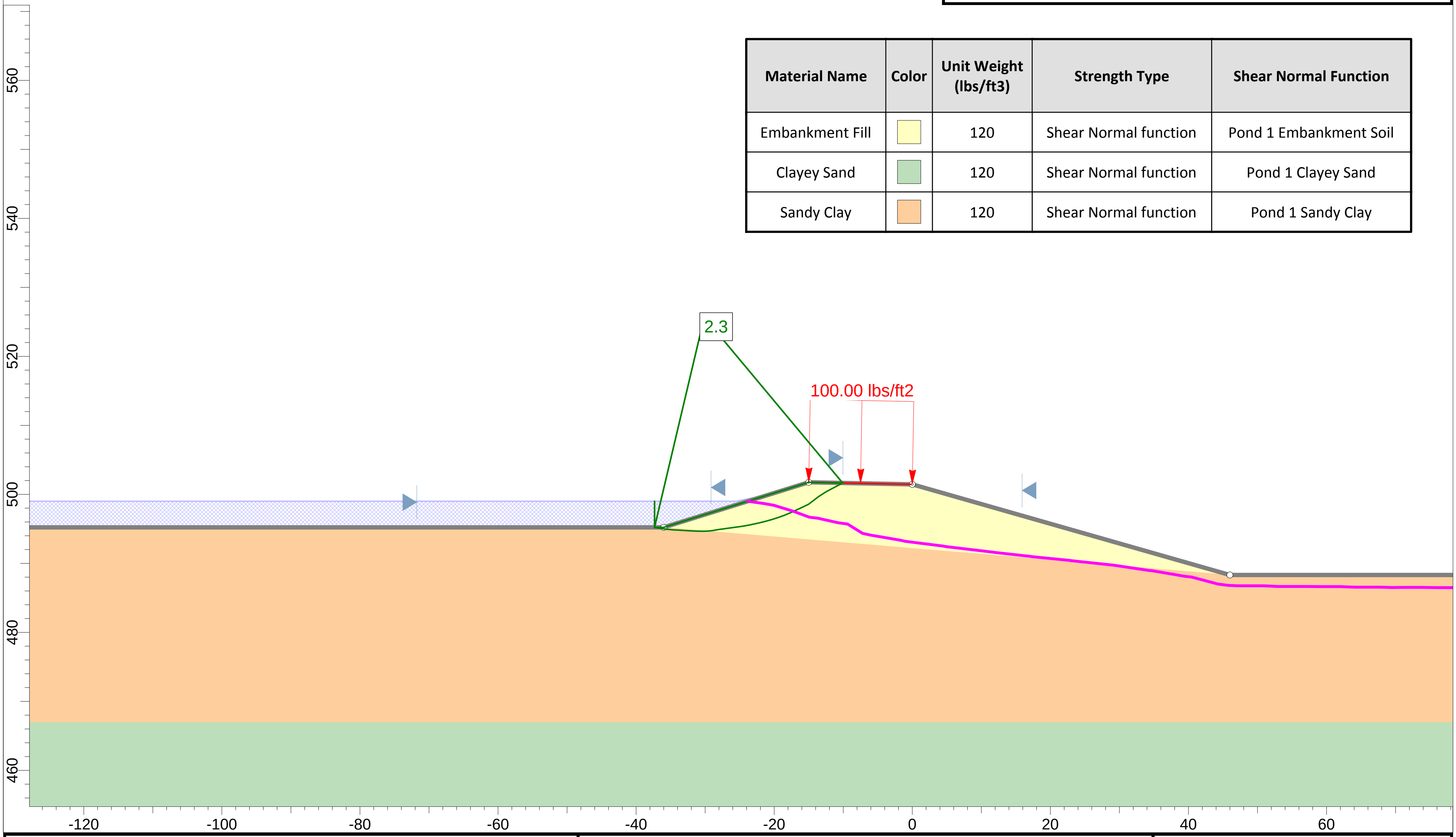
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-14a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



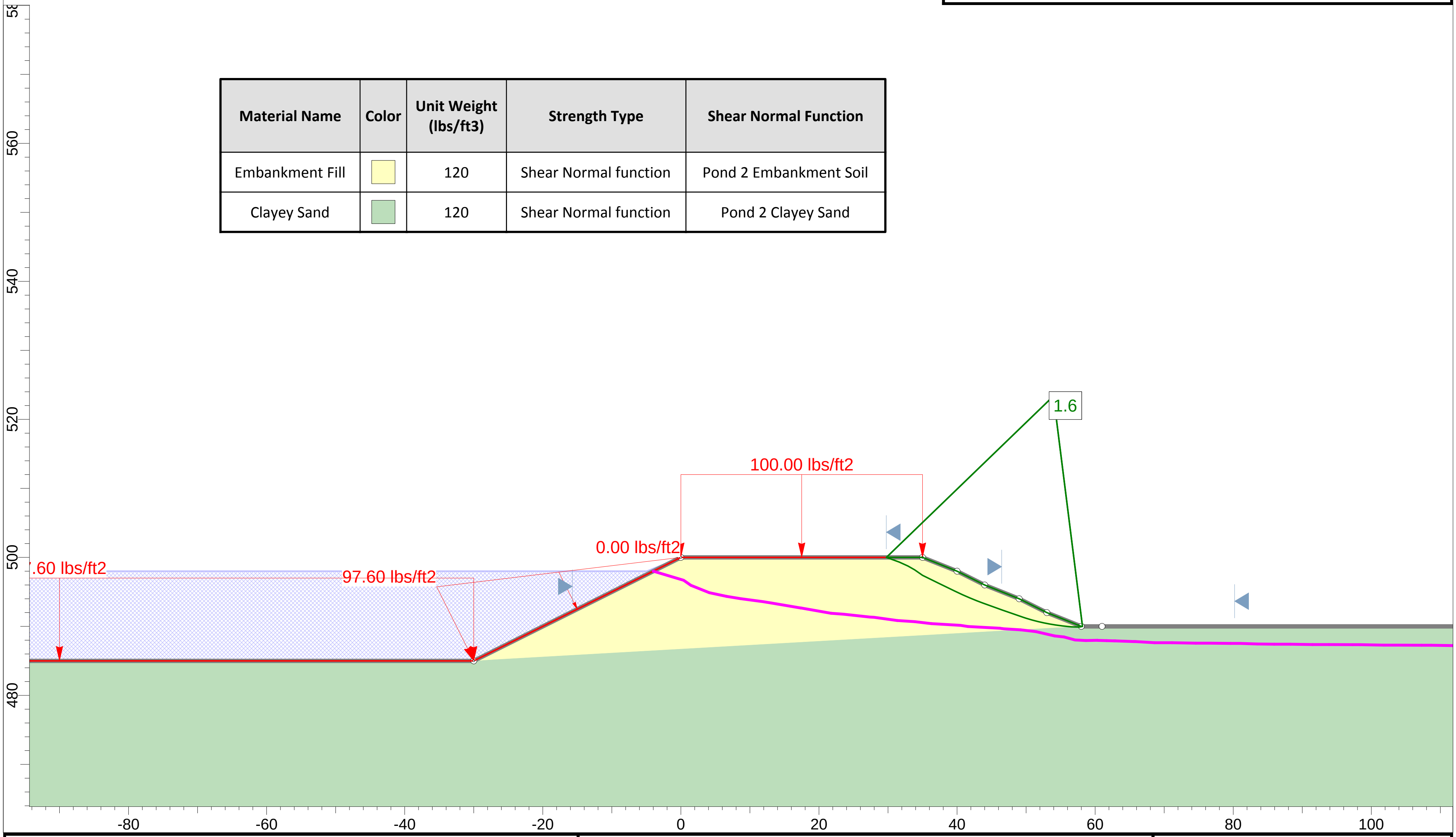
Profile "M" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-14b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand



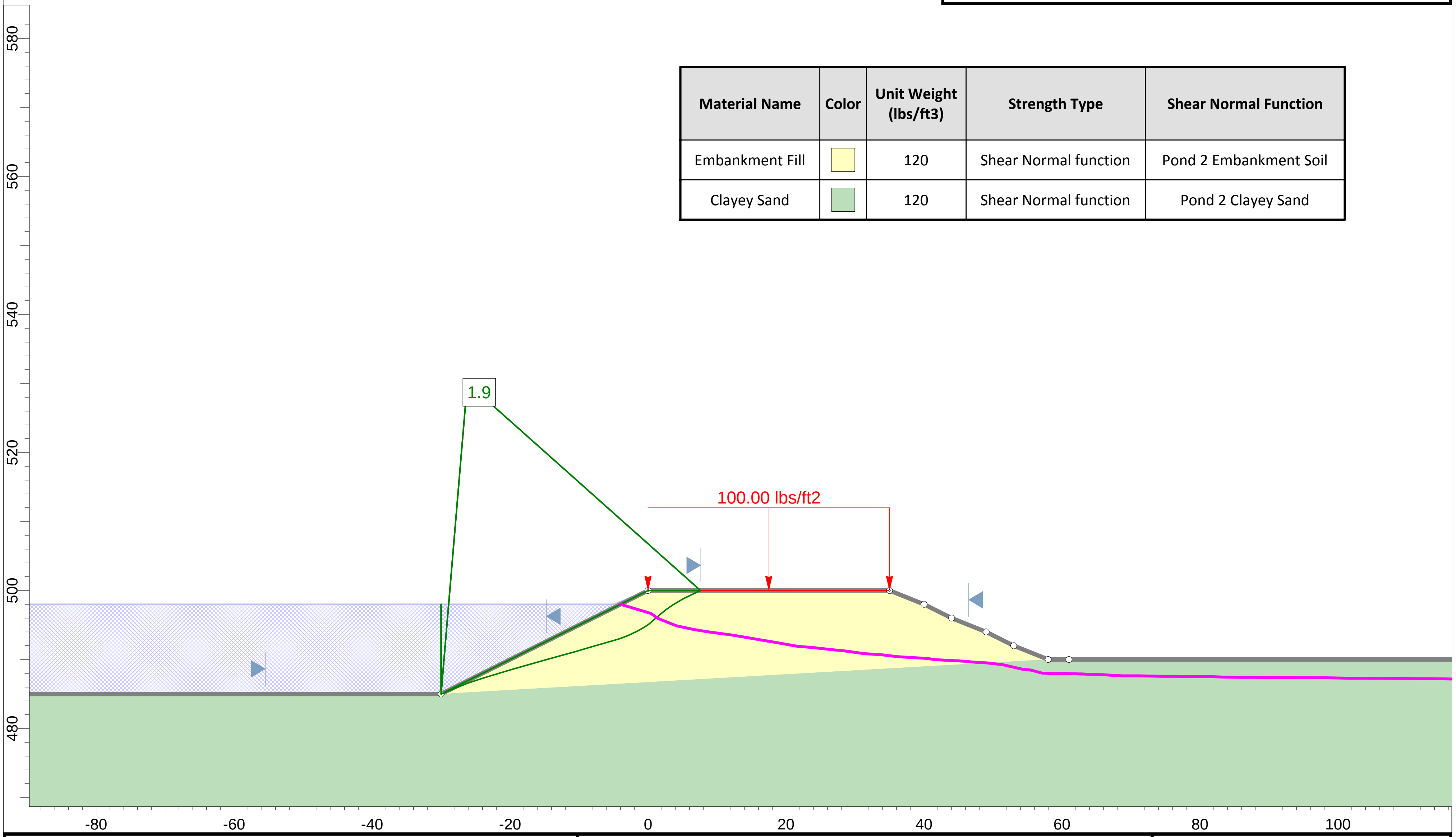
Profile "N" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-15a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand



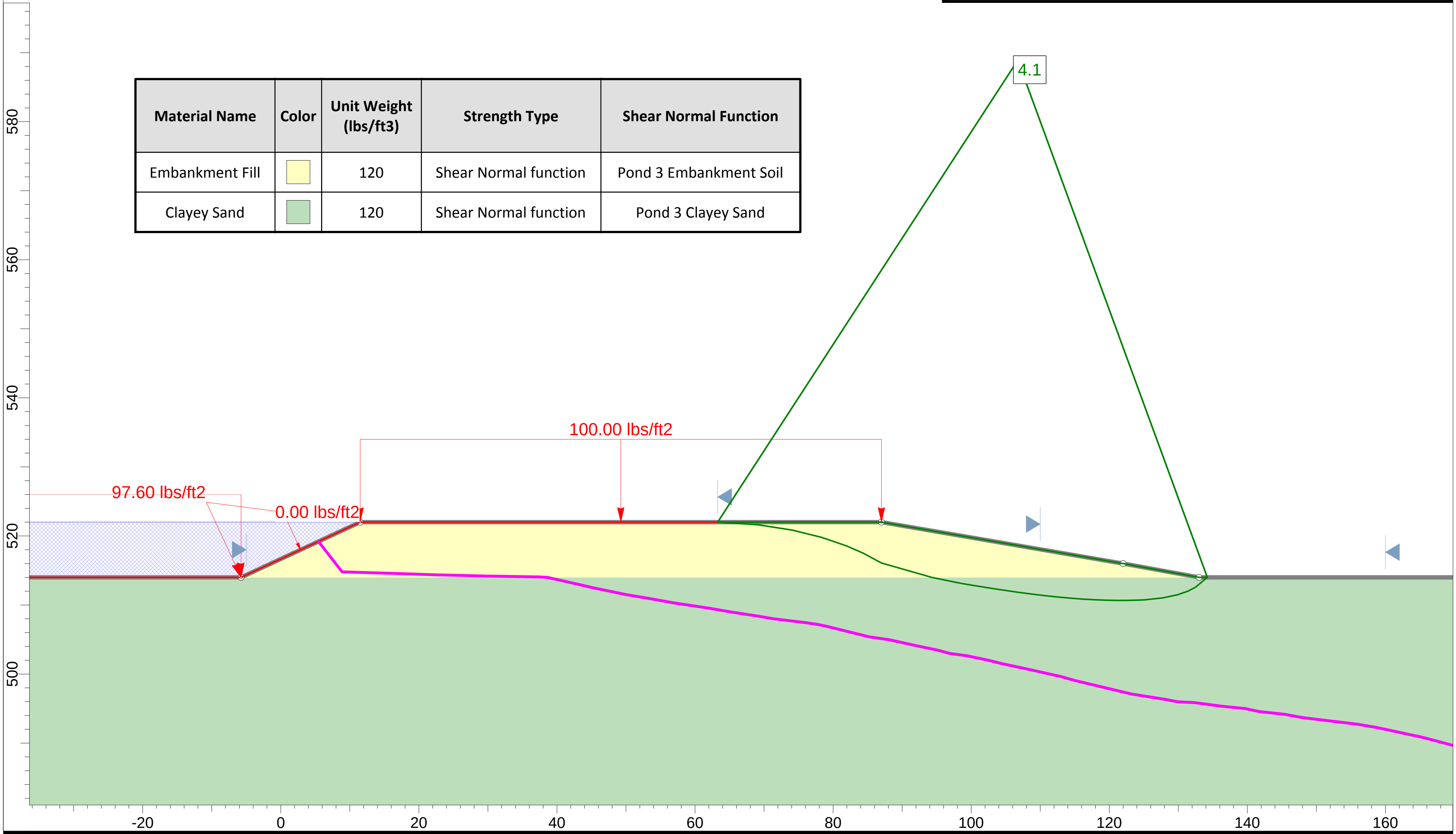
Profile "N" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-15b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



Profile "A" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

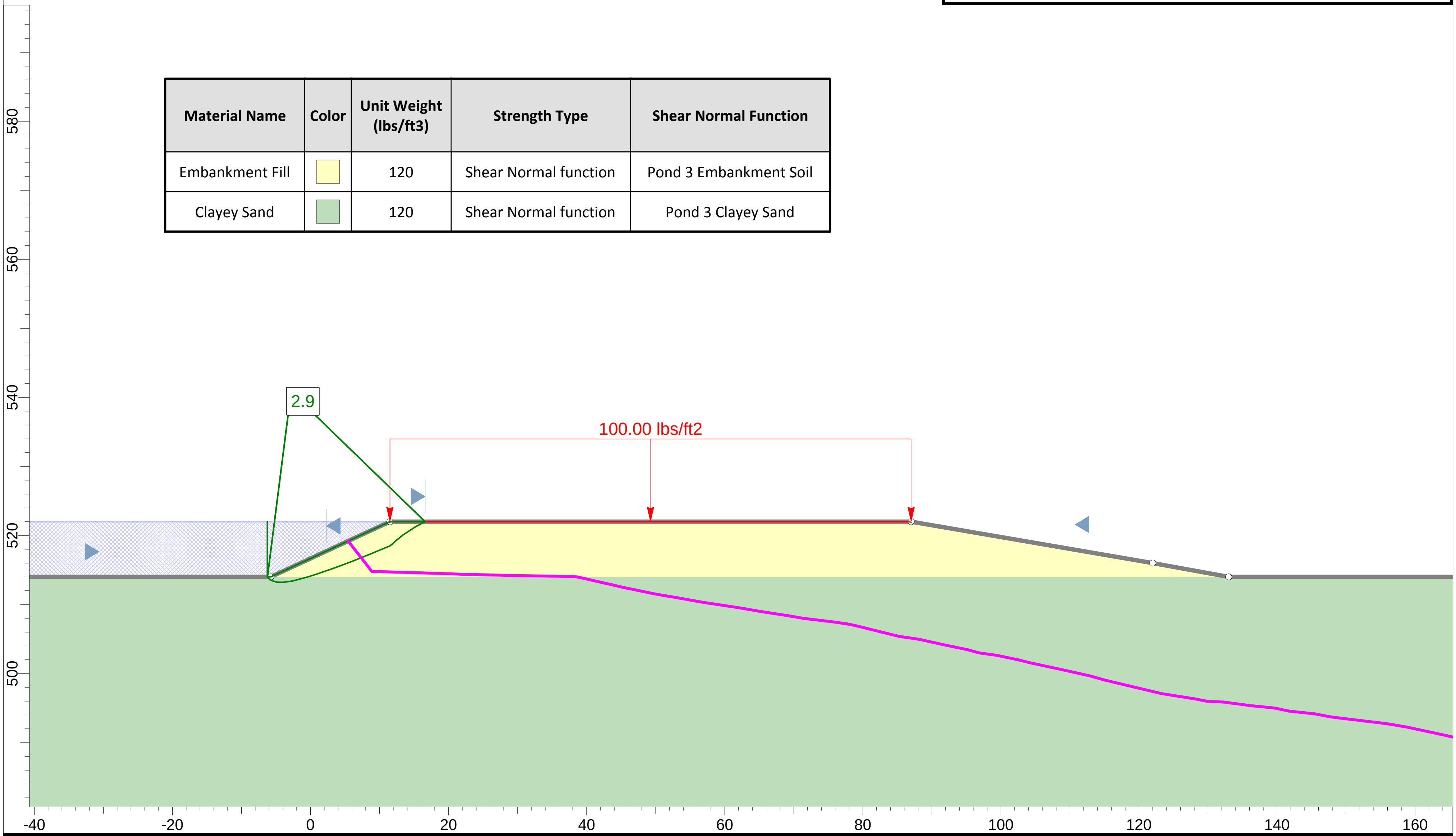
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-16a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



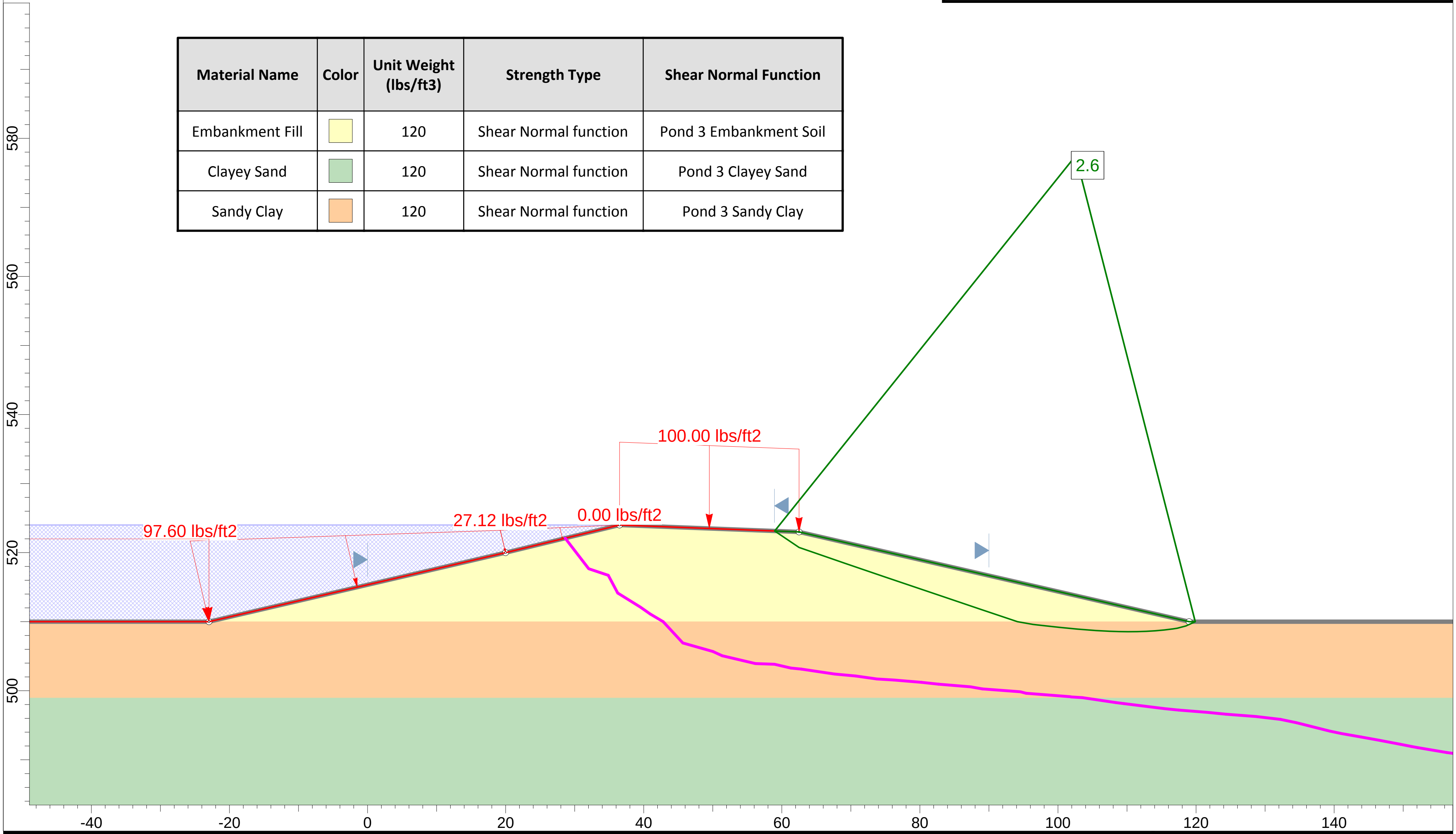
Profile "A" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-16b

RABA KISTNER CONSULTANTS

Global Stability Analysis



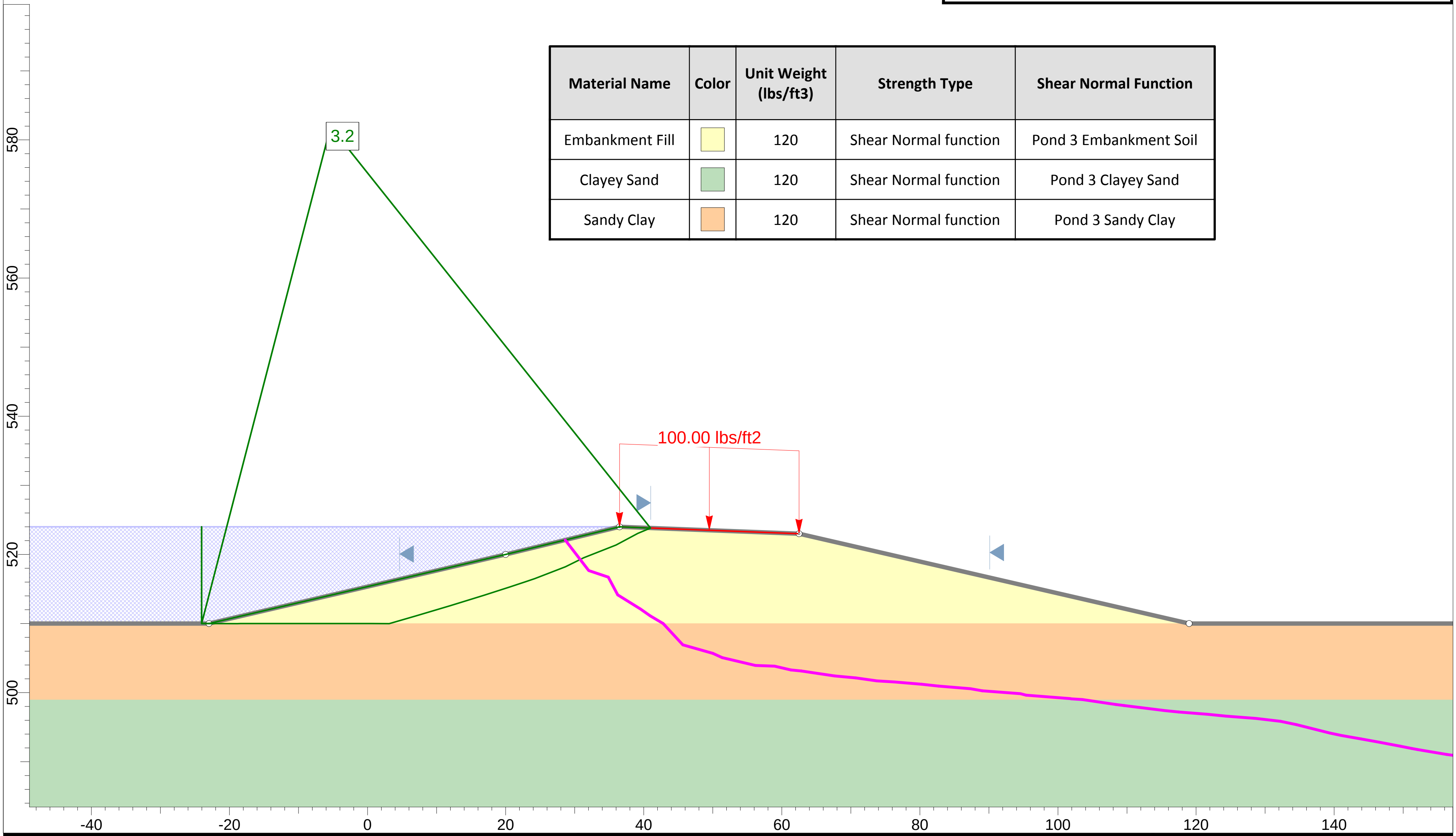
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

Profile "B" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-17a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

Profile "B" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

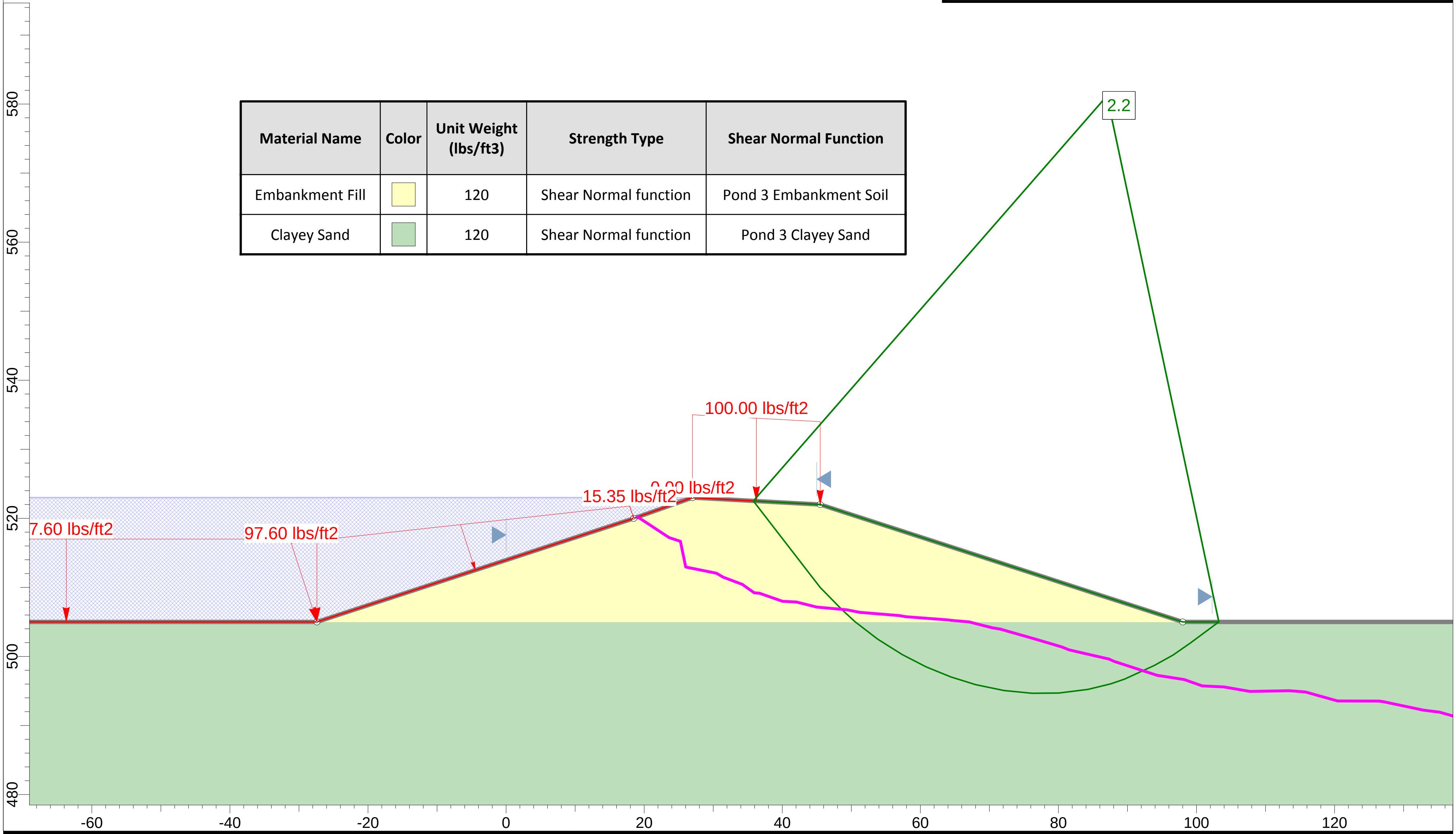
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-17b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



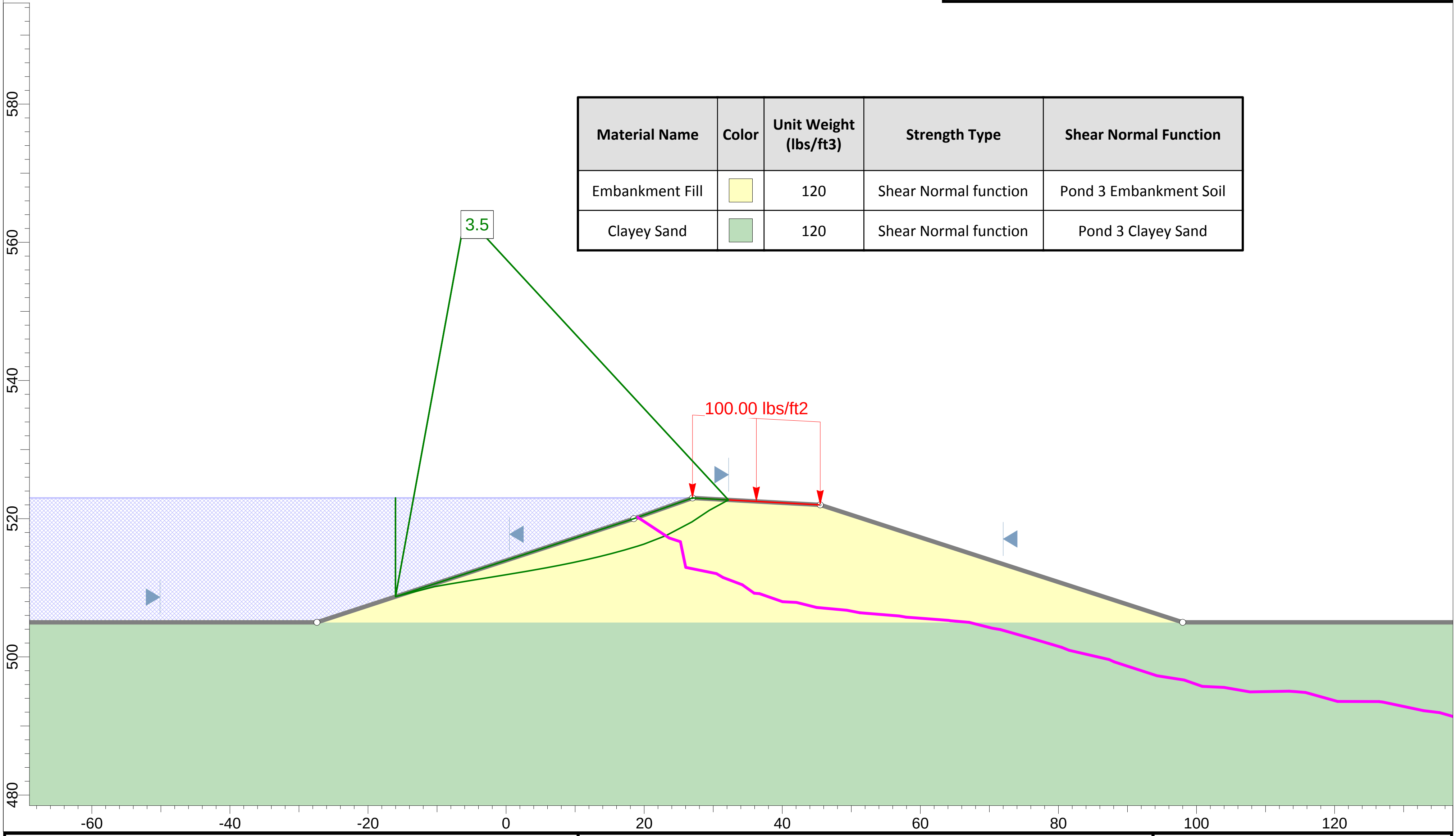
Profile "C" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-18a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand

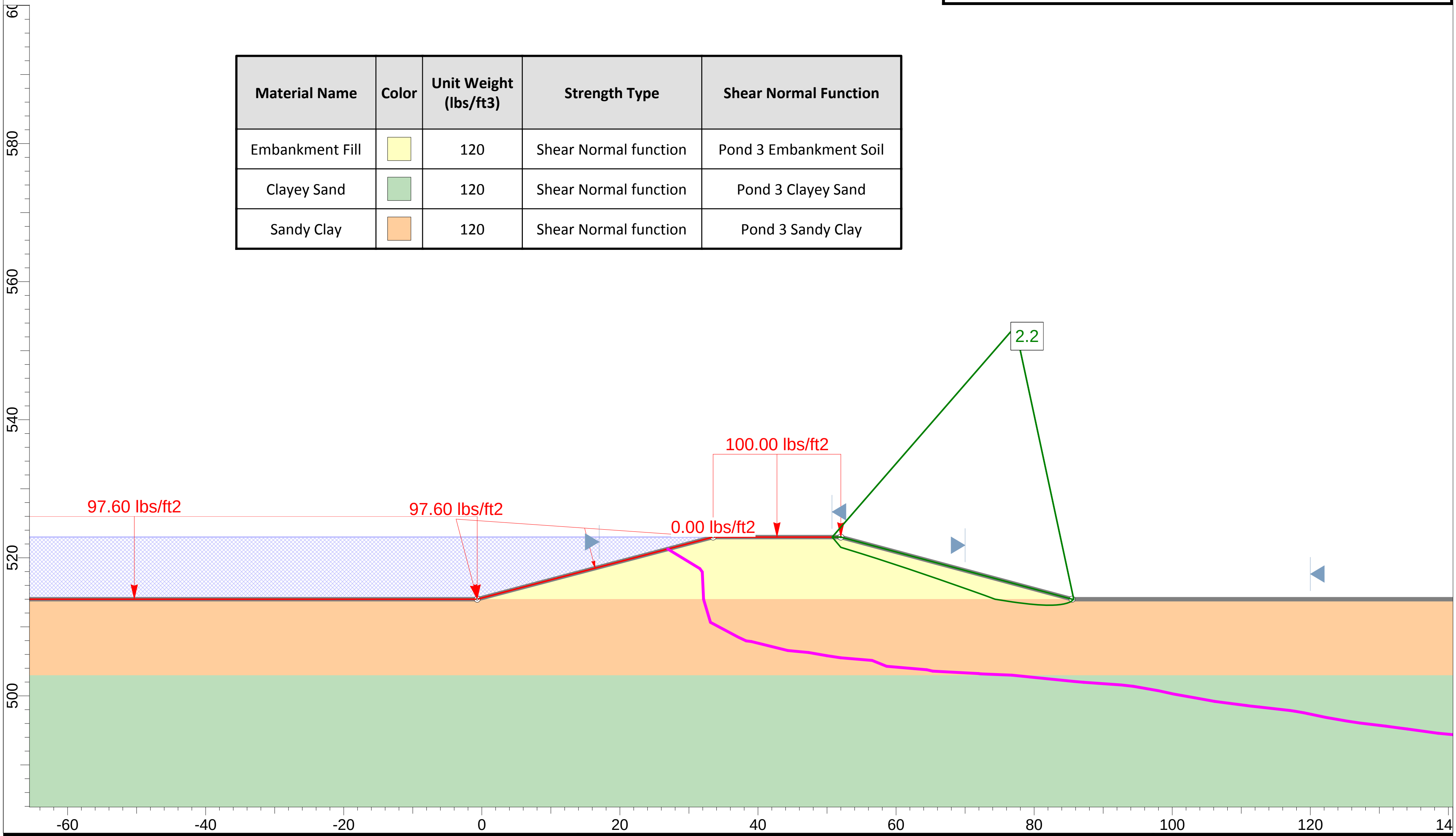


Profile "C" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-18b

Global Stability Analysis



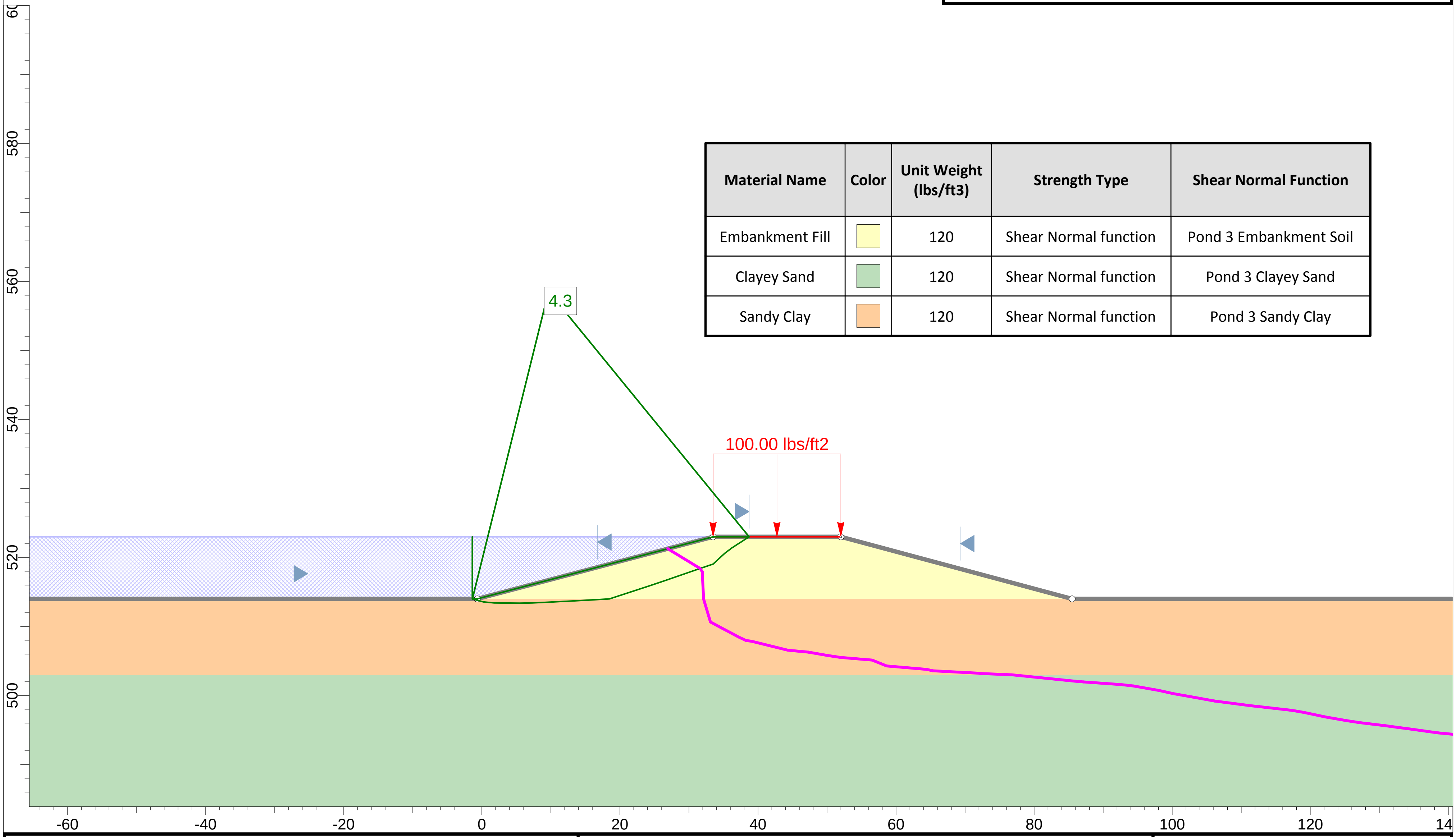
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

Profile "D" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-19a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

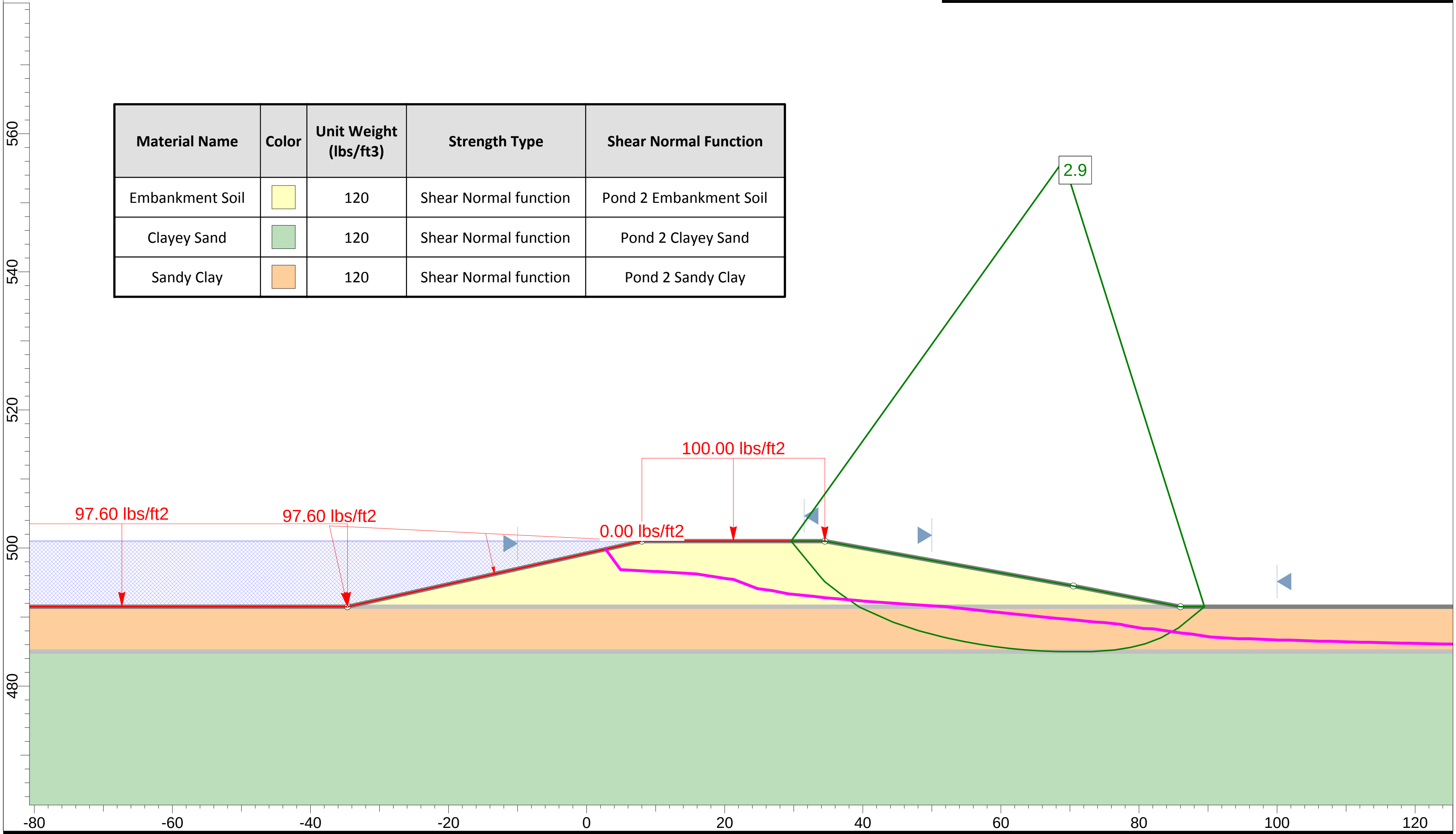
Profile "D" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-19b

RABA KISTNER CONSULTANTS

Global Stability Analysis



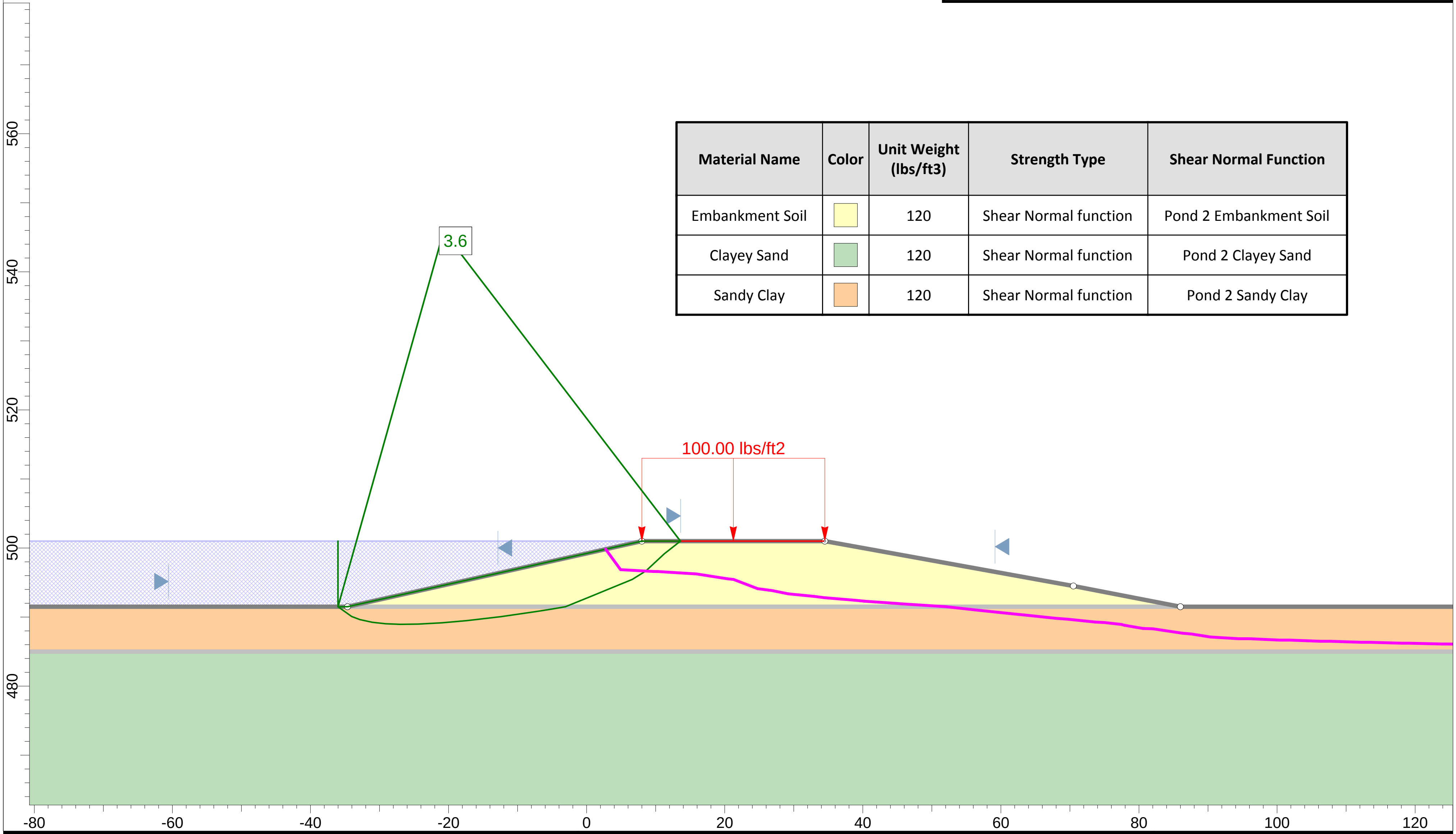
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Soil	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "E" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-20a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Soil	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "E" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

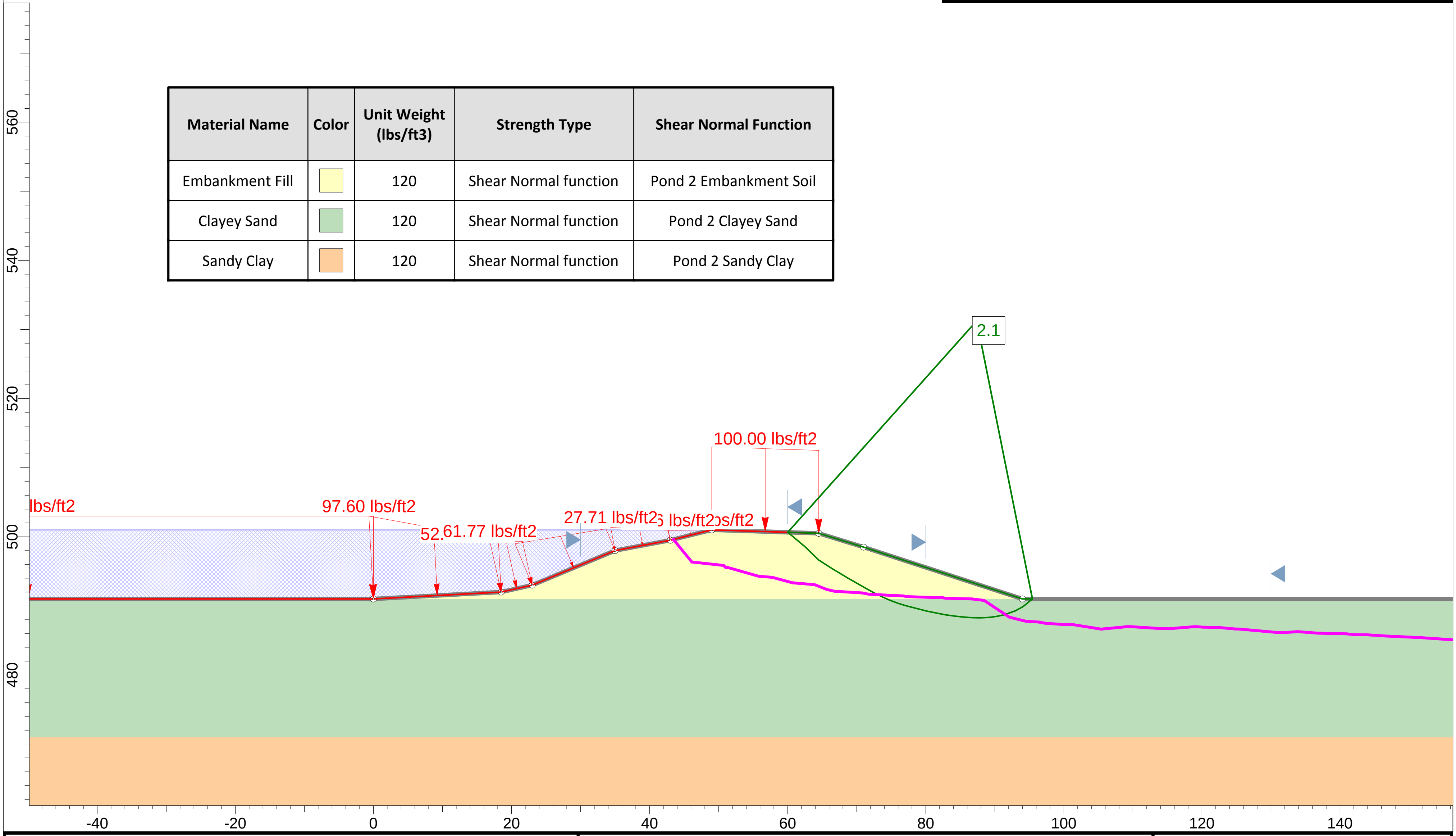
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-20b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay



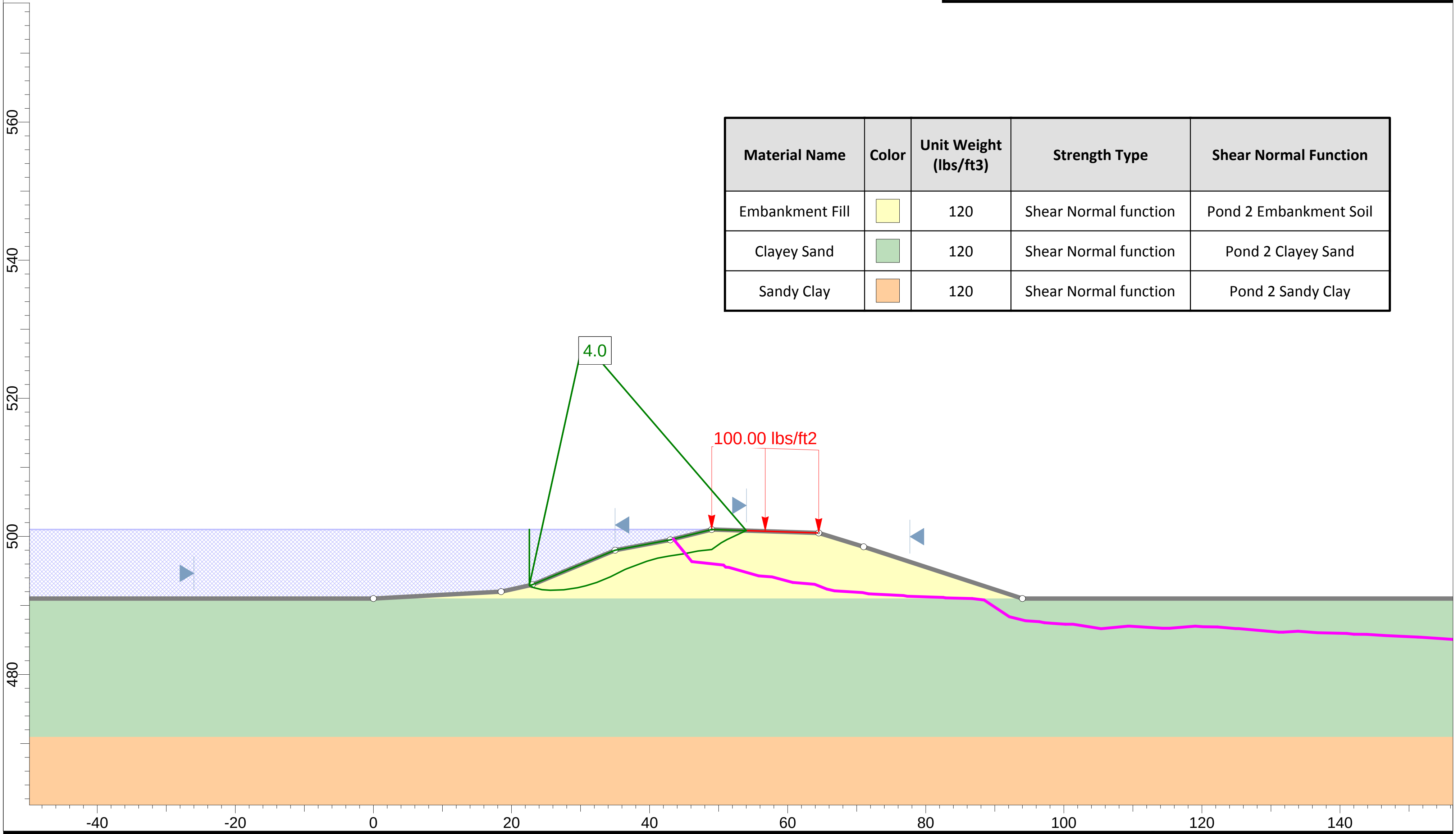
Profile "F" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-21a

RABA KISTNER CONSULTANTS

Global Stability Analysis



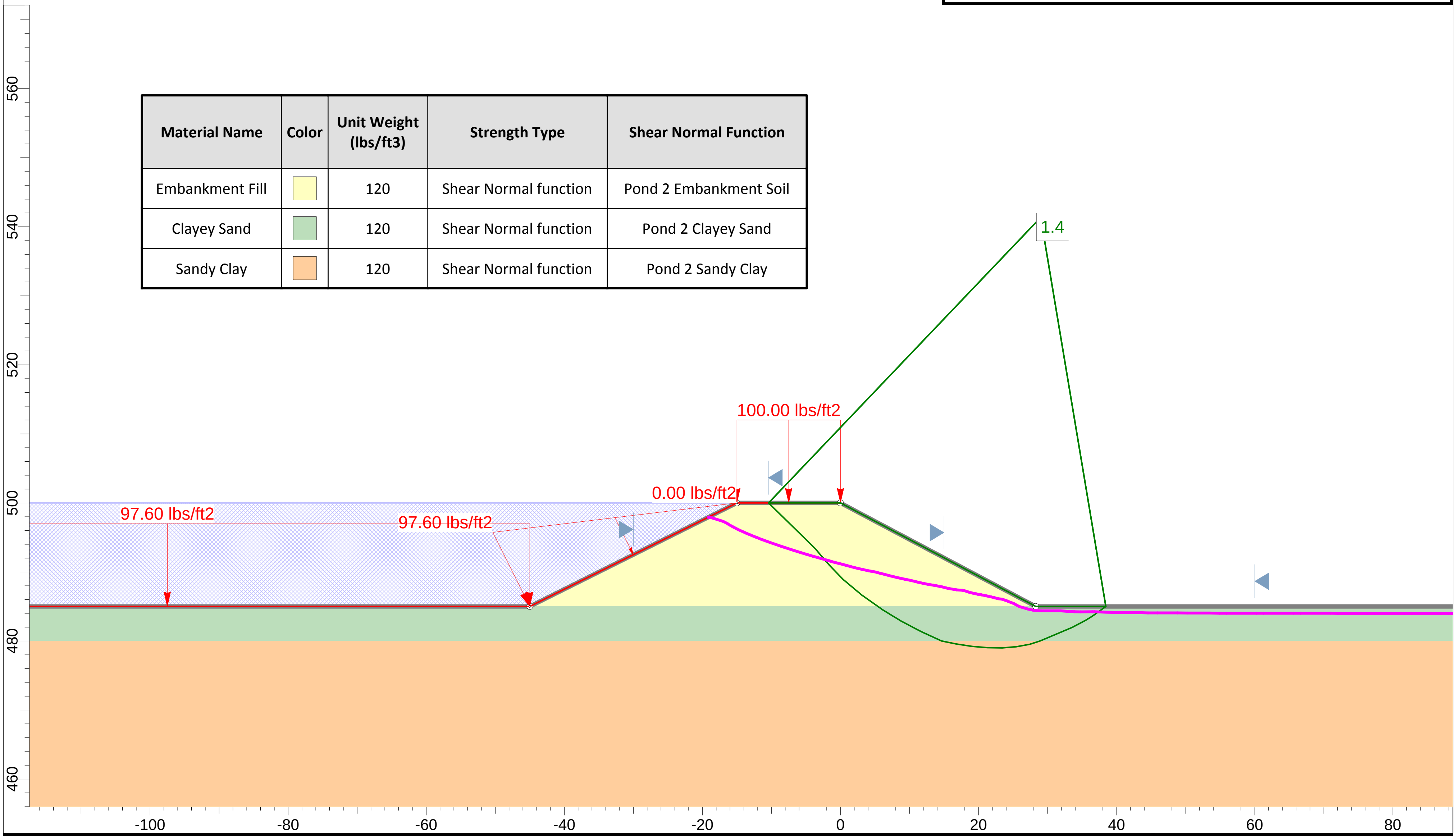
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "F" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-21b

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

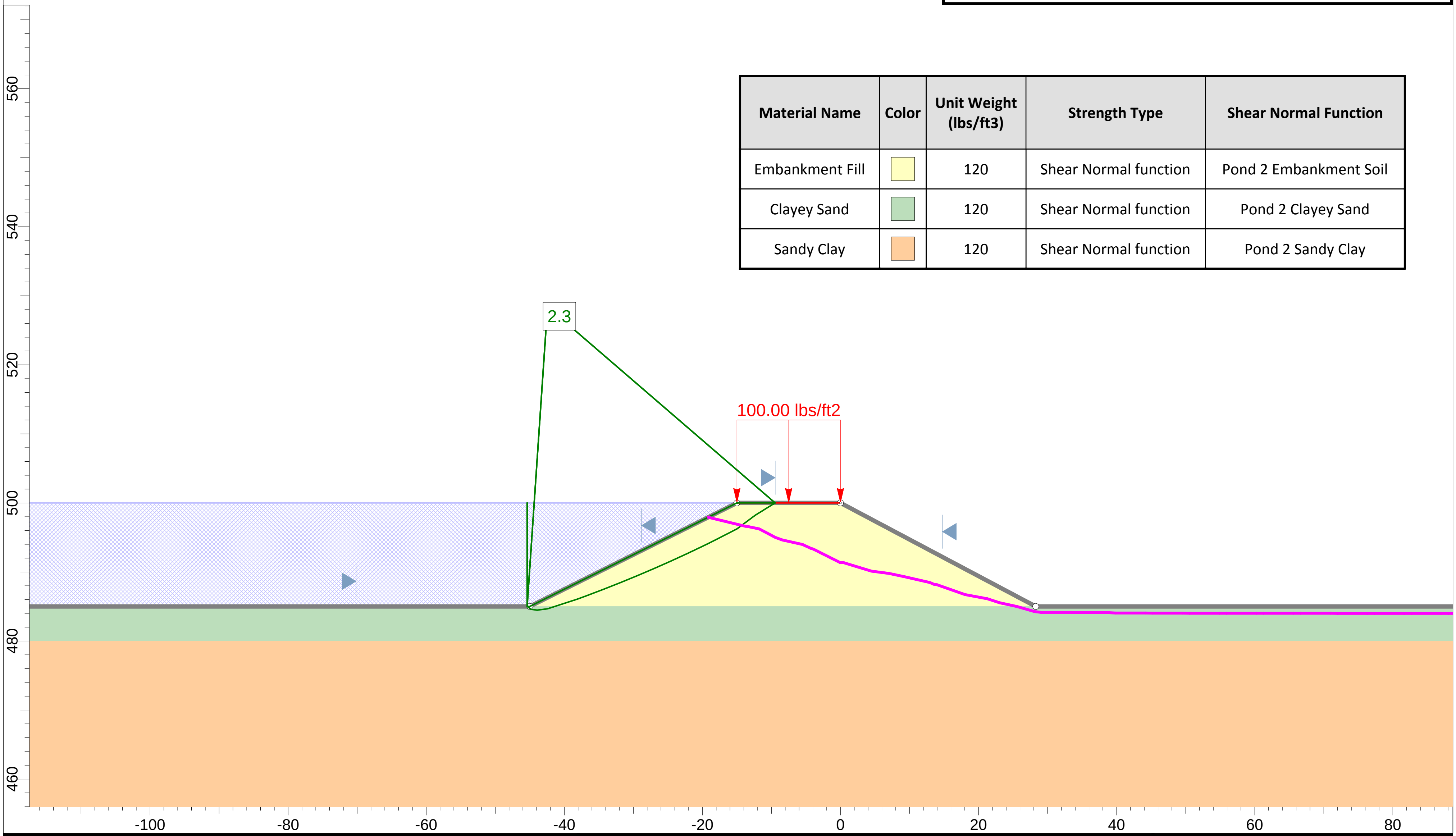
Profile "G" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-22a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay



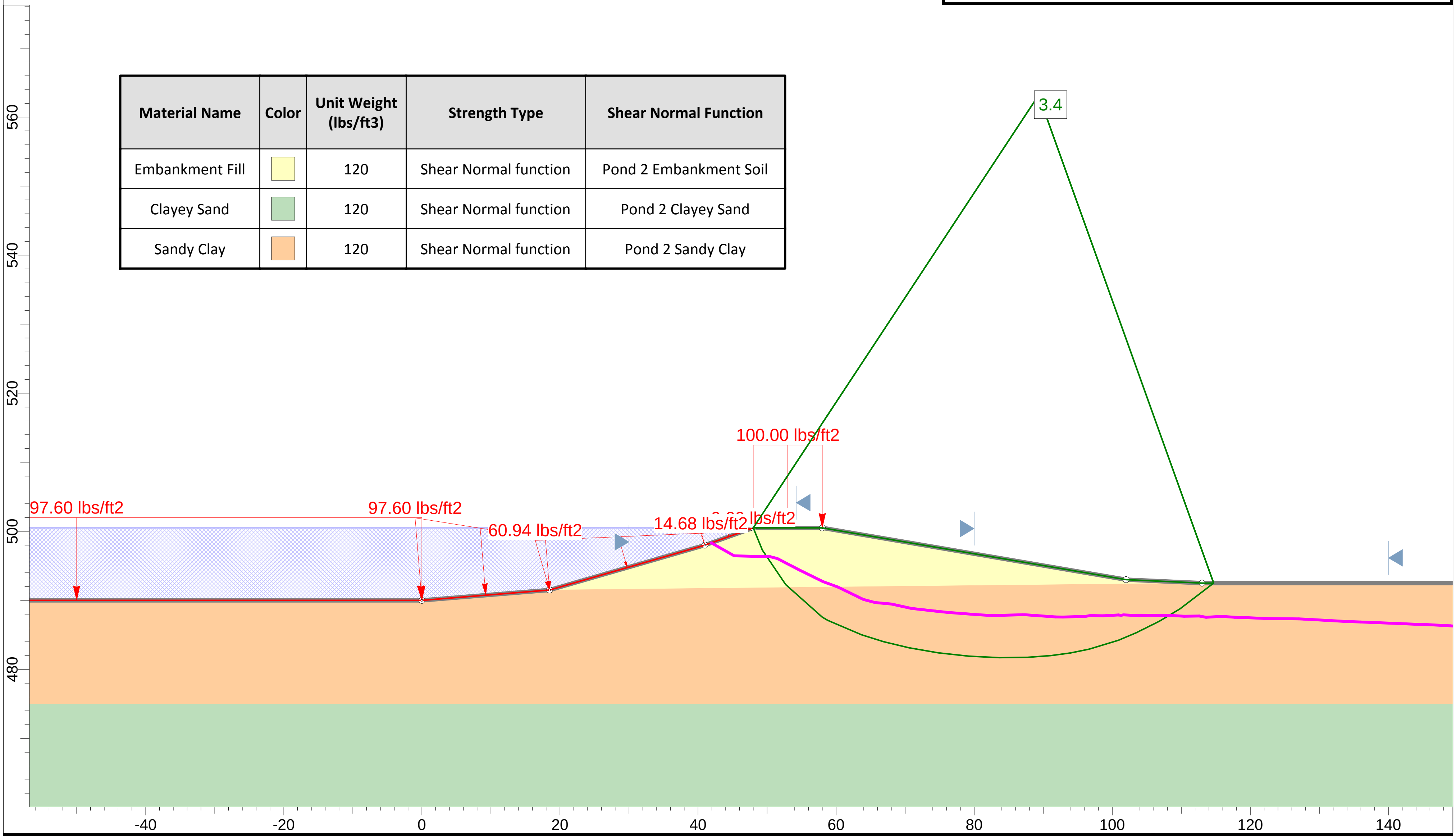
Profile "G" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-22b

RABA KISTNER CONSULTANTS

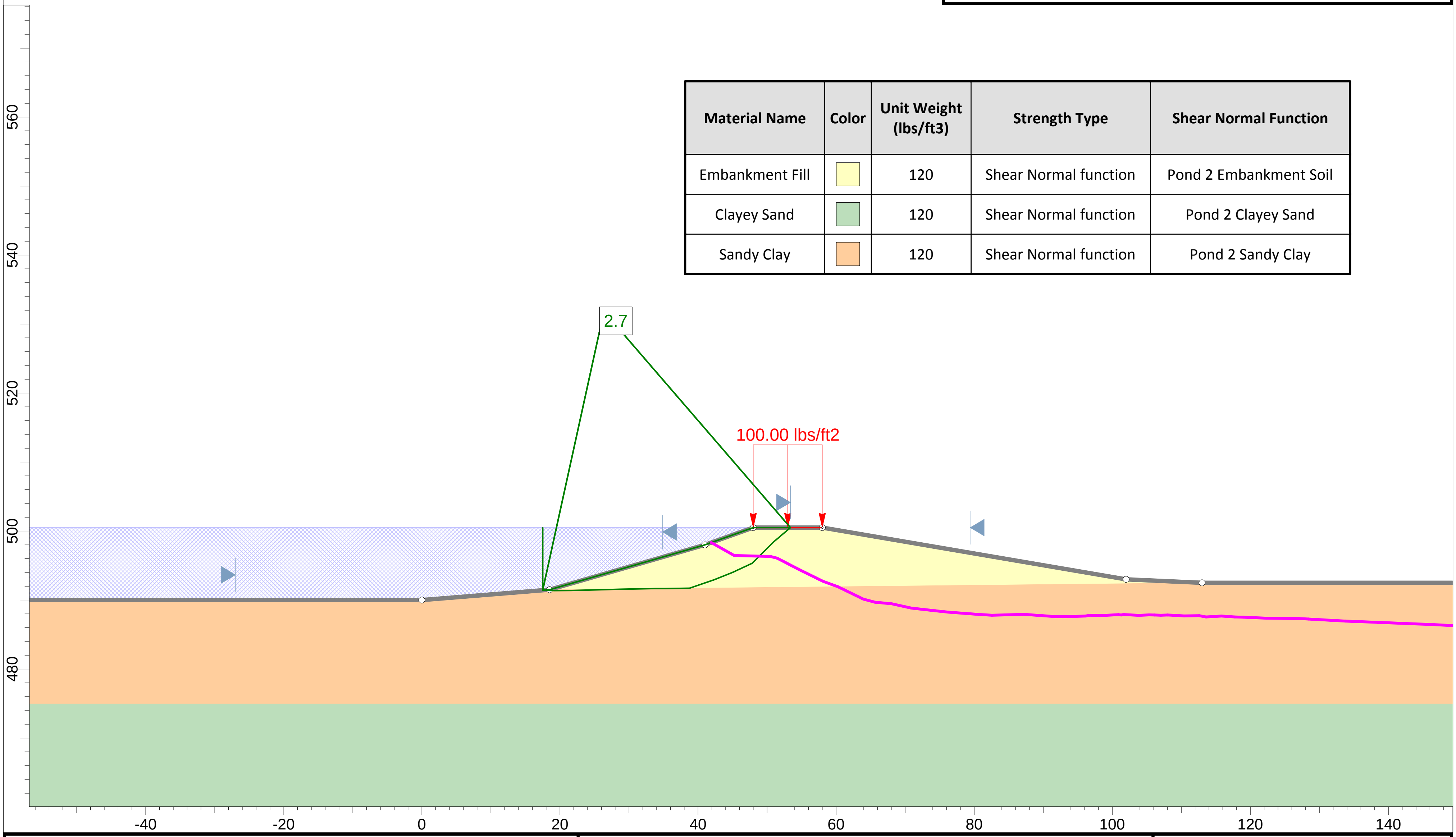
Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "H" - Maximum Pool Ash Pond Berms - Spruce/Deely Generation Units	Raba Kistner Consultants, Inc. ASA12-098-00	Figure C-23a RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

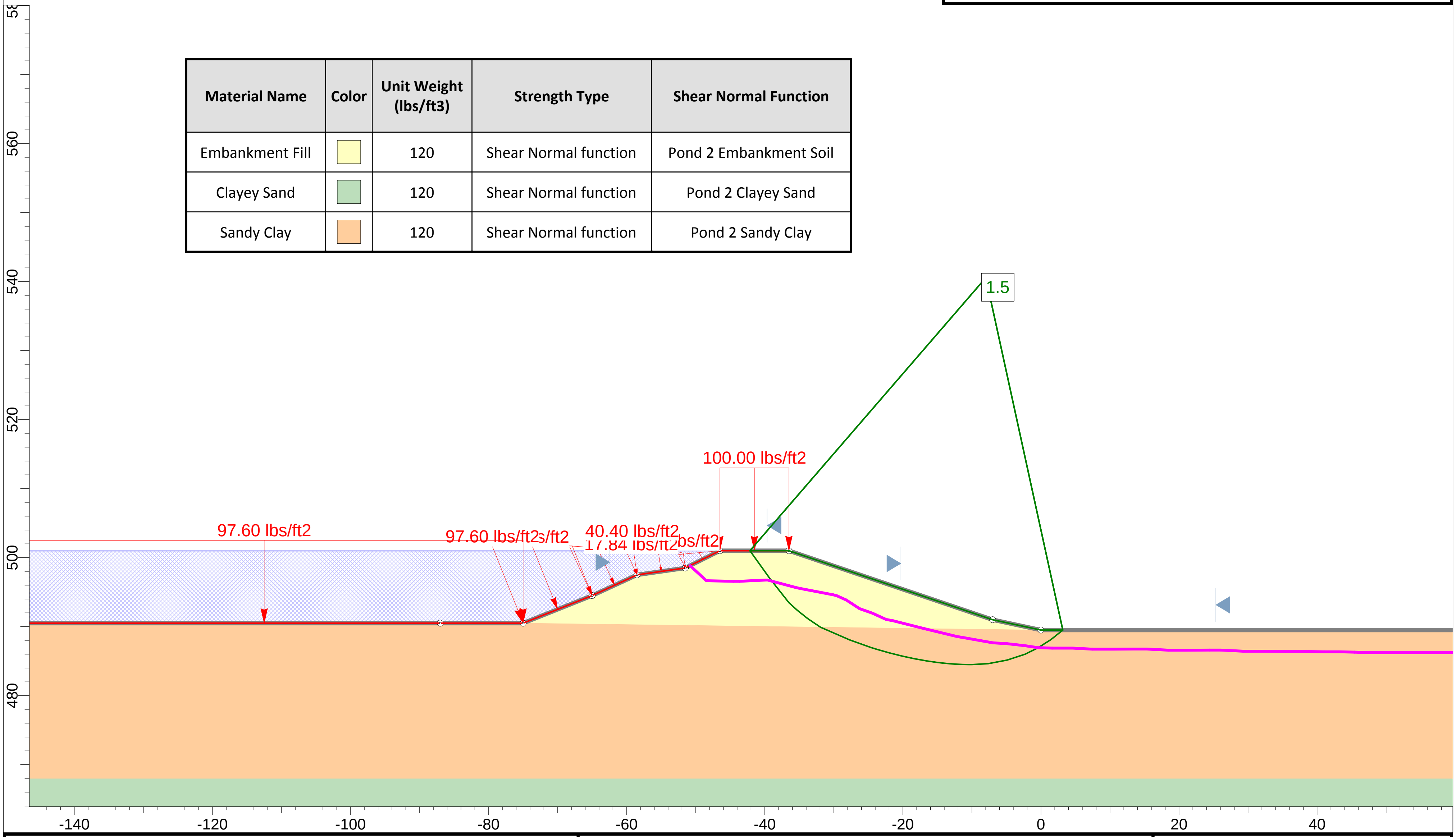
Profile "H" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-23b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

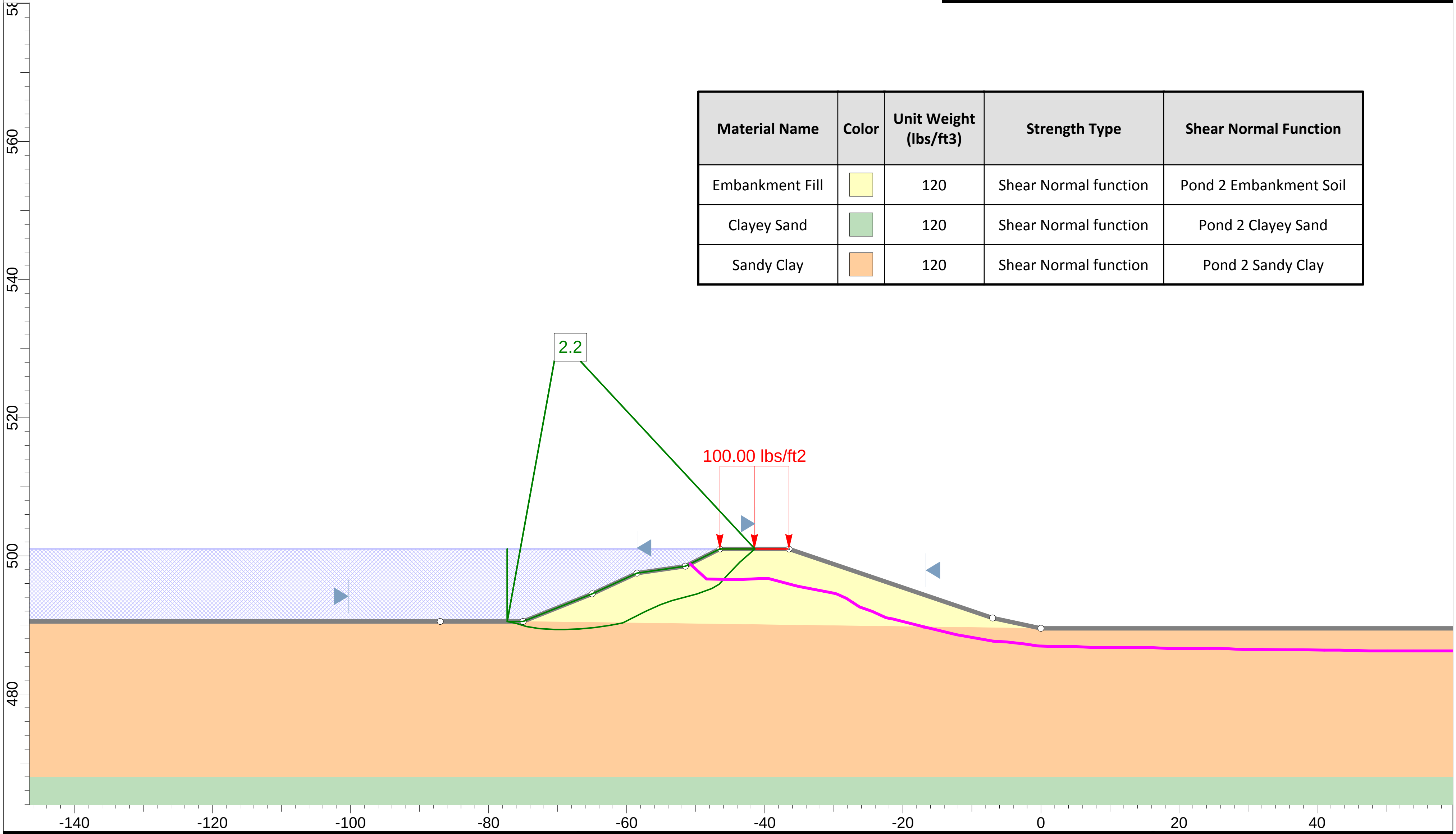


Profile "I" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-24a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "I" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

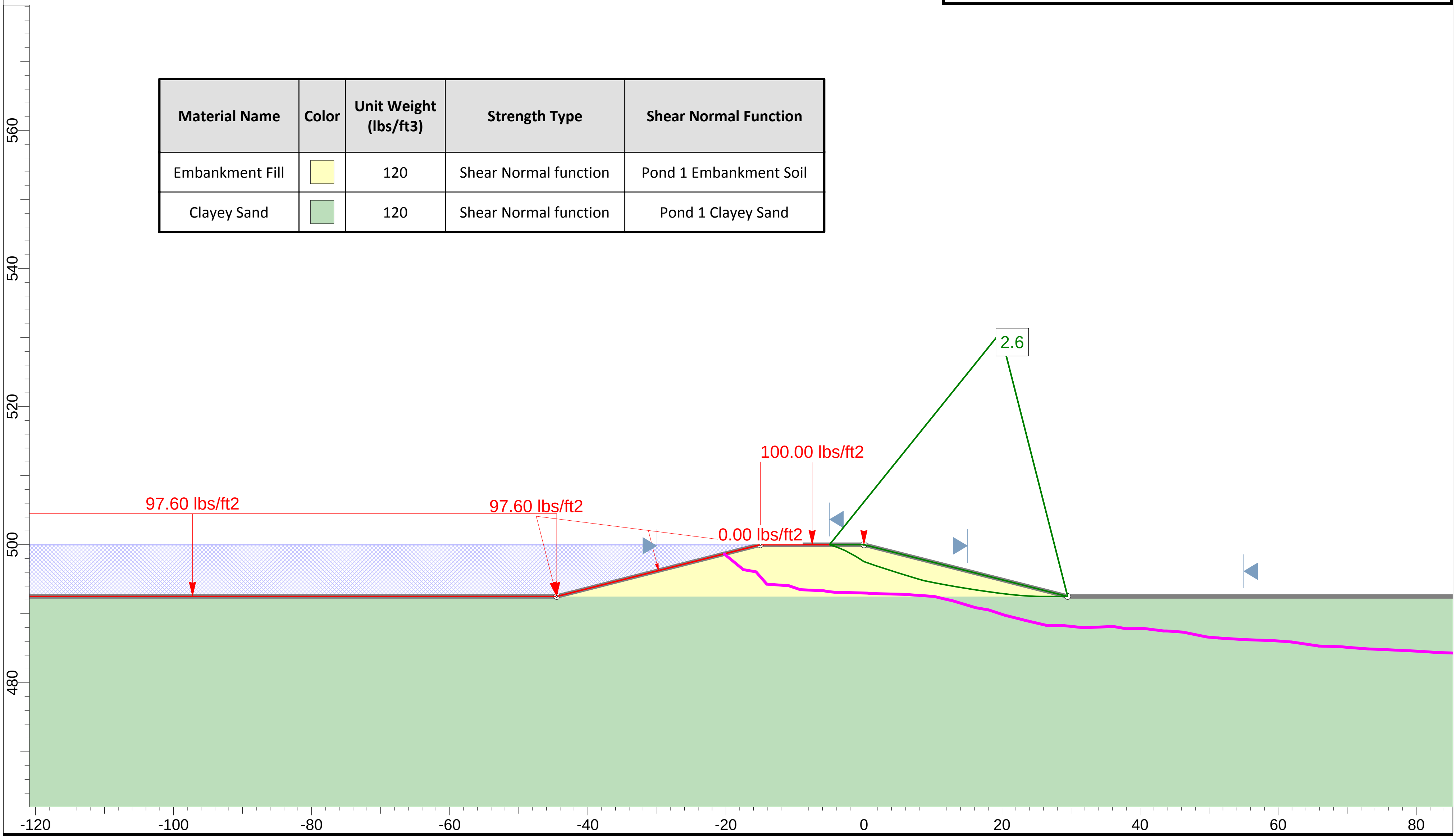
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-24b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand



Profile "J" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

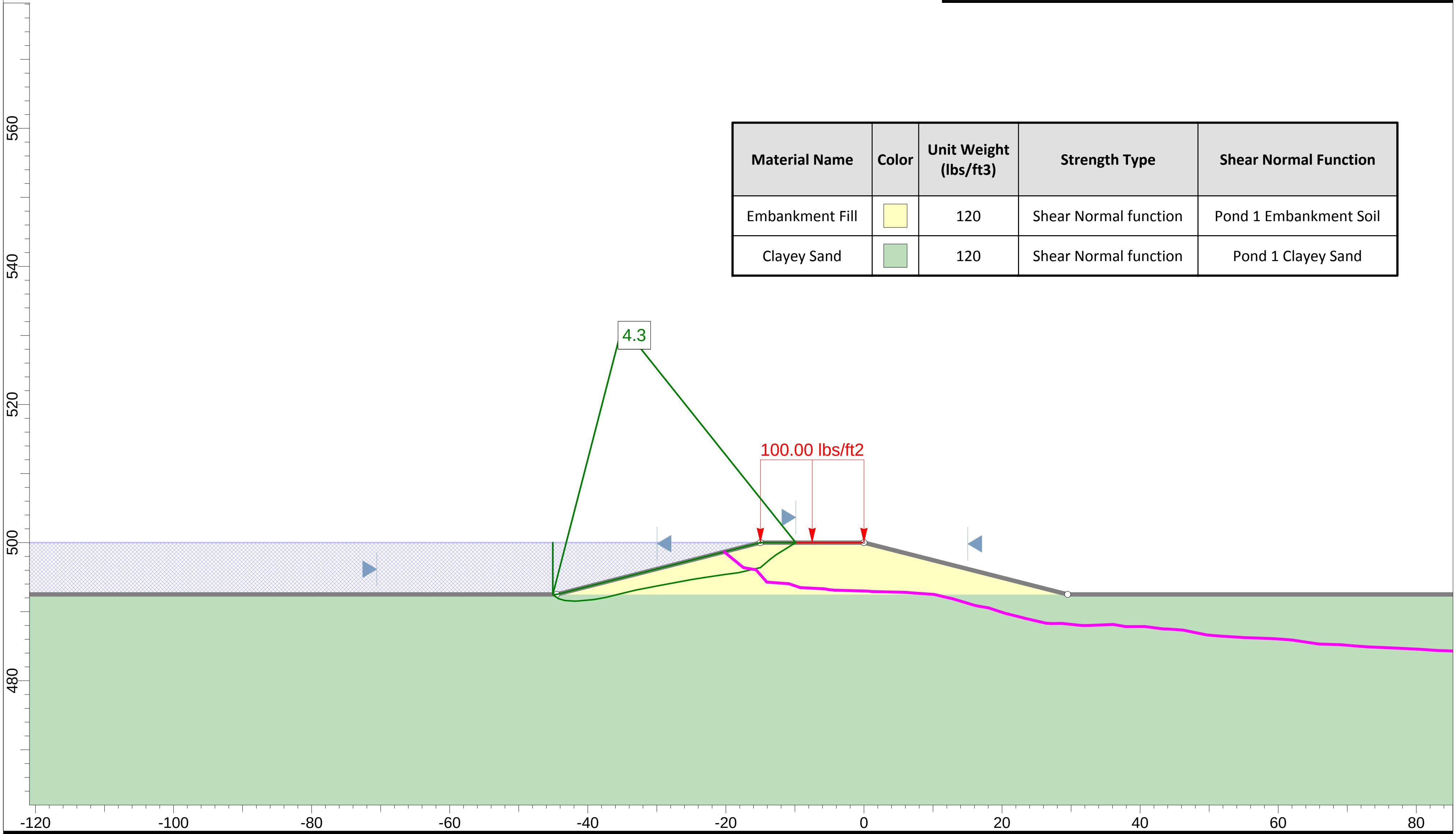
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-25a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand



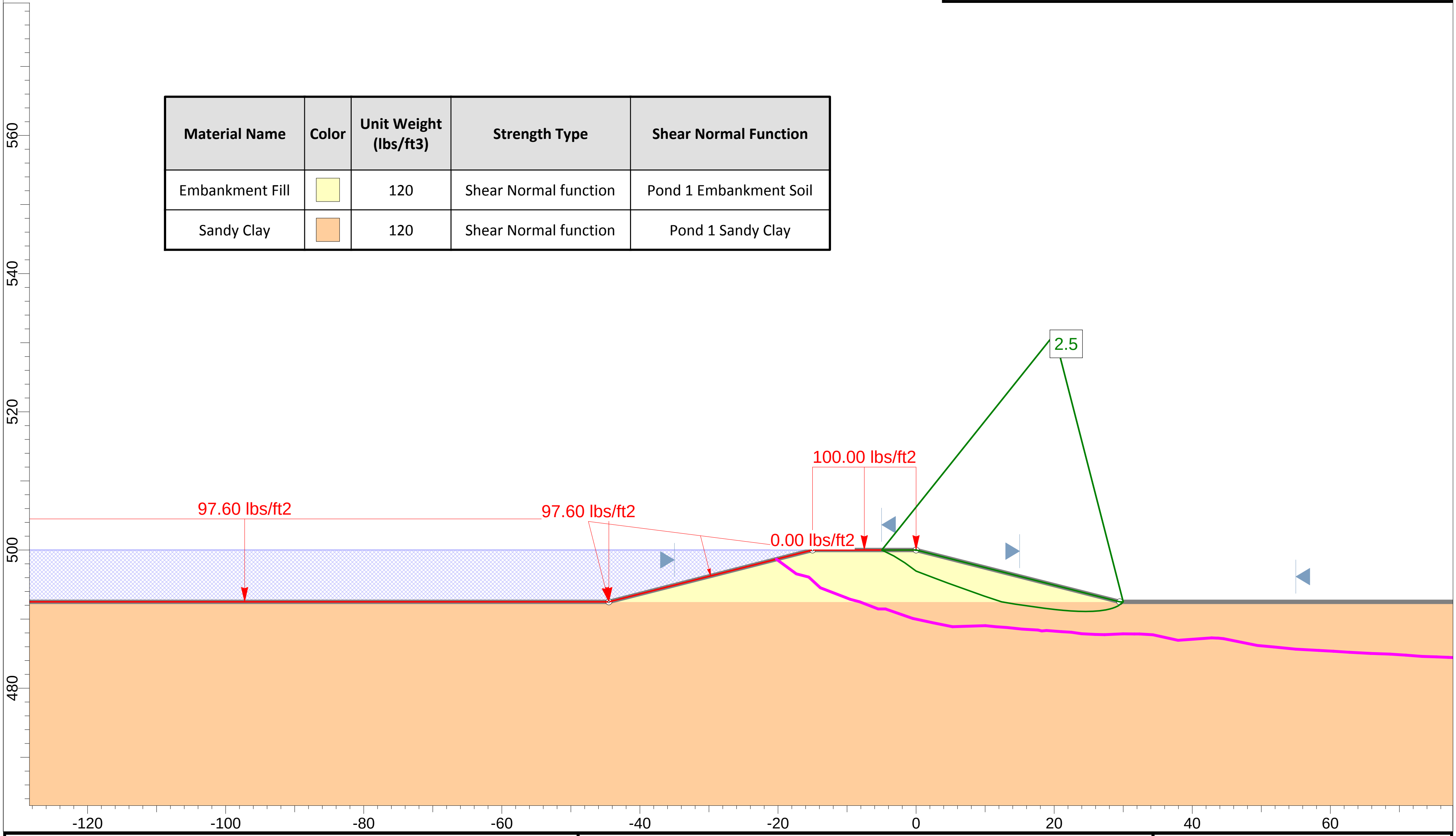
Profile "J" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-25b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay

Profile "K" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

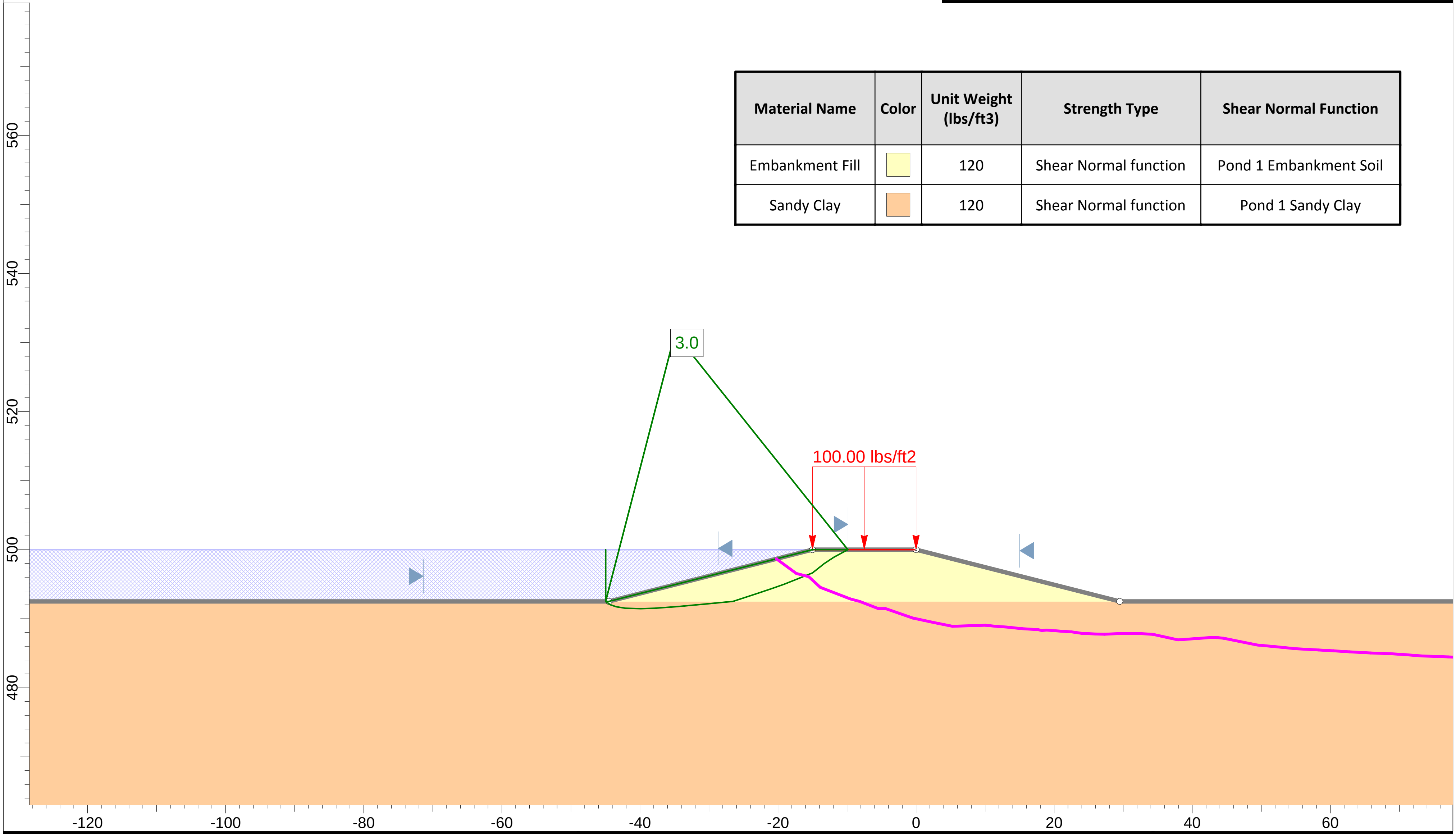
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-26a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



Profile "K" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

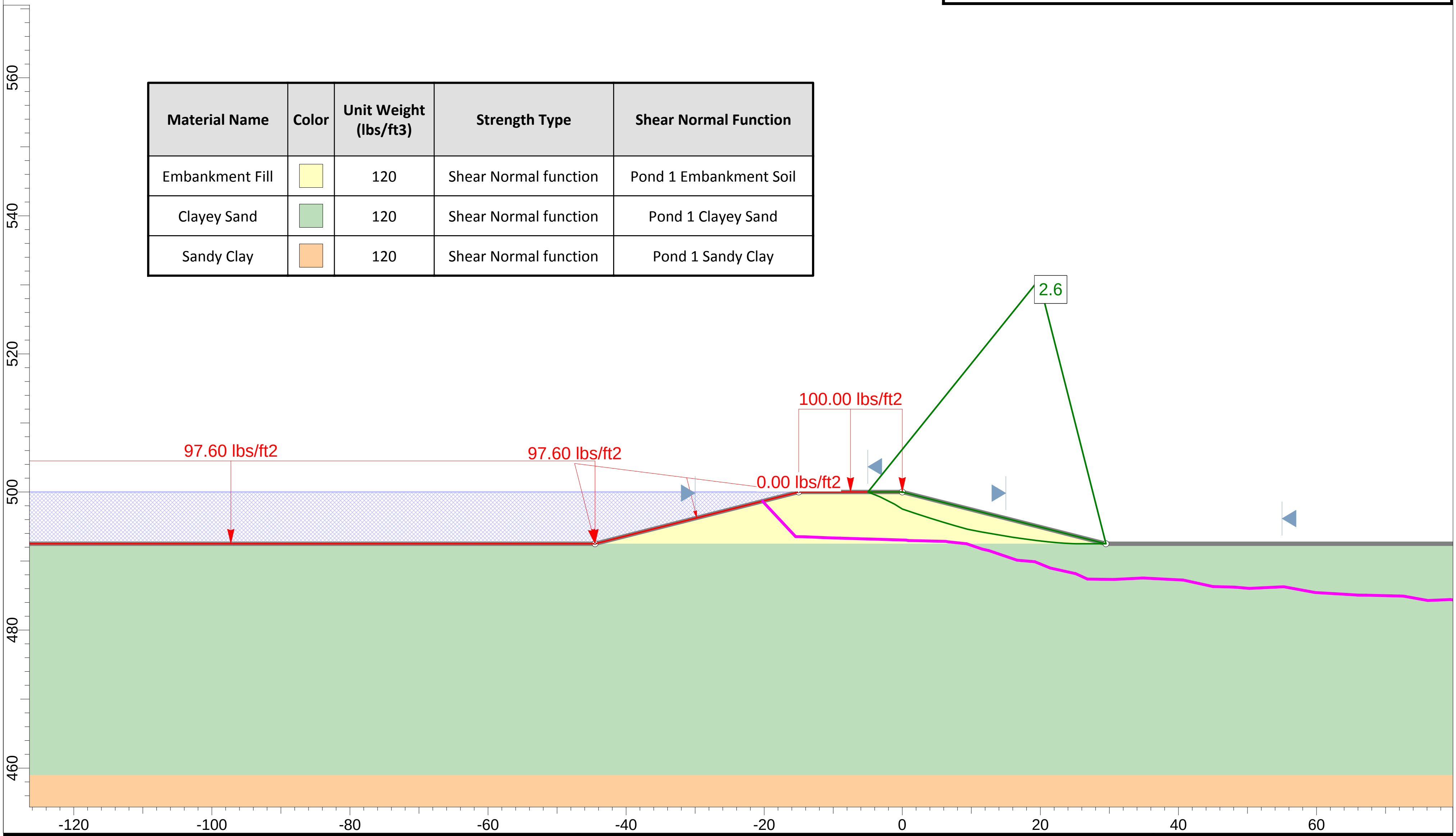
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-26b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



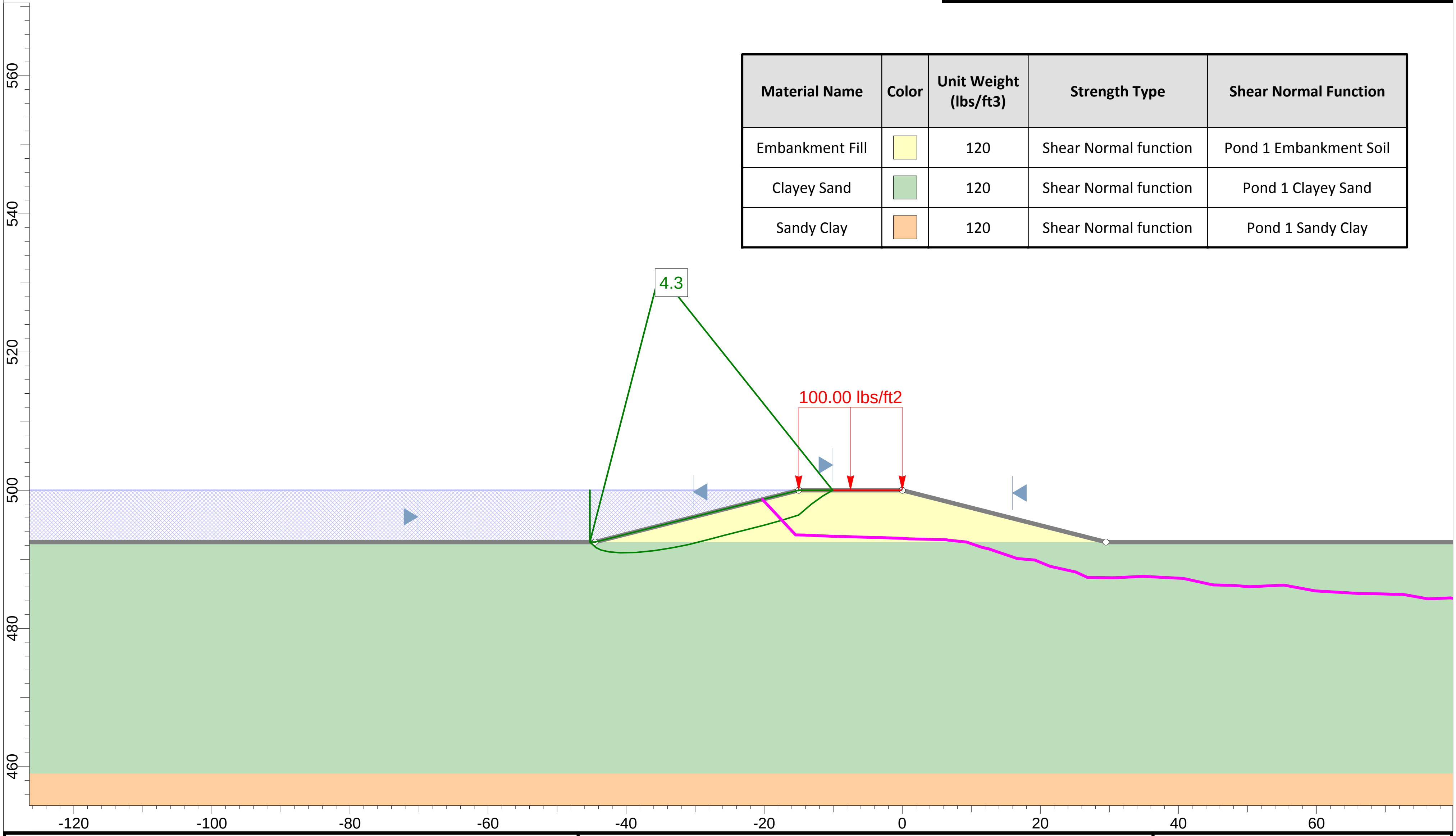
Profile "L" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-27a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



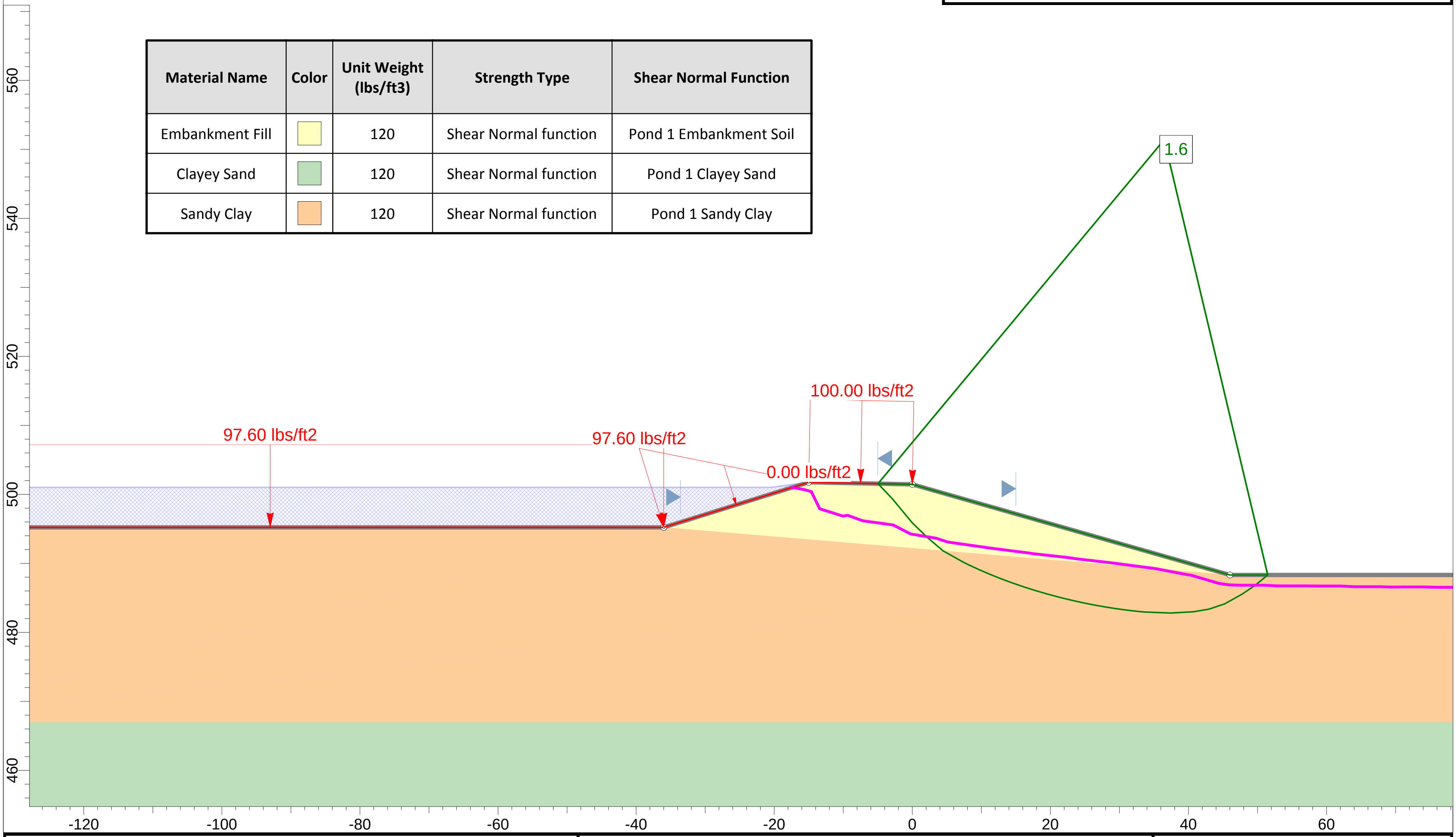
Profile "L" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-27b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay

Profile "M" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

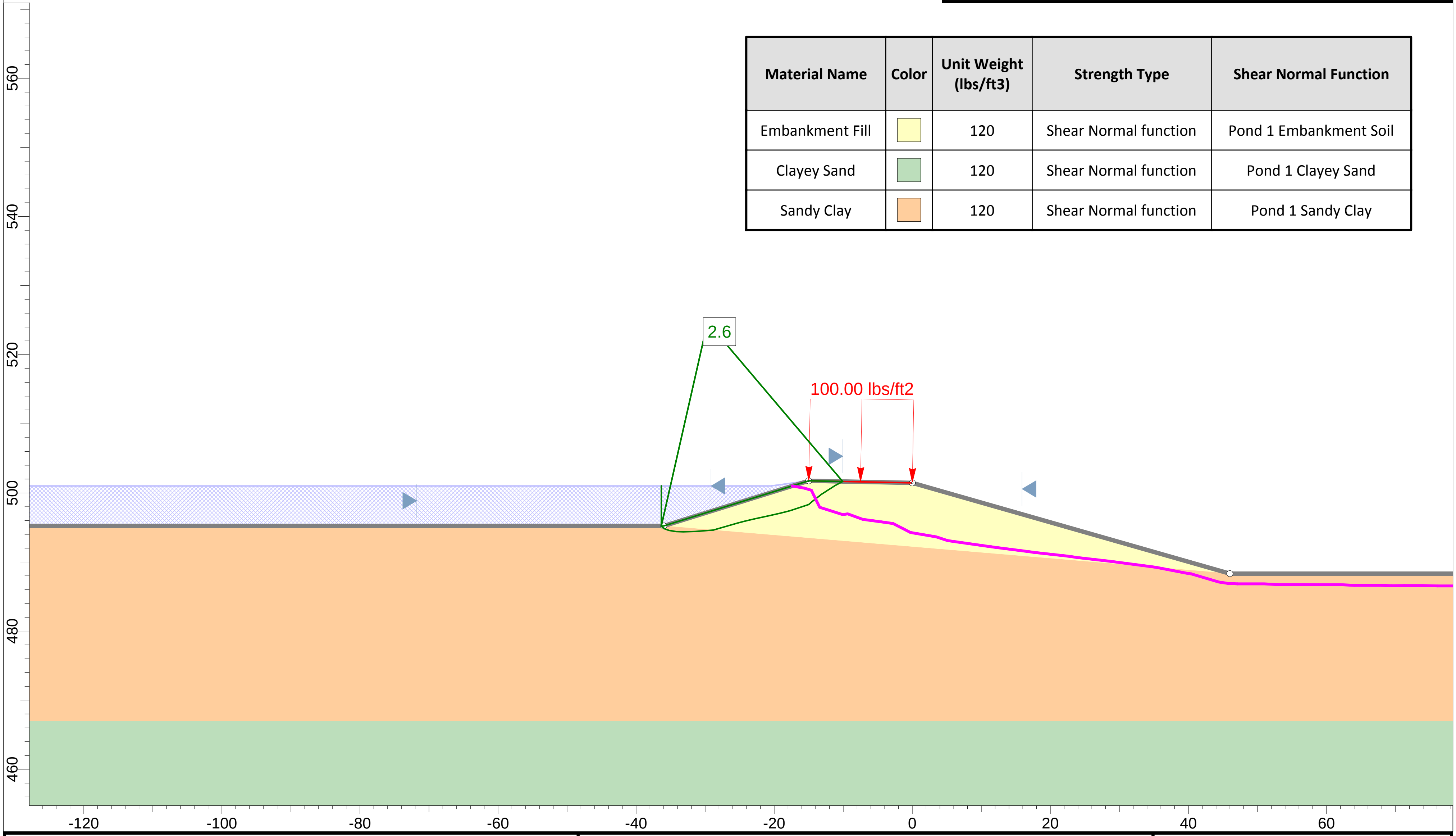
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-28a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



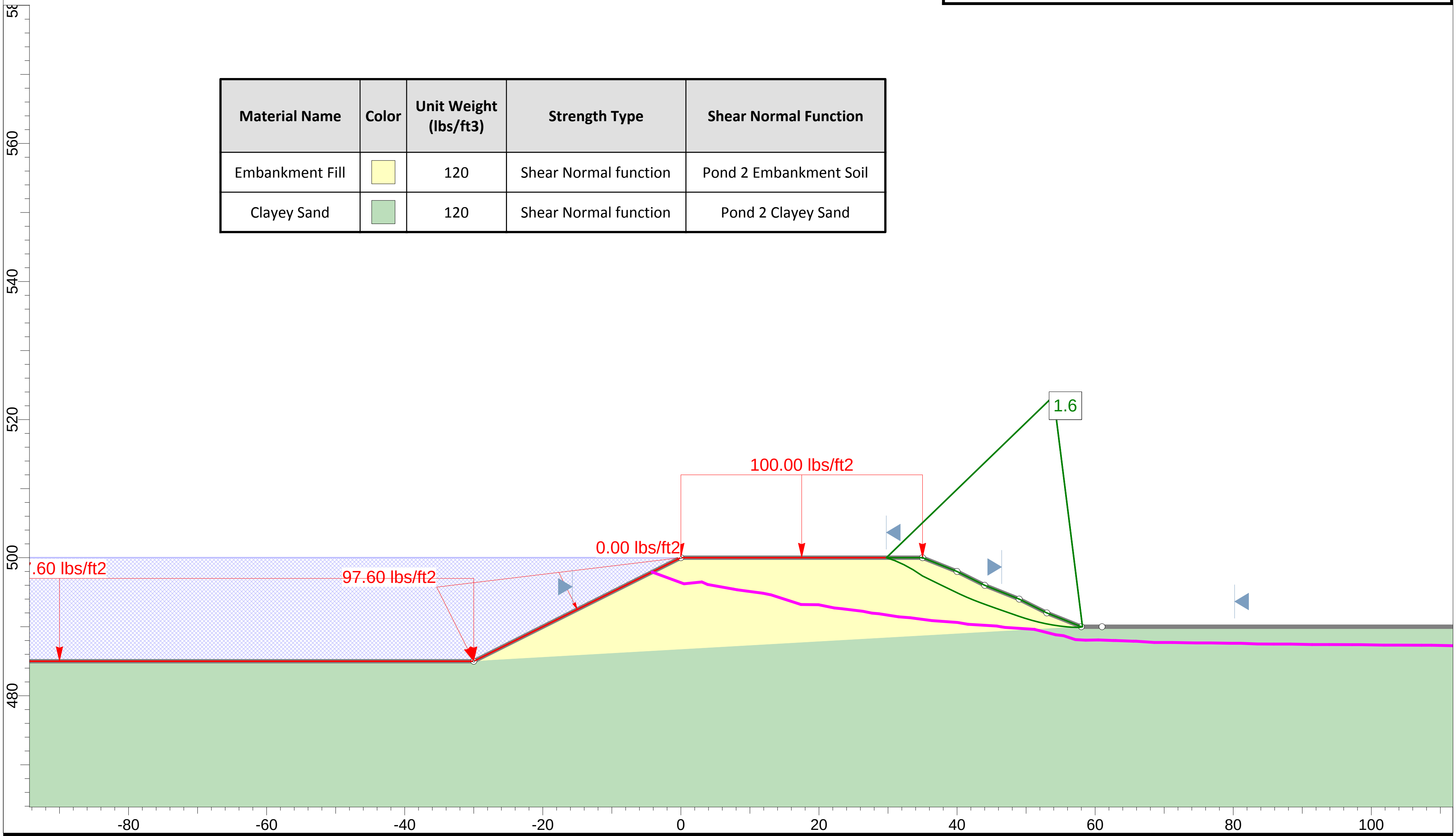
Profile "M" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-28b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand



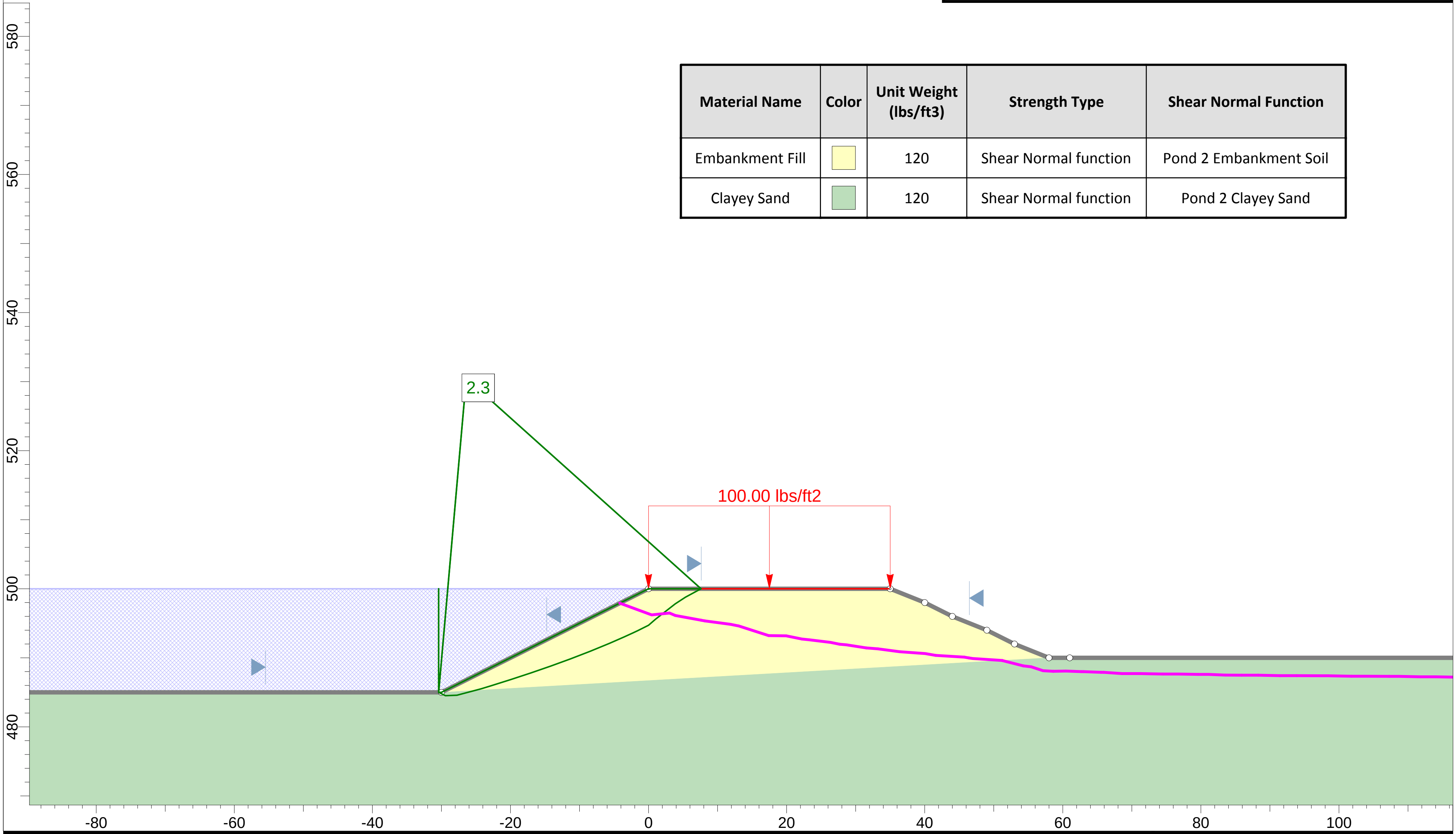
Profile "N" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-29a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand

Profile "N" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-29b

RABA KISTNER CONSULTANTS

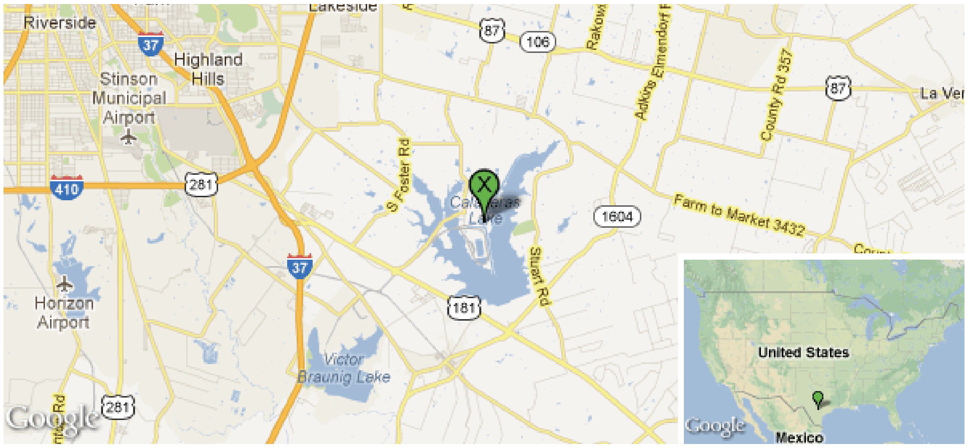
APPENDIX D

SEISMIC ANALYSES

USGS Design Maps Summary Report

User–Specified Input

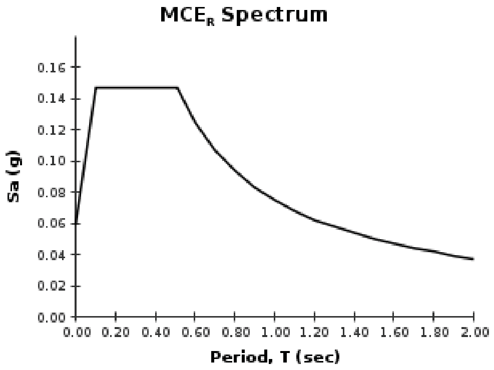
Building Code Reference Document	2009 NEHRP Recommended Seismic Provisions (which makes use of 2008 USGS hazard data)
Site Coordinates	29.30821°N, 98.3168°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

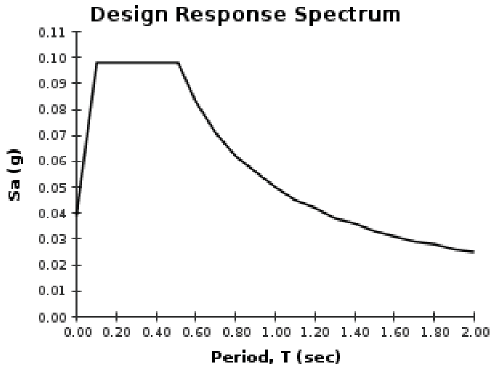


USGS–Provided Output

S_S =	0.092 g	S_{MS} =	0.147 g	S_{DS} =	0.098 g
S_1 =	0.031 g	S_{M1} =	0.075 g	S_{D1} =	0.050 g

For information on how the S_S and S_1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please view the detailed report.



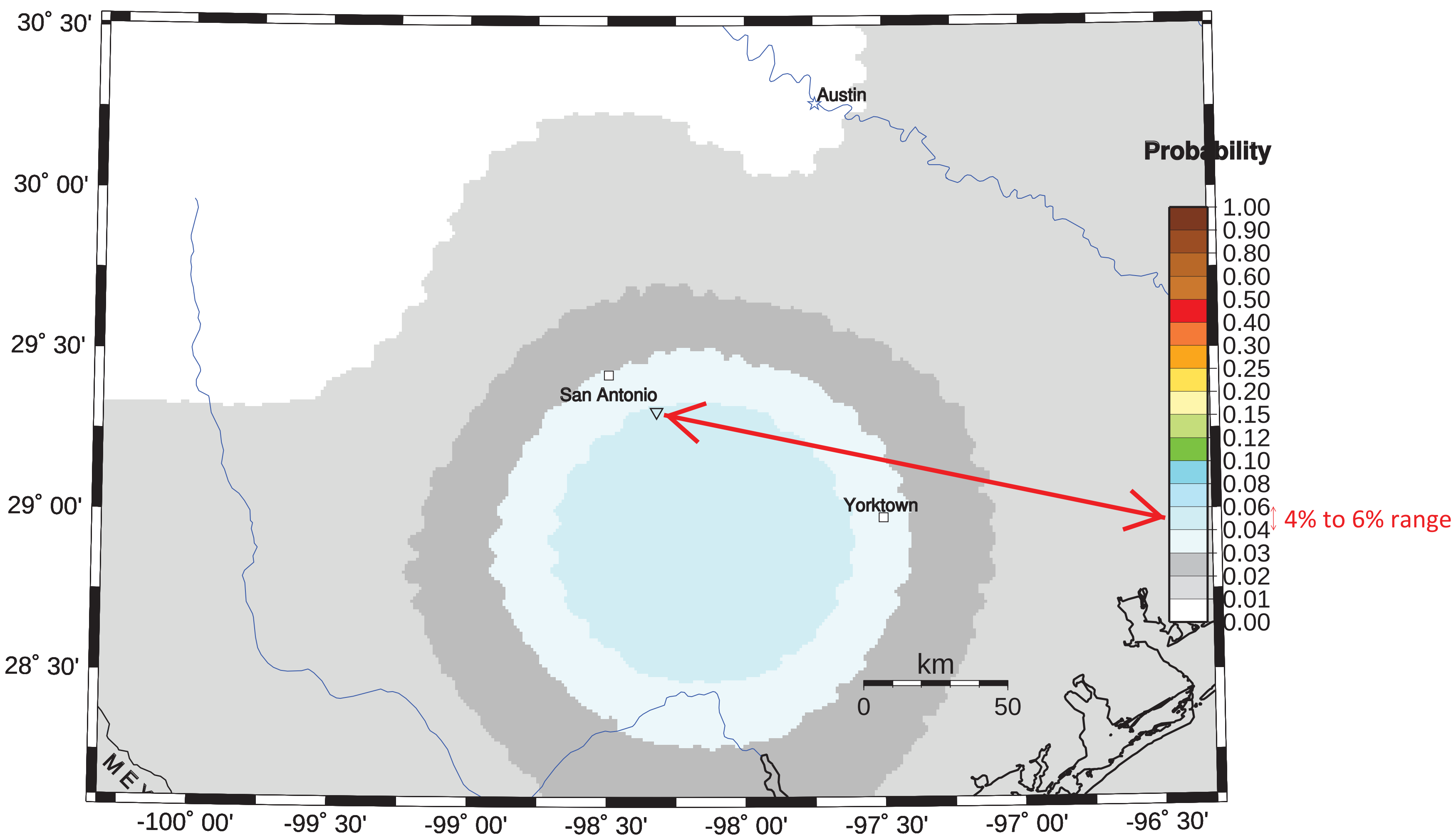


For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

Probability of earthquake with M > 5.0 within 250 years & 50 km

U.S. Geological Survey 2009 PSHA Model

Site: -98.32 d E 29.31



GMT 2012 Nov 19 15:18:38 **Earthquake probabilities from USGS OFR 08-1128 PSHA. 50 km maximum horizontal distance. Site of interest: triangle. Epicenters mb>5 black circles; rivers blue.**

ASA12-098-00
Figure D-2

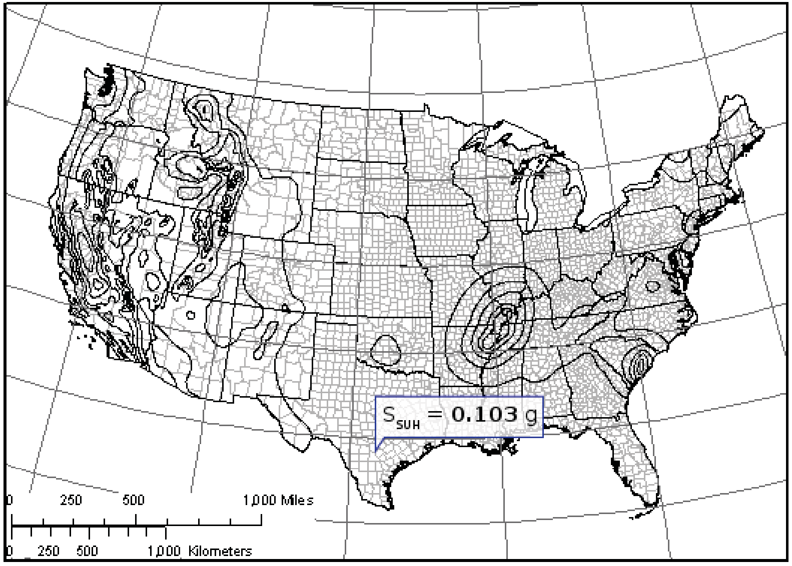
Design Maps Detailed Report

2009 NEHRP Recommended Seismic Provisions (29.30821°N, 98.3168°W)

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 2009 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



S_{SUH} = 0.103 g

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

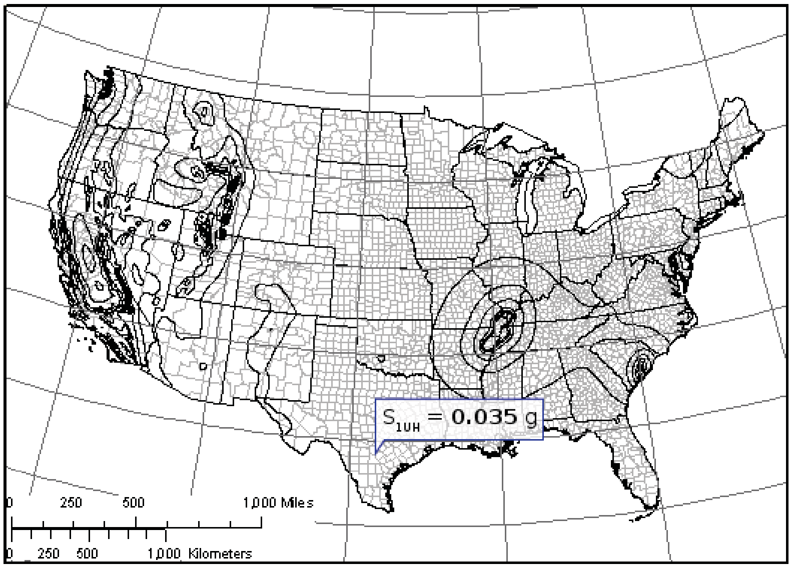

S_{1UH} = 0.035 g
0 250 500 1,000 Miles
0 250 500 1,000 Kilometers

Figure 22–3: Risk Coefficient at 0.2-Second Spectral Response Period

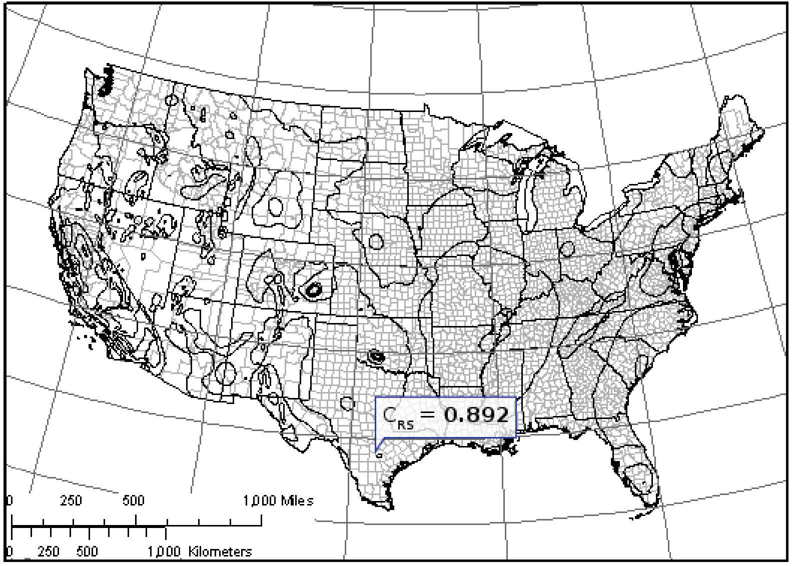


Figure 22–4: Risk Coefficient at 1.0-Second Spectral Response Period

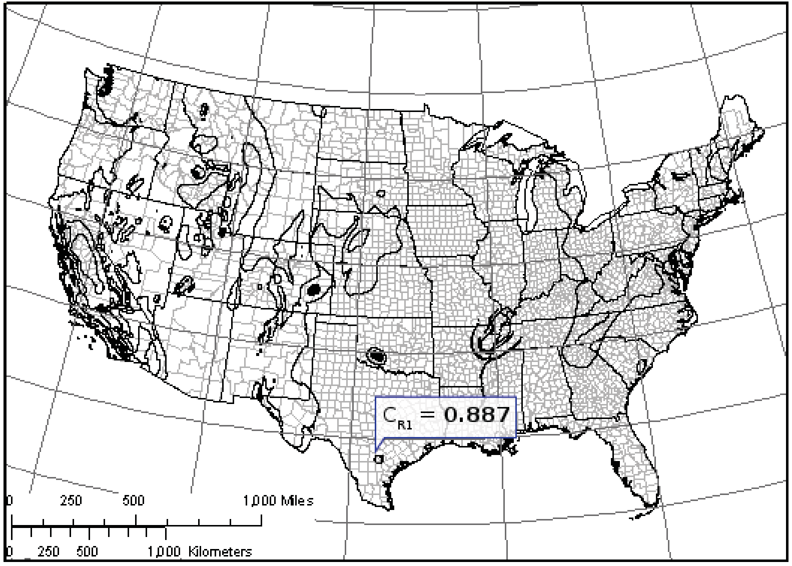


Figure 22–5: Deterministic Ground Motions of 0.2-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B

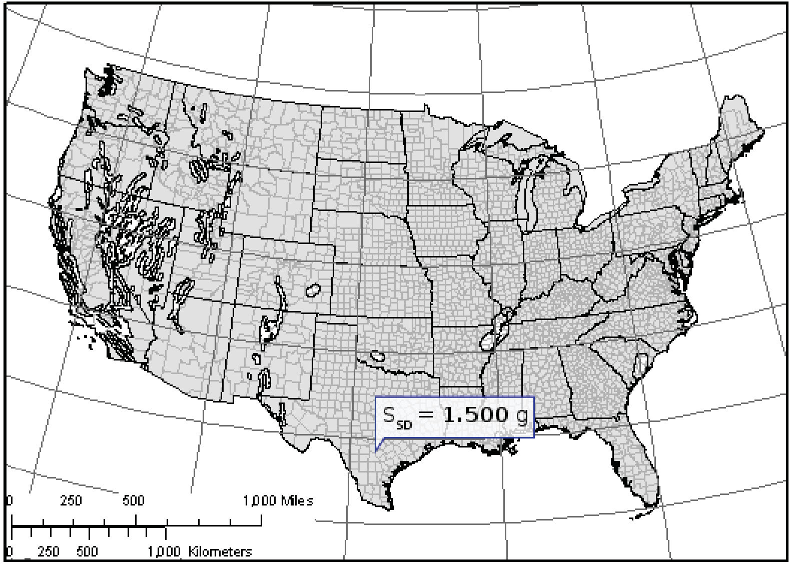
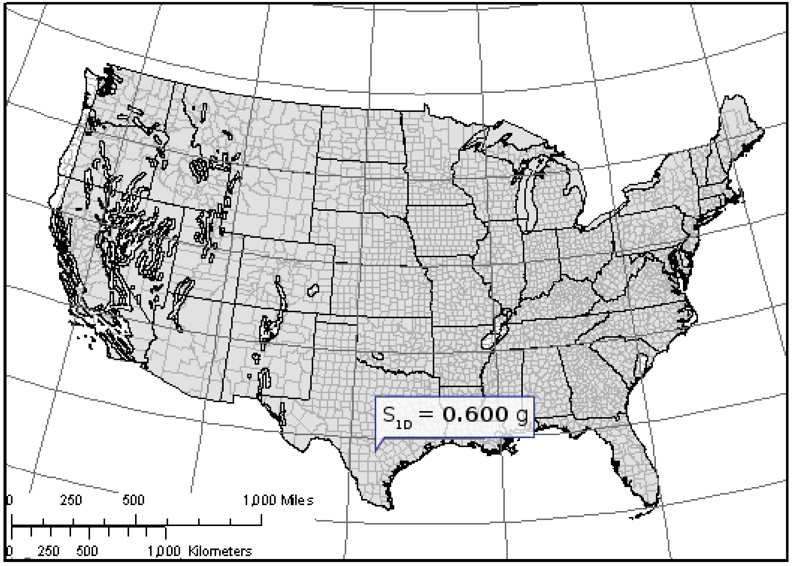


Figure 22–6: Deterministic Ground Motions of 1.0-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B



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: ● Plasticity index *PI* > 20, ● Moisture content *w* ≥ 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): $C_{RS}S_{SUH} = 0.892 \times 0.103 = 0.092$ g

Equation (11.4–2): $S_{SD} = 1.500$ g

$S_S \equiv$ “Lesser of values from Equations (11.4–1) and (11.4–2)” = 0.092 g

Equation (11.4–3): $C_{R1}S_{1UH} = 0.887 \times 0.035 = 0.031$ g

Equation (11.4–4): $S_{1D} = 0.600$ g

$S_1 \equiv$ “Lesser of values from Equations (11.4–3) and (11.4–4)” = 0.031 g

Table 11.4–1: Site Coefficient F_a

Site Class	Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.5$	$S_S = 0.75$	$S_S = 1$	$S_S \ge 1.25$
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	$\boxed{1.6}$	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 = 0.092 g, F_a = 1.600

Table 11.4–2: Site Coefficient F_v

Site Class	Spectral Response Acceleration Parameter at 1–Second Period				
	$S_1 \le 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \ge 0.5$
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	$\boxed{2.4}$	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): $S_{MS} = F_aS_S = 1.600 \times 0.092 = 0.147$ g

---

Equation (11.4–6): $S_{M1} = F_vS_1 = 2.400 \times 0.031 = 0.075$ g

---

Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4–7): $S_{DS} = ⅔\, S_{MS} = ⅔ \times 0.147 = 0.098$ g

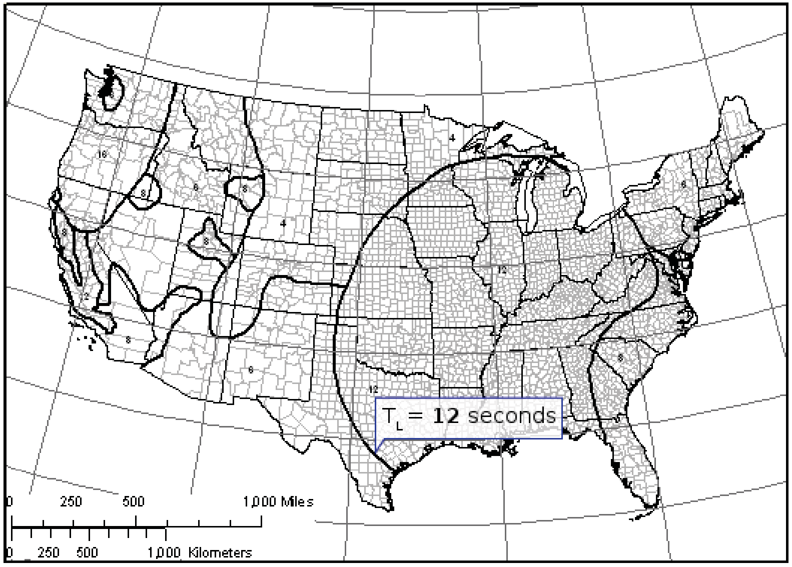
---

Equation (11.4–8): $S_{D1} = ⅔\, S_{M1} = ⅔ \times 0.075 = 0.050$ g

---

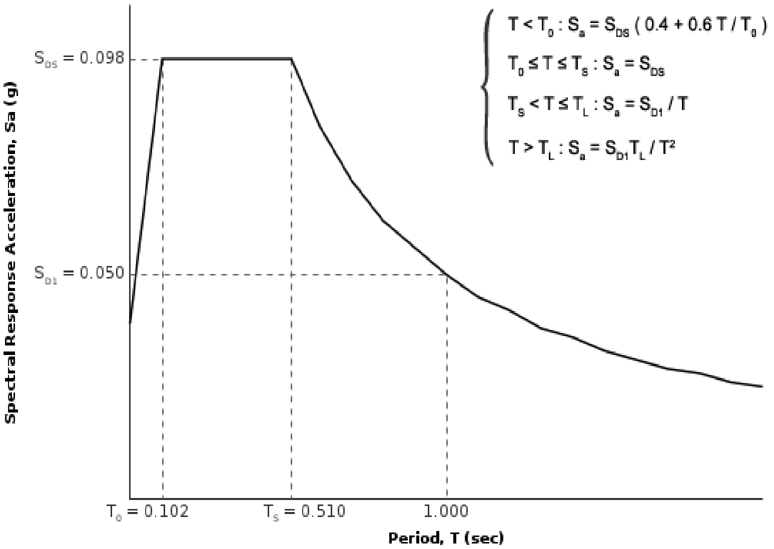
Section 11.4.5 — Design Response Spectrum

Figure 22–7: Long–period Transition Period, T_L (s)



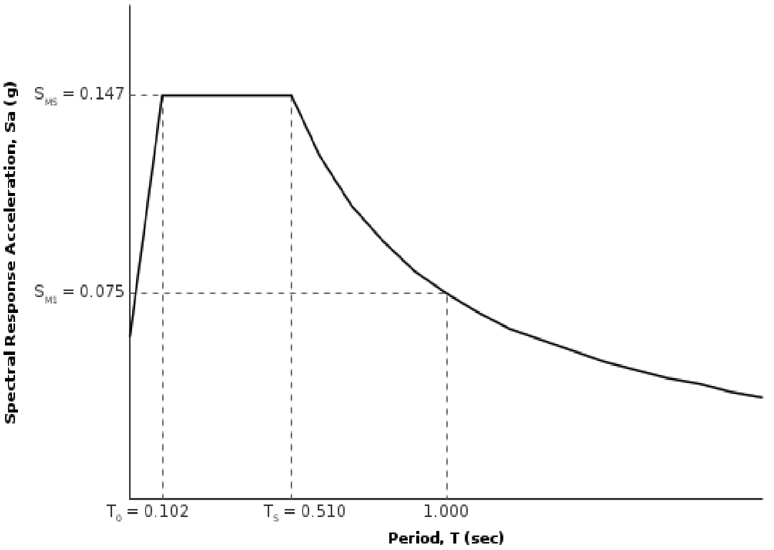
T_L = **12** seconds

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}

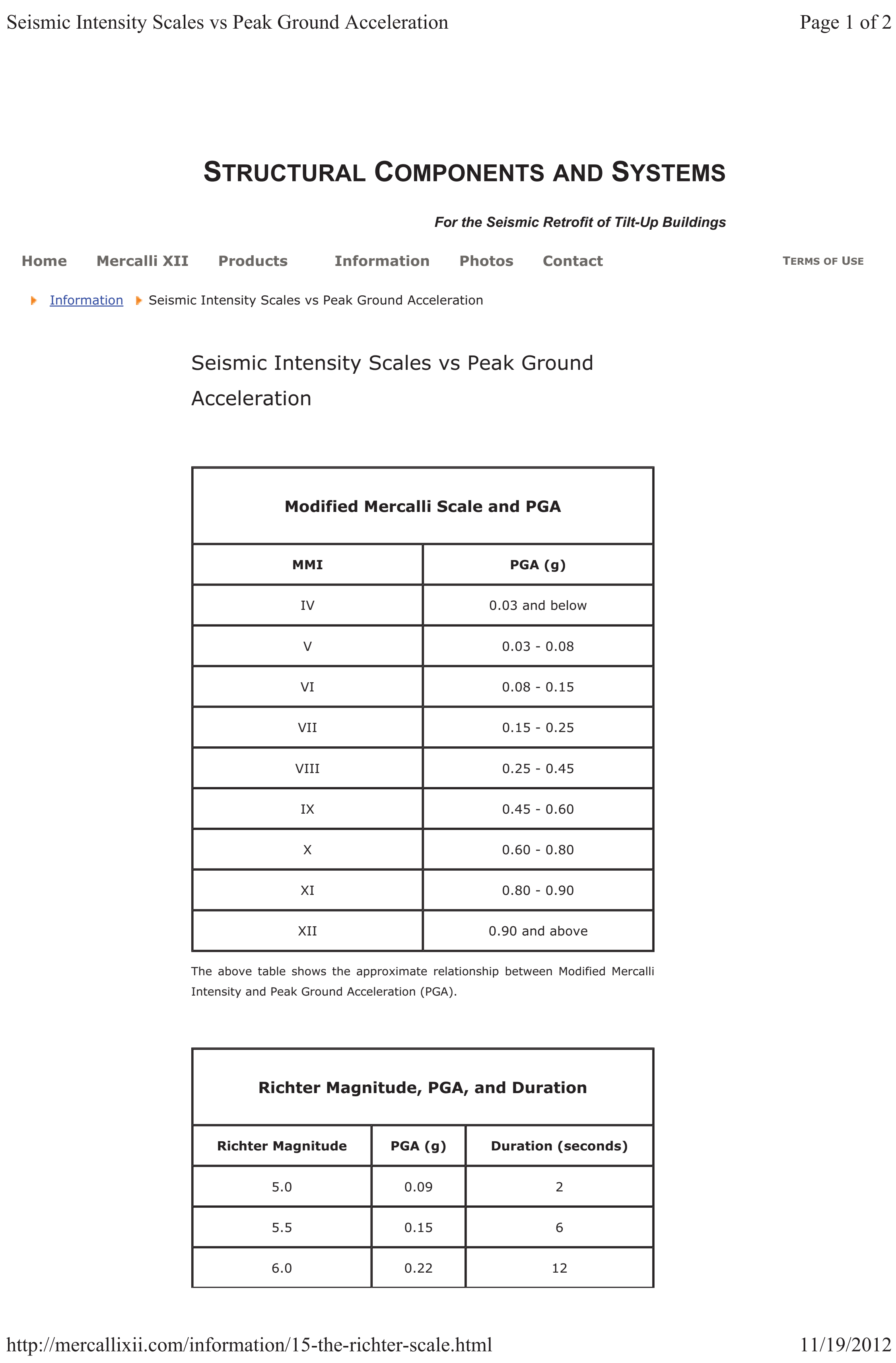
Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.1	PGA = 0.2	PGA = 0.3	PGA = 0.4	PGA ≥ 0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

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): $PGA_M = F_{PGA}PGA = 1.600 \times 0.047 = 0.075$ g



STRUCTURAL COMPONENTS AND SYSTEMS

For the Seismic Retrofit of Tilt-Up Buildings

Seismic Intensity Scales vs Peak Ground Acceleration

Modified Mercalli Scale and PGA

MMI	PGA (g)
IV	0.03 and below
V	0.03 - 0.08
VI	0.08 - 0.15
VII	0.15 - 0.25
VIII	0.25 - 0.45
IX	0.45 - 0.60
X	0.60 - 0.80
XI	0.80 - 0.90
XII	0.90 and above

The above table shows the approximate relationship between Modified Mercalli Intensity and Peak Ground Acceleration (PGA).

Richter Magnitude, PGA, and Duration

Richter Magnitude	PGA (g)	Duration (seconds)
5.0	0.09	2
5.5	0.15	6
6.0	0.22	12

ASA12-098-00
Figure D-12

6.5	0.29	18
7.0	0.37	24
7.5	0.45	30
8.0	0.50	34
8.5	0.50	37

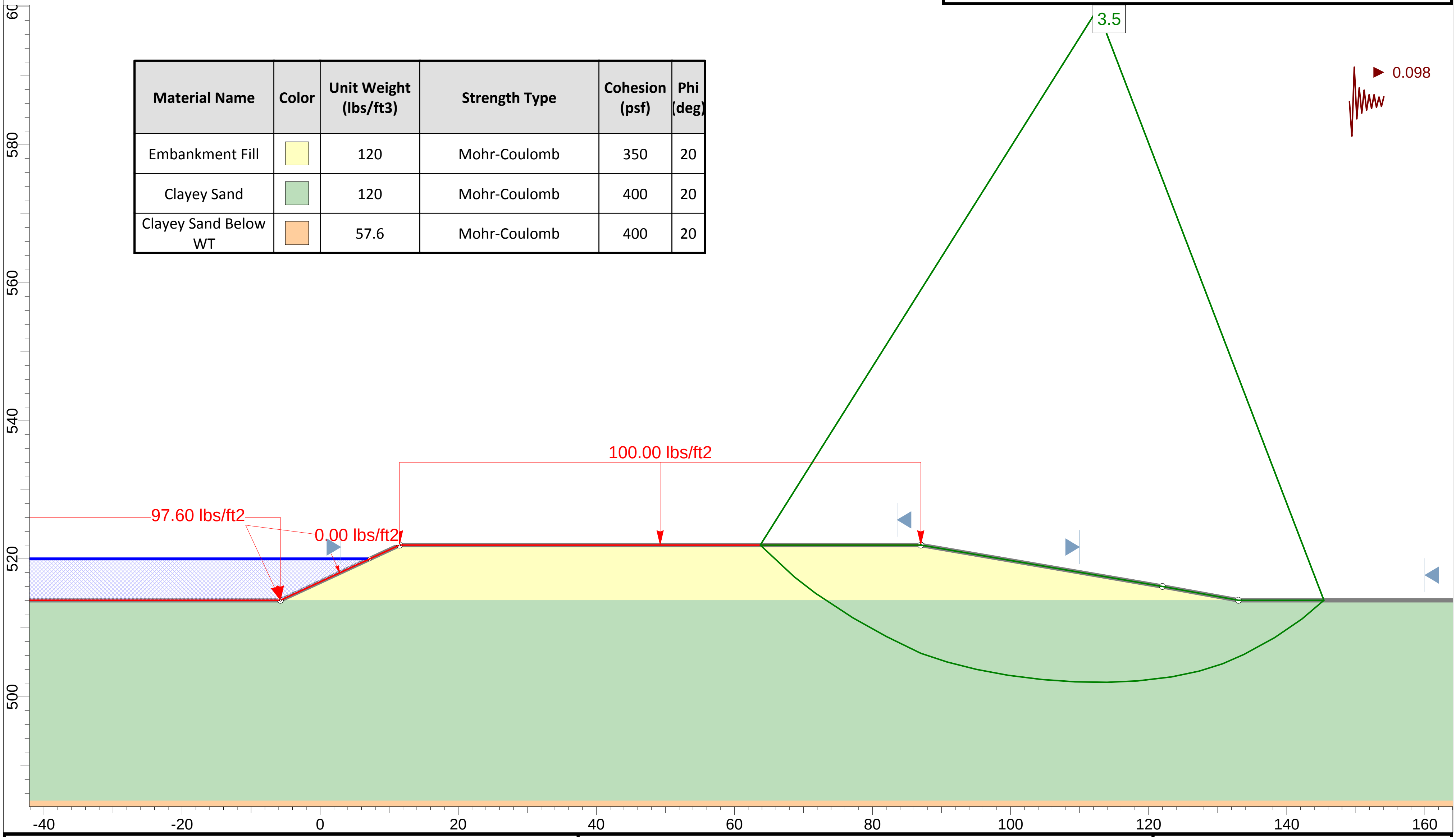
The above table shows the approximate relationship between Richter Magnitude, Peak Ground Acceleration (PGA), and duration of strong-phase shaking near the epicenter of earthquakes located in California.

< Prev Next >

Home | About Mercalli XII | Contact | Terms of Use

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



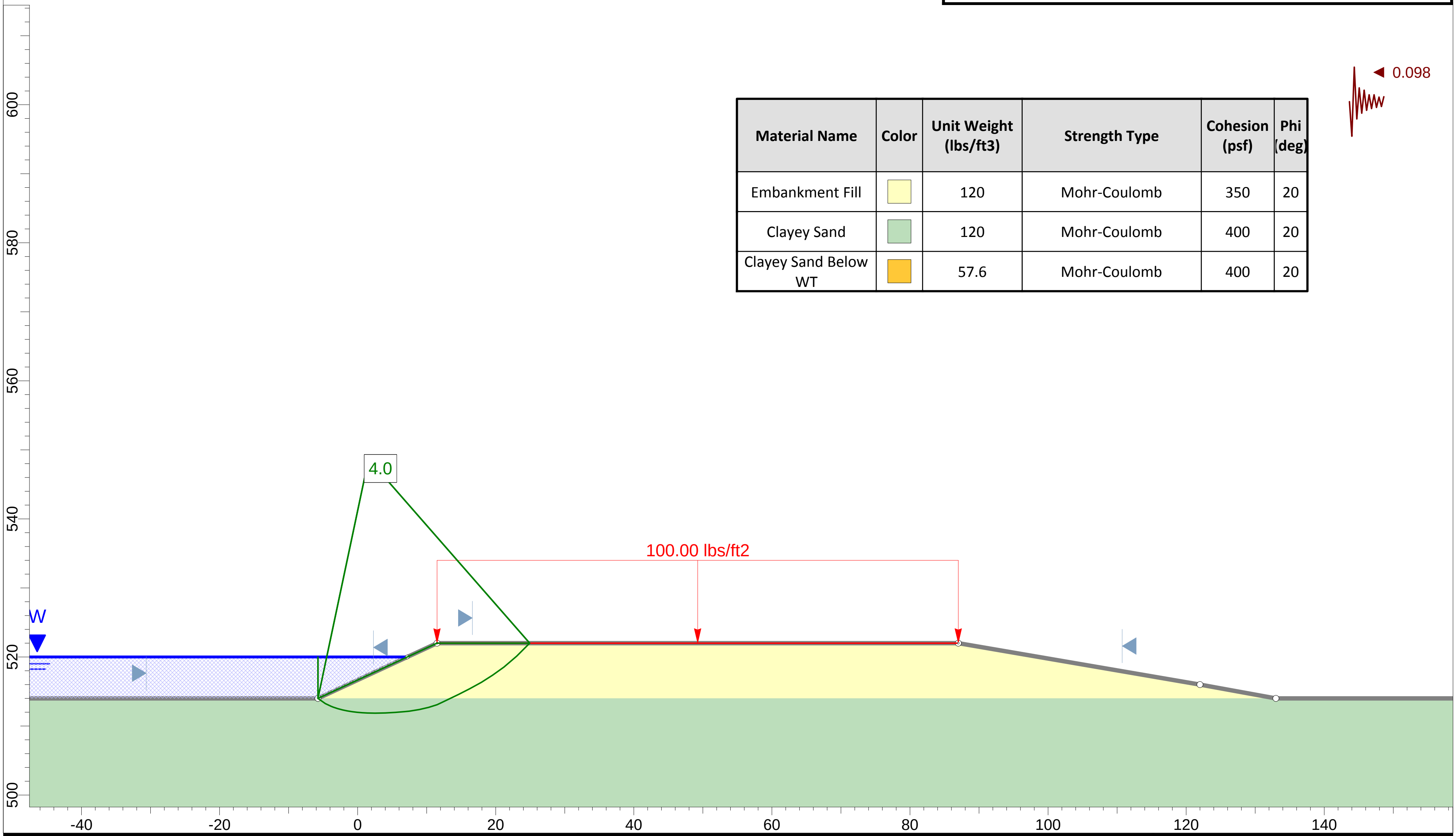
Profile "A" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-14a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

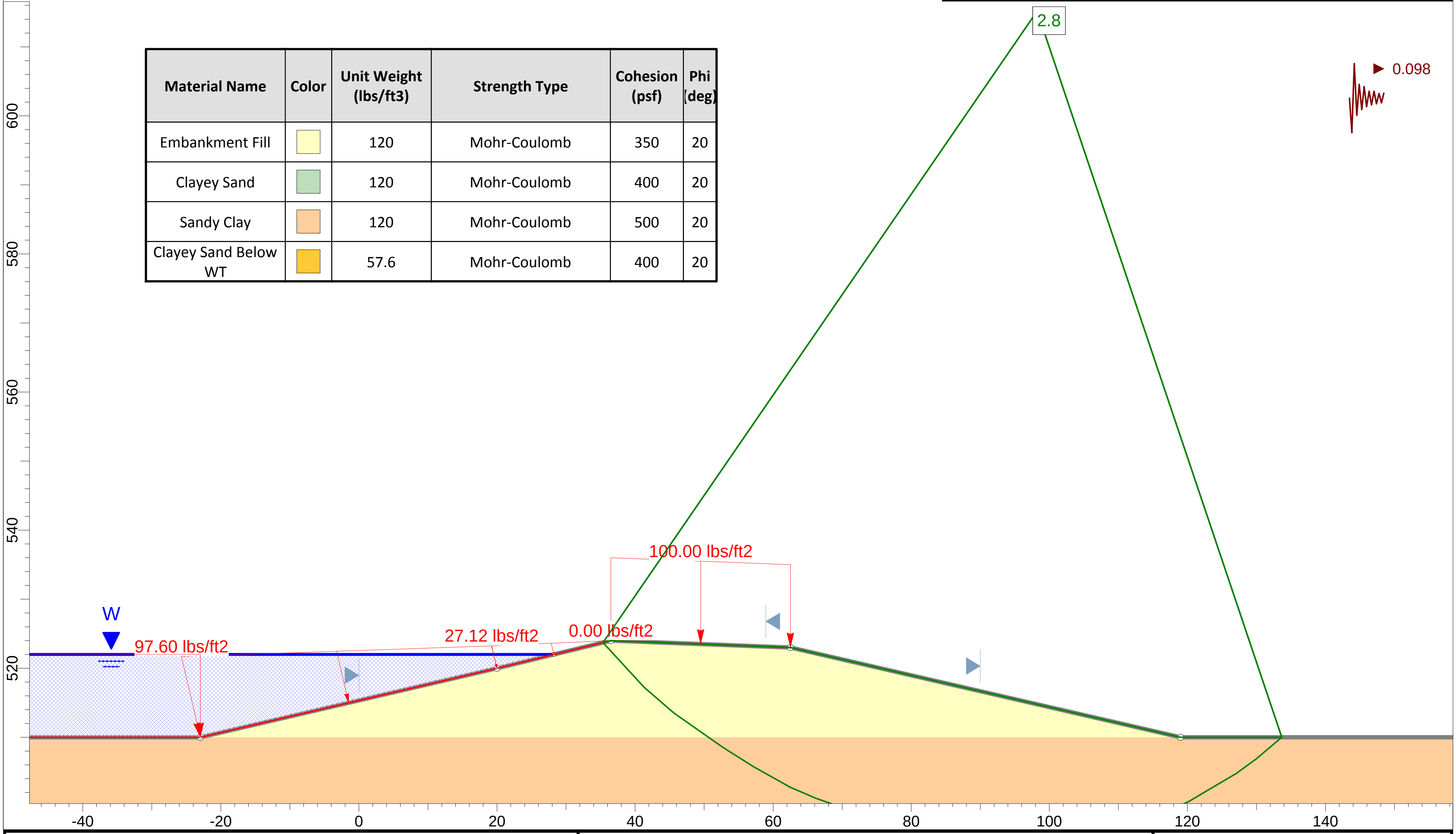


Profile "A" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-14b

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

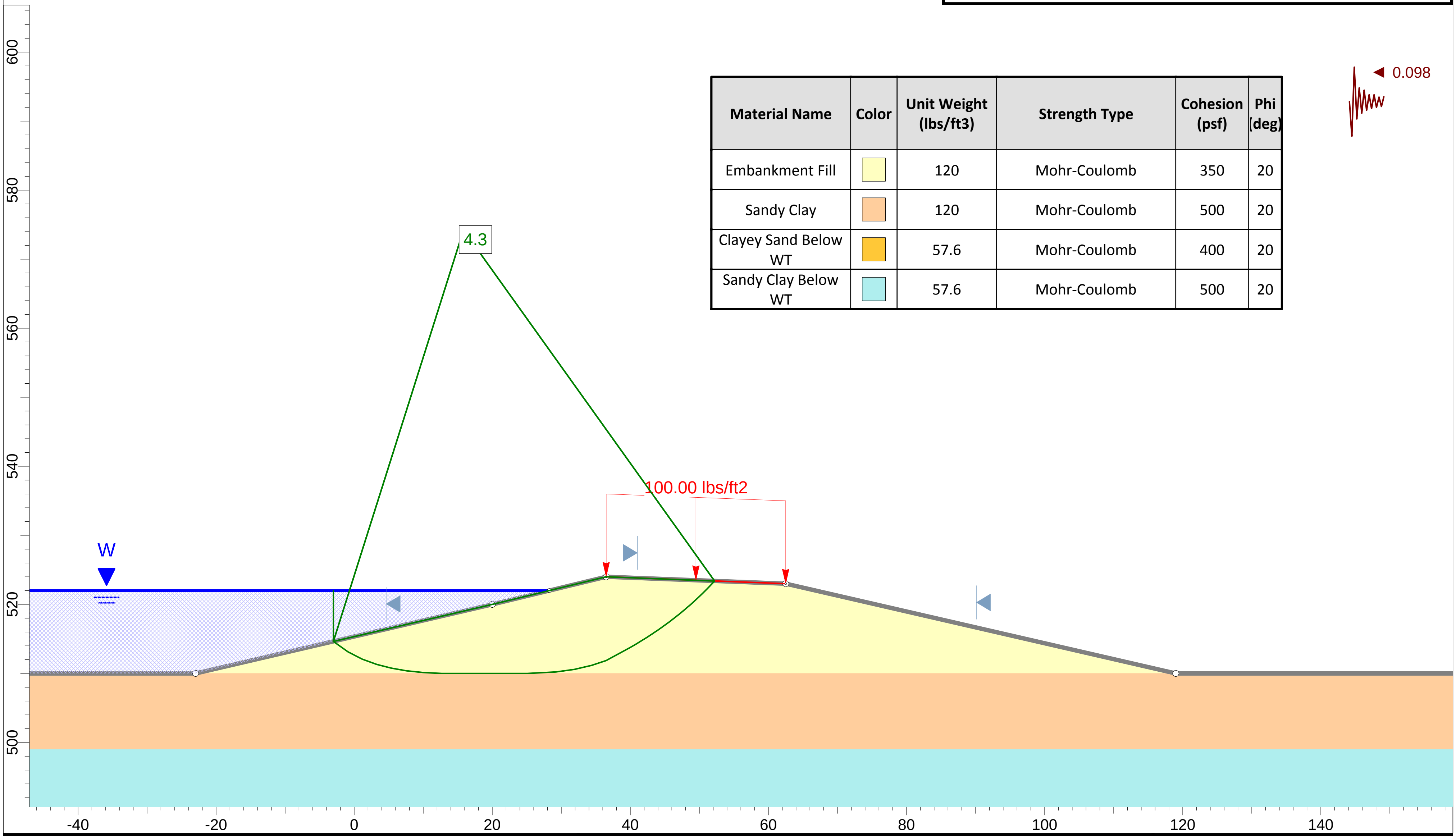
Profile "B" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-15a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

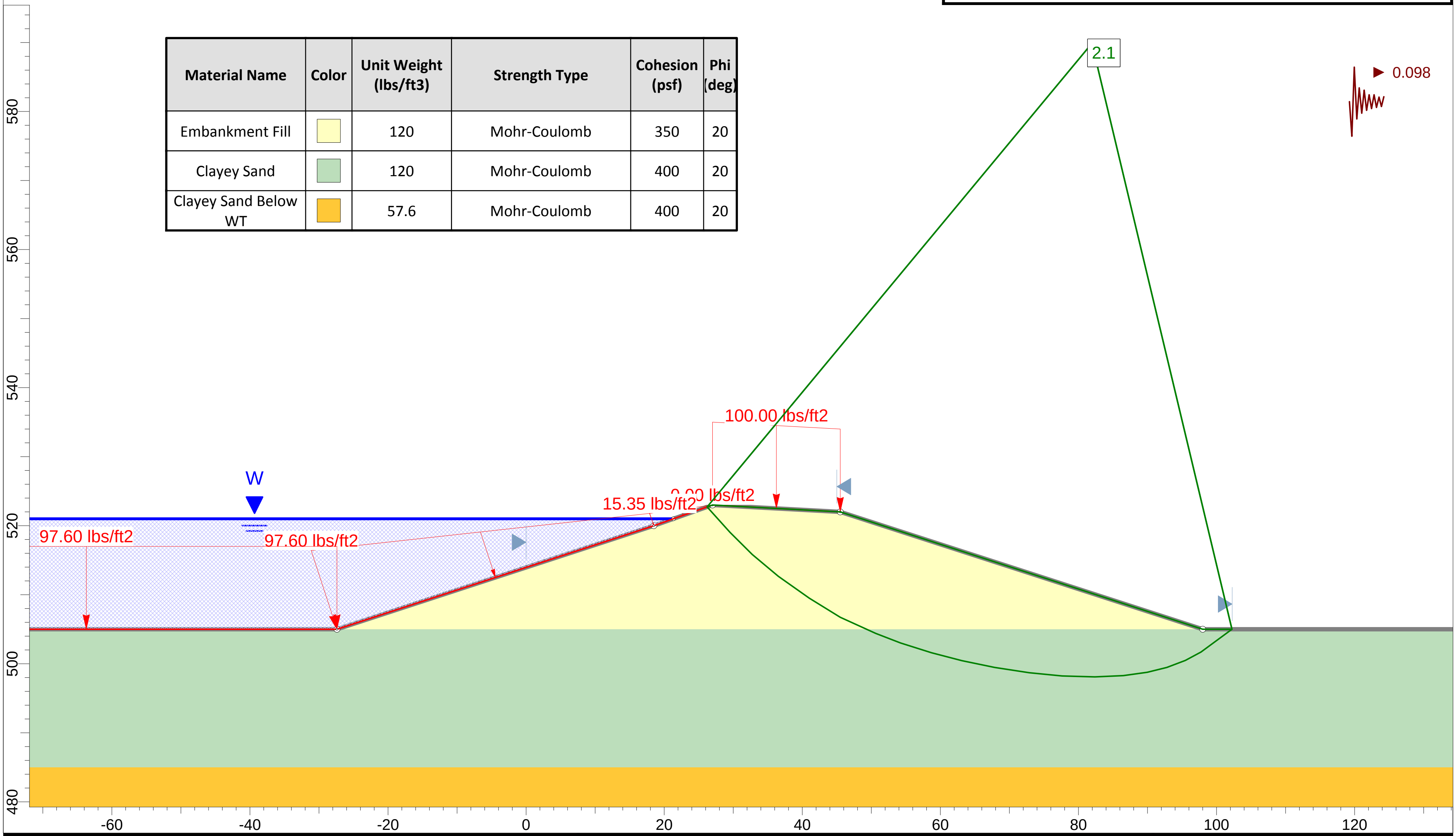
Profile "B" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-15b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

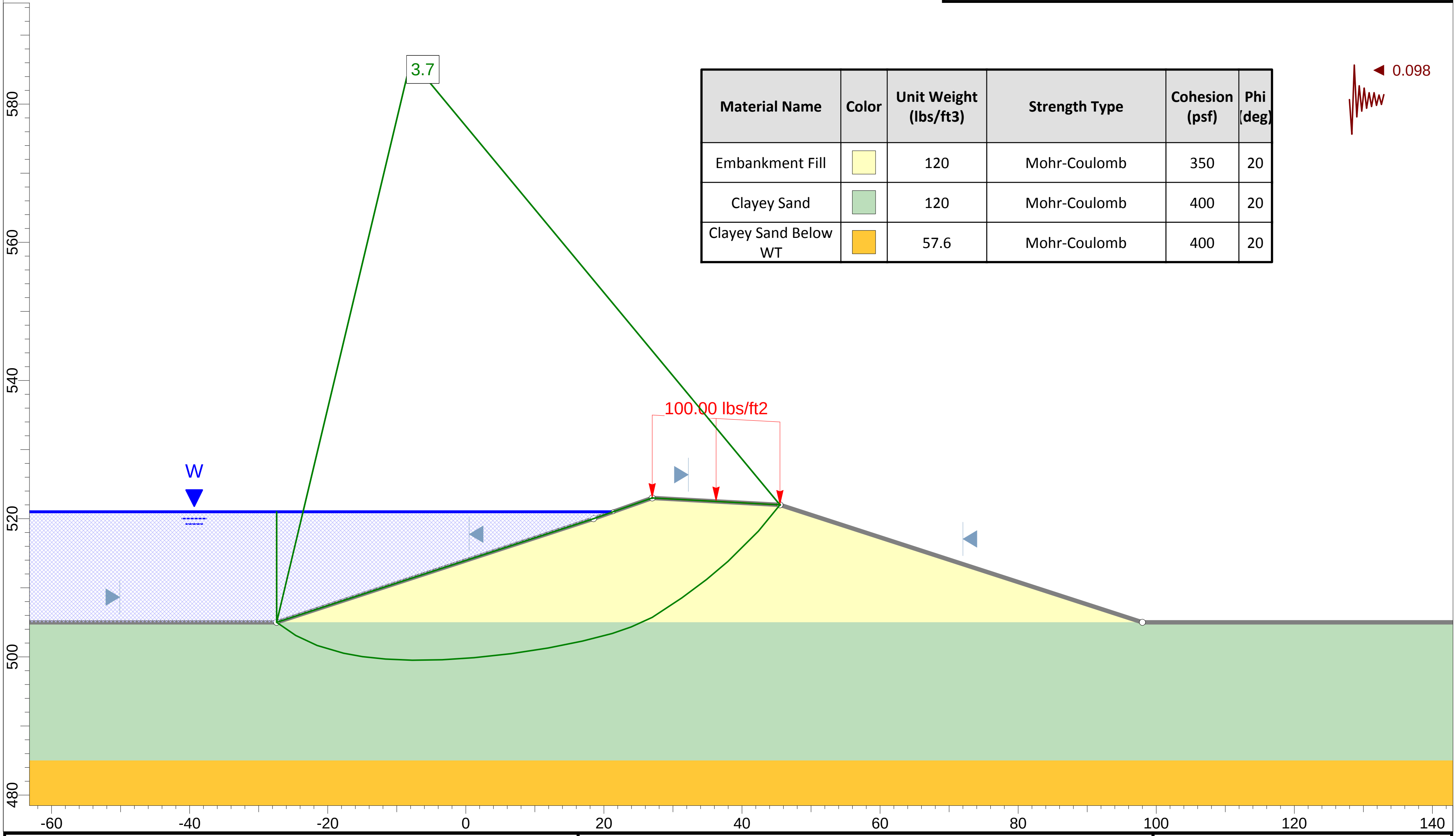
Profile "C" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-16a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

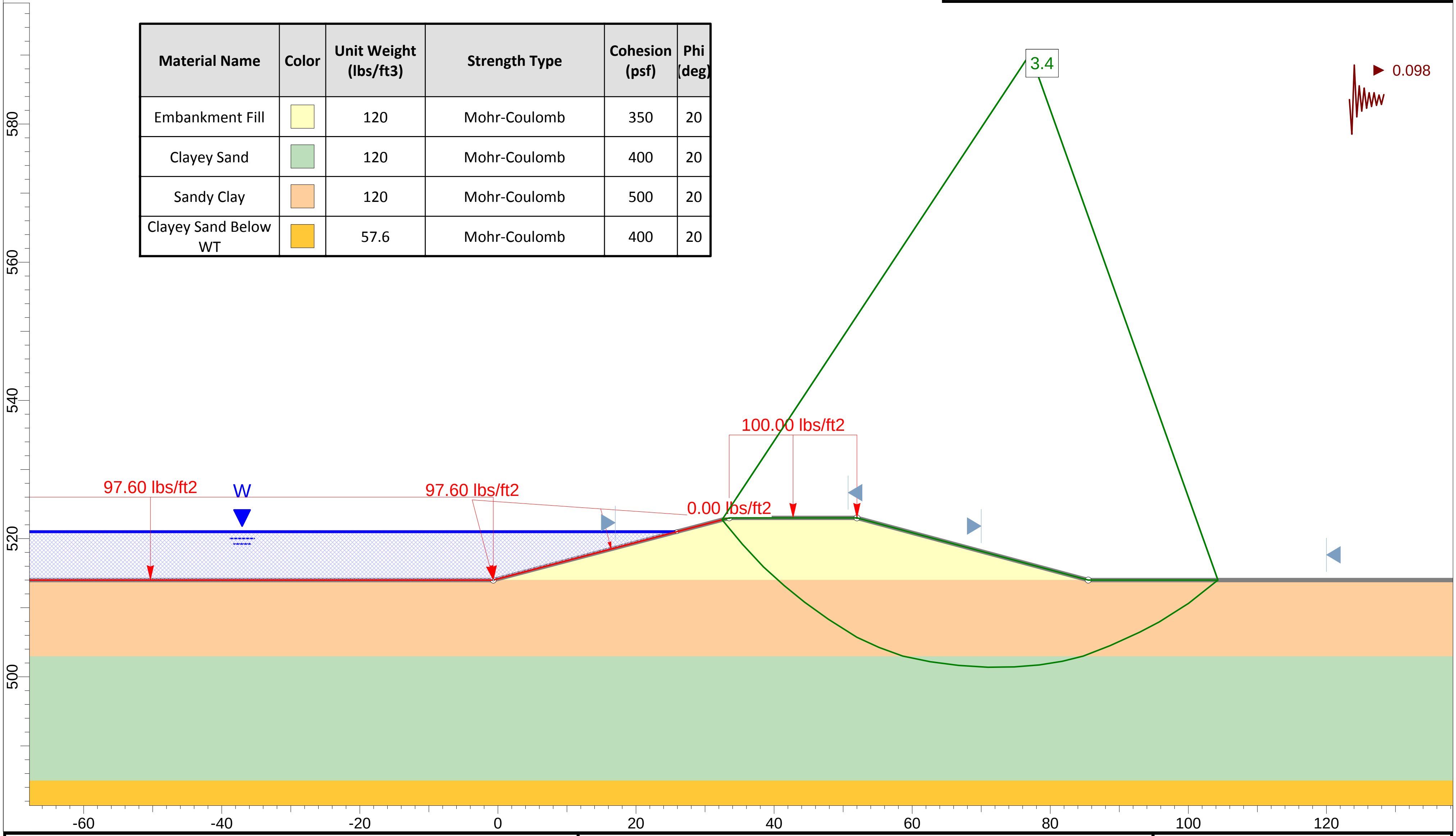
Profile "C" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-16b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20



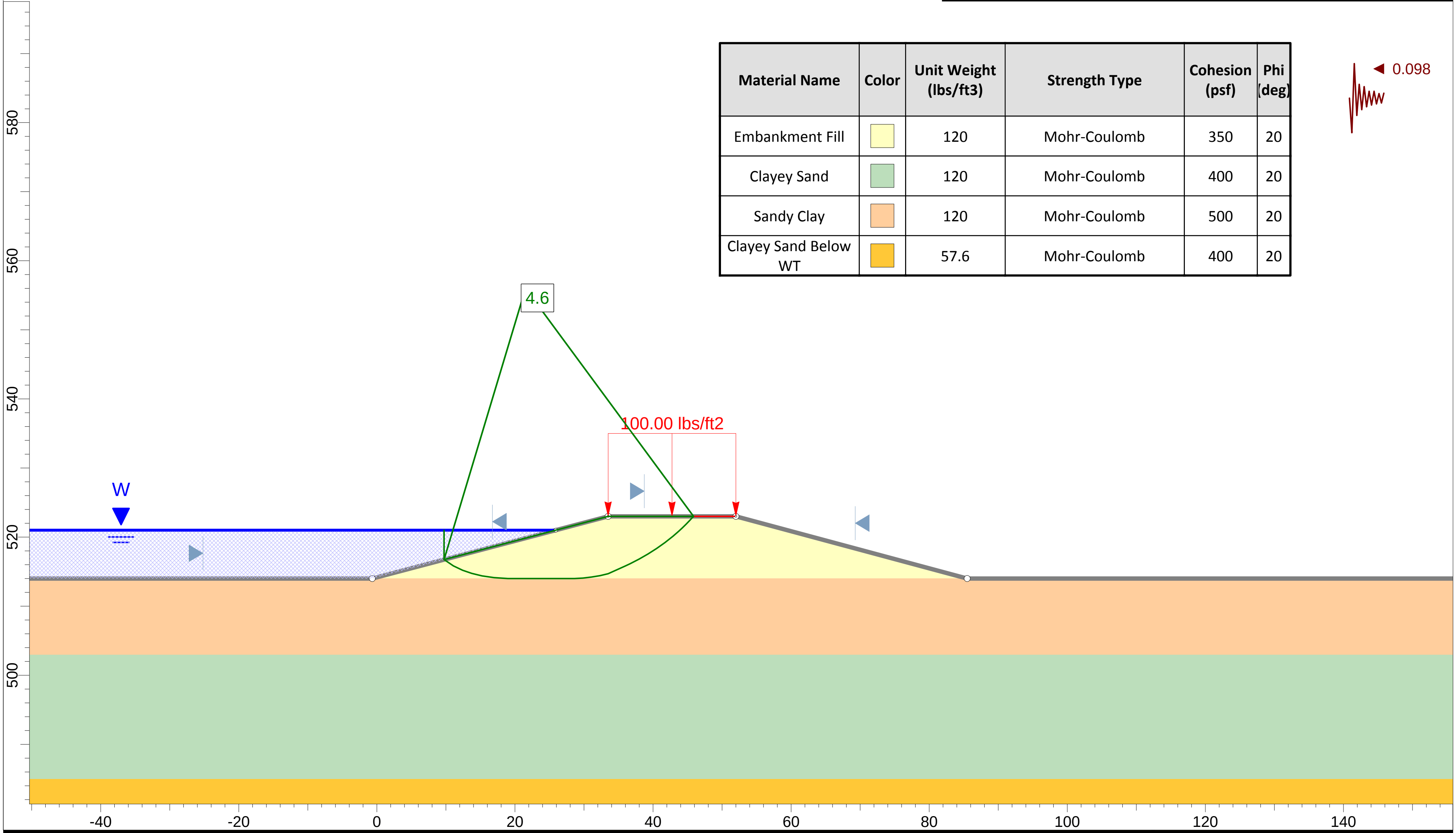
Profile "D" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-17a

RABA KISTNER CONSULTANTS

Global Stability Analysis



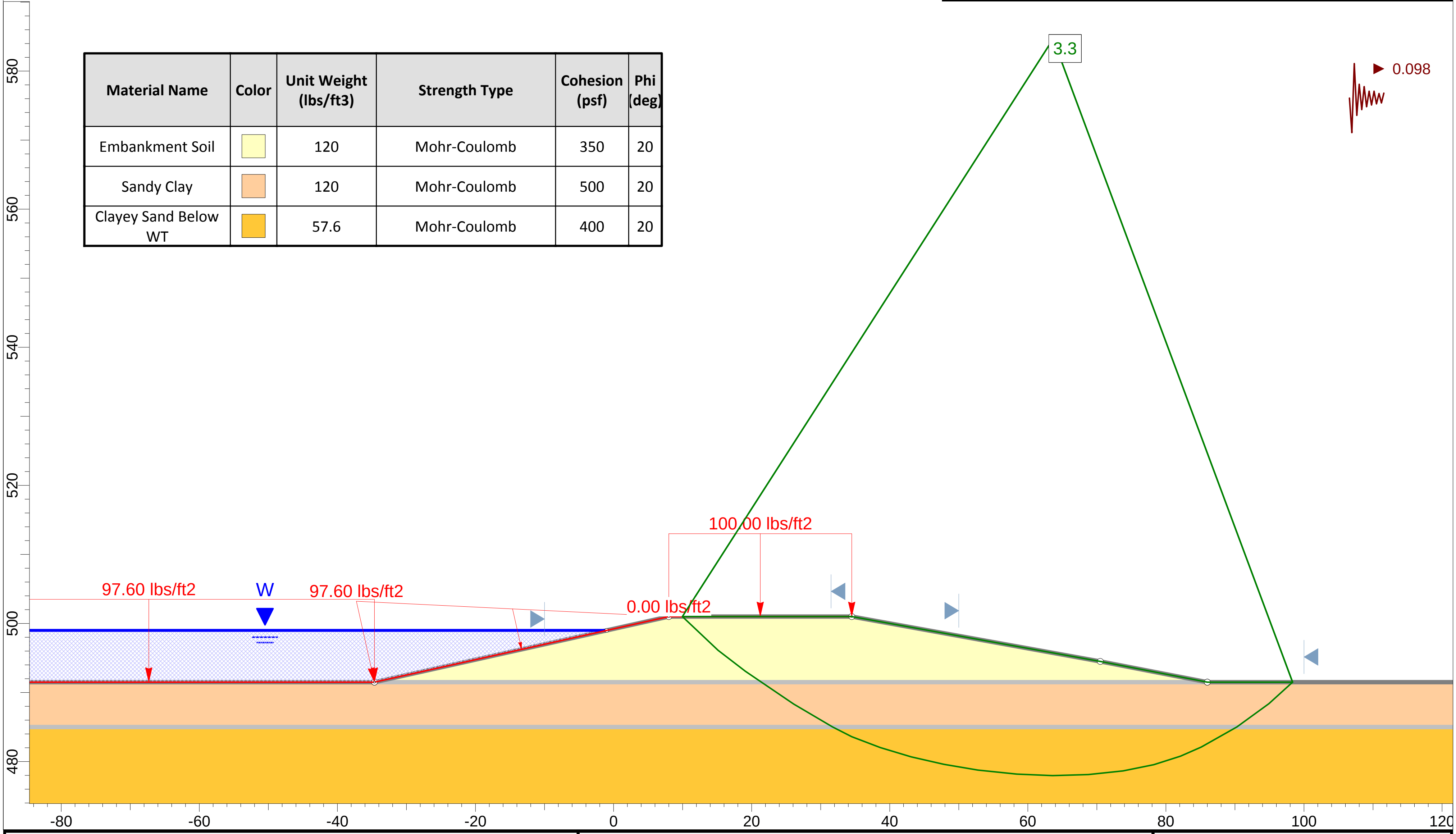
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

Profile "D" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-17b

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Soil	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

Profile "E" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

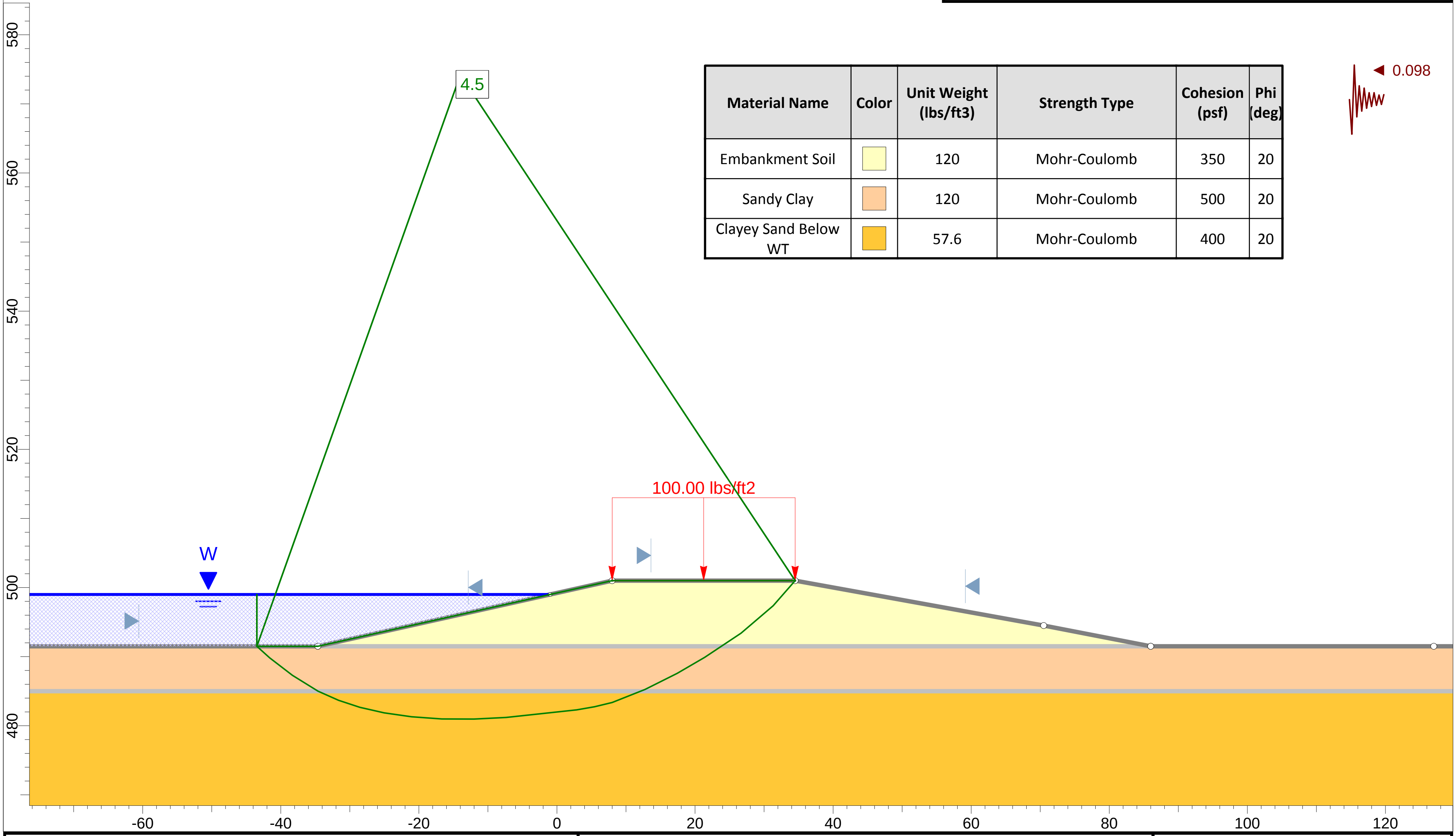
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-18a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Soil	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20



Profile "E" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

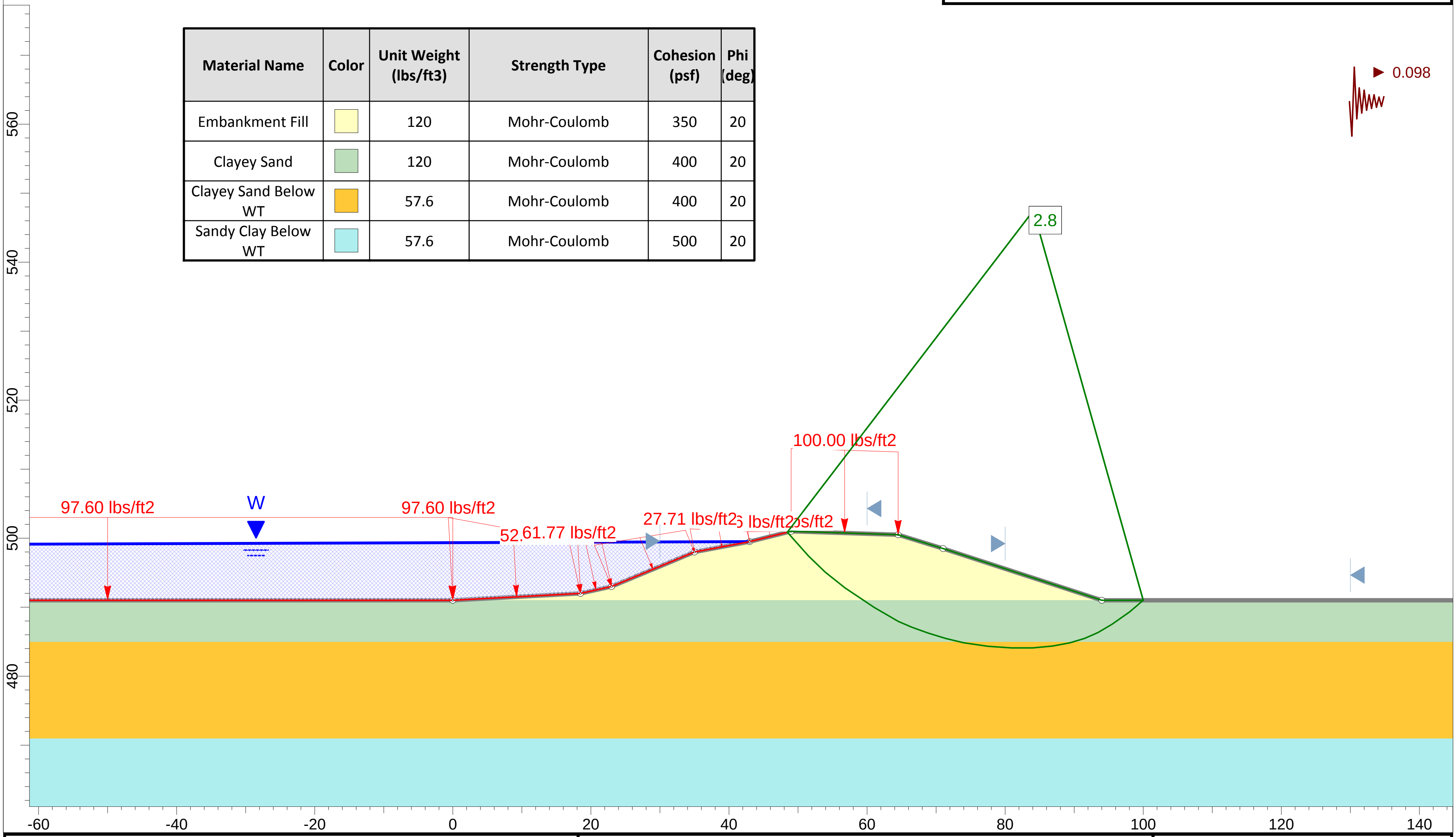
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-18b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



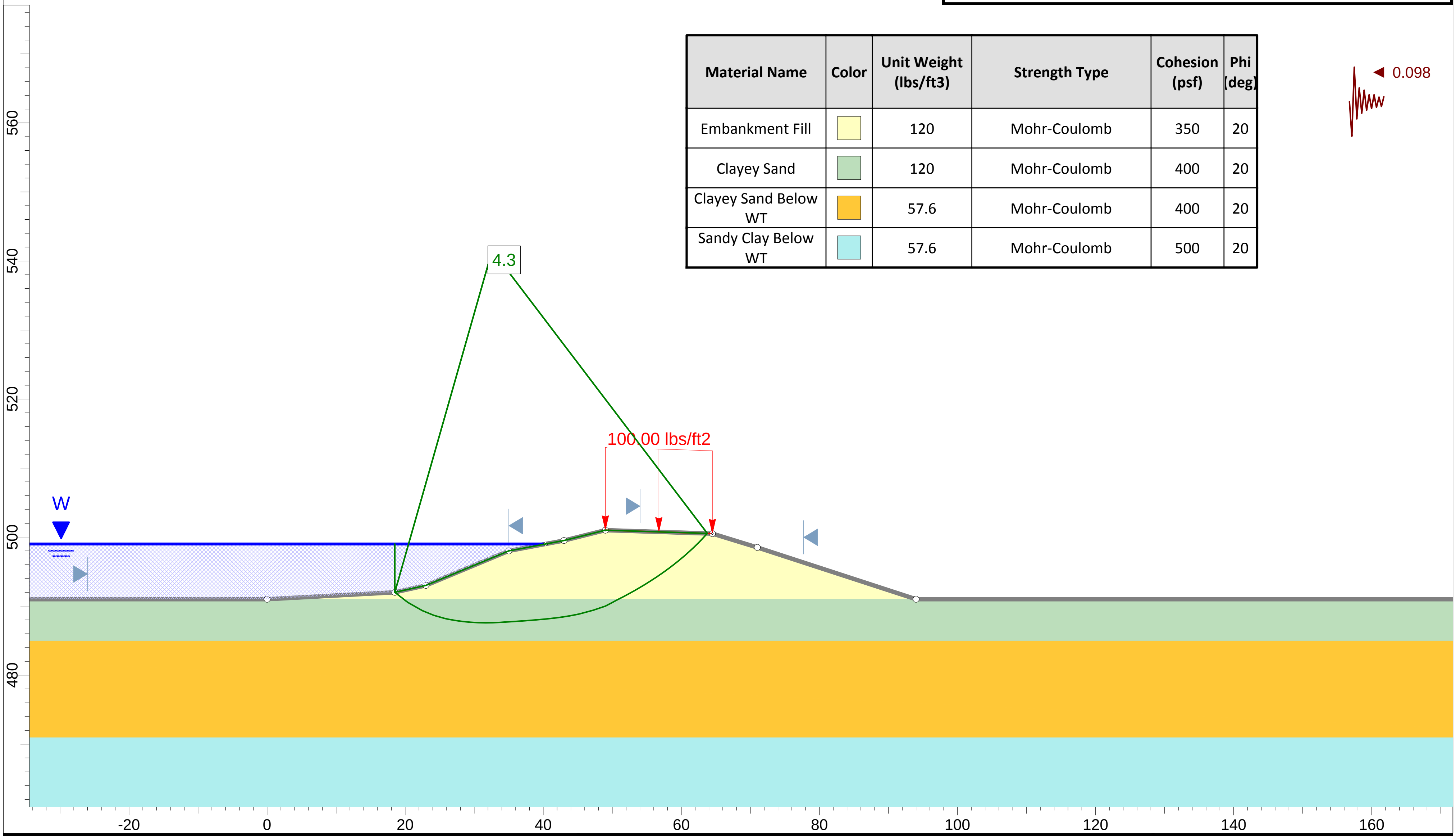
Profile "F" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-19a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



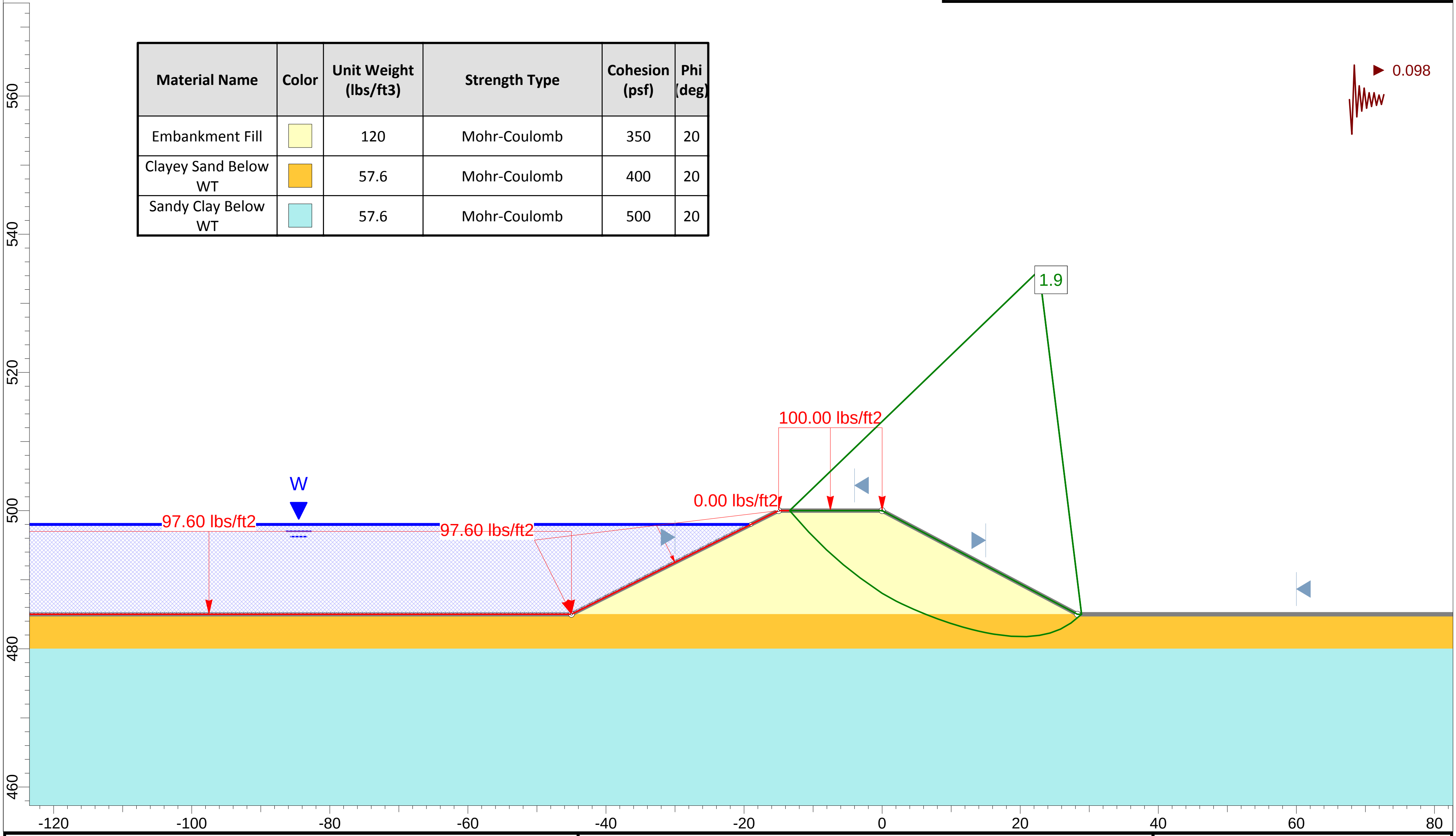
Profile "F" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-19b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

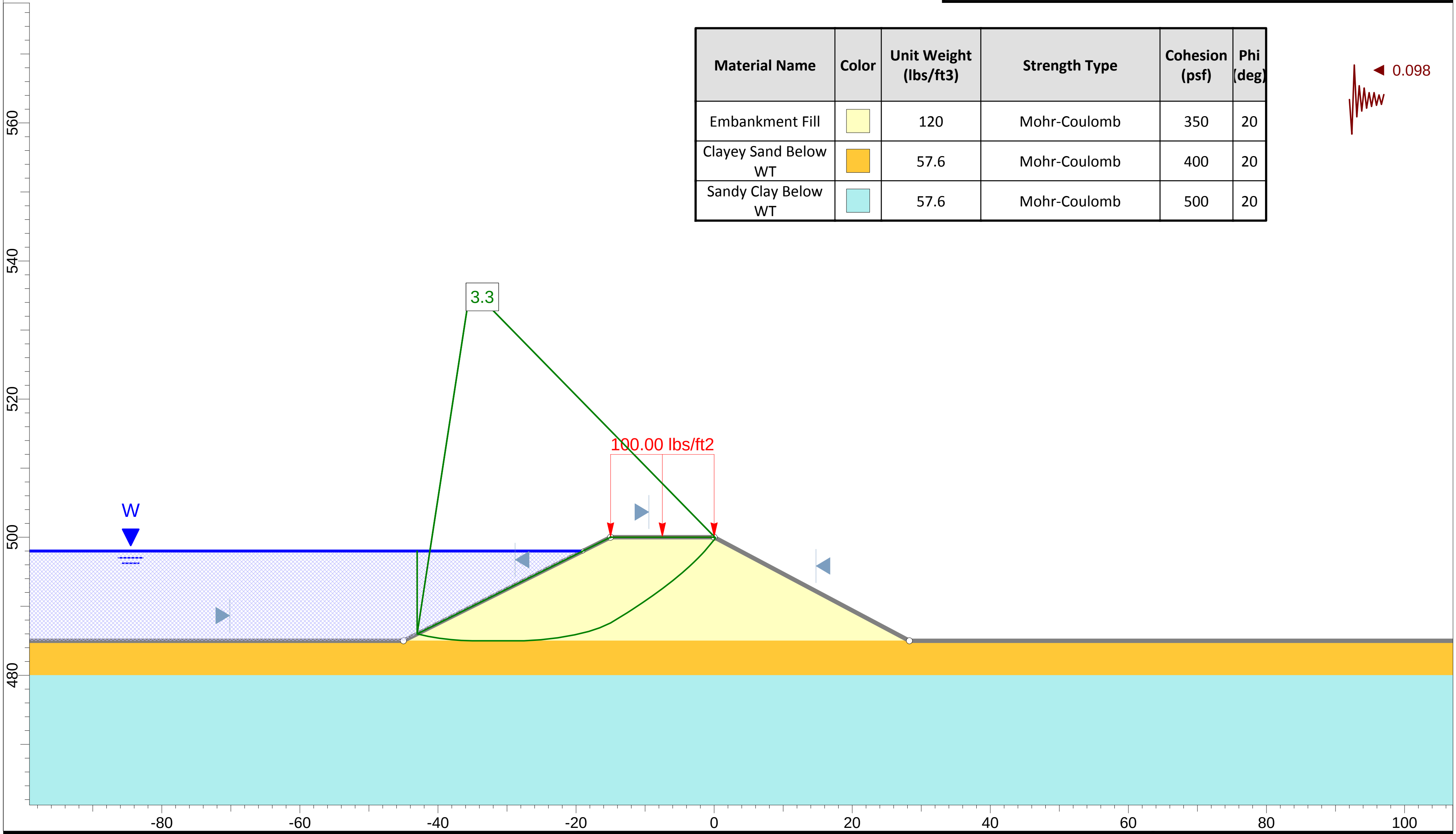
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-20a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

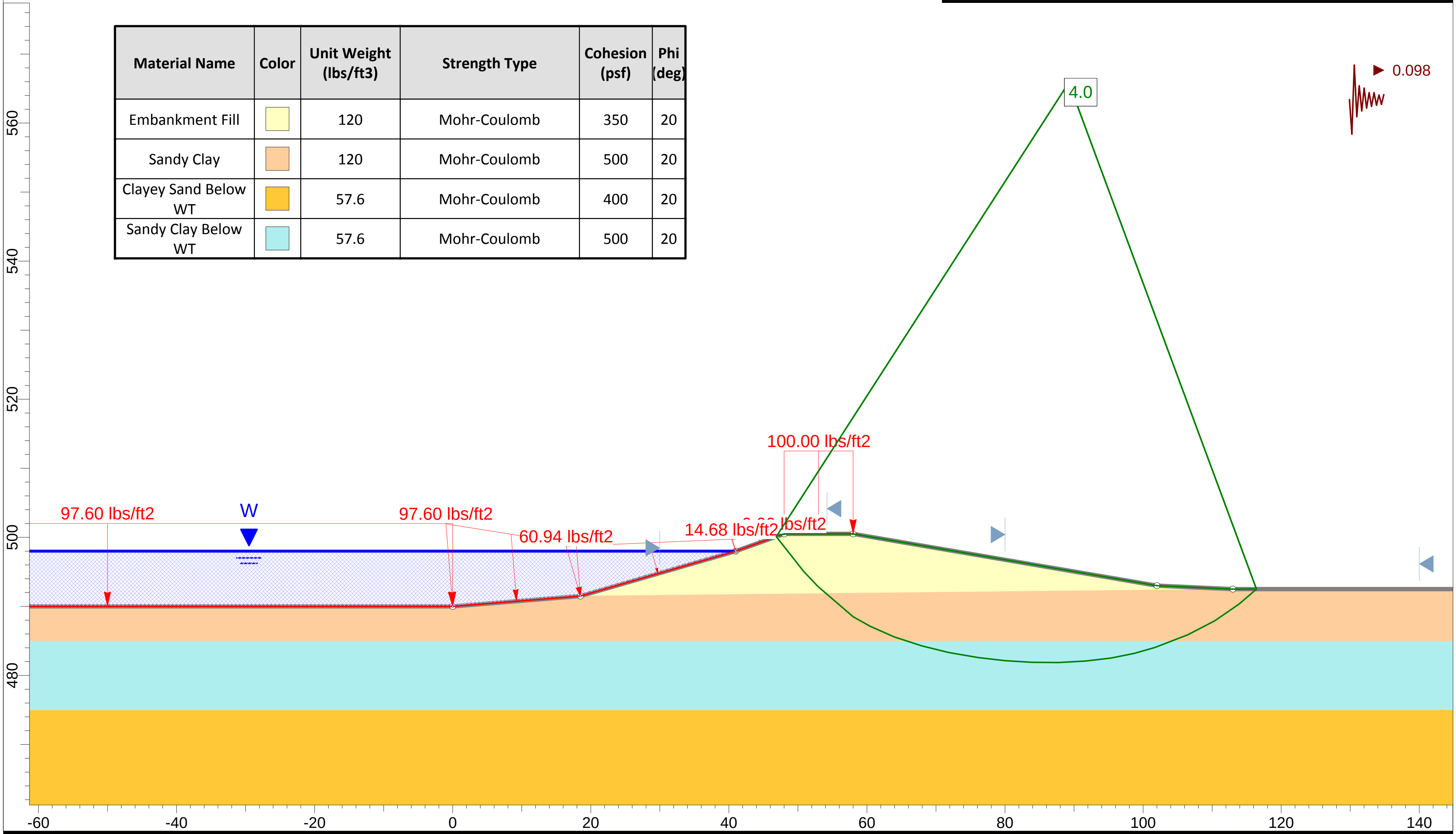
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-20b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "H" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

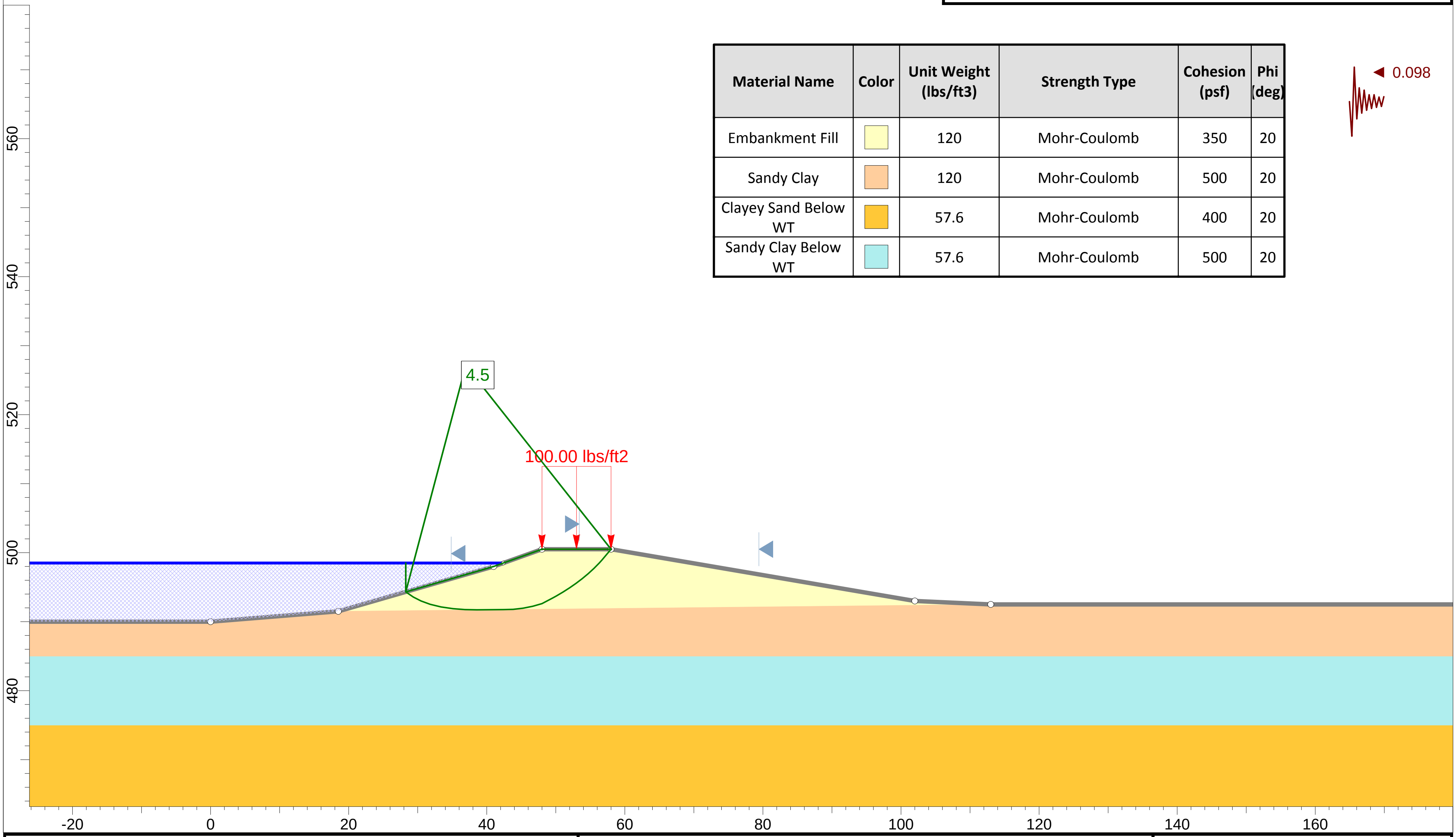
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-21a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



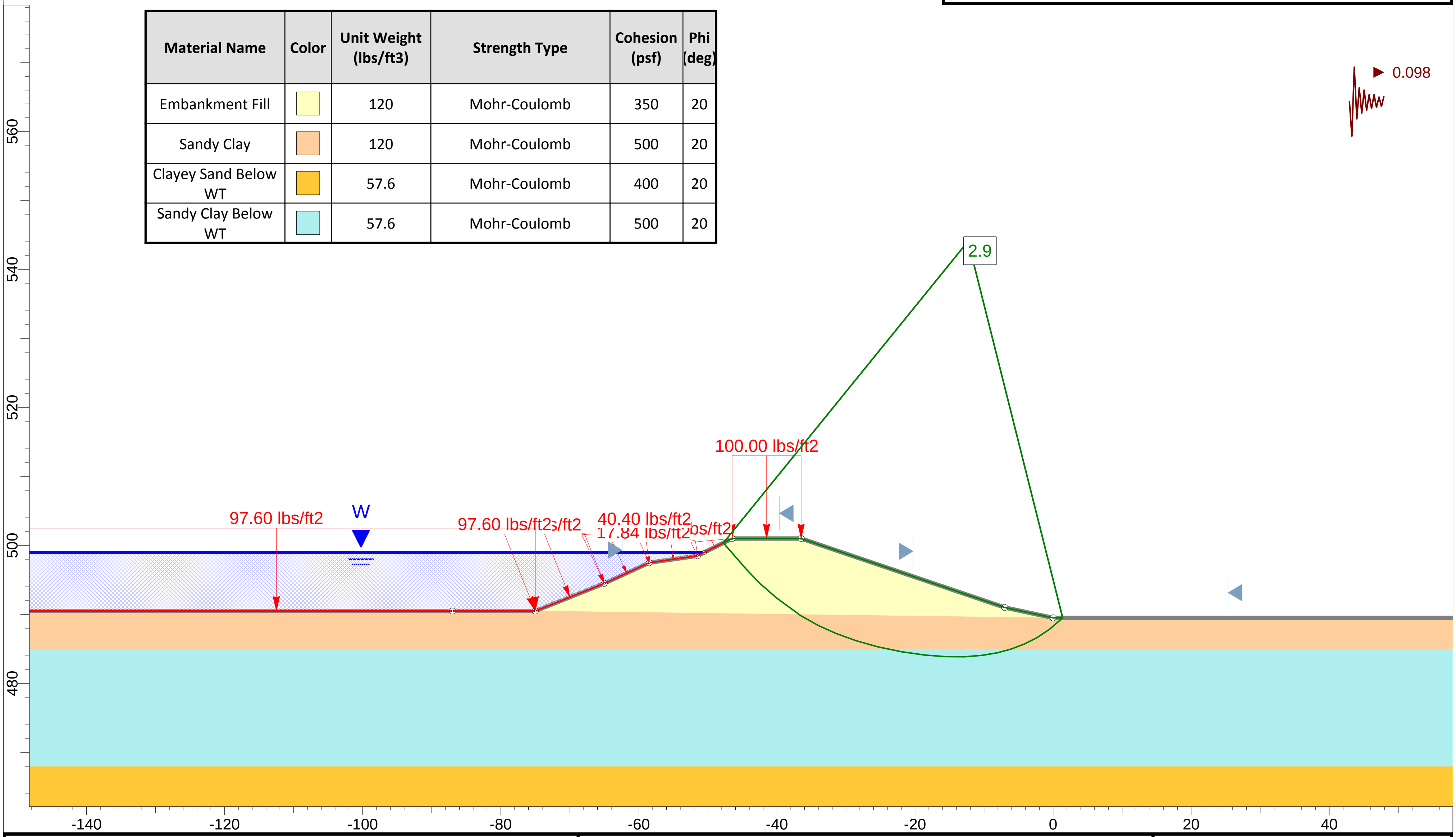
Profile "H" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-21b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



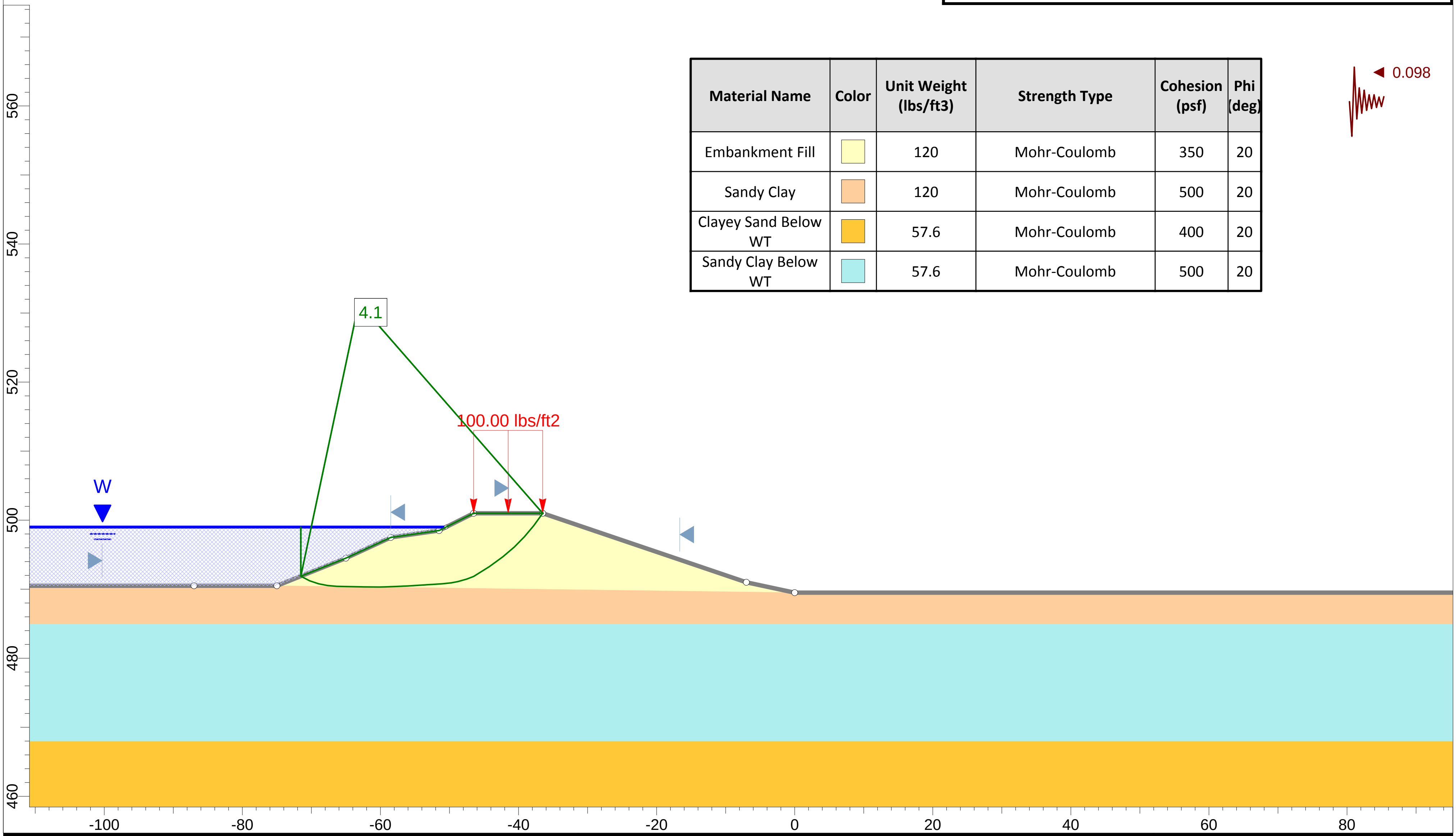
Profile "I" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-22a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

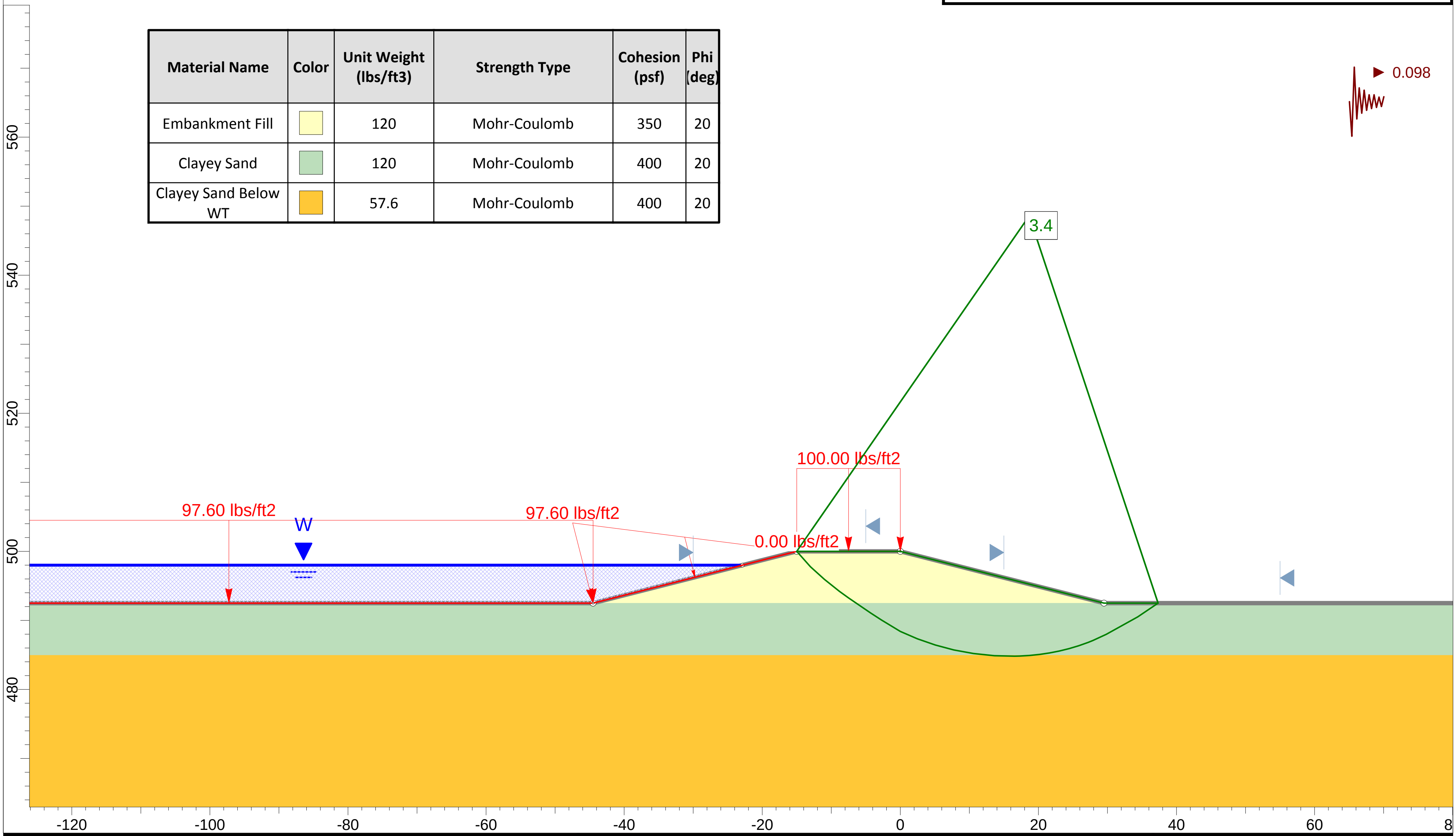
Profile "I" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-22b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "J" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

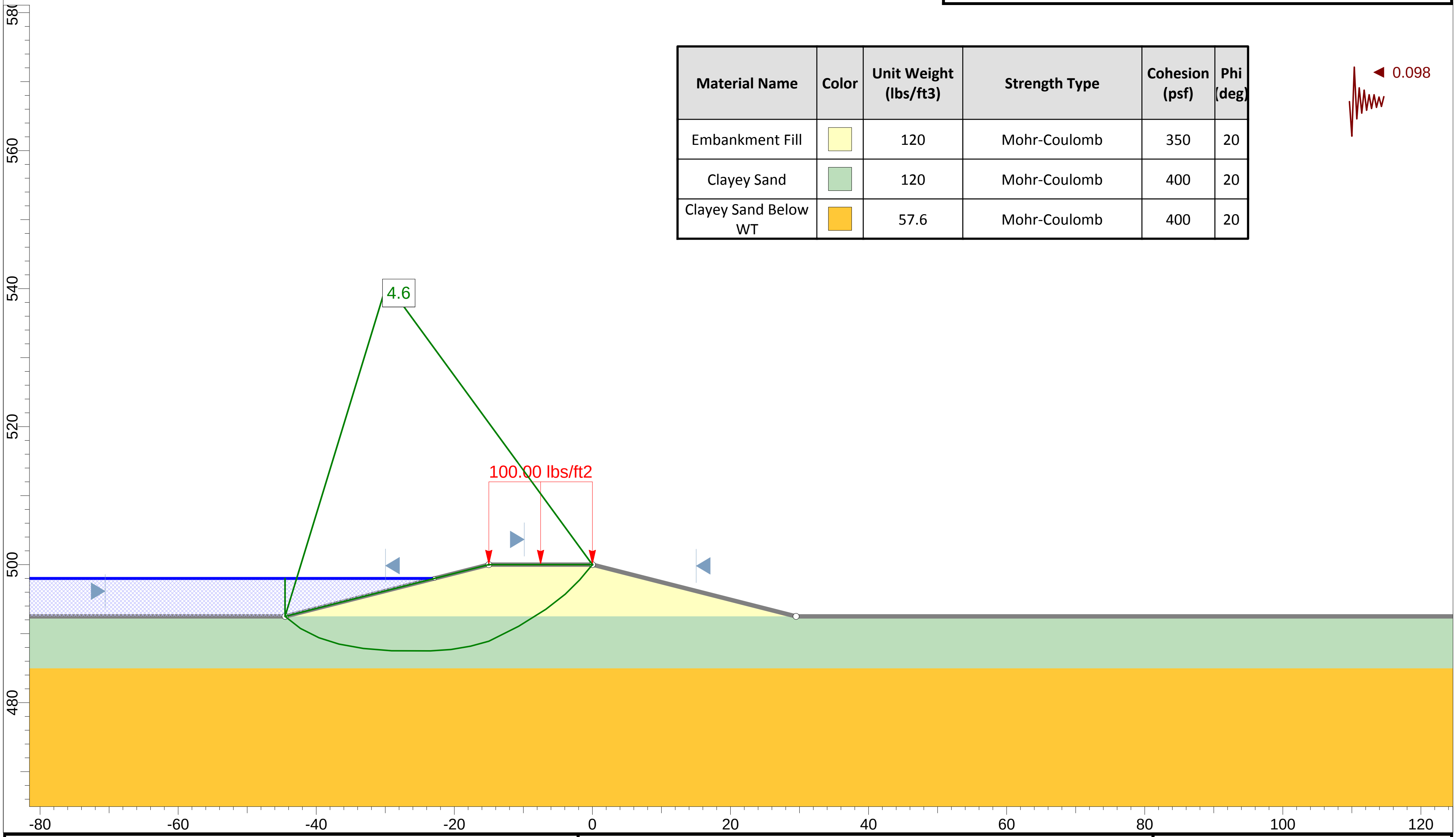
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-23a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



Profile "J" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

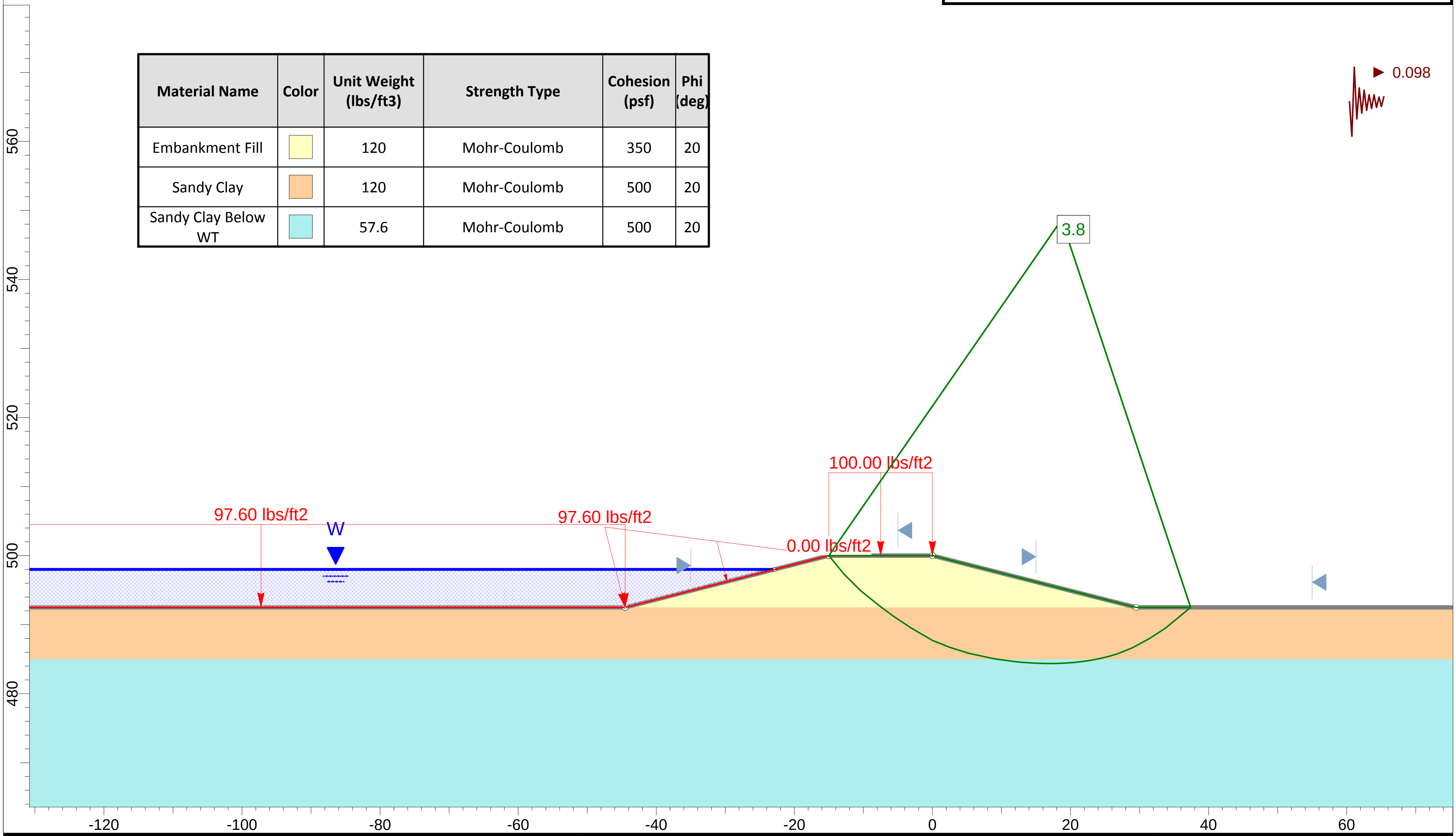
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-23b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

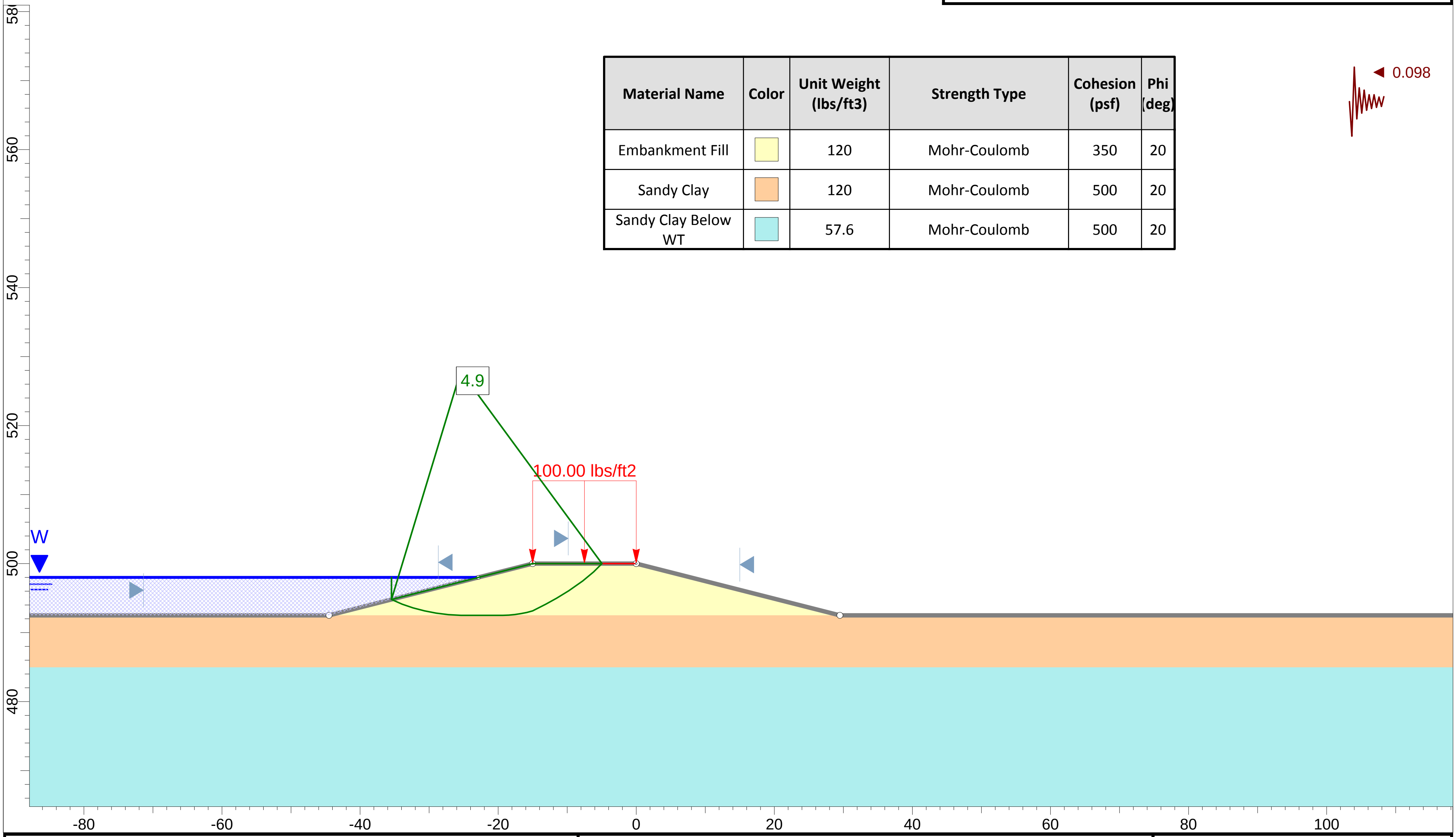


Profile "K" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-24a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "K" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

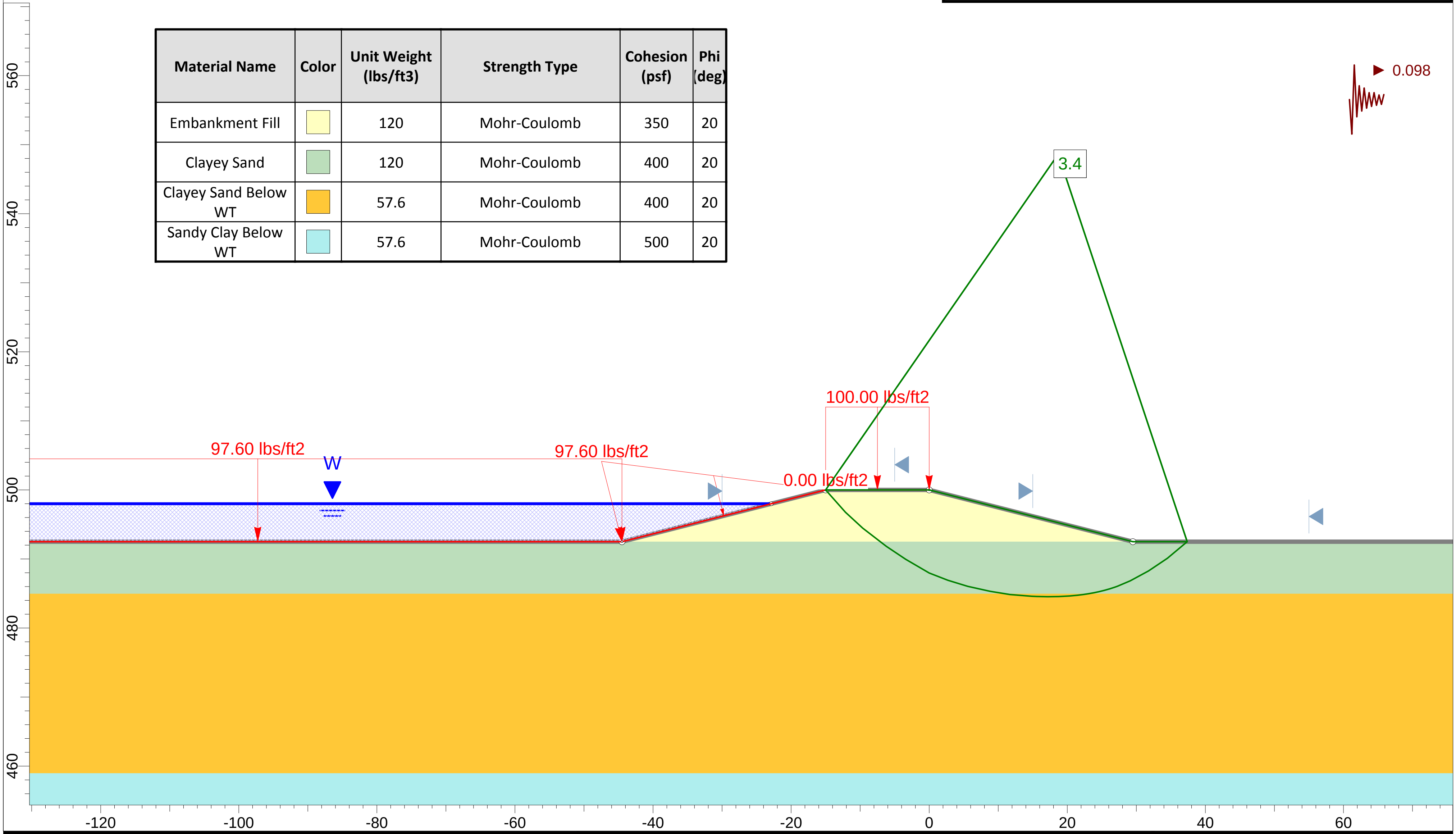
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-24b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



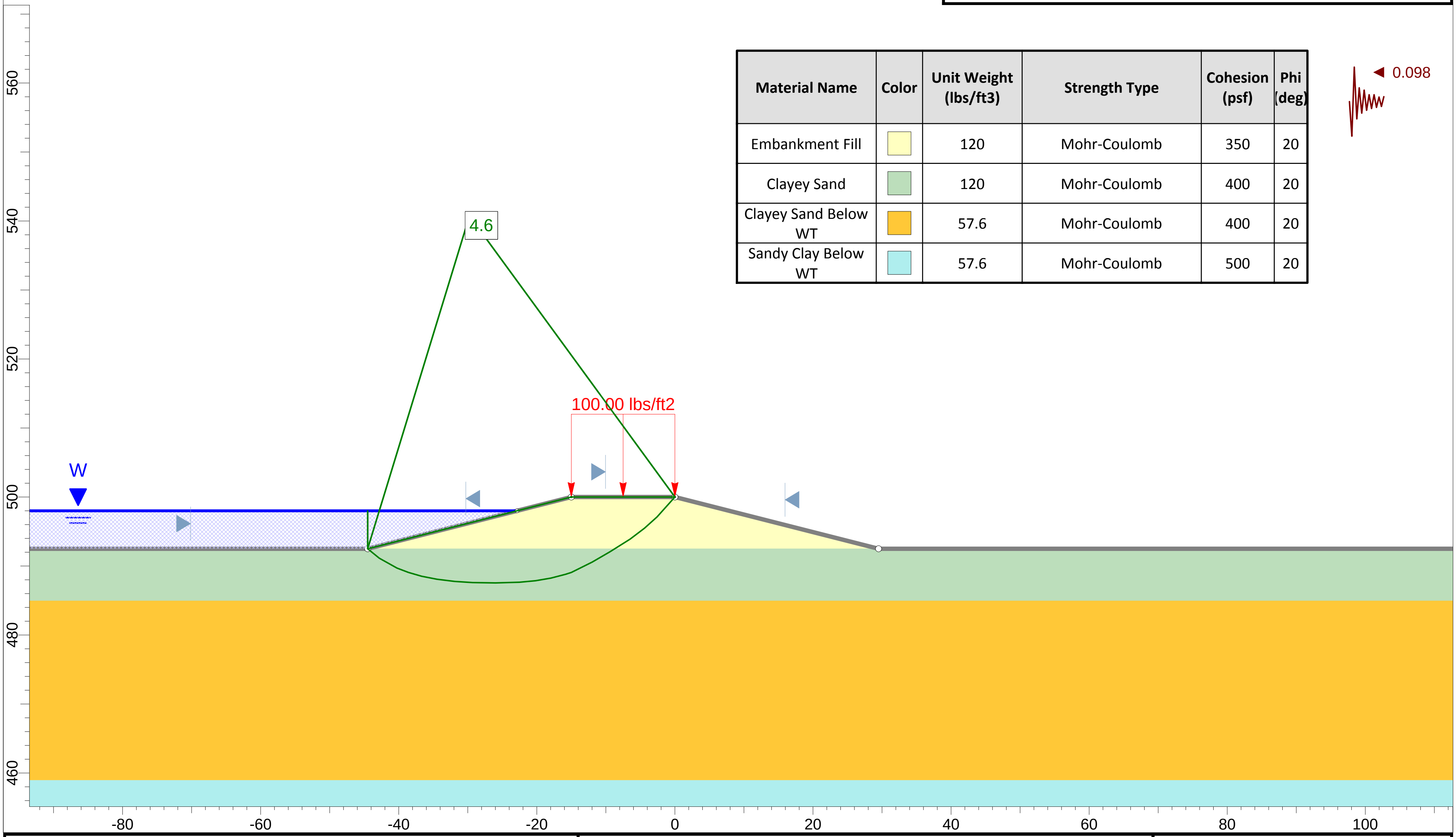
Profile "L" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-25a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "L" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

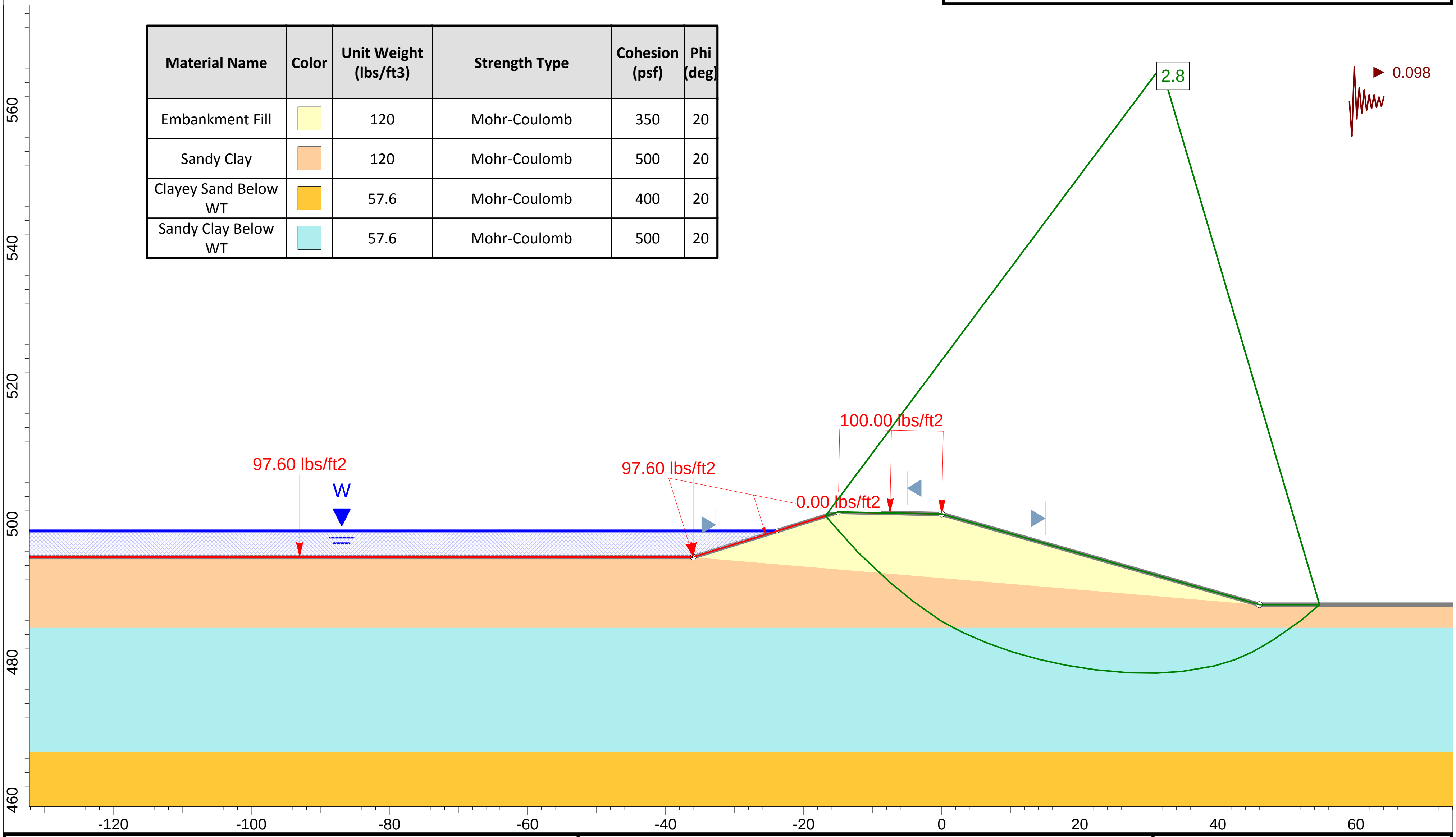
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-25b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



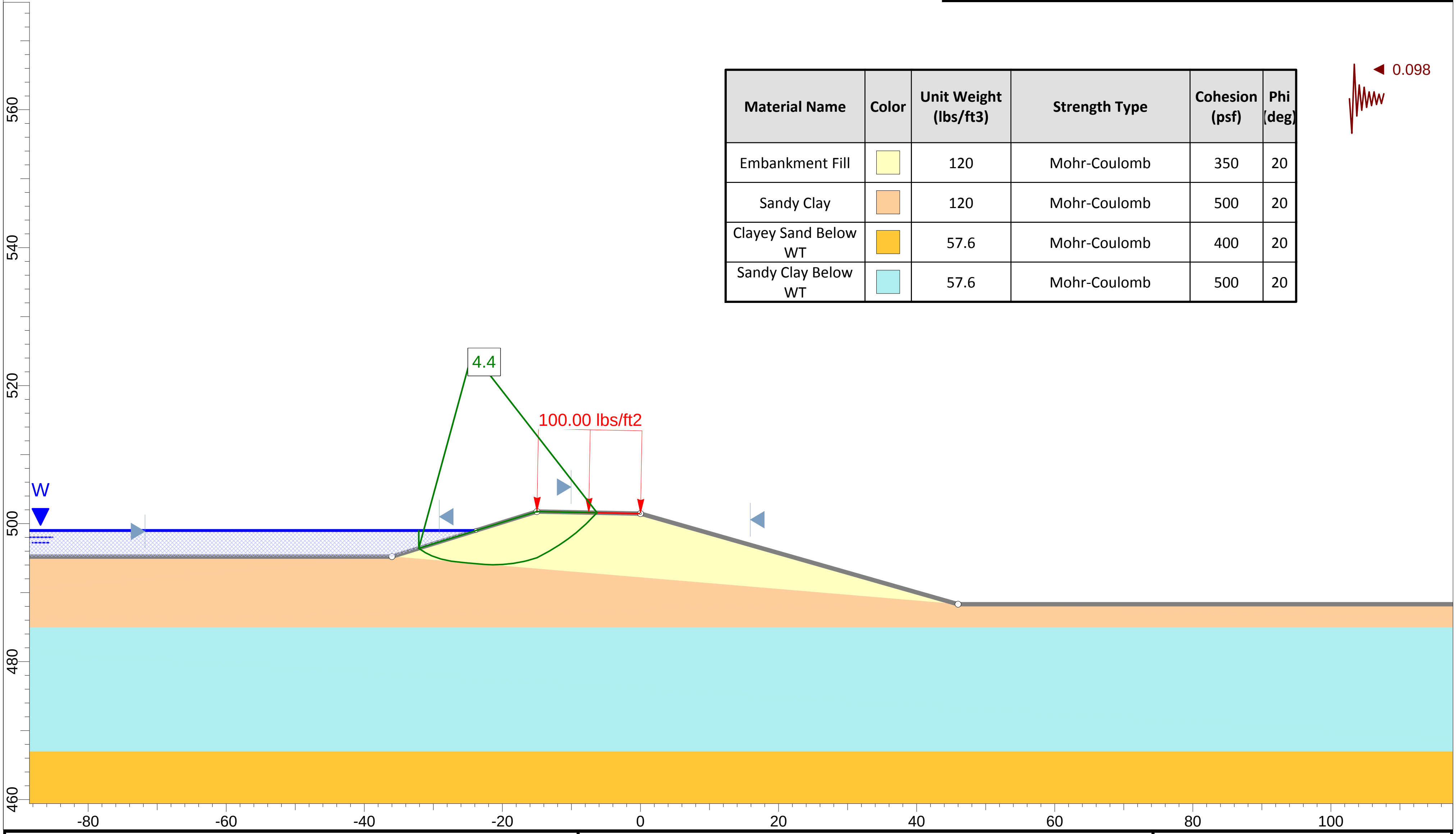
Profile "M" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-26a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



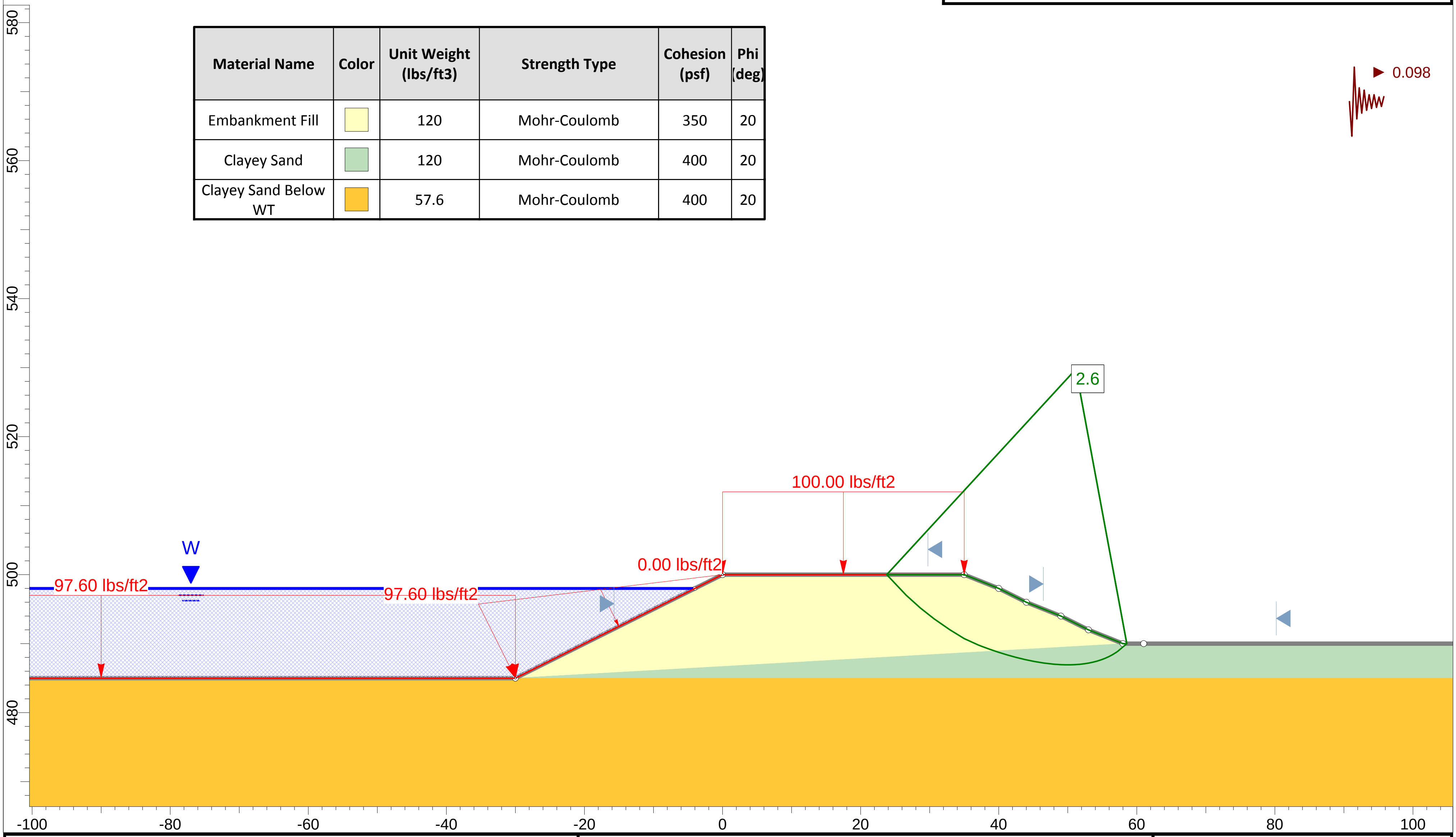
Profile "M" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-26b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



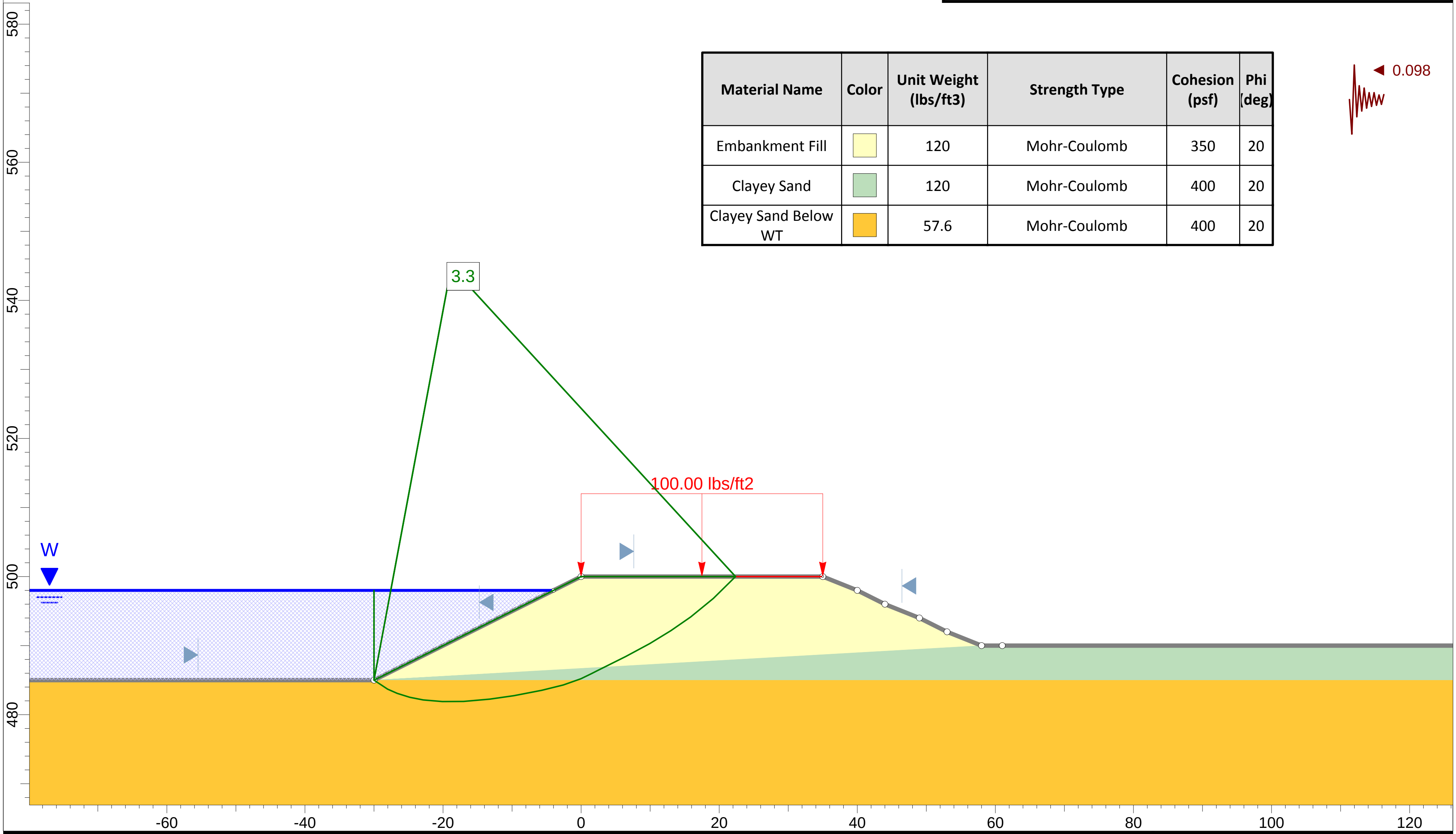
Profile "N" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-27a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

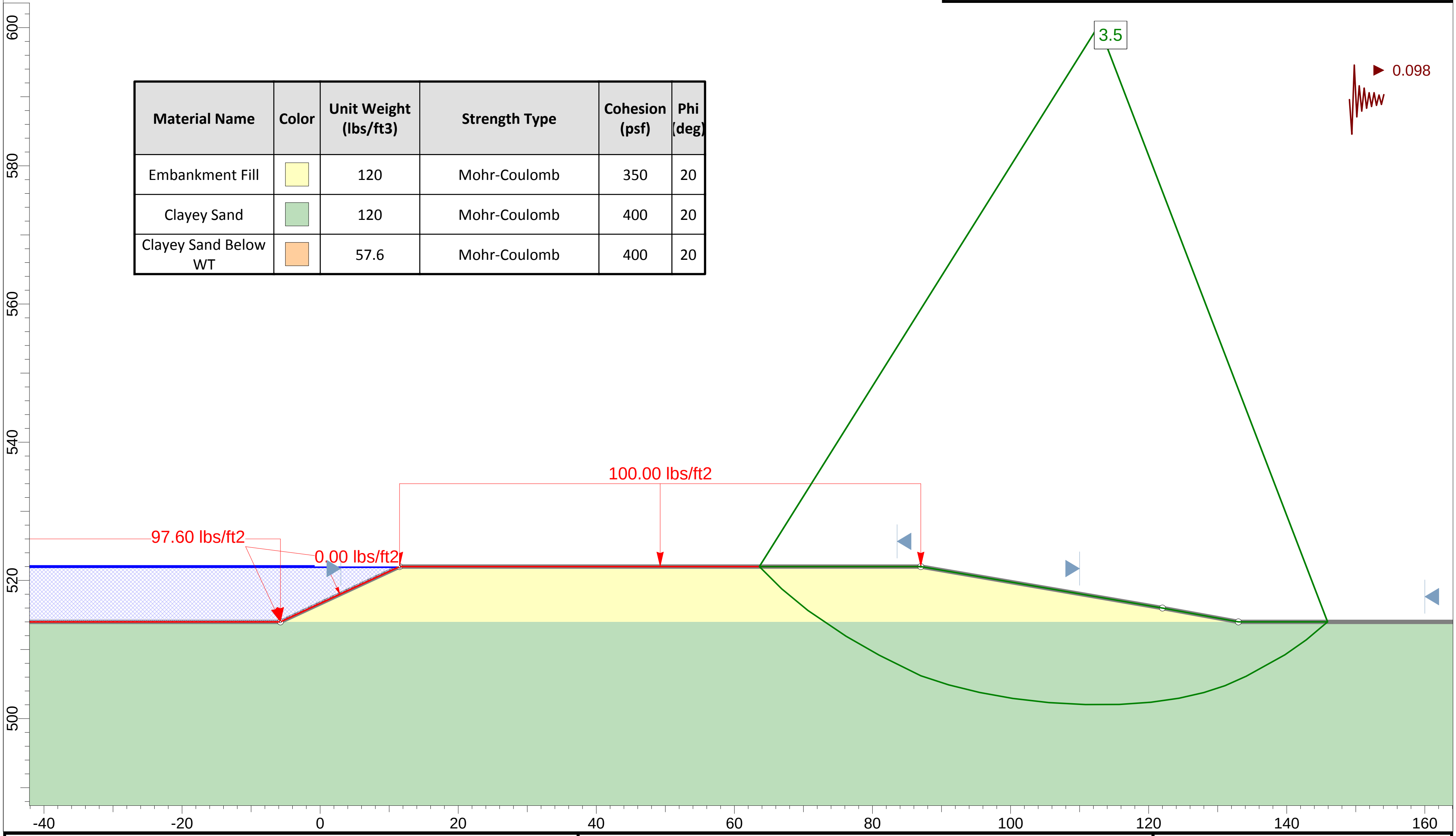
Profile "N" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-27b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



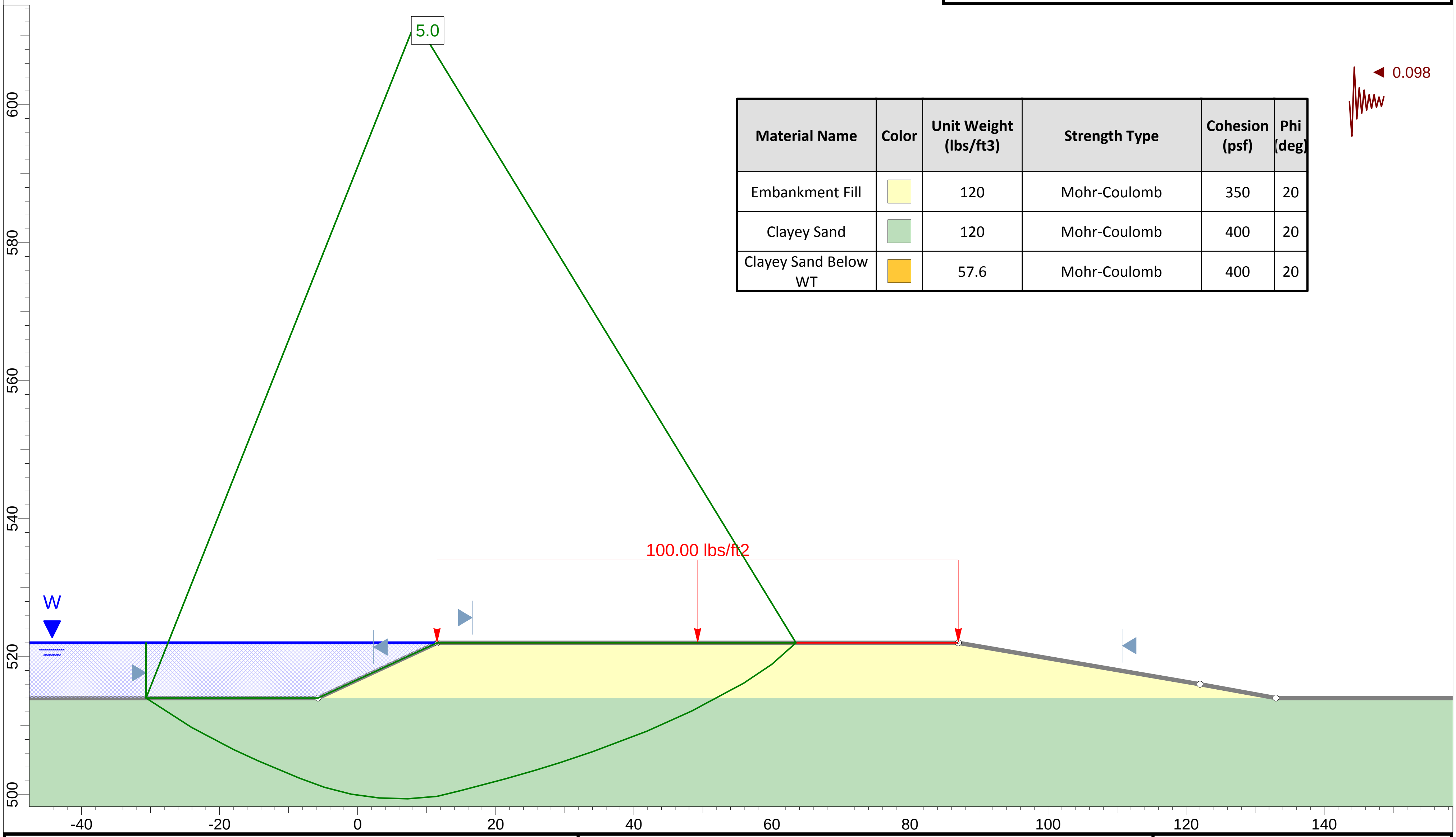
Profile "A" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-28a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "A" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

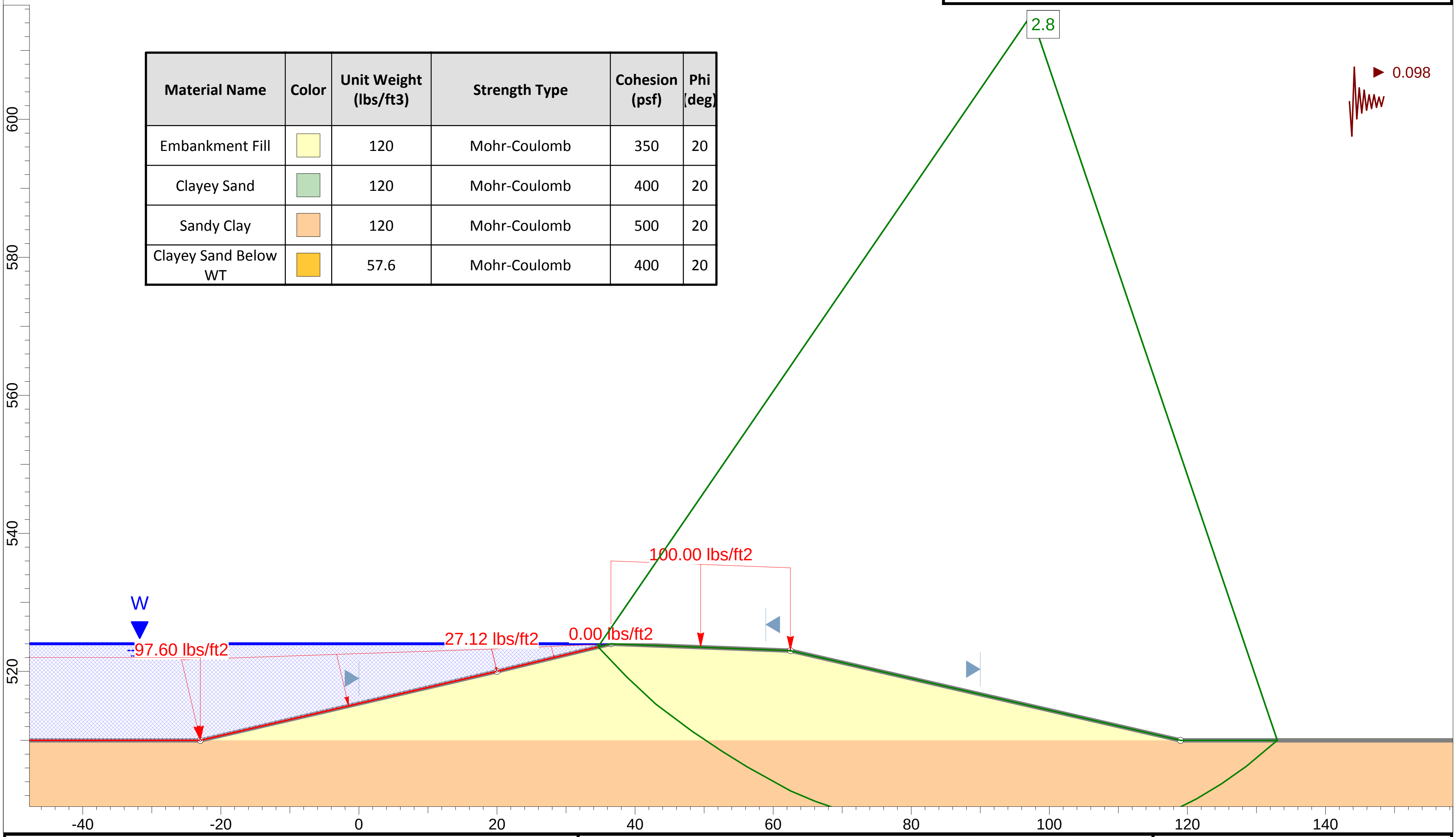
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-28b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20



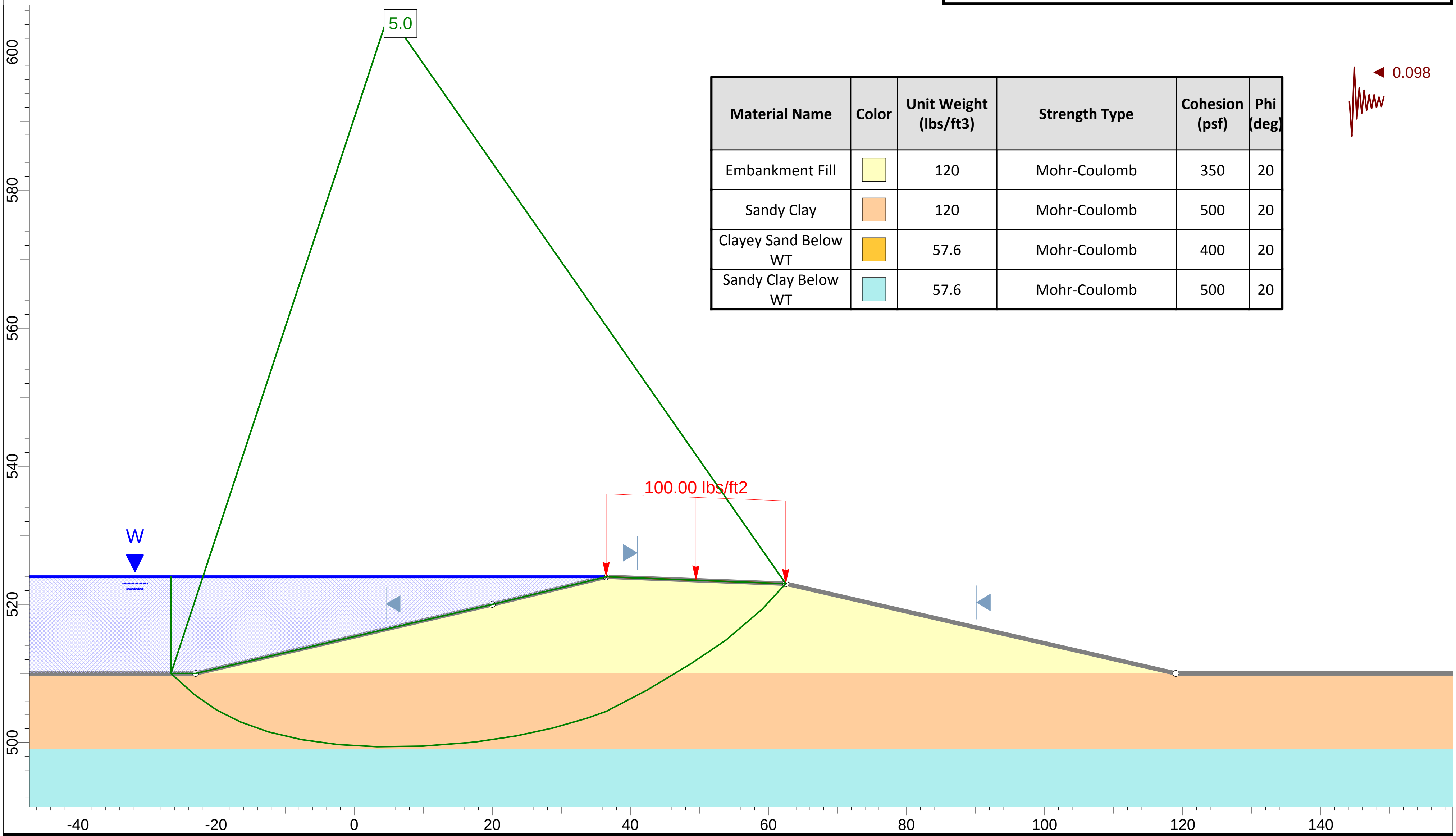
Profile "B" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-29a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "B" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

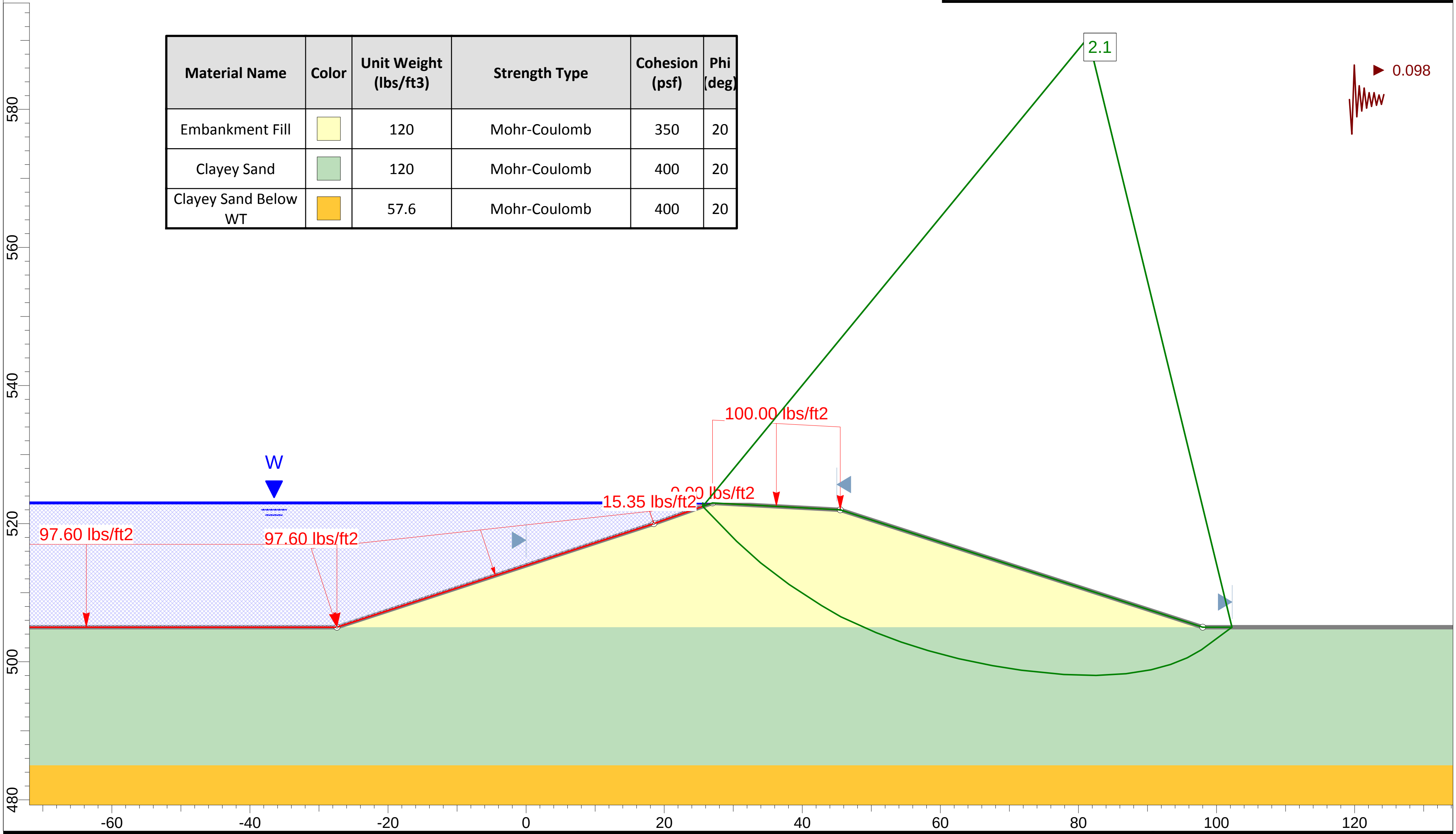
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-29b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



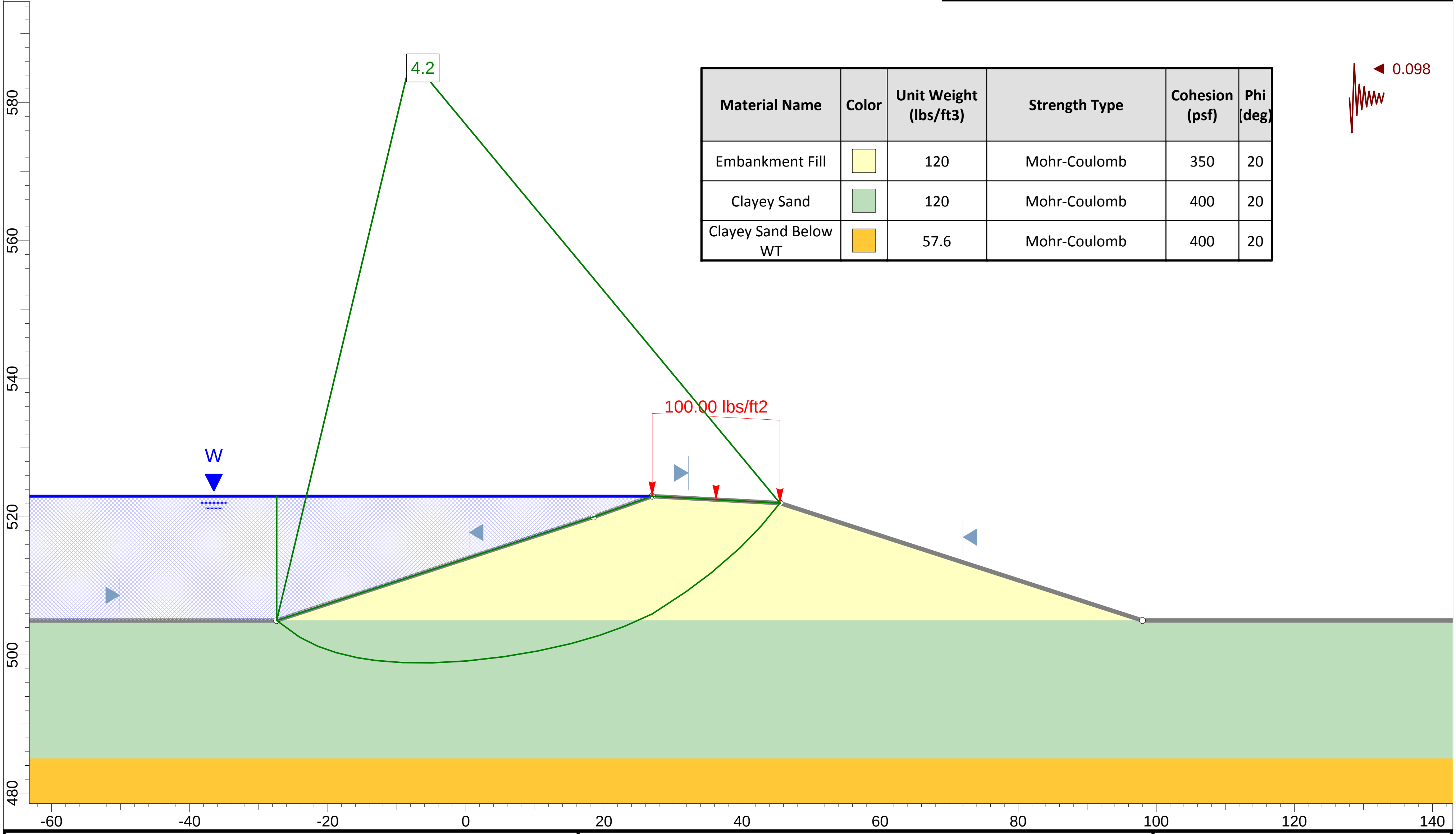
Profile "C" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-30a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "C" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

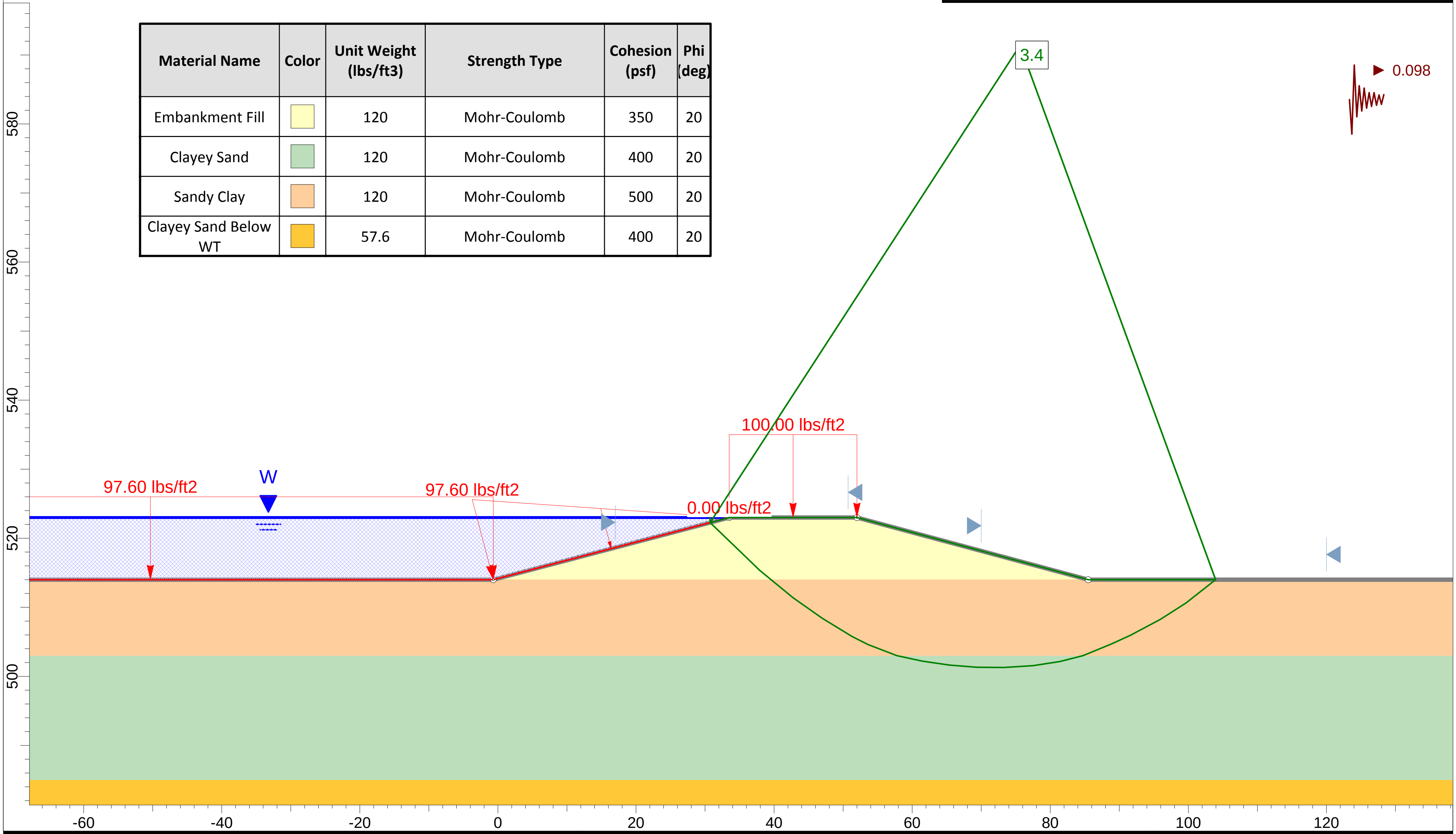
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-30b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20



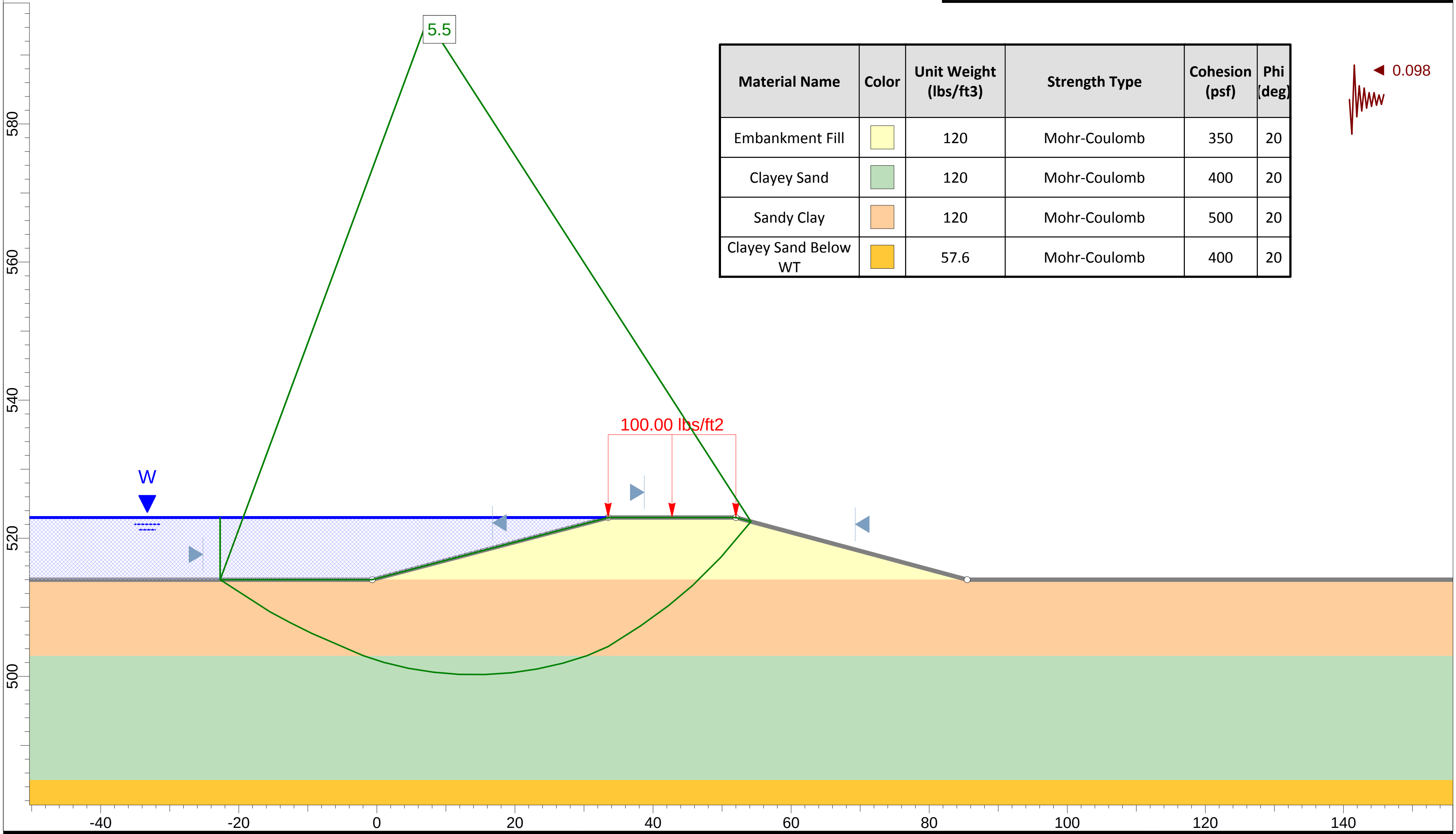
Profile "D" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-31a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

Profile "D" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

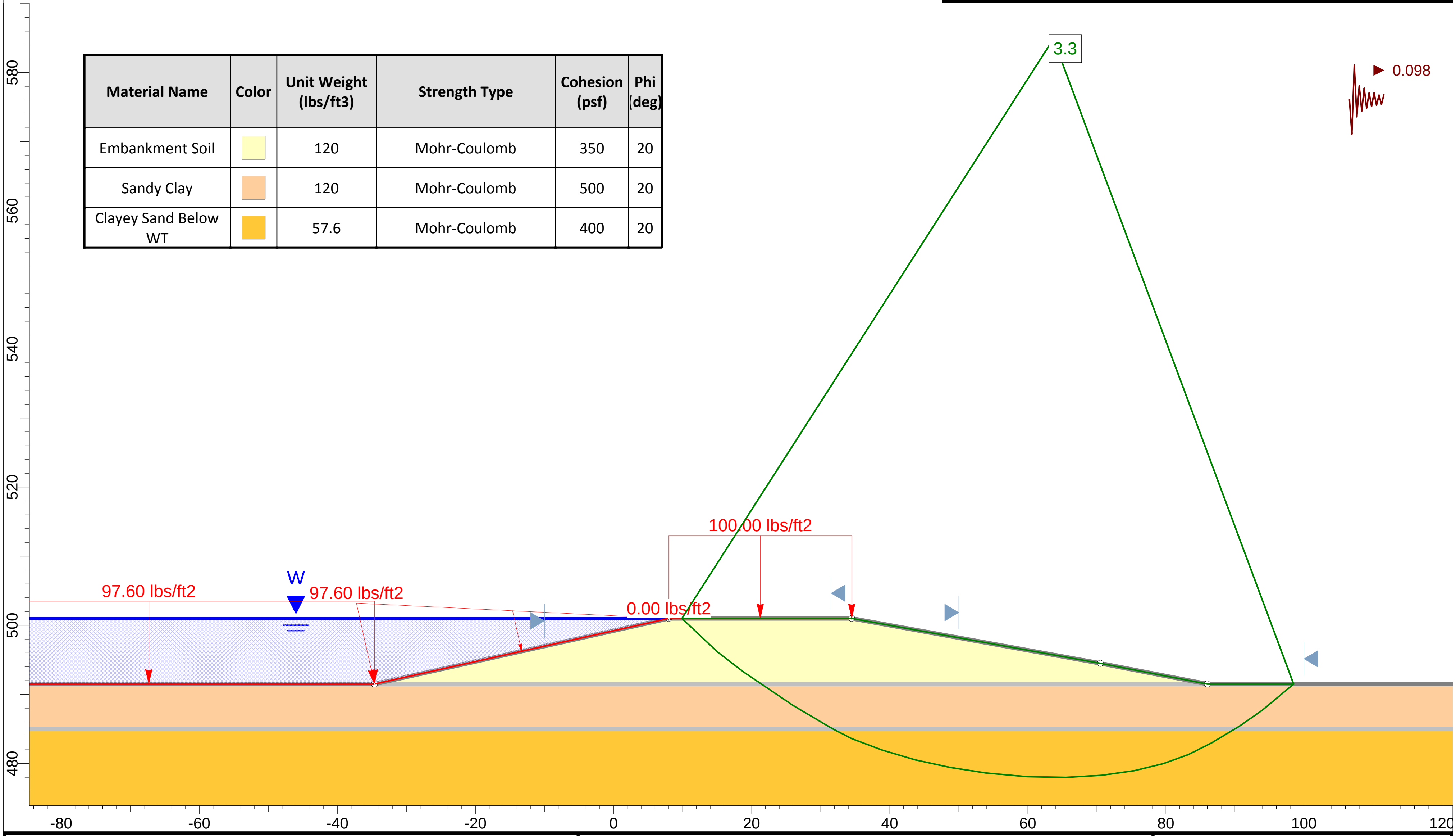
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-31b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Soil	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

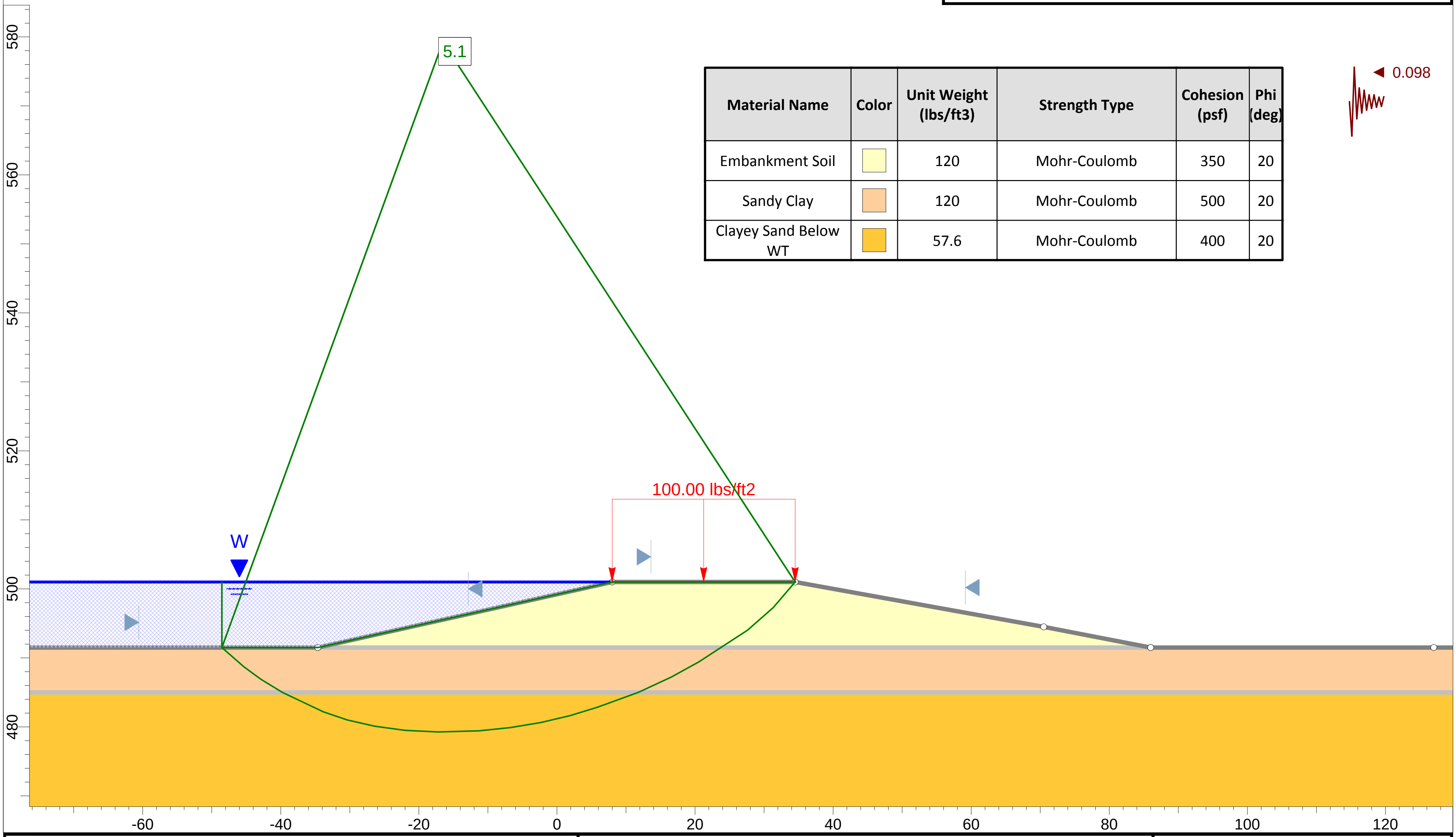


Profile "E" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-32a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Soil	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "E" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

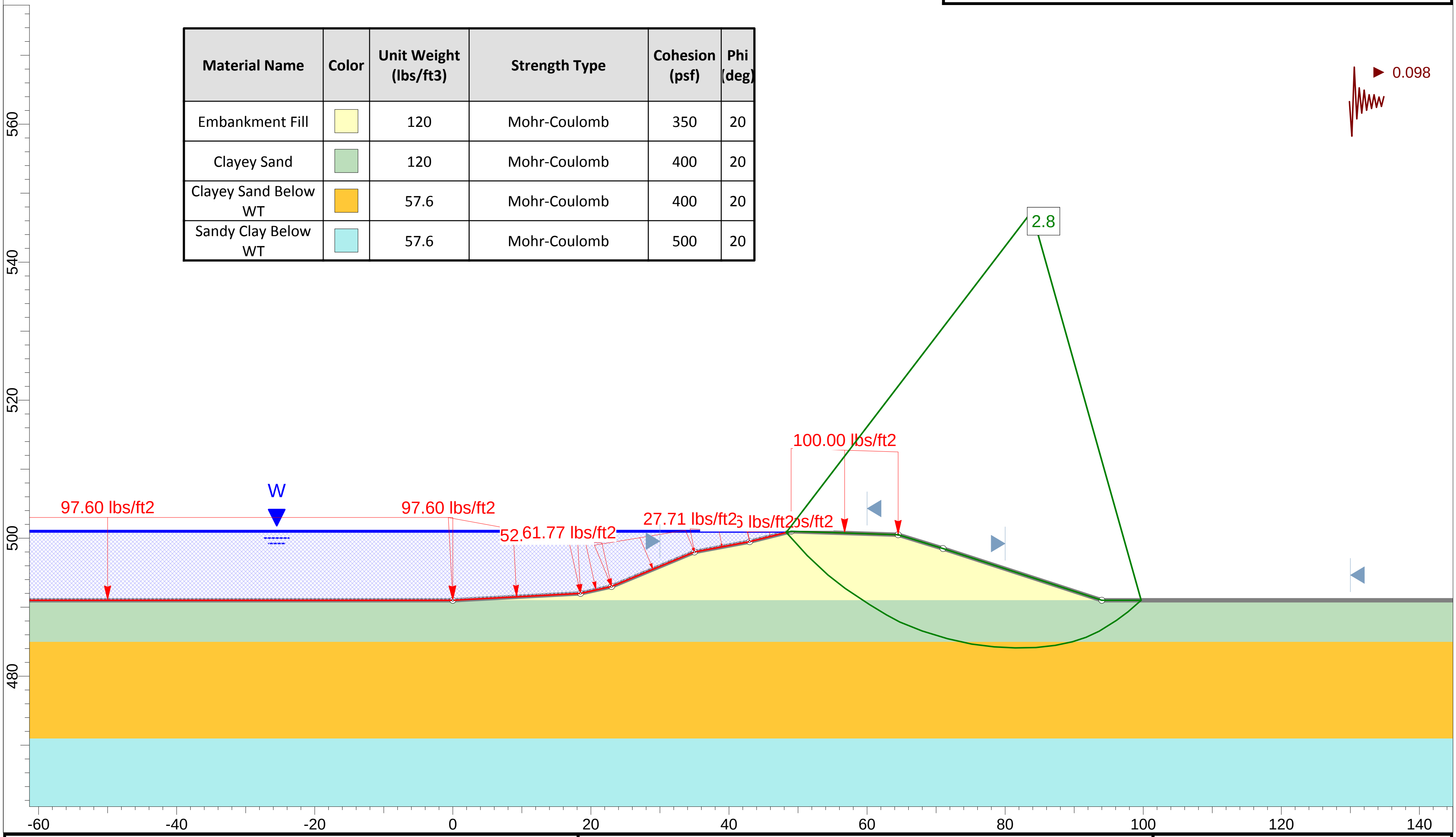
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-32b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "F" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

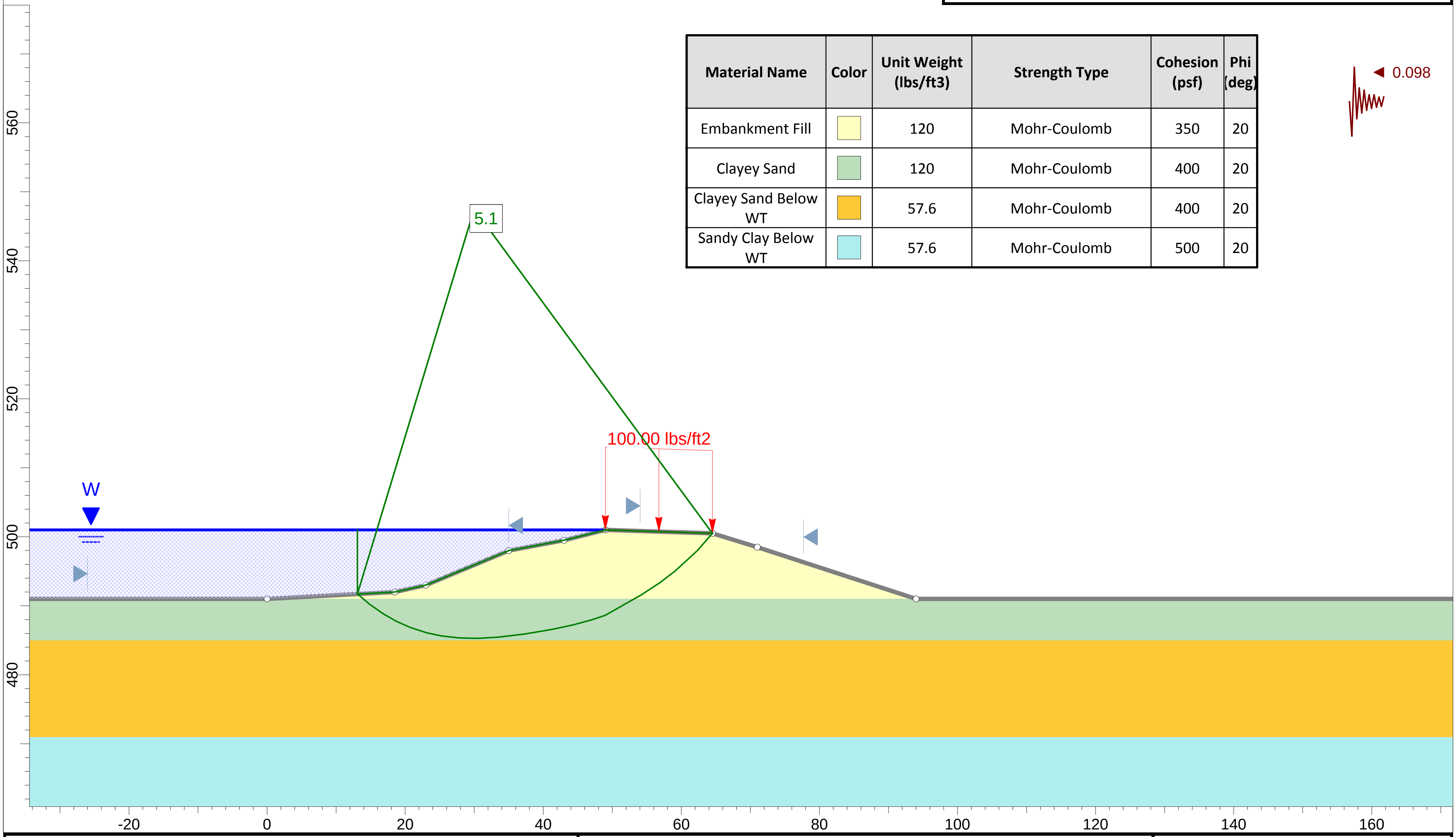
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-33a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "F" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

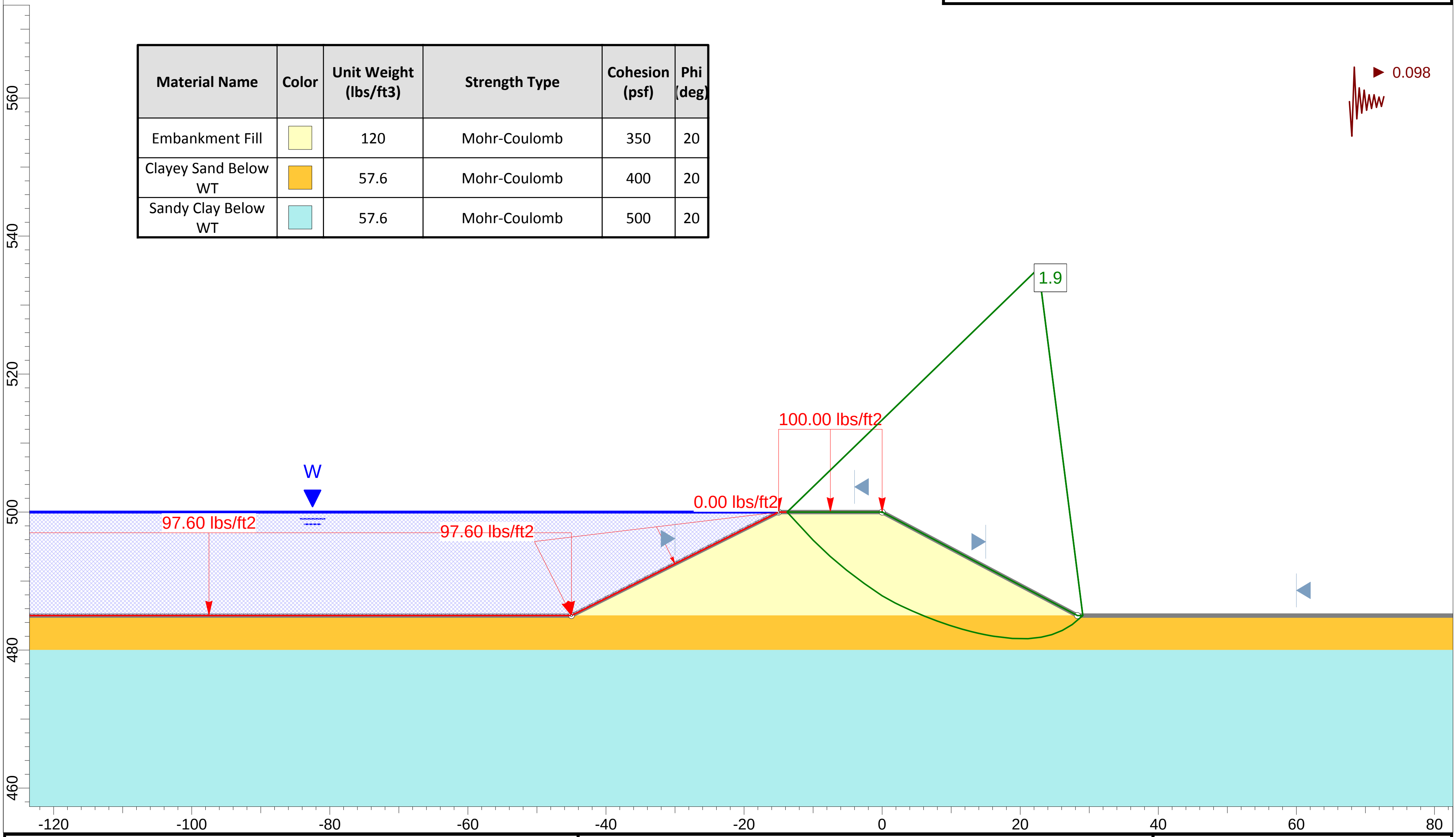
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-33b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



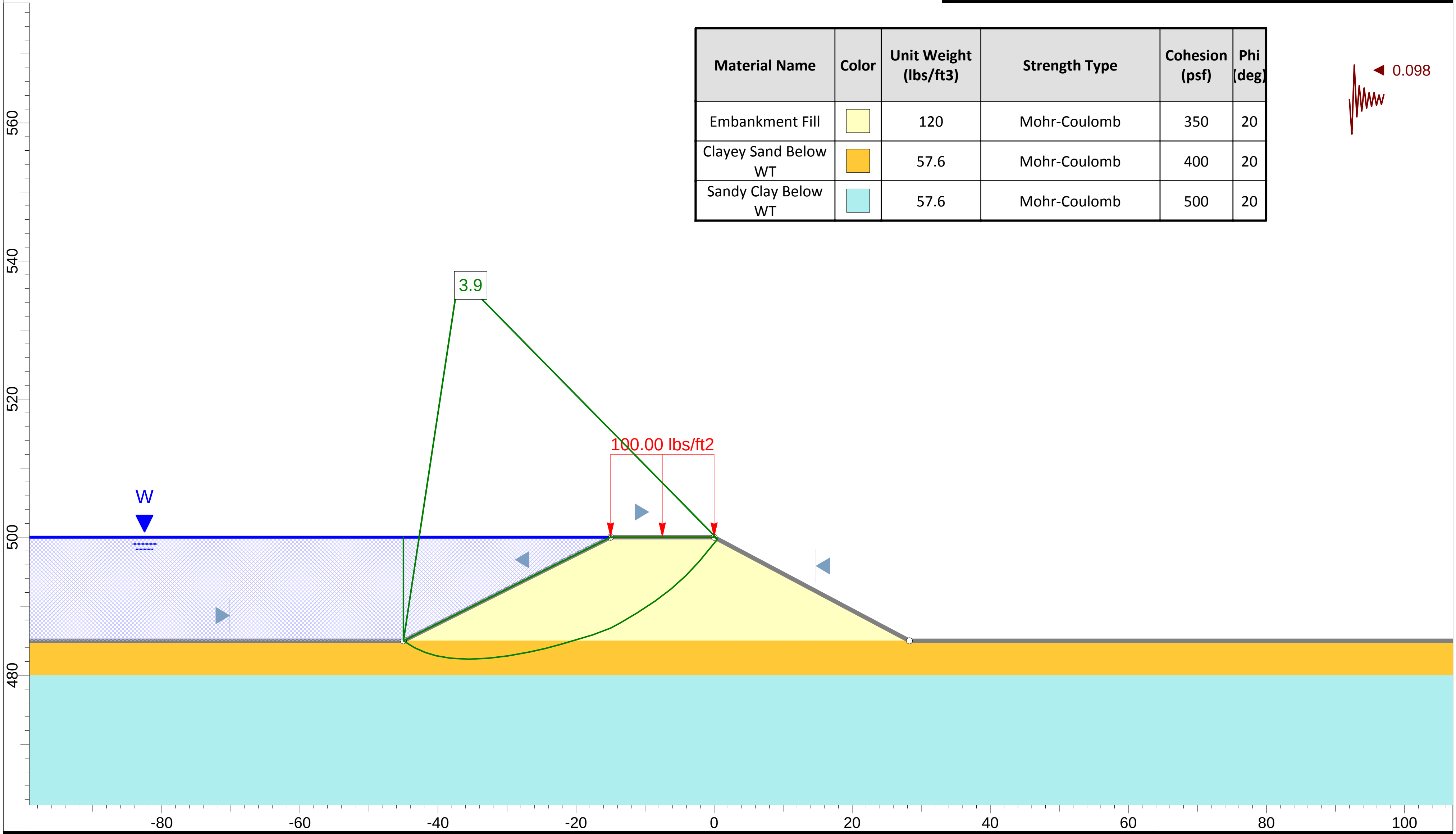
Profile "G" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-34a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "G" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

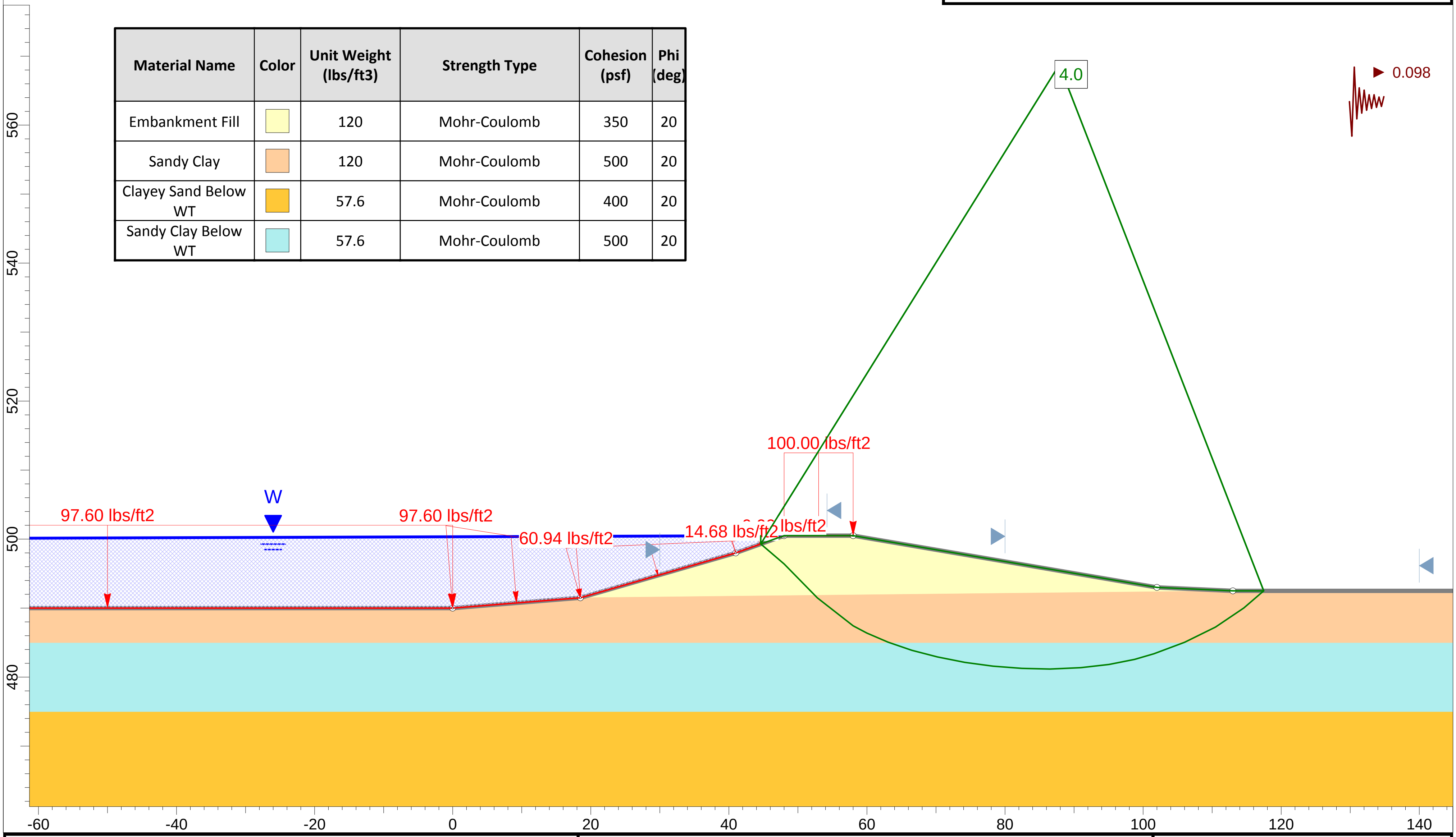
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-34b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



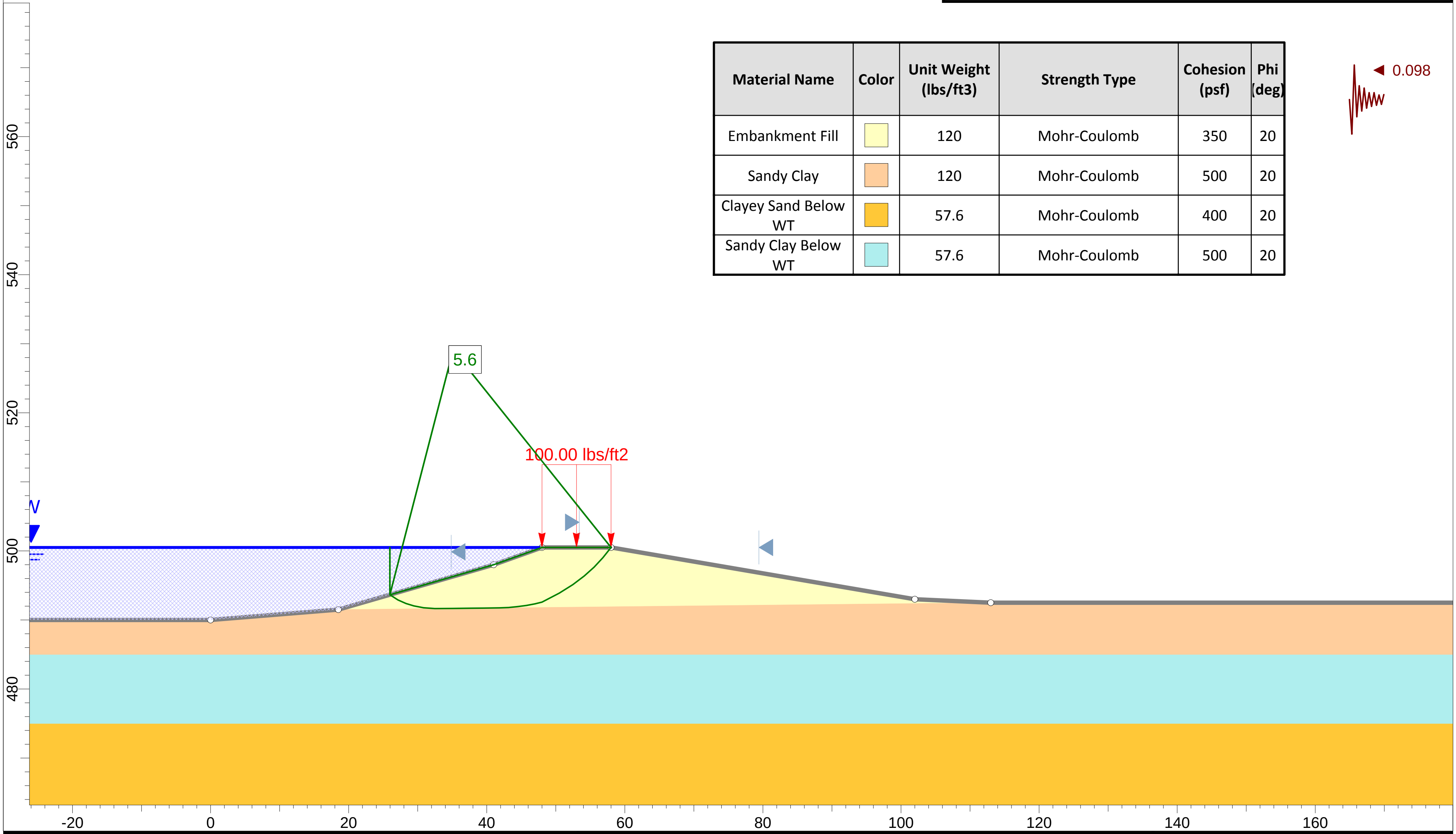
Profile "H" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-35a

RABA KISTNER CONSULTANTS

Global Stability Analysis



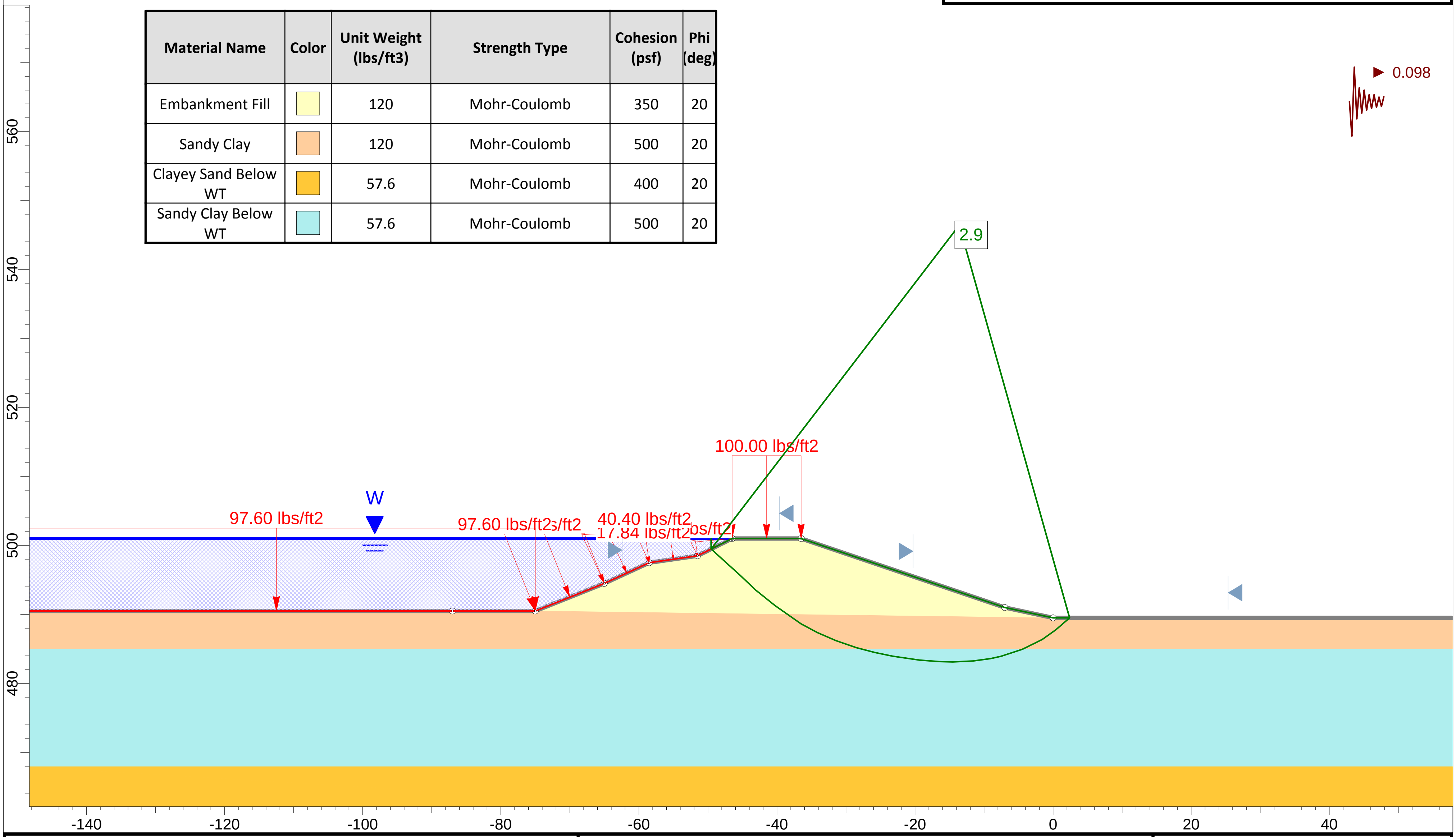
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "H" - Maximum Pool
Ash Pond Berms - Calaveras Lake Power Plant

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-35b

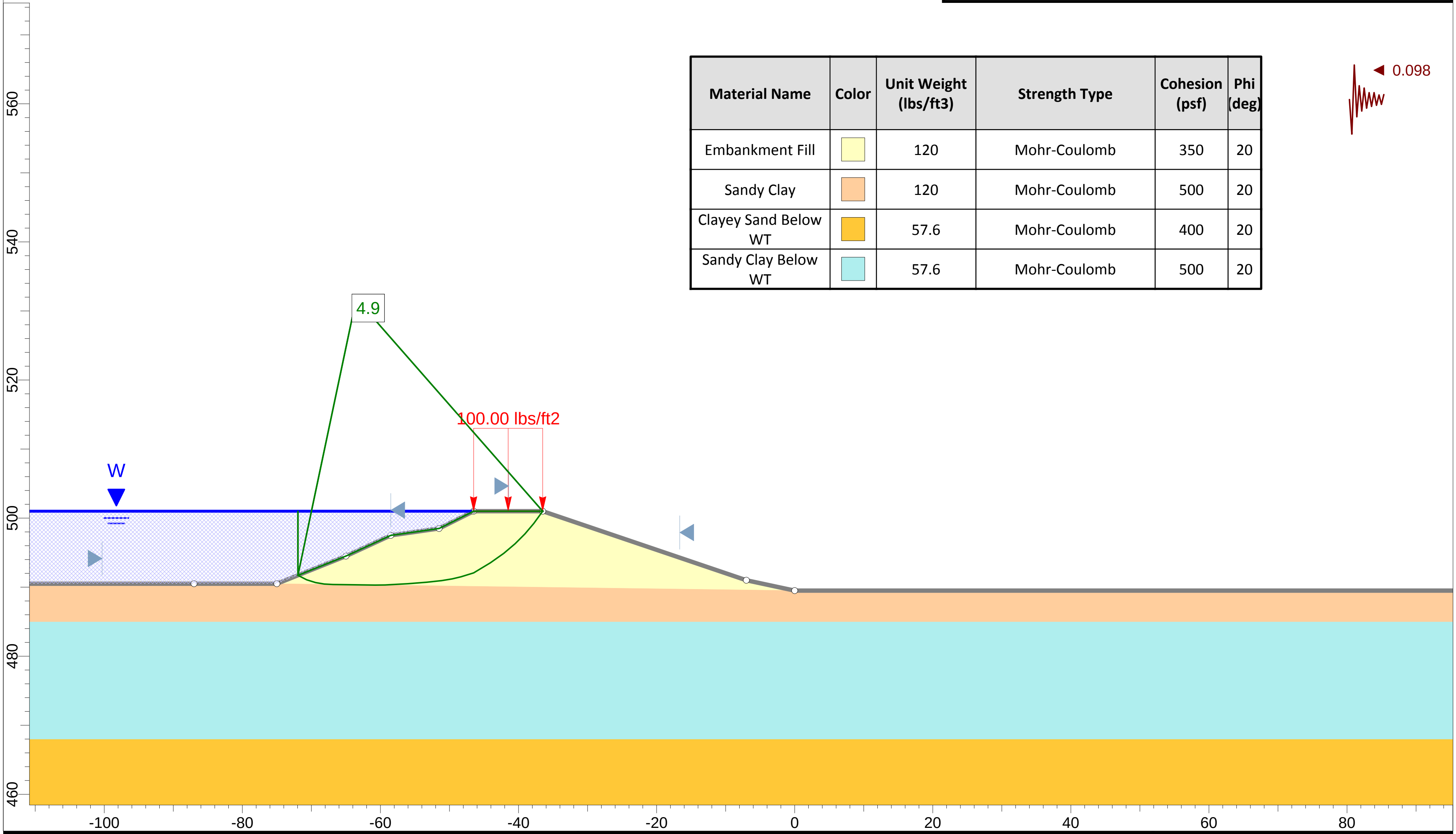
Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "I" - Maximum Pool Ash Pond Berms - Spruce/Deely Generation Units	Raba Kistner Consultants, Inc. ASA12-098-00	Figure D-36a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "I" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

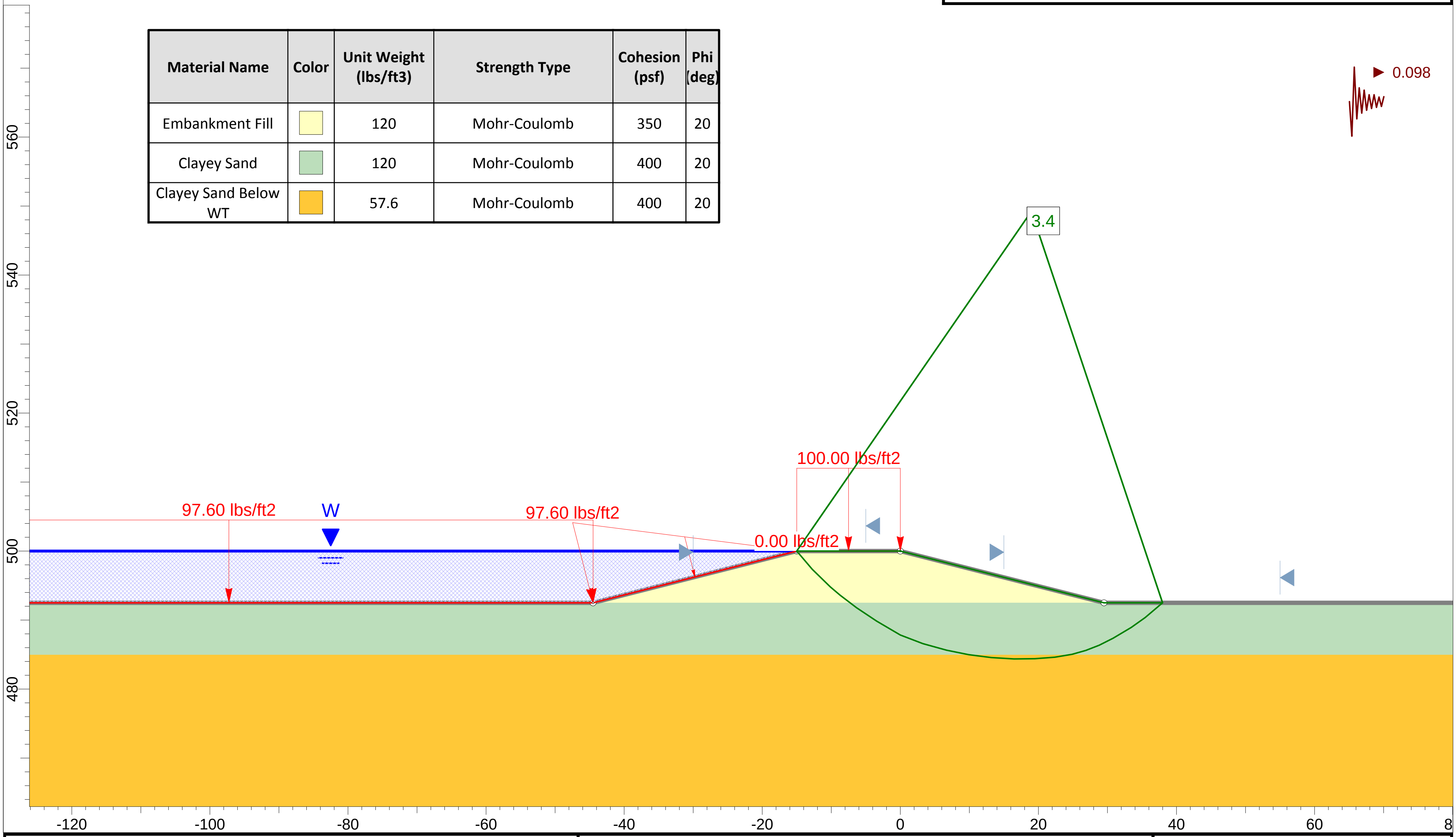
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-36b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



Profile "J" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

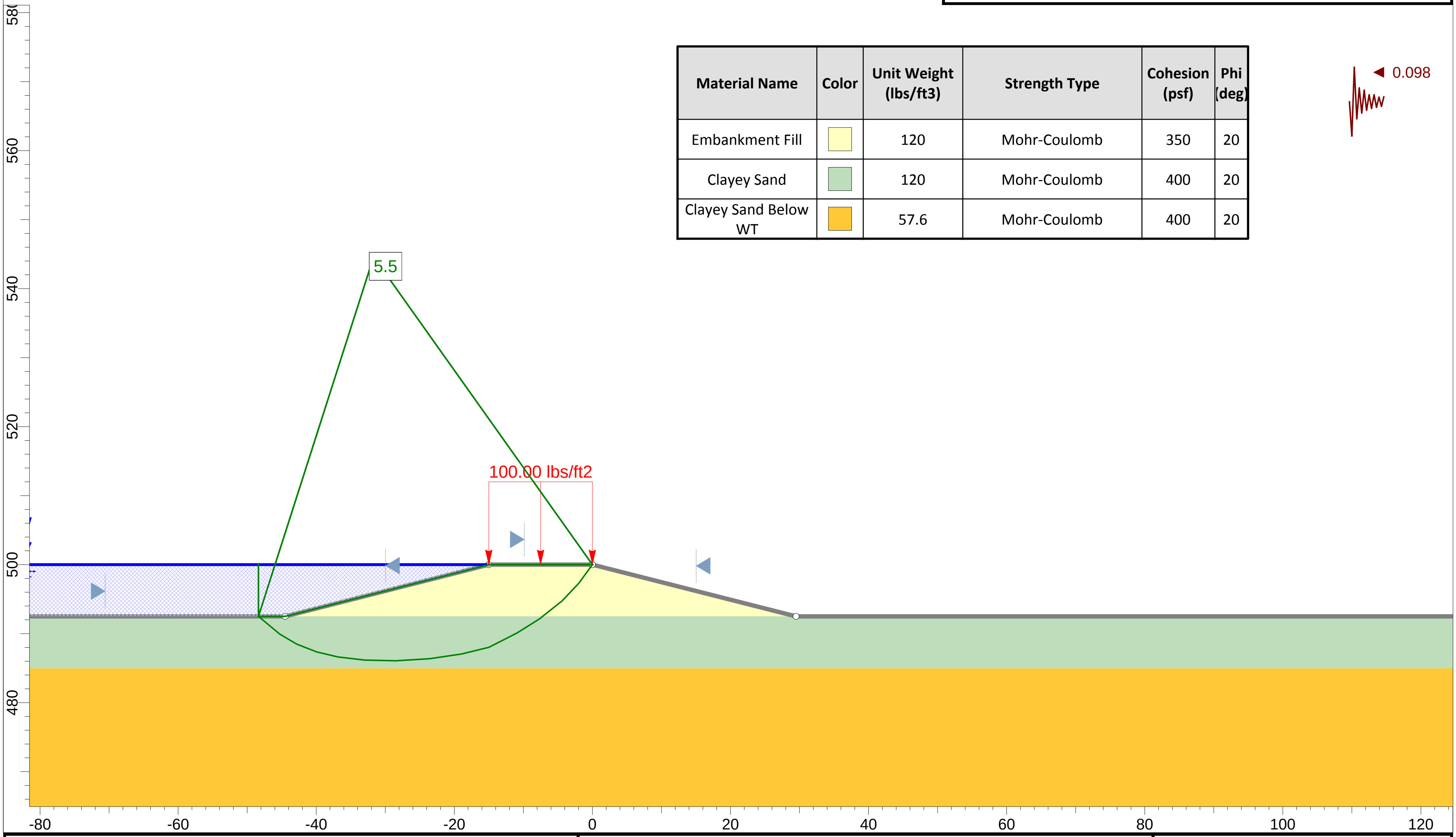
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-37a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



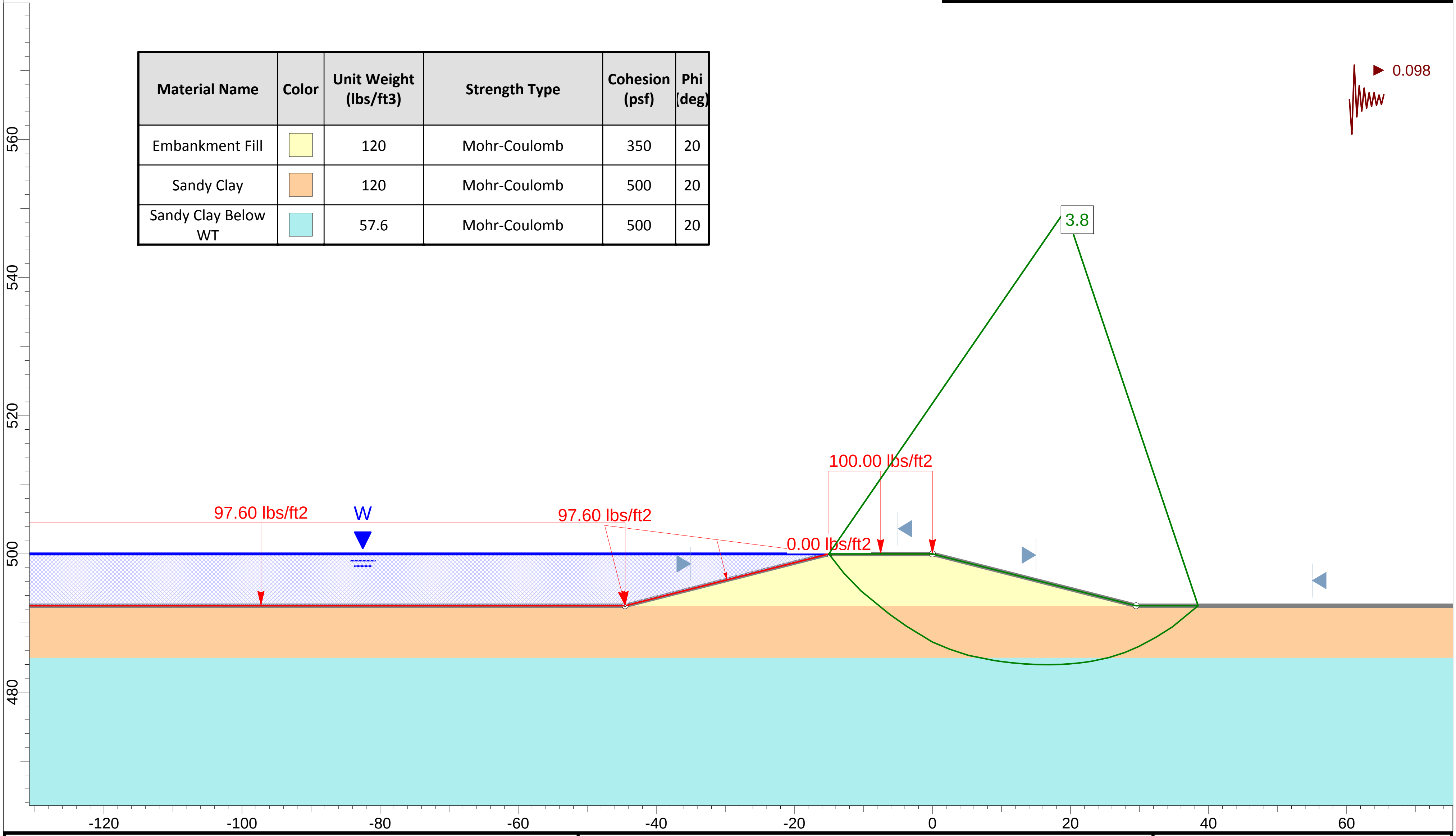
Profile "J" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-37b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

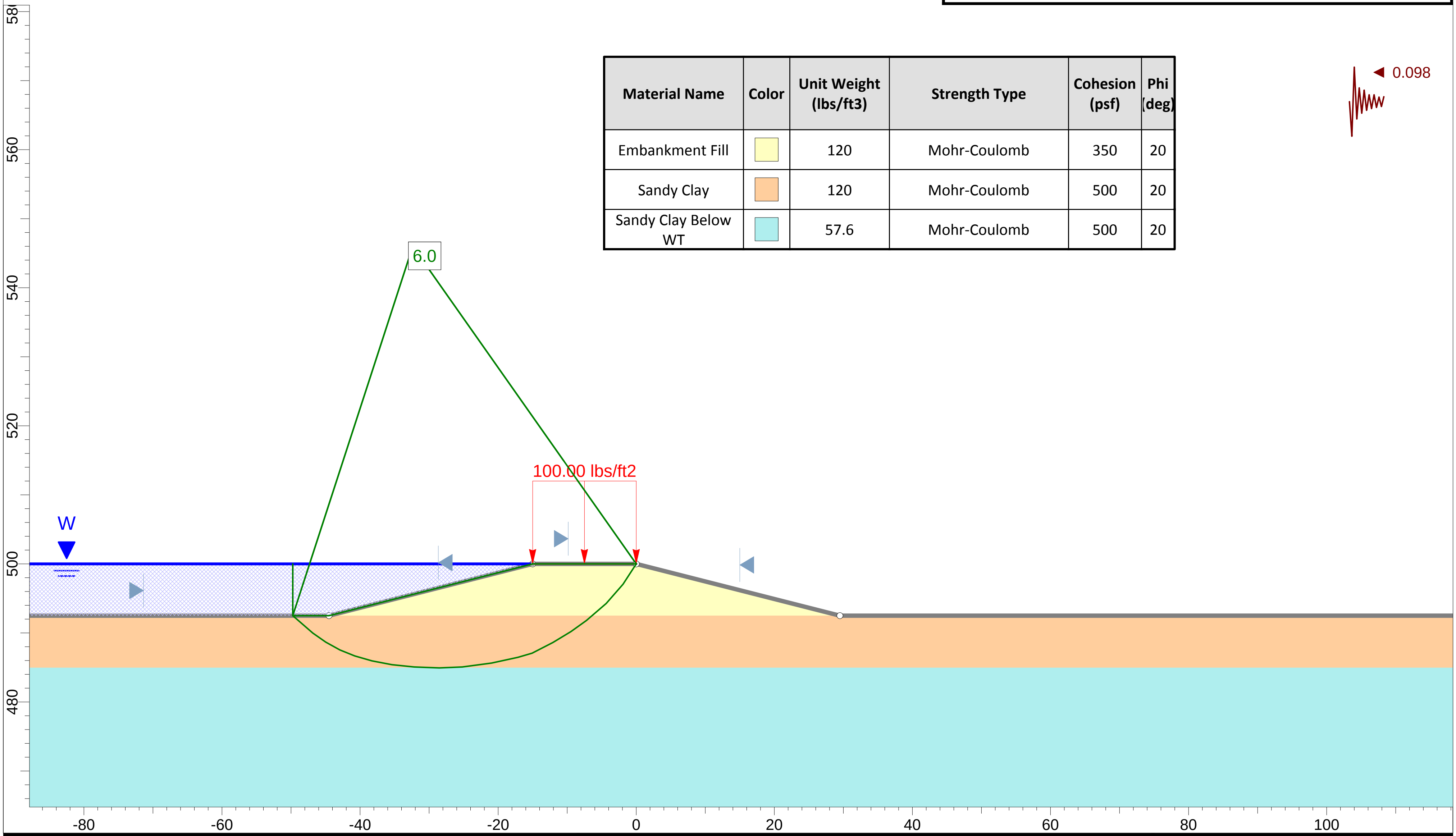
Profile "K" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-38a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "K" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

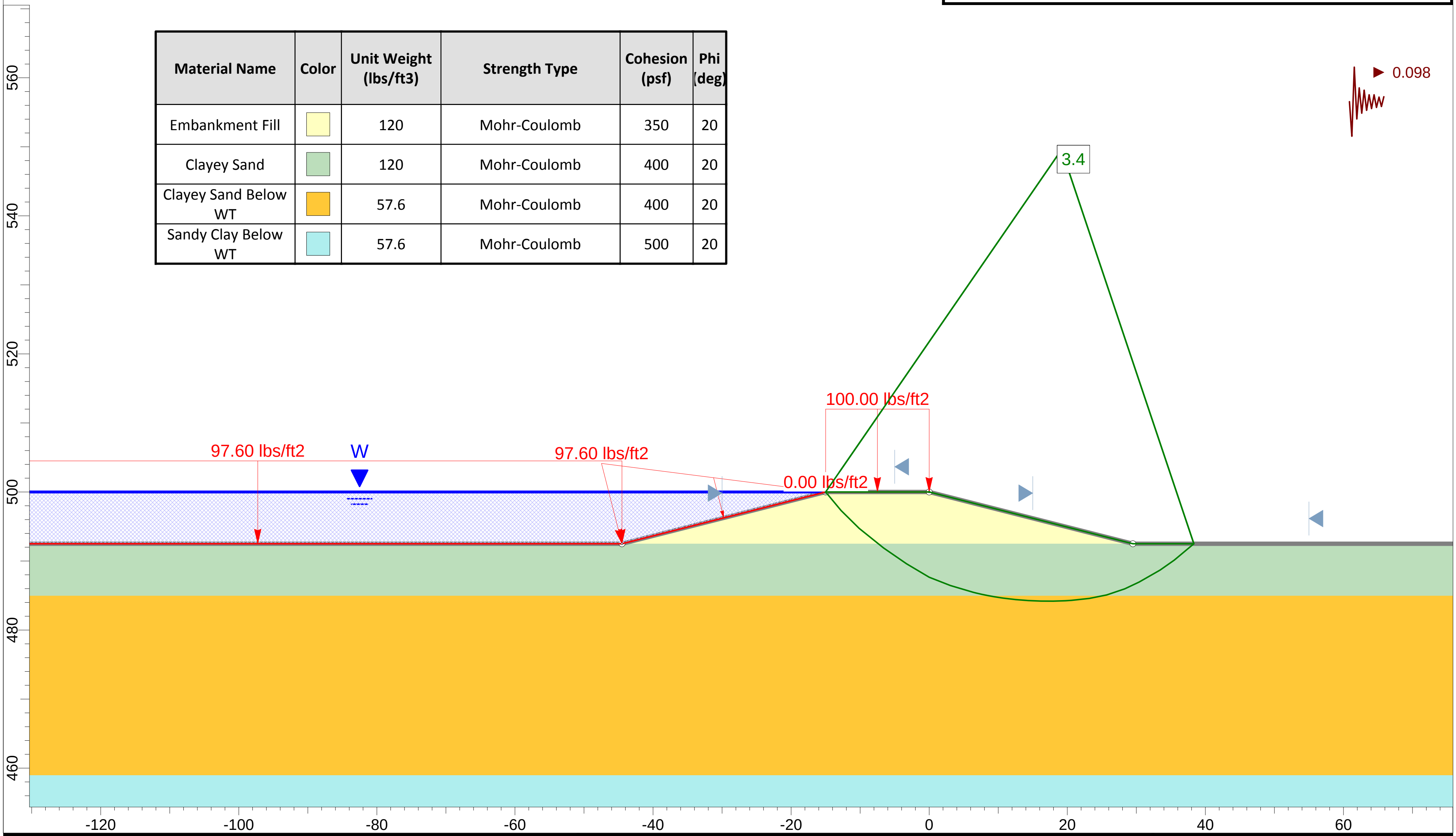
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-38b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "L" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

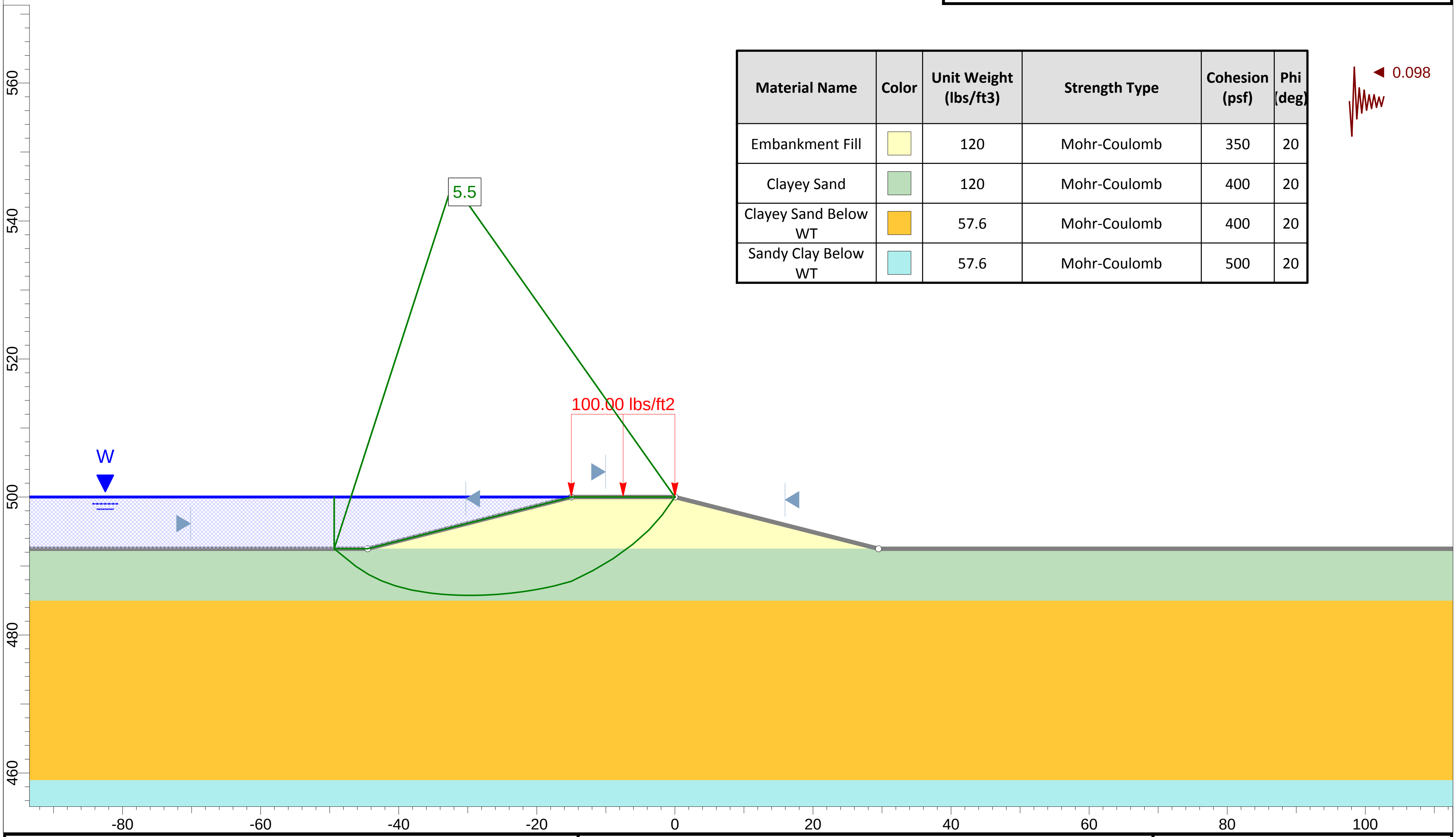
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-39a

RABA KISTNER CONSULTANTS

Global Stability Analysis

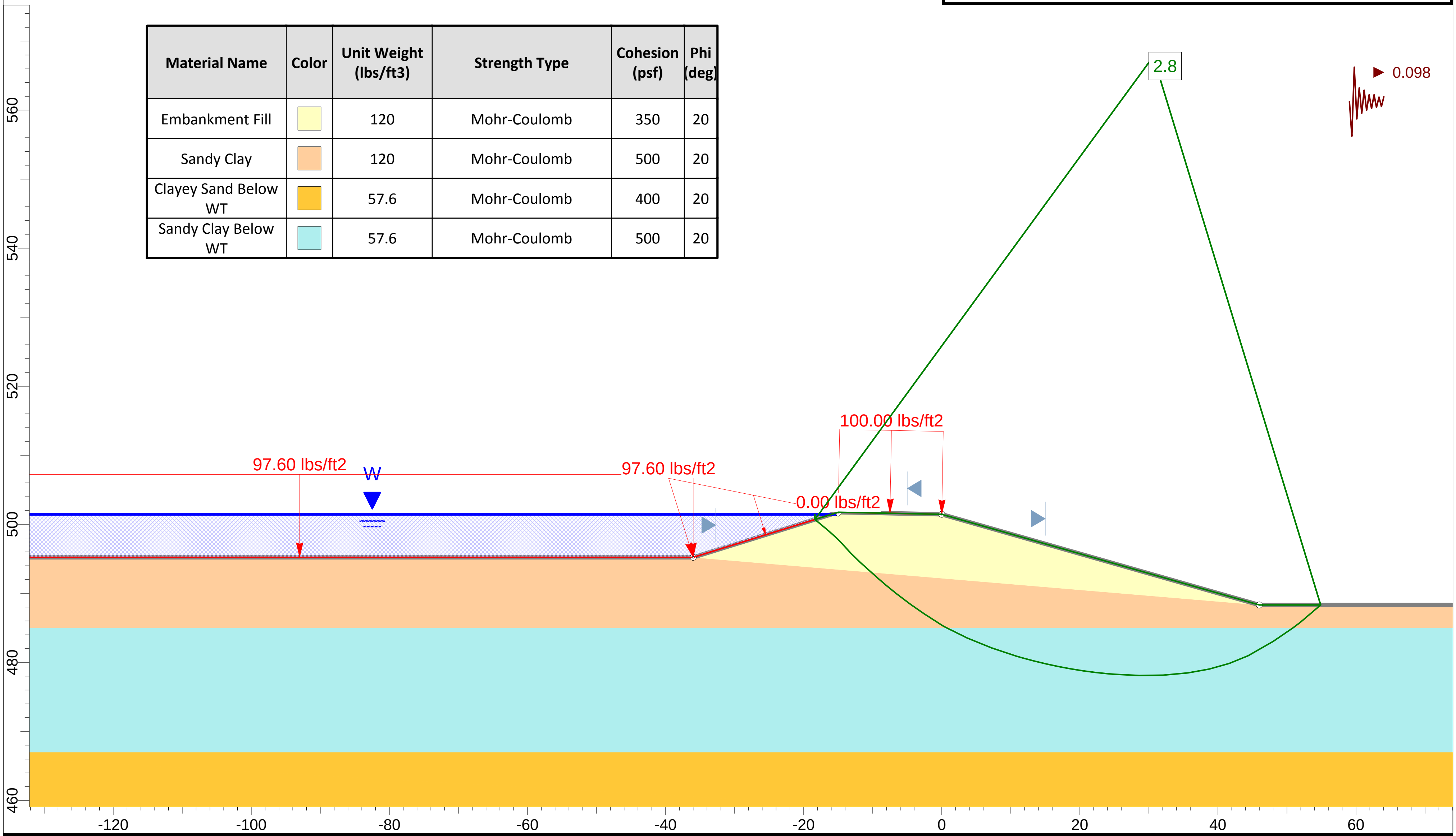
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "L" - Maximum Pool Ash Pond Berms - Spruce/Deely Generation Units	Raba Kistner Consultants, Inc. ASA12-098-00	Figure D-39b RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



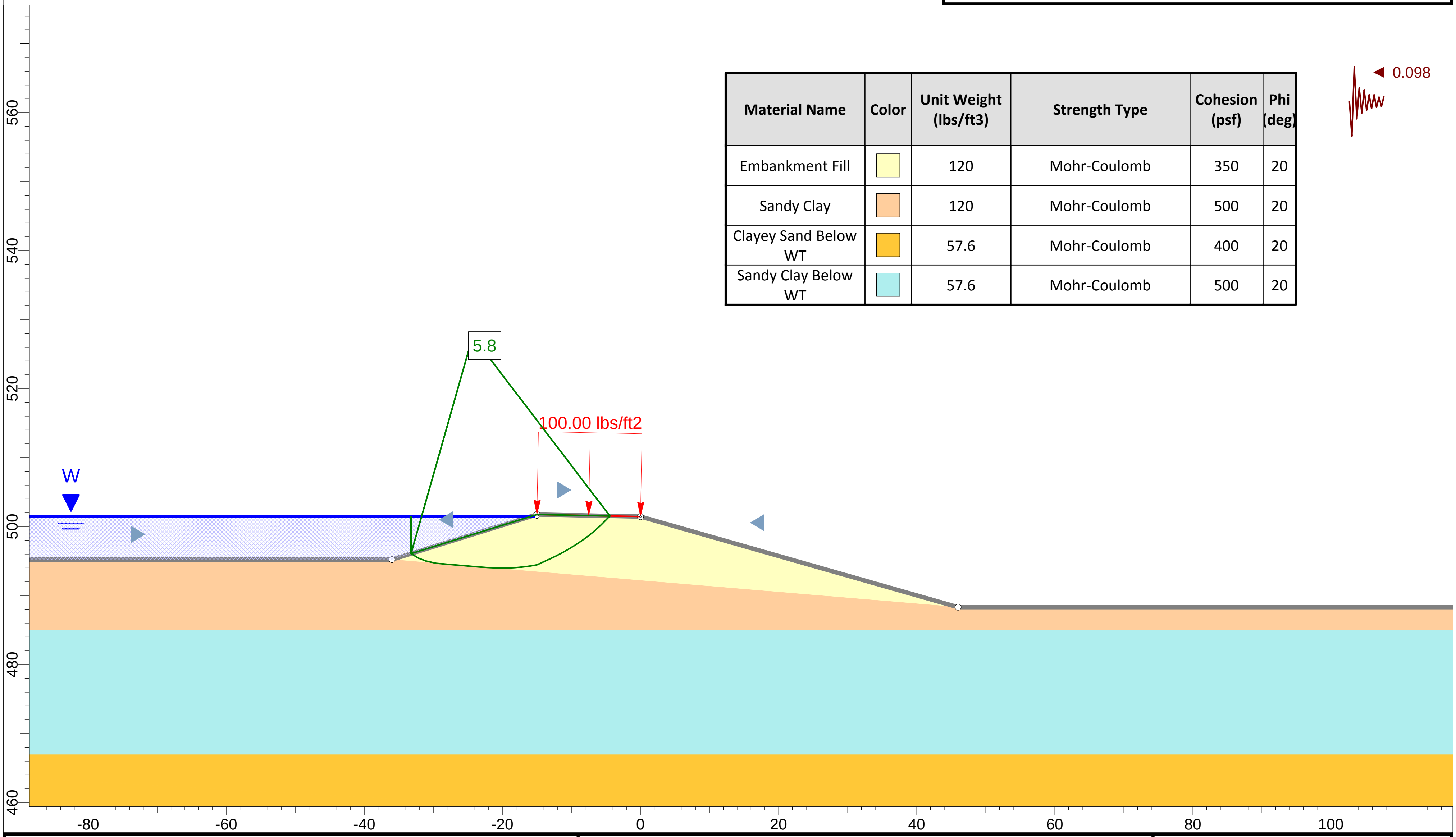
Profile "M" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-40a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

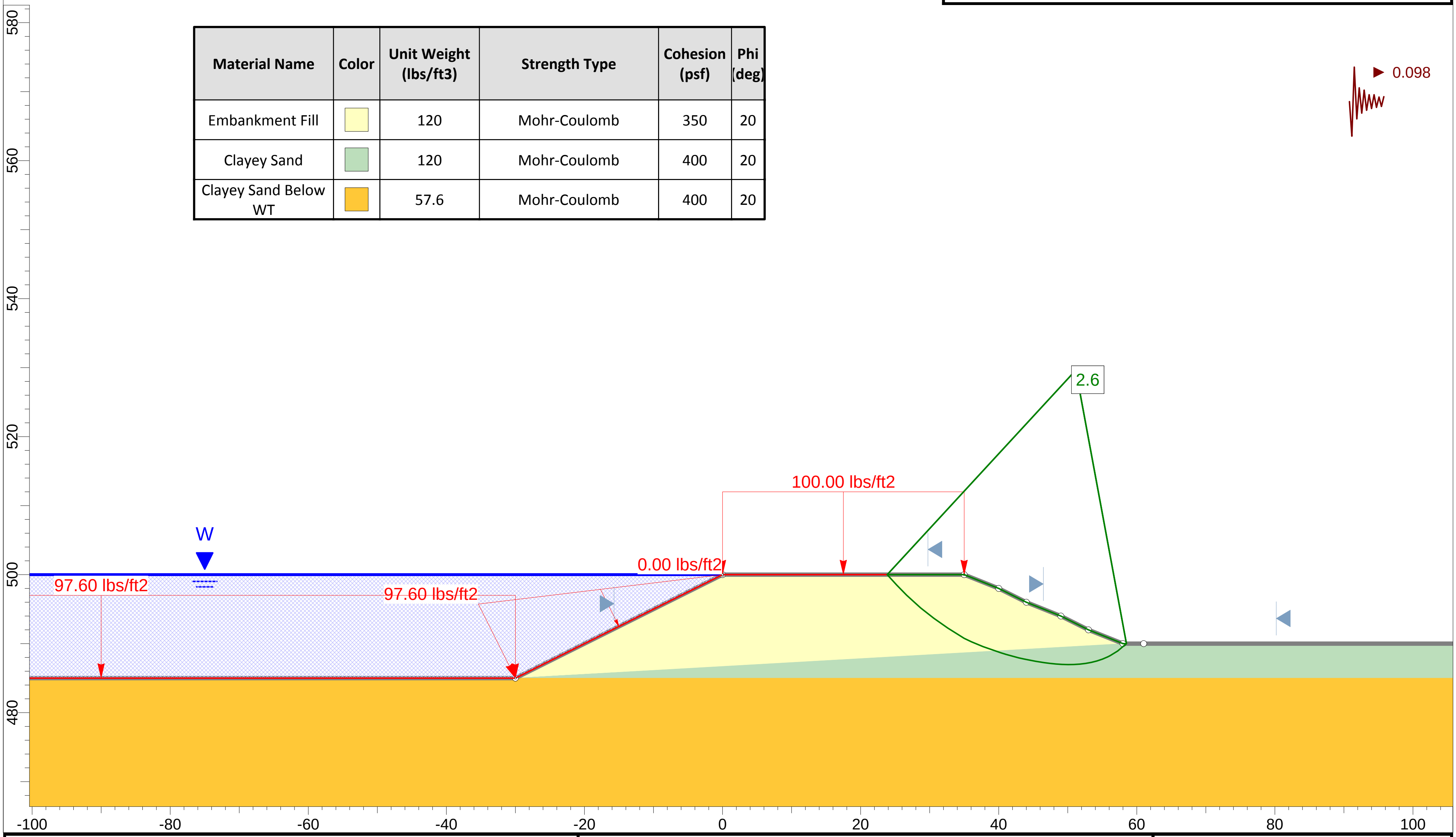
Profile "M" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-40b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

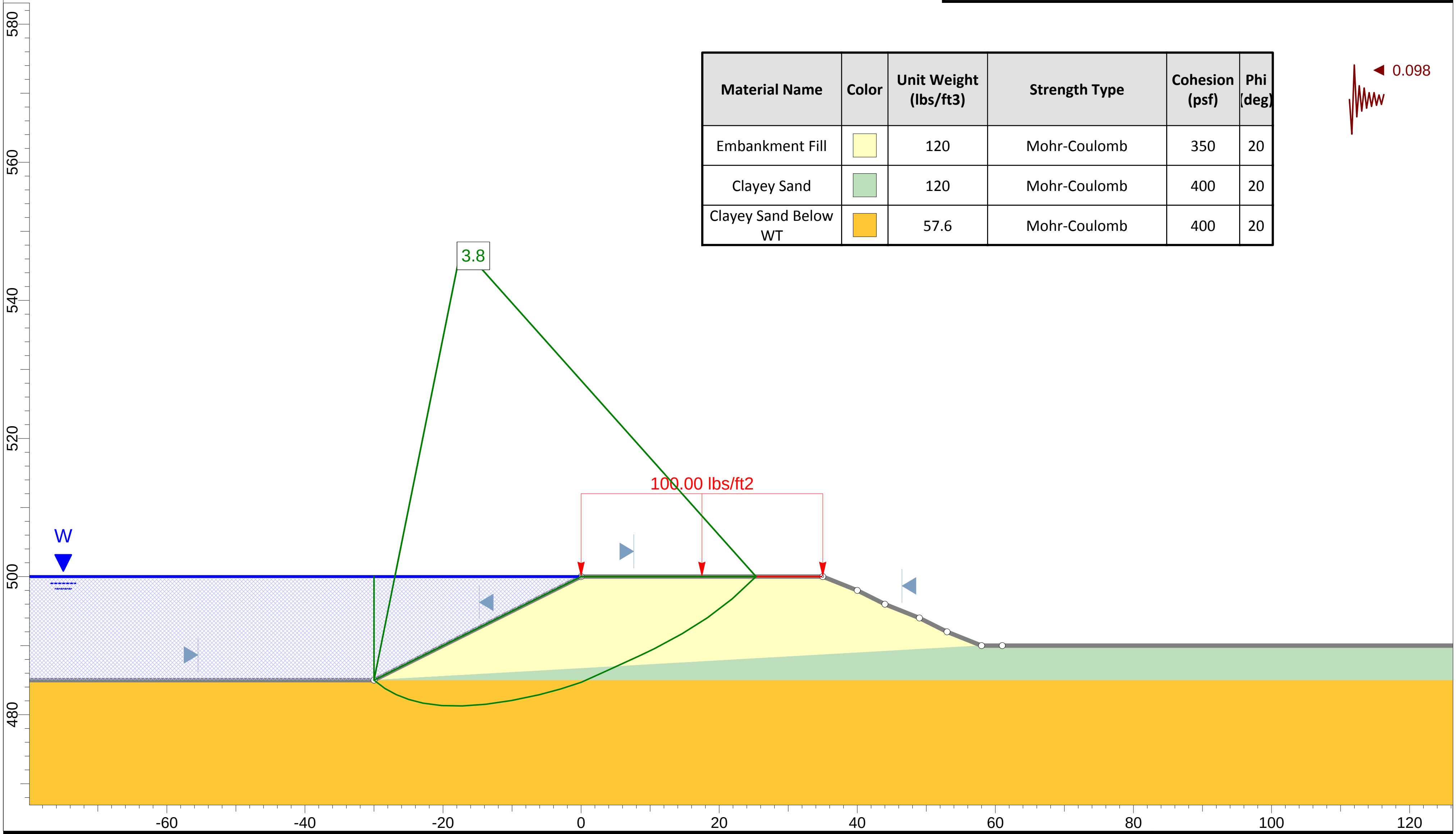
Profile "N" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-41a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "N" - Maximum Pool
Ash Pond Berms - Calaveras Lake Power Plant

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-41b

RABA KISTNER CONSULTANTS

Appendix B

USEPA Checklists

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: JT Deely Power Plant

Date: August 27, 2012

Unit Name: North Bottom Ash Pond

Operator's Name: CPS Energy

Unit I.D.:

Hazard Potential Classification: High [✓ Significant] Low

Inspector's Name: Jamal Daas/Bevin Barringer

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	none		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	499.0		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	499.0		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	DNA		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	501.0		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	DNA		Is water exiting outlet flowing clear?	see	note
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?	DNA	
9. Trees growing on embankment? (If so, indicate largest diameter below)	X		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?	DNA		Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?	DNA		22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

1. No formal inspections are performed. Once every 12-hr shift, staff records water level in impoundment and will make notes if anything irregular is noted.

6. Once every 12-hr shift staff records water level by measuring water level referenced to the decant inlet at El. 499 ft.

9. Largest diameter tree is approximately 8 inches in diameter.

20.Decant outlet at El. 499 was clear. Pipe outlet at El. 489 was submerged.

23. #1 Stormwater Runoff Pond is located at the west embankment exterior toe. The Bottom Ash Pond-South is located at the south embankment exterior slope.

EPA FORM -XXXX

N/A=not available
DNA=does not apply

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # WQ0001514000 INSPECTOR Jamal Daas/Bevin Barringer
Date August 27, 2012

Impoundment Name Bottom Ash Pond - North
Impoundment Company CPS Energy
EPA Region 6
State Agency (Field Office) Addresss Texas Commission on Environmental Quality
12110 Park 35 Circle, Austin, TX 78753
Name of Impoundment Bottom Ash Pond - North
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New x Update

	Yes	No
Is impoundment currently under construction?		x
Is water or ccw currently being pumped into the impoundment?	x	

IMPOUNDMENT FUNCTION: Stores bottom ash transport water,low volume waste, and metal cleaning waste.

Nearest Downstream Town : Name Elmendorf, TX
Distance from the impoundment 3.5 miles
Impoundment
Location: Longitude 98 Degrees 18 Minutes 58 Seconds
Latitude 29 Degrees 18 Minutes 31 Seconds
State TX County Bexar

Does a state agency regulate this impoundment? YES x NO

If So Which State Agency? Texas Commission on Environmental Quality

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

__X___ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

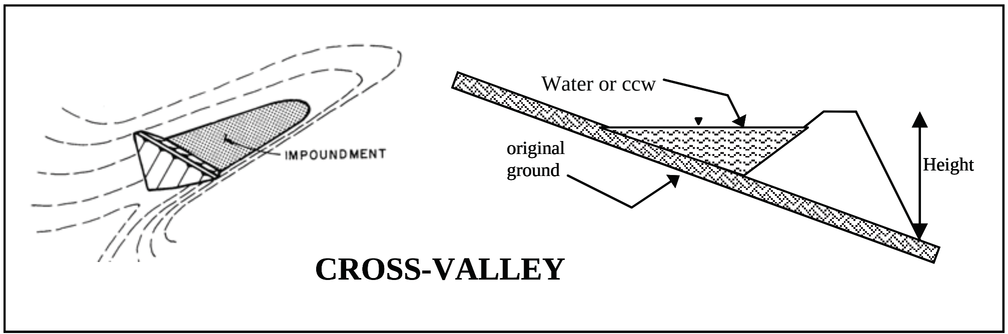
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

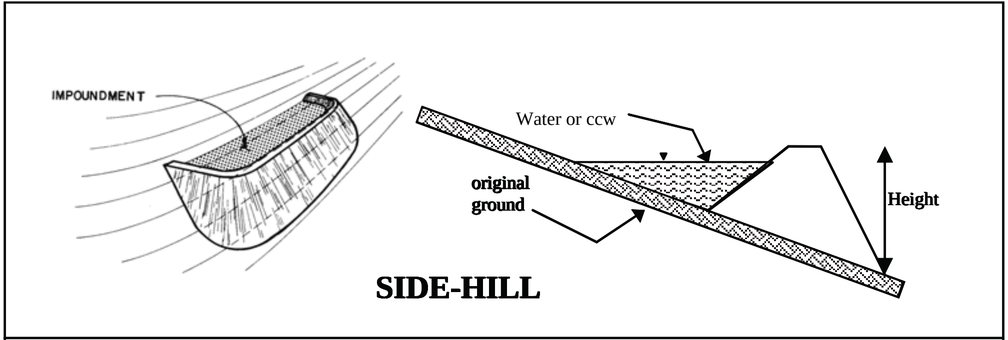
Because the impoundment shares a common embankment with the #1 Stormwater Runoff Pond and the Bottom Ash Pond - South,failure or misoperation of the Bottom Ash Pond - North could result in flow into the Bottom Ash Pond South and the #1 Stormwater Runoff Pond causing subsequent failure toward the plant facility.

No loss of human life however there would be environmental damage, economic losses and disruption of lifeline facilities.

CONFIGURATION:

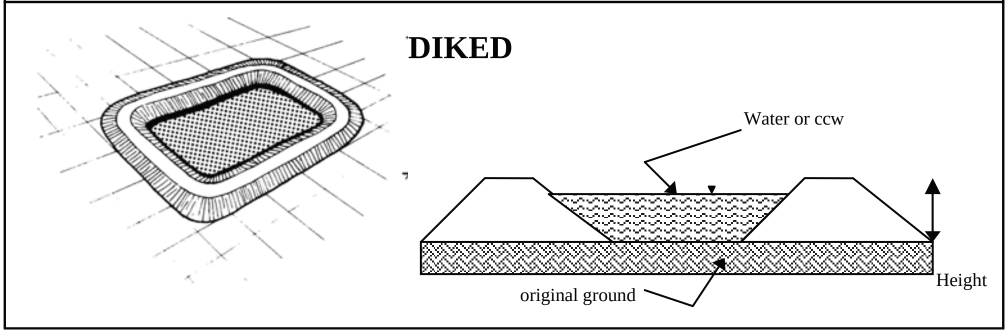


CROSS-VALLEY

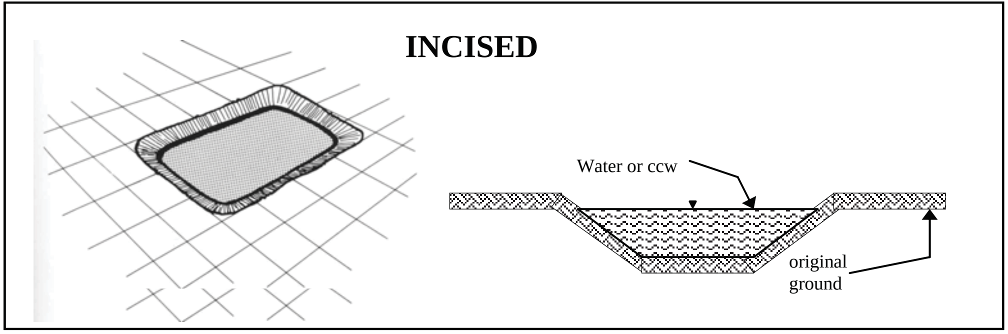


SIDE-HILL

DIKED



INCISED



______ Cross-Valley
______ Side-Hill
__x__ Diked
______ Incised (form completion optional)
______ Combination Incised/Diked

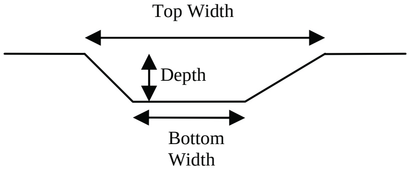
Embankment Height 12 feet
Embankment Material Cohesive material
Pool Area 6 acres
Liner none
Current Freeboard 2 feet
Liner Permeability DNA

TYPE OF OUTLET (Mark all that apply)

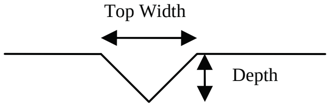
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width

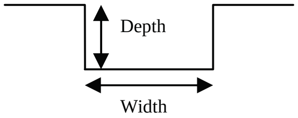
TRAPEZOIDAL



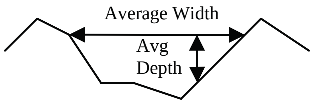
TRIANGULAR



RECTANGULAR

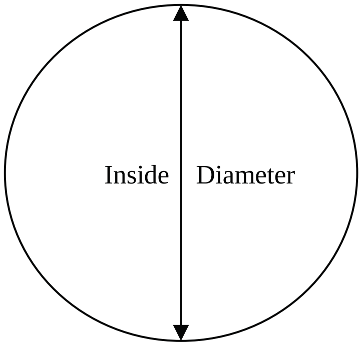


IRREGULAR



__X__ **Outlet**

2-12" inside diameter



Material
_____ corrugated metal
__X__ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ____________________

Is water flowing through the outlet? YES __X__ NO _______

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) ______________________________

The Impoundment was designed By Black & Veatch Consulting Engineers
____

Has there ever been a failure at this site? YES ___________ NO ____x_______

If So When? ______________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES ________ NO ___x____

If So When? ______________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________NO ___x____

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____________________

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

It does not appear the North Bottom Ash Pond embankments were constructed over wet ash, slag or other unsuitable materials. Historical information provided by CPS indicates the North Bottom Ash Pond was constructed in 1977. Borings performed in 2012 by Raba Kistner Consultants, Inc., indicate embankments bear on native material consisting of sandy clay and clayey sand with isolated tan and gray clay seams.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The assessor did not meet with, or have documentation from, the design Engineer of Record concerning foundation preparation.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

There was no indication of prior releases, failures or patchwork on the embankments.

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: JT Deely Power Plant

Date: August 27, 2012

Unit Name: South Bottom Ash Pond

Operator's Name: CPS Energy

Unit I.D.:

Hazard Potential Classification: High [✓ Significant] Low

Inspector's Name: Jamal Daas/Bevin Barringer

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	none		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	491.0		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	499.0		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	499.5		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	501.0		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	DNA		Is water exiting outlet flowing clear?	DNA	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?	DNA	
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	see	note	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?	DNA		"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	X		23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

1. No formal inspections are performed. Once every 12-hr shift, staff records water level in impoundment and will make notes if anything irregular is noted.

2. Impoundment was drained of water for cleaning during the assessment. Dry bottom ash in the pond ranged from El.489 to 491.

12. Sheet pile wall and sorbent was observed near the outlet pipes at the southeast corner of the impoundment.

23. Drainage ditch located at south embankment exterior toe. Bot. Ash Pond - North is located at the north embankment exterior slope. SRH Pond is located at the west embankment exterior slope.

EPA FORM -XXXX

N/A=not available
DNA=does not apply

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # WQ0001514000

INSPECTOR Jamal Daas/Bevin Barringer

Date August 27, 2012

Impoundment Name Botto,Ash Pond - South
Impoundment Company CPS Energy
EPA Region 6
State Agency (Field Office) Addresss Texas Commission on Environmental Quality
12110 Park 35 Circle, Austin, TX 78753
Name of Impoundment Bottom Ash Pond - South
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update ______

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?		X

IMPOUNDMENT FUNCTION: Stores bottom ash transport water, low volume waste, and metal cleaning waste.

Nearest Downstream Town : Name Elmendorf, TX
Distance from the impoundment 3.5 miles
Impoundment
Location: Longitude 98 Degrees 18 Minutes 58 Seconds
Latitude 29 Degrees 18 Minutes 27 Seconds
State TX County Bexar

Does a state agency regulate this impoundment? YES X NO ______

If So Which State Agency? Texas Commission on Environmental Quality

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

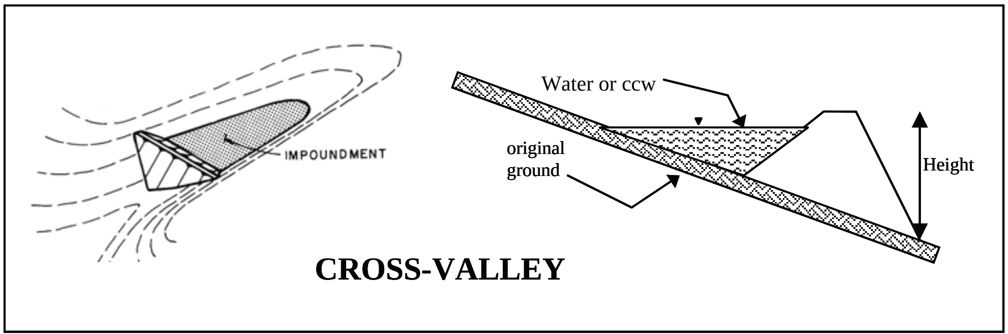
__X___ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

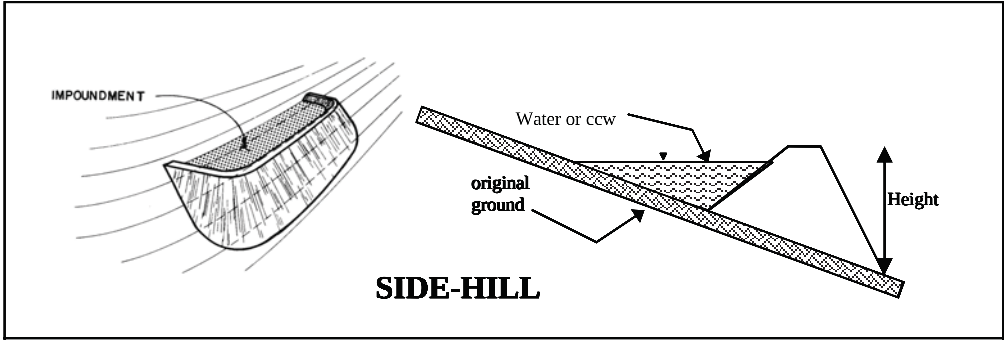
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

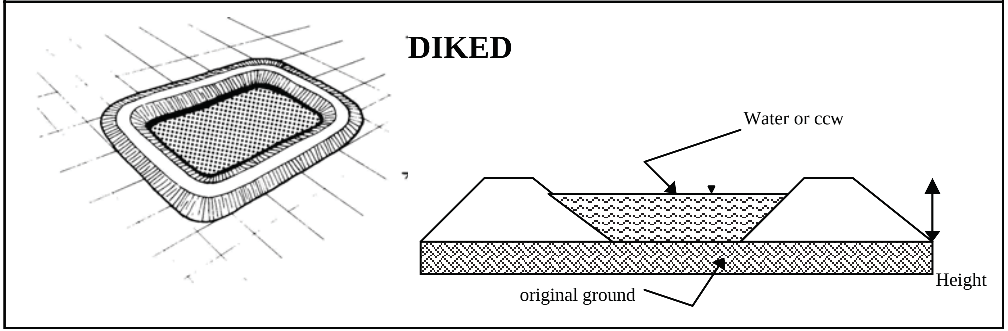
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

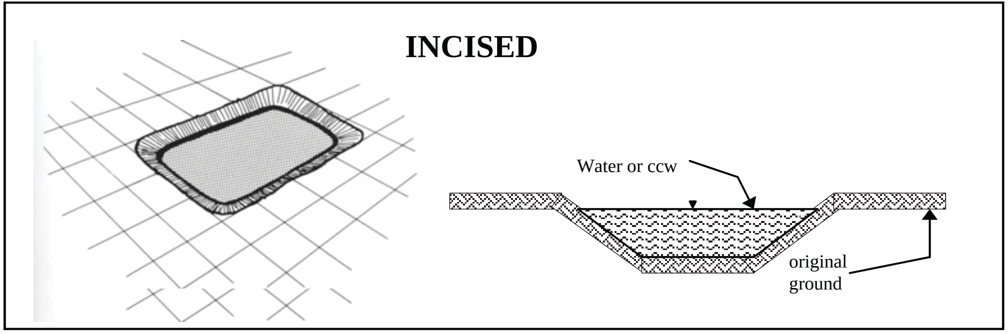
Because the impoundment shares a common embankment with the SRH Pond, failure or misoperation of the Bot. Ash Pond-South could result in flow into the SRH Pond, and subsequent failure of the SRH Pond. If the SRH Pond fails, liquid would likely flow toward the plant facility which is 100 feet east of the SRH Pond. There would be no probable loss of human life, but there be economic loss, environmental damage and disruption of lifeline facilities.

CONFIGURATION:









_____ Cross-Valley
_____ Side-Hill
__x___ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

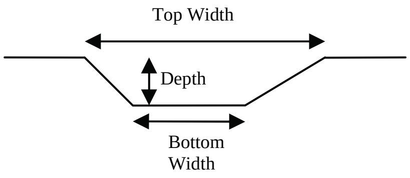
Embankment Height ___12_____ feet   Embankment Material Cohesive material
Pool Area _____7_____________ acres   Liner none
Current Freeboard _9__________ feet   Liner Permeability _DNA_____________

TYPE OF OUTLET (Mark all that apply)

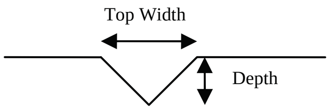
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width

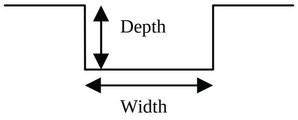
TRAPEZOIDAL



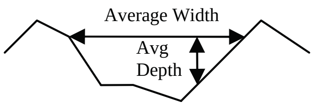
TRIANGULAR



RECTANGULAR

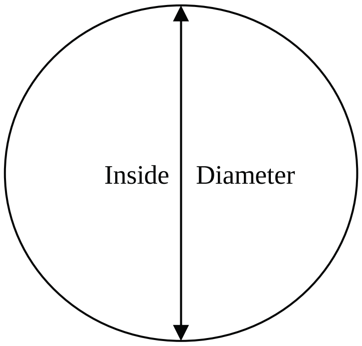


IRREGULAR



x **Outlet**

2-12" inside diameter



Material
_____ corrugated metal
x welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) _____________________

Is water flowing through the outlet? YES _______ NO x

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) _________________________________

The Impoundment was Designed By Black & Veatch Consulting Engineers

Has there ever been a failure at this site? YES ___________ NO ____X_______

If So When? ______________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES ________ NO ___X____

If So When? ______________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________ NO ___x____

If so, which method (e.g., piezometers, gw pumping,...)? ______________________

If so Please Describe : ______________________________

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

It does not appear the South Bottom Ash Pond was constructed over wet ash, slag, or other unsuitable material. Historical information provided by CPS indicates the South Bottom Ash Pond was constructed in 1977. Borings performed in 2012 by Raba Kistner Consultants, Inc., indicate the embankments bear on native material consisting of sandy clay, clayey sand and isolated gray clay seams.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The assessor did not meet with, or have documentation from, the design Engineer of Record concerning foundation preparation.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

There was no indication of prior releases, failures or patchwork on the embankments.

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: J Spruce/JT Deely Power Plants
Date: August 28, 2012
Unit Name: Evaporation Pond
Operator's Name: CPS Energy
Unit I.D.:
Hazard Potential Classification: High Significant [✓ Low]
Inspector's Name: Jamal Daas/Bevin Barringer

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	none		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	N/A		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	DNA		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	DNA		Is water entering inlet, but not exiting outlet?	DNA	
5. Lowest dam crest elevation (operator records)?	N/A		Is water exiting outlet, but not entering inlet?	DNA	
6. If instrumentation is present, are readings recorded (operator records)?	DNA		Is water exiting outlet flowing clear?	DNA	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?	DNA	
9. Trees growing on embankment? (If so, indicate largest diameter below)	X		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	DNA		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?	DNA		Around the outside of the decant pipe?	DNA	
15. Are spillway or ditch linings deteriorated?	DNA		22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	DNA		23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # — Comments

1. No formal inspections are performed.

2.,5.,8. No construction drawings or design information was provided for this this pond. The evaporation pond was constructed on top of a capped fly ash storage pond, based on information provided by CPS. The evaporation pond has no inlets or outlets. All material is brought in by truck for dewatering.

3.,4.,12.,14.,15.,16.,20.,21. There are no inlets or outlets.

9. argest tree diamter is approximately 6 inches in diameter.

toe.

N/A=not available
DNA=does not apply

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # WQ0001514000 INSPECTOR Jamal Daas/Bevin Barringer
Date August 28, 2012

Impoundment Name Evaporation Pond
Impoundment Company CPS Energy
EPA Region 6
State Agency (Field Office) Addresss Texas Commission on Environmental Quality
12110 Park 35 Circle, Austin, TX 78753
Name of Impoundment Evaporation Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update ______

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?		X

IMPOUNDMENT FUNCTION: sed to dewater scrubber waste.

Nearest Downstream Town : Name Elmendorf, TX
Distance from the impoundment 4.5 miles
Impoundment
Location: Longitude 98 Degrees 18 Minutes 53 Seconds
Latitude 29 Degrees 19 Minutes 27 Seconds
State TX County Bexar

Does a state agency regulate this impoundment? YES X NO ______

If So Which State Agency? Texas Commission on Environmental Quality

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

__X___ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

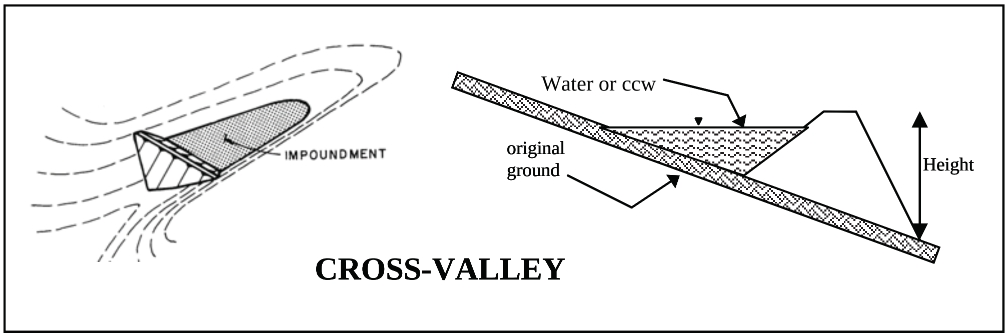
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

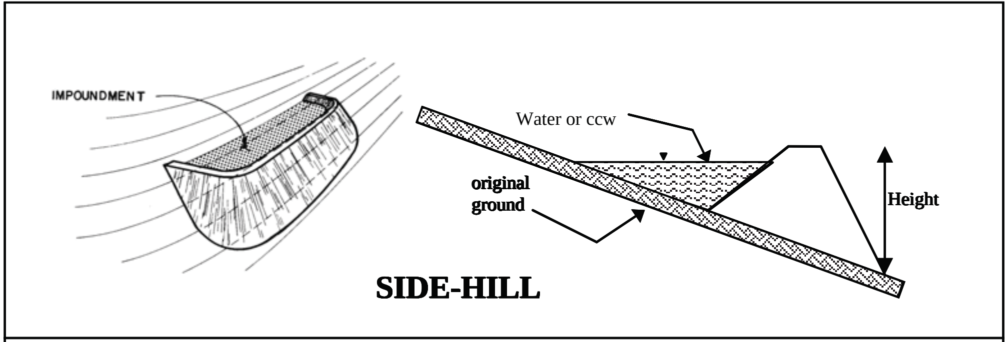
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

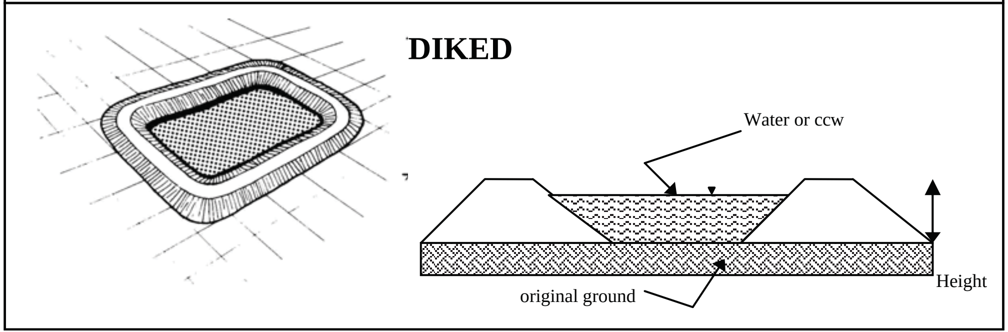
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

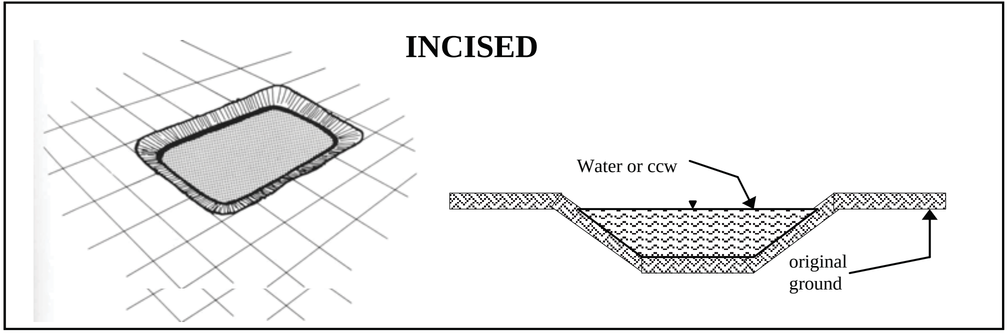
Failure or misoperation of the impoundment would likely result in damage to CPS property. Liquids would flow into Calaveras Lake which was constructed by and is owned by CPS Energy.

CONFIGURATION:


CROSS-VALLEY


SIDE-HILL


DIKED


INCISED

_____ Cross-Valley
_____ Side-Hill
__x___ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

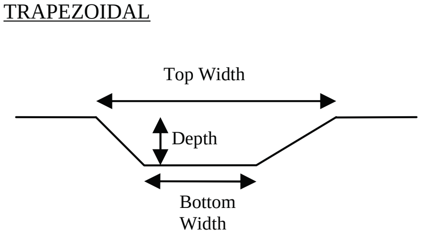
Embankment Height ___15_____ feet Embankment Material unknown
Pool Area ______4.5________ acres Liner PVC
Current Freeboard ____2______ feet Liner Permeability unknown

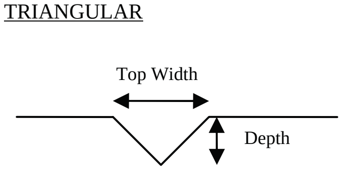
Because information was not provided on this pond, embankment height and current freeboard were estimated during the assessment.

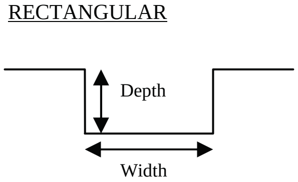
TYPE OF OUTLET (Mark all that apply)

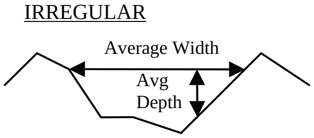
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width



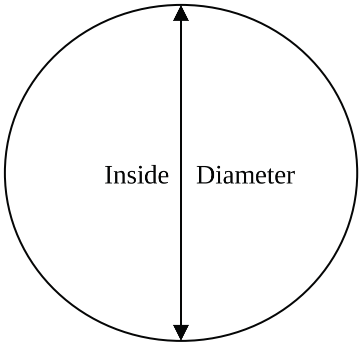






_____ **Outlet**

_____ inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ____________________

Is water flowing through the outlet? YES _______ NO _______

__x___ **No Outlet**

_____ **Other Type of Outlet** (specify) ________________________________

The Impoundment was Designed By unknown
____

Has there ever been a failure at this site? YES __________ NO ____X_______

If So When? ____________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES ________ NO ___x____

If So When? ______________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________ NO __x__

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____________________

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

The Evaporation Pond embankments were constructed on top of an area that had previously been used as a fly ash landfill and as a fly ash impoundment. Boring logs for subsurface investigations performed at the Evaporation Pond in 2012 by Raba Kistner Consultants, Inc., did not encounter CCW or other unsuitable materials per project boring logs.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

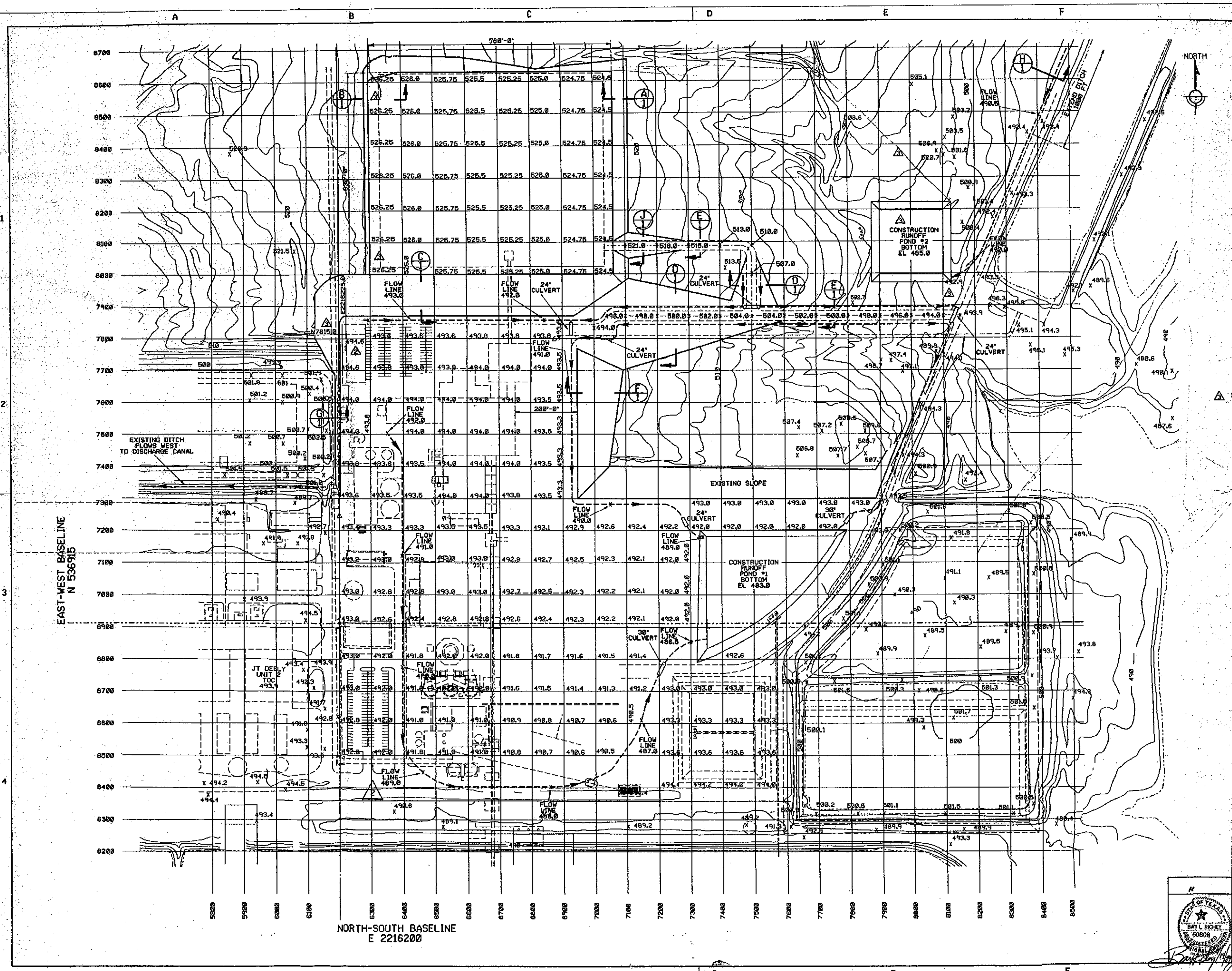
The assessor did not meet with, or have documentation from, the design Engineer of Record concerning foundation preparation.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

There was no indication of prior releases, failures or patchwork on the embankments.

Appendix C

Documentation from CPS



GENERAL NOTES

1. PLANT ELEVATION 100 FT = 494 FT (MSL)
2. ALL SITE FILL SHALL BE CONTROLLED COMPACTED FILL.
3. ─►─ INDICATES A DITCH AND DIRECTION OF FLOW
4. DITCHES SHALL BE CONSTRUCTED ON A UNIFORM SLOPE BETWEEN FLOW LINE ELEVATIONS INDICATED. CONTRACTOR SHALL INSURE THAT ALL DITCHES DRAIN TOWARD CONSTRUCTION RUNOFF PONDS.
5. CONTRACTOR SHALL INSURE THAT DURING THE COURSE OF CONSTRUCTION ALL STORMWATER RUNOFF FROM AREAS WITH DISTURBED SOIL, TEMPORARY FACILITIES, LAYDOWN AND CONSTRUCTION SHALL DRAIN INTO ONE OF THE TWO CONSTRUCTION RUNOFF PONDS.
6. GRADES GIVEN ARE TOP OF FINISHED CONSTRUCTION SUBGRADE.
7. TOP OF SLAB ELEVATIONS FOR MAJOR STRUCTURES OF UNIT #1 SHALL BE:

OFFICE BUILDING	495'-0" = 101'-0"
TURBINE BUILDING	495'-0" = 101'-0"
MAINTENANCE BUILDING	495'-0" = 101'-0"
BOILER BUILDING	495'-0" = 101'-0"
BAGHOUSE	494'-0" = 100'-0"
SCRUBBER	493'-0" = 99'-0"
AQCS BUILDING	492'-0" = 98'-0"

8. CULVERTS SHALL BE REINFORCED CONCRETE PIPE, CLASS III DESIGN
9. SOILS EXCAVATED FROM THIS AREA MAY BE USED AS FILL OR STOCKPILED FOR USE AS FILL IF IT IS FREE OF LARGE ROCKS, ORGANIC MATERIALS OR DEBRIS.
10. △3 TOP OF CONCRETE SLAB FOR JKS CONSTRUCTION OFFICES TO BE AT ELEV 496'-0".

REFERENCE DRAWINGS

1. SECTIONS AND DETAILS D-CL05-006-S006
2. CONSTRUCTION RUNOFF PONDS D-CL06-166-S001

RECEIVED APR 04 1994 POWER [illegible]

AS CONSTRUCTED

NO	REVISIONS	DATE	BY	CHK	DSGN	APPR
3	MOVED POND/ADD COORD/REV AS NOTED	032989	[illegible]	[illegible]	[illegible]	[illegible]
2	ADDED NOTE 10 REV AT D 2&4	081088	JKB	JKB	BLR	DH
1	REVISED TO REFLECT CONSTRUCTION POND	052388	CEJ	JKB	BLR	DH
0	ISSUE FOR CONSTRUCTION	050188	JKB	DLR	BLR	DH

THIS DRAWING IS THE PROPERTY OF UTILITY ENGINEERING CORPORATION AMARILLO, TEXAS AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS OR APPARATUS EXCEPT WHERE PROVIDED FOR BY AGREEMENT WITH SAID COMPANY

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
A C-E COMPANY

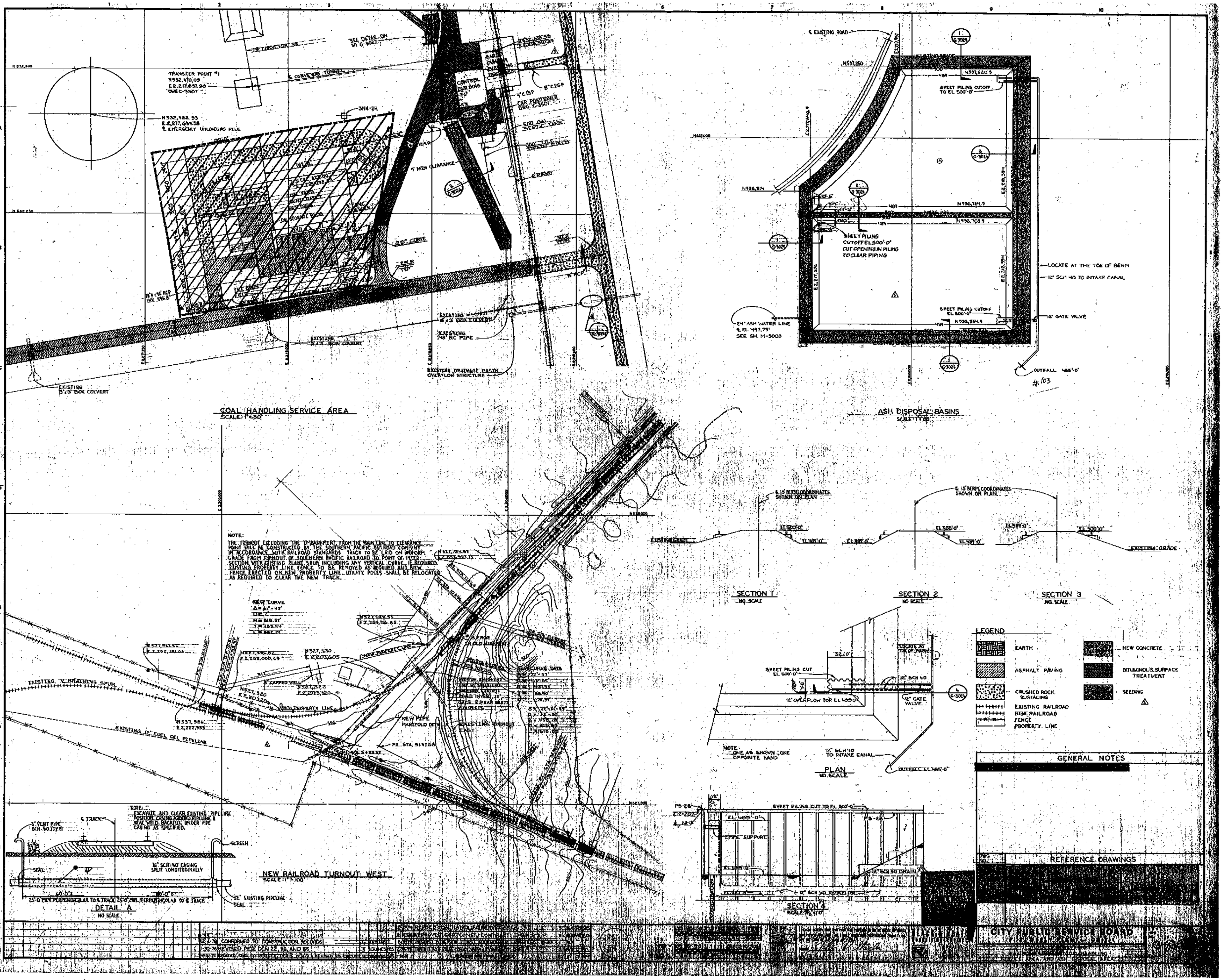
SITE PREPARATION
CONSTRUCTION GRADES

BARY L. RICHEY 60808

MITCHELL 3-22-88

D-CL05-006-6005 3

APR 19 1989

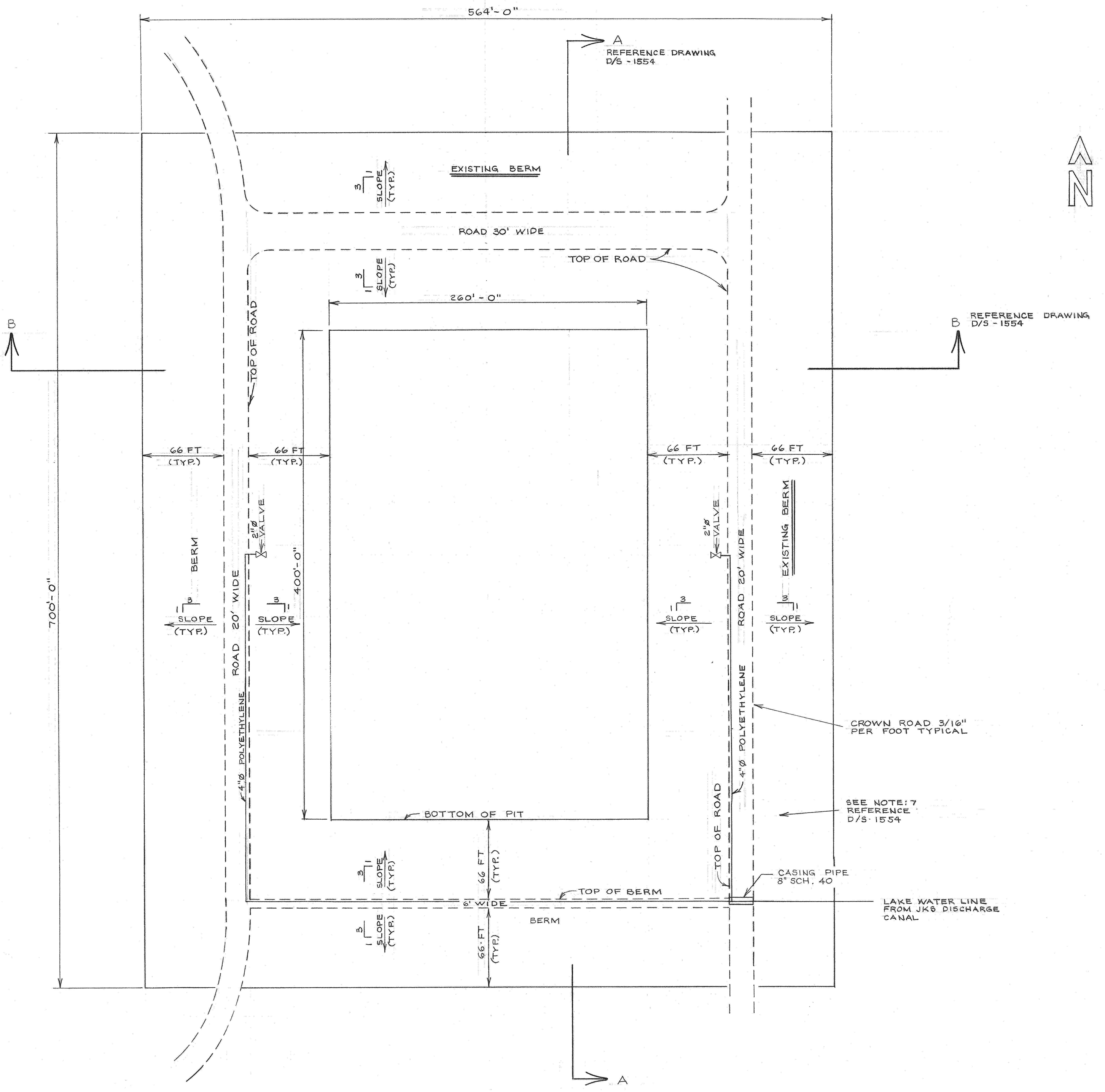


NOTE:
THE TURNOUT EXCLUDING THE EMBANKMENT, FROM THE MAIN LINE TO CLEARANCE POINT WILL BE CONSTRUCTED BY THE SOUTHERN PACIFIC RAILROAD COMPANY IN ACCORDANCE WITH RAILROAD STANDARDS. TRACK TO BE LAID ON UNIFORM GRADE FROM TURNOUT OF SOUTHERN PACIFIC RAILROAD TO POINT OF INTERSECTION WITH EXISTING PLANT SPUR INCLUDING ANY VERTICAL CURVE IF REQUIRED. EXISTING PROPERTY LINE FENCE TO BE REMOVED AS REQUIRED AND NEW FENCE ERECTED ON NEW PROPERTY LINE. UTILITY POLES SHALL BE RELOCATED AS REQUIRED TO CLEAR THE NEW TRACK.

NOTE:
EXCAVATE AND CLEAR EXISTING PIPELINE. POSITION CASING AROUND PIPELINE & SEAL WELD. BACKFILL UNDER PIPE CASING AS SPECIFIED.

NOTE:
ONE AS SHOWN, ONE OPPOSITE HAND

12-2-78 CONFORMED TO CONSTRUCTION RECORDS
1-30-76 REVISED PER DCN 22, 58, AND 65



REFERENCE DRAWINGS
1, D-CL05-289-S002
2 D/S 1554

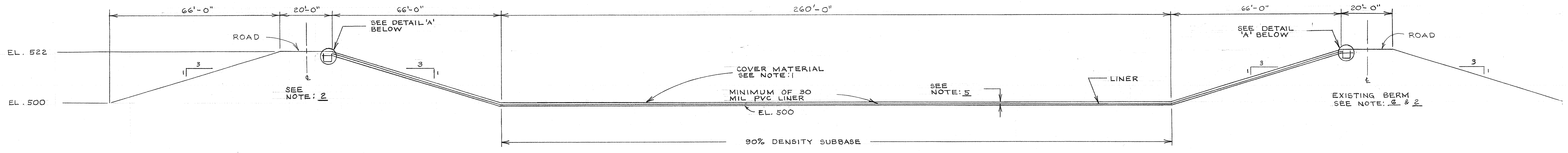
J.T. DEELY/J.K. SPRUCE
ASH DISPOSAL PIT # 4
PLAN VIEW

CITY PUBLIC SERVICE
SAN ANTONIO, TEXAS

DRAWN: FRANK TOBAR	DATE: 7/16/90
CHECKED: DTS	SCALE: 1" = 50'-0"
APPROVED: DTS	SHEET 1 OF 1

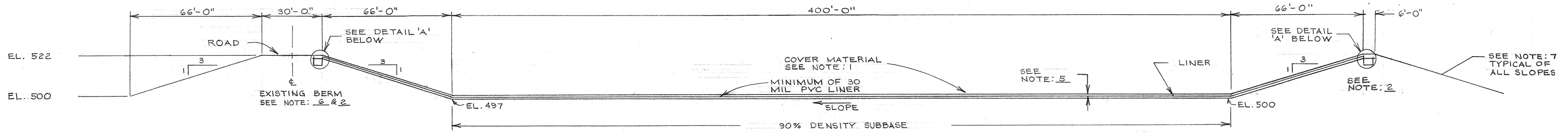
SYSTEM	I.D.	DRAWING NUMBER	CODE
		D/S - 1547	

No.	DATE	REVISION	BY	CK'D	APP
1	7-25-90	BID ISSUE	F.T.	DES	DTS



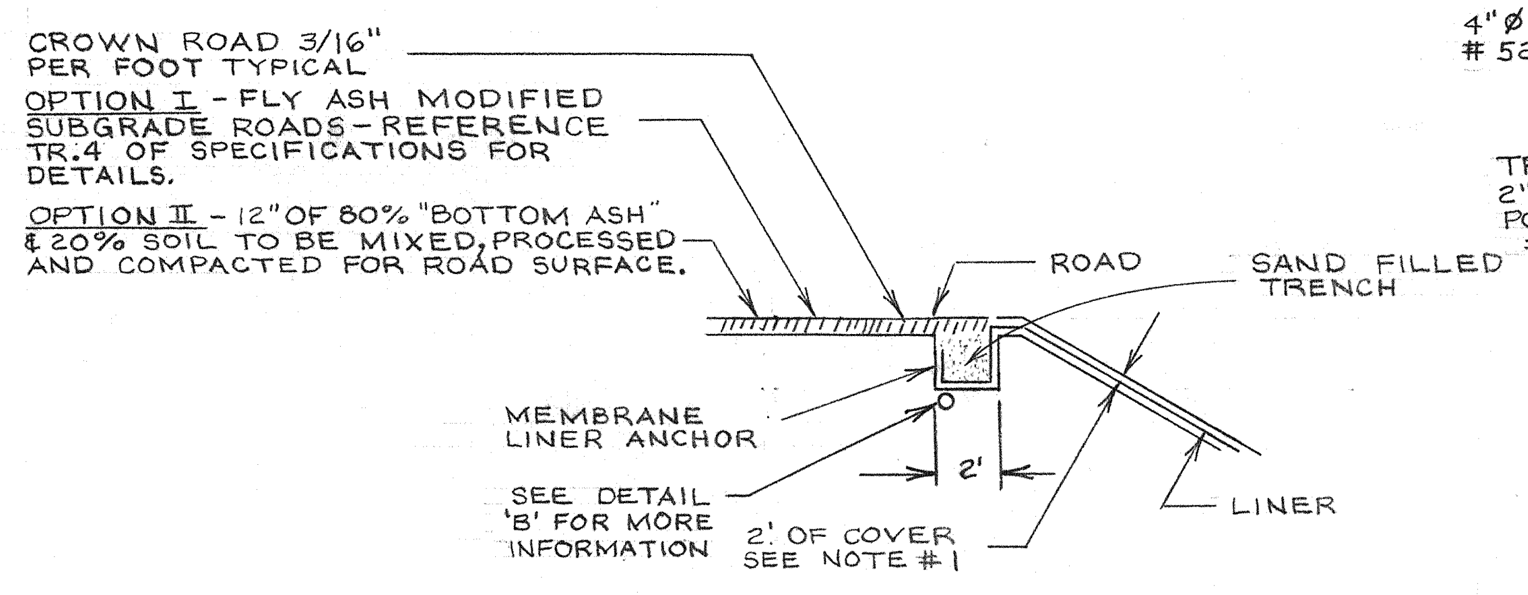
SECTION 'B-B'
—LOOKING NORTH—
SCALE: 1" = 20'-0"

REFERENCE DRAWINGS
1. D-CLOS-289-S002
2. D/S-1547

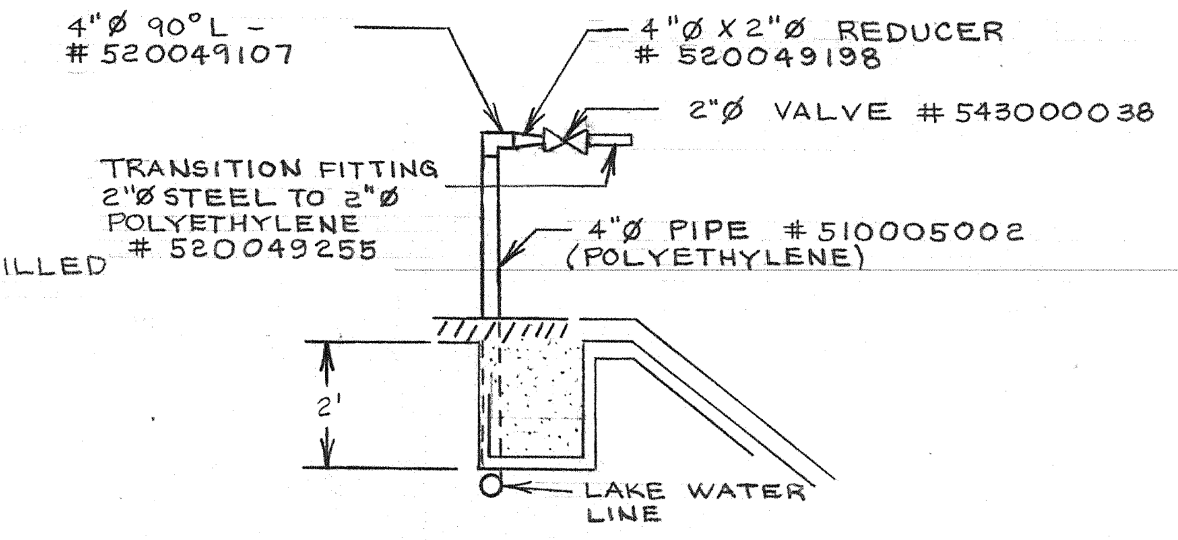


SECTION 'A-A'
—LOOKING EAST—
SCALE: 1" = 30'-0"

NOTE:
1) COVER MATERIAL SHALL BE COHESIVE SOILS FREE OF ALL ROCKS, ROOTS AND OTHER FOREIGN MATERIALS. THE COVER MATERIALS SHALL BE PLACED OVER THE LINER AS RECOMMENDED BY THE MANUFACTURER AND APPROVED BY CPS FIELD REPRESENTIVE.
2) SUBGRADE COMPACTED TO 90% DENSITY
3) ROCKS THAT ARE LESS THAN 6"X12" ARE ACCEPTABLE IN ALL BUT THE TOP TWO FEET OF THE BERM.
4) CONTRACTOR WILL BE REQUIRED TO WATER ALL EXTERNAL SLOPES FOR A PERIOD OF TWO MONTHS (DAILY) TO AID IN THE ESTABLISHMENT OF GRASS
5) REQUIREMENTS FOR SOIL COVER MATERIAL
   a) PVC - 1FT. OF THE TYPE OF SOIL STATED IN NOTE #1
   b) HDPE - 4 IN. OF THE TYPE OF SOIL STATED IN NOTE #1
6) MOST OF THIS BERM IS EXISTING. THE CONTRACTOR WILL BE REQUIRED TO COMPLETE THE INSIDE SLOPES AND TO BRING THE EXISTING ROAD UP TO ELEVATION 522.
7) MIRAMAT "2400" OR TENSAR "NS 3000" EROSION CONTROL AND REVEGETATION MAT SHALL BE INSTALLED ON EXTERNAL SLOPES, PER MANUFACTURE RECOMMENDATION. EROSION CONTROL MAT IS TO BE SUPPLIED AND INSTALLED BY CONTRACTOR. MAT IS TO BE COVER WITH A MINIMUM OF 1" OF TOP SOIL. ALL EXTERNAL SLOPES SHALL THEN BE SEEDED, FERTILIZED AND MULCHED BY CONTRACTOR PER SPECIFICATIONS.



DETAIL 'A'
(TYP.)



NOTE: ALL PHILLIPS DRISCO POLYETHYLENE PIPE AND ACCESSORIES WILL BE FURNISHED FROM CPS STOCK AND INSTALLED THE CONTRACTOR.

DETAIL 'B'
(TYP.)

J.T. DEELY / J.K. SPRUCE
ASH DISPOSAL PIT # 4
ELEVATION VIEWS

CITY PUBLIC SERVICE
SAN ANTONIO, TEXAS

DRAWN: FRANK TOBAR	DATE: 7/16/90
CHECKED: DTS	SCALE: SHOWN
APPROVED: DTS	SHEET 1 OF 1

No.	DATE	REVISION	BY	CK'D	APP
1	7-25-90	BID ISSUE	F.T.	DTS	DTS

SYSTEM	I.D.	DRAWING NUMBER	CODE
		D/S - 1554	

Day 8/16/12 Munoz

0700 START 3B AHP / 3C & 4A ON PURGE

0800 SECURED 3B AHP

*BEGAN SHOCK CHLORINATION ON 24" RETURN

1400 START 3B AHP / START 3A & 4A BAS

1530 Comp 3A & 4A BAS / START PURGE

- POND +5' / 24" RETURN - CLOSED @ 0515 (FOR CHLORINATION)
- ECON HOPPERS & DRAG CHAINS - OK
- ADDED H2 to C3 & C4 @ 0545
- RECEIVED AMMONIA TRUCK
- CHLORINATED 24" RETURN
- WATER USAGE ON C3 & C4
- STARTED DEELY DIESEL FIRE PUMP FOR COAL YARD WASH / BACK IN AUTO
- FIRE ON COAL PIPES ON C4 BELOW 11th FLOOR GRATING H4 CORNER
- SEAL AIR BOOSTER FAN MCC ON C3: 3C MCC SHORTED OUT (BLEW UP)
- EMPTIED PYRITE HOPPER - 4C

NIGHT 8-15-12 McBLAIN

2100 START 3A & 4A BAS
2230 COMP 3A & 4A BAS S/P
2350 START 3C & 4C BAS
0100 COMP 3C & 4C BAS S/P
0230 SHUT DOWN BAS / SECURED 3A-AWP

- POND-7S 24"-OPEN
- ECON HOPPERS & DRAG CHAIN-OK
- T1-1'4¼" / T2=7'7¼"
- RAN TRAVELING SCREENS
- DRAINED C3 VACUUM PRIMING
- CLEANED 3B, 4C, 4D PYRITES

DAY 8/15/12 MUNOZ

0600 START 3C & 4C BAS
0800 COMP 3C & 4C BAS / START PURGE
1130 START 3B & 4A BAS
1300 COMP 3B & 4A BAS / START PURGE
1400 START 3D & 4A BAS
* ELECTRICIANS REPLACED SOLENOID ON 4A BAS GATE
1530 COMP 3D & 4A BAS / START PURGE

* HAVE BOTTOM ASH COMPLETE BY 0600 SO 24" RETURN CAN BE CHLORINATED

- BMS + 4" / 24" RETURN - OPEN
- ECON HOPPERS & DRAG CHAIN - OK
- ADDED H2 TO C4 @ 0615
- RAN TRAVELING SCREENS
- PUMPED DOWN C3 & C4 YARD DRAIN PITS
- ELECTRICIANS REPLACED #2 BAS GATE SOLENOID
- EMPTIED PYRITE HOPPERS - 4C & 4A
- REPLACED MOTOR AIR FILTERS - 3A MILL, 3C MILL, 3A PA FAN, 3A SBAC
- SWAPPED 3B MILL LUBE OIL FILTERS

* 3D TRANSPORT BLOWER I/B LOW OIL LEVEL - (LWO)
* C/B REV GAS FAN I/B LOW OIL LEVEL - (LWO)
* 3B SBAC STAGE 1 TRAP BYPASS LEAKING - (LWO)
* 3A SBAC STAGE 3 TRAP BYPASS LEAKING - (LWO)

es

Night 8-14-12 GRoss

1900 Start 3B & 4A BAS (Could not get 4B gate open)
2020 Comp. 3B & 4A
2035 Begin purges
2135 Start 3D & 4D BAS
2250 Comp. 3D & 4D
2310 Begin purges
0100 Comp. purges

0300 Start 3A & 4A BAS
0410 Comp 3A & 4A
0425 Begin purges

Pond +5" (24" return drain still open)
- Shutdown 4A SBAC, started 3B SBAC
- Drained C3 vac priming suct. tank
- pyrites cleaned: 4D 3A
- T1 1' 4$\frac{1}{4}$" T2 7' 7$\frac{3}{8}$"
- C3 & C4 Econo hoppers and drag chains OK
- 4D A/W conv. solenoid is malfunctioning, had to override to get the gate closed (WWO)
- C3 & C4 put travelling screens back to auto

Loto)
rounds

DAY 8/14/12 Graves

05:30 purging 3D + 4D BAS
07:00 Shutdown BAS
13:00 Started 3A + 4A BAS
14:00 Purging 3A + 4A BAS
16:00 Started 3C + 4C BAS

- Traveling screens on C3 + C4
- cleaned 3D Pyrite hopper
- started 4A SBAC, shutdown 3B (on Loto)

* - C4 seal trough make-up valves at 1½ rounds open as per D. Martinez.

- cleand 3C + 4A pyrite hoppers

JES NIGHT 8-13-12 McBLAIN

1730 START 3A-AWP FOR I+E

1900 START 3A+4A BAS

2020 COMP 3A&4A BAS S/P

2125 START 3C+4C BAS

2240 COMP 3C+4C BAS S/P

0200 START 3B+4A BAS

0300 COMP 3B+4A BAS S/P

0420 START 3D+4D BAS

- POND-+1 24" RETURN DRAIN-OPEN
- ECON HOPPERS + DRAG CHAIN-OK
- RAN TRAVELING SCREENS
- ADDED GAS C3+C4 @ 1940
- DRAINED C3 VACCUM PRIMING
- T1-0 1'4¼" / T2-7'7¼"
- CLEANED 3E, 4D + 4E PYRITES

WWO 4C-DIAPHRAGM BLOWN

Day 5/13/19 Graves

05:20 Started 3C and 4C BAS
06:30 Purging 3C and 4C BAS
07:30 Shutdown BAS
11:00 Started 3A Ash water Pump
11:00 Started 3B + 4B BAS
12:30 Purging 3B + 4B BAS
13:30 Started 3D + 4D BAS

Pond +1
Cleaned 4D + 4C pyrite hoppers

s on

NIGHT 5/12/12 MUNOZ

1900 START 3B ; 4A BAS / START 3B AWP
2040 COMP 3B ; 4A BAS / START PURGE
2240 START 3D ; 4D BAS
0300 COMP 3D ; 4D BAS / START PURGE
0230 START 3A ; 4A BAS
0440 COMP 3A ; 4A BAS / START PURGE

3EM.()

Fan,

ft

- PONDS - +1" / 24" RETURN - OPEN
- ECON HOPPERS ; DRAG CHAIN - OK
- T1 - 14'4" / T2 - 37'4"
- TRAVELING SCREENS IN AUTO
- SWAPPED OIL FILTERS ON 3B MILL
- EMPTIED PYRITE HOPPERS - 3A ; 4D
- SWEPT TURBINE DECK
- I3D 3D MILL

was

☆ SOUTH OIL FILTER ON 3B MILL DIRTY - (USED)

26 Day 8-12-12 Lawson

0530 start 3D & 4D BAS
0710 comp 3D & 4D SP
1100 Start 3A & 4A BAS
1200 comp 3A & 4A SP
1300 Start 3C & 4C BAS
1400 comp 3C + 4C SP
1500 purge complete shut down 3A AWP

cleaned pyrites C4 4A, 4B, 4C, 4D

Changed Air filters C3: 3A Mill, 3B Mill, 3E Mill
3A PA Fan 3A & 3B FD Fan
C4: 4B, 4C, 4D, 4E Mills, 4B PA Fan,
4B FD Fan

Picked up others dirty filters left
laying around.

ASH Pond # 2
T1 1' 4 3/16"
T2 7' 7 1/4"

:HM Night 5/11/12 Muniz

1900 START 3A & 4A BAS
2140 COMP 3A & 4A BAS / START PURGE
2240 START 3C & 4C BAS
2350 COMP 3C & 4C BAS / START PURGE
0300 START 3B & 4A BAS
0415 COMP 3B & 4A BAS / START PURGE

- POND - +1" / 24" RETURN - OPEN
- GRIT HOPPERS & DRAG CHAIN - OK
- T1 - 1'4¼" / T2 - 7'7¼"
- C2 LOW'S
- EMPTIED 4B - PUMITE

HIGH DIFF.

DAY 08/11/2012 BOEHM

0600 START 3C & 4C BAS
0800 COMP 3C & 4C BAS / START PURGE
1200 START 3B & 4B BAS
1345 COMP 3B & 4B BAS / START PURGE
1445 START 3D & 4D BAS
COMP 3D & 4D BAS / START PURGE
SECURED AWP

CLEANED 4C & 4D PYRITE HOPPERS
RAN ALL TRAVELING WATER SCREENS DUE TO HIGH DIFF.
DRAINED C3 VAC. PRIMING TANK
COMPOUND CHEMICALS @ 1200

POND @ +2"

Night 8/10/12 Munoz

1900 Start 3B & 4A Bas

2040 Comp 3B & 4B Bas | Start Purge

2200 Start 3B & 4B Bas

2310 Comp 3B & 4B Bas | Start Purge

0200 Start 3A & 4A Bas

0330 Comp 3A & 4A Bas / Start Purge

-Pond +1' | 24" Bottom to Crown

-T1 - 1'4¼" | T2 - 7'7¼"

5 TURNS -Clean Hoppers & Drag Chain - ok

-Drained C3 Vac Prime Tank

-Emptied Pyrite Hoppers - 4C & 4D

DAY 8-10-12 McBLAIN

0730 CONTINUOUS PULL C3 BAS FOR WASH

1200 START 4ABAS

1310 COMP 4A BAS S/P

1435 START 4C BAS

1550 COMP 4C BAS S/P

- POND - +1 24"-OPEN
- ECONOMIZER DRAG CHAIN + HOPPERS - OK
- RAN TRAVELING SCREENS
- SLUCE GATE CLOSED ON C3 YARD DRAIN
- YARD DRAIN PIT PUMPED DOWN + WASHED SLUCE GATE 5 TURNS
- CLEANED 4D PYRITES

Night 8/9/17 Munoz

1750 Start 3C ; 4C Bas
2010 Comp 3C ; 4C Bas / Start Purge
2340 Start 3B ; 4A Bas
*Drained 4B air/water converter tank to 1/2 way
0130 Comp 3B ; 4A Bas / Start Purge
0230 Start 3D ; 4D Bas
0340 Comp 3D ; 4D Bas / Start Purge

- Pond Even / 24" Return Open
- T1 - 1'4¼" / T2 - 3'7¼"
- Econ Hoppers ; Dragchain - OK
- Drained C3 Vac Prime Tank
- Ran Traveling Screens
- Put absorbent on East side of C4 Hotwell (Pickle Area)
- Emptied Pyrite Hoppers - 4C ; 4D

* C4 Battery Relief Pump - ([illegible])
* 3A ; 3B Lube Oil Temp Hi @ 132°F (Alarm Point @ 130°F)
* 3A ID Fan VFD Alarm - Coolant Temp Hi

DAY 8-9-12 McBLAIN

1120 START 3A-AWP / START PURGE ON C3 CROSSOVER TO C4

1230 STOP PURGE (ELECTRNS WORKING ON 3EQXV-357)

1410 START 3A&4A BAS

1630 COMP 3A&4A BAS S/P

- POND - EVEN 24" OPEN
- RECEIVED AMMONIA TRUCK
- ECON HOPPERS & DRAG CHAIN - OK
- RAN TRAVELING SCREENS
- CLEANED 4C&D PYRITES
- changed 3A, 3E mill ~~to~~ motor Filters
- changed 3B PA fan motor Filters
- changed 3A SBAC motor Filters
- changed 3B AWP motor Filters
- CLEANED 4D PYRITES AGAIN

NIGHT 8/8/12 HIGGINS

1730 START 3A/4A PURGE
1830 PURGE COMPLETE / START 3C/4C BAS
CROSSOVER 2200 3C/4C PURGE COMPLETE / SHUTDOWN BAS
2205 STOPPED 3B AWP
0300 ~~START 3B AWP / START 3B/4A BAS~~ (SEE NOTE BELOW)

* POND +4
* T1 – 1'4 3/16" T2 – 7'7 5/16"
* CLEANED 4D PYRITE 2 TIMES
* CROSSOVER VALVES 357 AND 358 OPENED WHILE BAS WAS OFF CAUSING IT TO LOSE PERMITS TO RESTART. THE 0300 PULL IS POSTPONED UNTIL CRAFTS CAN RESTORE PROPER VALVE OPERATION

DAY 8-8-12 McBLAIN

0540 LOST C3 BAS PERMIT

0600 CONTINOUS PULL C4

1300 SHUT DOWN BAS / SECURED 3B-AWP (ELET. WORKING ON CROSSOVER

1440 START 3B-AWP / START 3A&4A BAS

- POND - #3 24" - OPEN @ 0950
- ECON HOPPER & DRAG CHAIN - OK
- CLEANED 3A&4D PYRITES
- ALL TRANSPORT & FLUIDZING BLOWERS BACK IN SERVICE

Night 8-7-12 Lawson/Graves

1733 3A AWP on
1833 3A AWP off
1850 3B AWP on
1920 Start 3A & 4A BAS
2140 Comp 3A & 4A SP
2230 Start 3C & 4D BAS
0100 Comp 3C & 4D BAS
0200 start 3B & 4A BAS
0300 Comp 3B & 4A SP
0400 start 3D & 4D BAS
0445 comp 3D SP

Changed filters: C3 3A Bowl Mill, 3B AWP
C4 4A Bowl Mill
WWO: C3 3C clinker grinder will not stay running
C4 BAS crossover VLV #357 limits needs reset.
Cleaned Pyrite Hoppers: C3 3A, 3B, 3E, 3A again
C4 4C, 4D
T-1 1' 4 3/16" T-2 7' 7 5/16"
Pond +1

Day 8-7-12 Brooks

Pond -3

- AWP Cell is going empty waiting for someone to look at the issue
- Deisolated 3A Mill
- Deisolated 3 Vac. prime system
- Electricans fixed C4 Pentex Recirc. pmp
- Got a load of Amonnia
- Got a load of Nitrogen
- Cleaned 3C pyrite
- vac. primeing crossover vlv. still open and on loto.

8-6-10 Night Lawson

~~Start 3AWP Start 3B + 4A BAS~~
~~Comp 3B + 4A SP~~
~~Start 3D + 4D BAS~~
~~Comp 3D + 4D SP~~
~~Comp purge shut down 3A AWP~~
~~Start 3B AWP Start 3A + 4A BAS~~
~~Comp 3A & 4A SP~~

AWP Cell Level indicator not working
Could not pull BAS uwo.

Ashpond Even

Changed filters C3 3B SBAC

Cleaned 3D & 4D pyrite hoppers

5:45 shut down BAS

12:00 start 3B AWP
start 3A & 4A BAS
1:00 purge 3A & 4A BAS
2:00 start 3C & 4C BAS
2:45 purge 3C & 4C BAS
3:55 shut down BAS

pond +2

Gms fixed 3D diaphram
cleaned 4C pyrite
changed filters on 4B DA

-4554

NIGHT 8-5-12 McBLAIN

1900 START 3A & 4A BAS
2010 COMP 3A & 4A BAS S/P
2200 START 3C & 4C BAS
2320 COMP 3C & 4C BAS S/P
0045 START 3B & 4A BAS
0200 COMP 3B & 4A BAS S/P
0320 START 3C & 4D BAS
0415 COMP 3C & 4D BAS S/P

- POND - +2 24" - OPEN
- ECON HOPPERS & DRAGCHAIN - OK
- T1 - 1'4 3/4" / T2 - 7'7 1/4"
- RAN TRAVELING SCREENS
- CLEANED 3A PYRITES
- CHANGED MOTOR AIR FILTERS ON 3B-SBAC
- ADDED WATER TO STATOR TANK ON C3 - 53.8

8-5-12 Day Lyssy

7:00 pull 3C & 4C BAS
8:30 purge 3C & 4C BAS
11:00 start 3B & 4A BAS
12:00 purge 3B & 4A BAS
1:00 start 3D & 4D BAS
2:30 purge 3D & 4D BAS

pond +2

C4 drained vac priming tank
compounded chemicals
cleaned 3A pyrites 4C

NIGHT 8-4-12 McBLAIN

1900 START 3A-AWP / START 3B+4A BAS
2030 3A AWP shut off / started 3B
2250 Comp 3B / 4A BAS started purge
2300 START 3C + 4D BAS
0020 COMP 3C + 4D BAS S/P
0300 START 3A+4A BAS
0400 COMP 3A+4A BAS S/P

- POND #2 24" RETURN DRAIN OPEN
- ECON HOPPERS & DRAG CHAIN - OK
- T1 - 1'4¼" / T2 - 7'7¼"
- RAN TRAVELING SCREENS
- TIED C3 + C4 VACUUM PRIMING (WWO)
- CLEANED 3A 4C & E PYRITES

WWO - 4EQXV-358 BAS CROSSOVER VALVE LIMIT
WWO - 4B HYDRAZINE PUMP NOT PUMPING

Day 8-4-11 Brooks

0630 shut down BAS
1130 Start 3B + 4A BAS
1230 3B + 4A comp. S/P
1330 Start 3C + 4C BAS
1430 3C + 4C BAS comp S/P
1530 purge comp.
1630 stop AWP

Pond #2

3B Mill has hole in expansion joint on 1½ floor above pulverizer.

Compounded Chemicals

ISON

NIGHT 8-3-12 M^c BLAIN

1900 START 3A-AWP / START 3A + 4A BAS

2000 LOST POWER TO AWP'S / START 3B-AWP / CONTINUE 3A+4A BAS

2100 COMP 3A + 4A BAS S/P

2200 START 3C + 4C BAS

2300 COMP 3C + 4C BAS S/P

0110 START 3B + 4A BAS

0220 COMP 3B + 4A BAS S/P

0330 START 3C + 4D BAS

0430 COMP 3C + 4D BAS S/P

- POND - +2 24" RETURN DRAIN - OPEN
- ECON HOPPERS + DRAG CHAIN - OK
- T1 - 1' 4 1/4" / T2 - 7' 7 1/4"
- DRAINED C3 VACUUM PRIMING

on WWO

Day 8-3-12 Lawson

0530 start 3C & 4C BAS
0800 comp 3C & 4C SP
1100 start 3B & 4A BAS
1200 comp 3B & 4A SP
1300 start 3D & 4D BAS
1400 Comp 3D & 4D SP
1500 comp purge shutdown 3B AWP

C3 found 3D BAS vent diaphragm blown WWC
Cleaned 4C pyrite hopper
Changed filters 3D bowl mill
Ash Pond + 3

UCS

NIGHT 8-2-12 McBLAIN

1730 COMP 3A+4C BAS S/P

1900 START 3B+4B BAS

2020 COMP 3B+4B BAS S/P

2115 START 3D+4D BAS

2205 COMP 3D+4D BAS S/P

2345 SHUTDOWN BAS / SECURED 3A-AWP

0320 START 3B-AWP / START 3A+4A BAS

0435 COMP 3A+4A BAS S/P

- POND - +1 24" RETURN DRAIN - OPEN
- ECON HOPPERS + DRAG CHAIN - OK
- T1 - 1'4¼" / T2 - 7'7¼"
- SWAPPED OIL FILTERS ON 3B +3D MILLS (WWO)
- CLEANED 3B+D PYRITES
- ADDED H2 TO C3 + C4 @ 2300

WWO - 3A-SBAC NOT MAINTAINING SET POINT 308 psi 3A @ 250 psi

WWO - 4A TBFP SEAL WATER PUMP STRAINER

WWO - 4B TBFP SEAL WATER PUMP PACKING LEAK

WWO - C4-PANTEX RECIRC PMP

DAY 8/2/12 Graves

Continuous pull on C3

Pond +2 return open

cleaned 4 C pyrite hopper

~~MA~~ GMS work on 4 B BAS Gate.

DAY 8-1-12 GARCIA

0600 Comp 3A/4A Start purge
0745 Start 3C/4C BAS
0715 Comp 3C Start purge
★ C4 BAS continuous pull for cascade wash ★
0945 Start 3A AWP
0950 Secured 3B AWP
1100 Start 3A BAS 3B diaphragm blown/WWD
1230 Comp 3A BAS / Start Purge
1330 Start 3D BAS
1430 Comp 3D / Start purge
Placed 3B on purge for GMS

Pond = +1 24" return drain = open
Deisolated 3A 10 Baghouse Comp.
C3 Vacuum priming not rising above 11 according to gauge — got vacuum to recover but seal tank acting up
+ Racked out CEMS Atlas Copco for Machinists / Complete

Night

6:00 purge 3B & 4A BAS
8:00 start 3C & 4C BAS
9:00 purge 3C & 4C BAS
10:00 start 3A & 4A BAS
11:00 purge 3A & 4A BAS
3:00 start 3A AWP
start 3B & 4A BAS

pond +3
economizer drag chains o
cleaned 4C pyrite
T1 1'4¼ T2 7'
C4 could not deisolated bear
C4 4C blown diaphram

Night 8-1-12 Lyssy

6:00 purge 3B & 4A BAS
8:00 start 3C & 4C BAS
9:00 purge 3C & 4C BAS
10:00 start 3A & 4A BAS
11:00 purge 3A & 4A BAS
3:00 start 3A AWP
start 3B & 4A BAS

pond +3
economizr drag chans ok
cleaned 4C pyrite
T1 1'4¼ T2 7'7¼
C4 could not de-isolated bearing wtr to 4A CWP vlv stuck
C4 4C blown diaphram

---

cording to
cting up
mplete

shut down

Operator Name: (print) R. Munoz

Supervisor Name: (print) J. [illegible]

Shift: (circle) Day [✓ Night]

Date: 8/20/12

SCRWP = Screen Wash Pump

	3A CWP	3B CWP	4A CWP	4B CWP	3A SCRWP	3B SCRWP	4A SCRWP	SCRWP in Service	SCR Wash Strainer D/P
Oil Levels	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI ~~OK~~ LOW	3A [✓ 3B] 4A	10 psi

Bearing Wtr Strainer D/P	C3 20 psi	C4 20 psi	Bearing Water Z @ CWP's	C3 62 psi / C4 15 psi
Run Traveling Screens	3A Yes [✓ No]	3B Yes [✓ No]	4A Yes [✓ No]	4B Yes [✓ No]
Traveling Screen Levels	3A 0.09 ft	3B 0.12 ft	4A 0.14 ft	4B 0.19 ft

Verify Rotation

Yard Drains Pits Outlet Valve # of Turns Open: #3 5 #4 5

ID Fans & Lube Oil Skids	3A	3B	4A	4B
Pump Discharge Z	95 psi	90 psi	95 psi	95 psi
Oil Supply Z	75 psi	75 psi	75 psi	75 psi
Filter D/P	3 psi	2 psi	3 psi	2 psi
IB Bearing Flow	11 gpm	11 gpm	10 gpm	10 gpm
OB Bearing Flow	3.75 gpm	4.25 gpm	4 gpm	4.25 gpm
Discharge Q	130 °F	125 °F	125 °F	125 °F
Reservoir Q	130 °F	125 °F	125 °F	125 °F
Reservoir Oil Level	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Fan Oil Levels IB/OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Motor Oil Lvls IB/OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
ID Fan Stator Q's (x6) °C	68 | 65 | 68 69 | 68 | 66	68 | 68 | 62 71 | 68 | 69	72 | 76 | 72 75 | 69 | 71	71 | 71 | 72 73 | 72 | 73
ID Fan IB / OB Bearing Q's °C	67 | 96	67 | 76	82 | 67	81 | 120
Any VFD Faults Present	Yes [✓ No]	Yes [✓ No]	Yes [✓ No]	Yes [✓ No]
VFD Coolant Pump Suction Z	3 psi	4 psi	5 psi	3 psi
Coolant Level	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
VFD Evaporator Screens Clean	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No
VFD Evap. # Of Fans In Service	6	6	4	4

Baghouse Compartment D/P's

3A1	5	3B1	4	4A1	6	4B1	5
3A2	5	3B2	3	4A2	6	4B2	4
3A3	5	3B3	6	4A3	5	4B3	4
3A4	4	3B4	6	4A4	6	4B4	5
3A5	5	3B5	5	4A5	5	4B5	4
3A6	5	3B6	5	4A6	5	4B6	4
3A7	5	3B7	5	4A7	5	4B7	5
3A8	9	3B8	3	4A8	4	4B8	5
3A9	5	3B9	4	4A9	5	4B9	5
3A10	5	3B10	5	4A10	4	4B10	4

Reverse Gas Fans	3A	3B	4A	4B
Oil Levels IB / OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
ACW Flow IB / OB Bearings	2.2 | 2.4	2.6 | 2.4	1.6 | 1.4	1.4 | 1.2
Inlet/Outlet Linkage Intact	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No
ACW Lines Vented	C3 [✓ Yes] No		C4 [✓ Yes] No	

Atlas Copco @ CEMS Shack

Tank Z	116	psi
Filter D/P's (x3)	0 | 3 | 0	
Comp Out Z	114	psi
Max Z	132	psi
Running Hours	28076	
Loaded Hours	17578	
Motor Starts	1985	
Module Hours	31754	
Element Out Q	203	°F
Opacity Reading In CEMS Shack	1.27	%
Stack Lights Indicator Panel In Alarm	Yes [✓ No]	

Ash Water Pumps

Adams Strainer D/P C3	— psi
Adams Strainer D/P C4	— psi
Flume Make-up Vlv Pos (When BA3 is Pulling) C3	0 %
Flume Make-up Vlv Pos (When BA3 is Pulling) C4	30 %
Drain Pump Discharge Z	80 psi
AWP Seal Wtr Strainer D/P	— psi
AWP Seal Water Supply Z	140 psi
3A AWP Seal Water Z	100 psi
3B AWP Seal Water Z	100 psi
3A AWP Motor Oil Level	✓
3B AWP Motor Oil Level	✓

	Winding Q	Liquid Q	Pressure	Level	Voltage
TP3AA1					480
TP3AA2					480
TP3BB1					520
TP3BB2					520
TP4AA1					500
TP4AA2					480
TP4BB1					500
TP4BB2					500

	C3	C4
Precip Switchgear Room Fire Panel Power	[✓ On] Off	[✓ On] Off

	C3		C4	
BH Heat Trace Panel Alarm In	[✓ Yes] No		Yes [✓ No]	
Baghouse H.S.A. Tanks Z	110	psi	110	psi
Baghouse Inst. Air Tank Z	108	psi	110	psi
Aeration Blower Discharge Z	5	psi	5	psi
Aeration Blower Discharge Q	175	°F	210	°F

Economizer Hoppers Checked

	25	26	27	28	29	30
C3	✓	✓	✓	✓	✓	✓
C4	✓	✓	✓	✓	✓	✓

Dragchain Oil Level

C3	HI [✓ OK] LOW
C4	HI [✓ OK] LOW

Transport Air Blowers	3A	3B	3 A/B	4A	4B	4 A/B
Oil Levels IB / OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Discharge Z	6 psi	— psi	11 psi	5 psi	— psi	— psi
Filter D/P	12 psi	OFF psi	10 psi	10 psi	OFF psi	OFF psi

Fluidizing Air Blowers	3A	3B	4A	4B
Oil Level	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Discharge Z	psi	5.5 psi	psi	6.5 psi
Discharge Q	OFF °F	354 °F	OFF °F	349 °F
Filter D/P	psi	5 psi	psi	5 psi

FD Fans	3A	3B	4A	4B
Fan Oil Levels IB/OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Motor Oil Lvls IB/OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Inlet Screens Clean	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No
Inlet/Discharge Linkage Intact	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No

PA Fans	3A	3B	4A	4B
Fan Oil Levels IB/OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Motor Oil Lvls IB/OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Inlet Screens Clean	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No
Inlet/Discharge Linkage Intact	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No	[✓ Yes] No

Bowl Mills	3A	3B	3C	3D	3E
Oil Z	25 psi	22 psi	25 psi	18 psi	psi
Oil Inlet / Outlet Q's	120 | 110 °F	120 | 110 °F	120 | 110 °F	100 | 160 °F	| °F
Oil Level (when mill is off)	OK LOW [✓ ON]	OK LOW [✓ ON]	OK LOW [✓ ON]	OK LOW [✓ ON]	OK LOW ON
Motor Oil Lvls IB/OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI OK LOW
Filter In Service	North [✓ South]	North [✓ South]	North [✓ South]	North [✓ South]	North South
Filter Condition	[✓ Clean] Dirty	[✓ Clean] Dirty	[✓ Clean] Dirty	[✓ Clean] Dirty	Clean Dirty
Pyrite Hopper Level					

Bowl Mills	4A	4B	4C	4D	4E
Oil Z	OFF psi	26 psi	22 psi	24 psi	24 psi
Oil Inlet / Outlet Q's	OFF °F	120 | 110 °F	120 | 110 °F	120 | 110 °F	120 | 110 °F
Oil Level (when mill is off)	[✓ OK] LOW ON	OK LOW [✓ ON]	OK LOW [✓ ON]	OK LOW [✓ ON]	OK LOW [✓ ON]
Motor Oil Lvls IB/OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Filter In Service	[✓ North] South	North [✓ South]	[✓ North] South	North [✓ South]	North [✓ South]
Filter Condition	[✓ Clean] Dirty	[✓ Clean] Dirty	[✓ Clean] Dirty	[✓ Clean] Dirty	[✓ Clean] Dirty
Pyrite Hopper Level					

TBFP Seal Water Pumps	3A	3B	4A	4B
Discharge Z	425 psi	350 psi	OFF psi	425 psi
Suction Strainer D/P	1 psi	1 psi	psi	1 psi
Motor Oil Level (when running)	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW

Condensate Pumps	3A	3B	4A	4B
Motor Oil Lvls IB/OB Bearings	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW	HI [✓ OK] LOW
Seal Water Z	175 psi	250 psi	175 psi	175 psi

ACW Pumps	3A	3B	4A	4B
Suction Z	30 psi	10 psi	25 psi	35 psi
Discharge Z	100 psi	60 psi	70 psi	70 psi

Main Supply Header Vented	C3	[✓ Yes] No	C4	[✓ Yes] No

BAS System		C3	C4
AWP Supply Z (inside building)		200 psi	200 psi
AHMUP Adams Strainer D/P		5 psi	10 psi
AHMUP Suction Z		4 psi	2 psi
AHMUP Discharge Z		95 psi	85 psi
Clinker Grinder Seal Water Z	A	— psi	20 psi
	B	15 psi	20 psi
	C	20 psi	30 psi
	D	60 psi	40 psi
Air/Water Converter Tank Level	A	HI [✓ OK] LOW	HI [✓ OK] LOW
	B	HI [✓ OK] LOW	HI [✓ OK] LOW
	C	HI [✓ OK] LOW	HI [✓ OK] LOW
	D	HI [✓ OK] LOW	HI [✓ OK] LOW
BAS Ejector Supply Z (Before Hopper)	A	psi	psi
	B	psi	psi
	C	psi	psi
	D	psi	psi
Hopper Vent Line Cleared (after pull)	A	Yes No	[✓ Yes] No
	B	[✓ Yes] No	Yes No
	C	[✓ Yes] No	[✓ Yes] No
	D	[✓ Yes] No	[✓ Yes] No
Pantleg Bubbler Air Flow	A/B	— scfh	2 scfh
	C/D	2 scfh	— scfh

BAS Ponds	North	South
Overflow Level	+3" in	— in
Pond Drain	Open [✓ Closed]	[✓ Open] Closed
24" Line Drain	[✓ Open] Closed	[✓ Open] Closed
Date/Time IF You Opened or Closed Either Drain Valve		
24" Return Line Screens Clean	[✓ Yes] No	[✓ Yes] No

Chemical Pumps	Oil Level	Discharge Z	Tank Level
3A Hydrazine	HI [✓ OK] LOW	— psi	in
3B Hydrazine	HI [✓ OK] LOW	250 psi	26
Phosphate	HI [✓ OK] LOW	2800 psi	26 in
4A Hydrazine	HI [✓ OK] LOW	— psi	25 in
4B Hydrazine	HI [✓ OK] LOW	450 psi	
Phosphate	HI [✓ OK] LOW	2600 psi	26 in

C3 (I-beam by pantax) C4 (back of x-mitter rack by BAS)

24" RETURN LINE LOW FLOW SYMPTOMS AND SHOCK CHLORINATION PROCEDURES

The 24" return line can normally handle all water requirements while pulling bottom ash on both units. As the weather warms up, Algae forms inside the lining of the 24" return line. This Algae restricts the flow of water returning to the bottom ash cell. Depending on the thickness of the build up, it can cause problems at the pond and at the ash water pump cell and drain cell. The noticeable symptoms start very slowly, and then things start to go wrong at the drain cell and ash water pump cell. Some symptoms are as follows:

1. The pond level starts rising a little bit every day, its hardly noticeable.
2. The water level at the pond overflow gradually starts getting higher and higher. A couple of inches above the overflow can be considered normal. Five inches or more, everyone should watch it closely.
3. The vortex or swirl around the concrete plug will get more and more sluggish as the algae build up gets thicker. Check the vortex only when you are pulling bottom ash. A normal vortex will swirl rapidly around the plug.
4. The flumes will start contributing more and more water to maintain the ash water pump cell level as the 24" return line flow becomes less. This will cause the pond level to rise, and explains the first two symptoms.
5. The instrument department will start getting complaints from operations that the pit levels will not maintain their normal operating levels.
6. This is what can cause serious problems----The Ash Water Pumps will start tripping out on low level trips. All of us tend to get complacent about low level trip outs on the pumps. We just simply go out to the pump and restart it. BUT WHAT IF IT WAS FROM ANOTHER CAUSE SUCH AS ELECTRICAL OR MECHANICAL TROUBLE. YOU COULD WIPE THE PUMP OR MOTOR OUT ON THE NEXT RESTART. Do not jeopardize your job by assuming that it was a low level trip out.

A

J.T. DEELY
ASH OPERATOR DUTIES

1. OBSERVE ALL SAFETY RULES PERTAINING TO THE OPERATION OF THE ASH HANDLING SYSTEMS. USE ALL PROTECTIVE EQUIPMENT SUCH AS GOGGLES, DUST RESPIRATORS, GLOVES, ETC.

2. PULL FLY ASH AS PER THE PULLING SCHEDULE. PULL DIFFERENTLY IF CONDITIONS DICTATE TO DO SO.

3. THE ASH OPERATORS WILL OBSERVE AND INSPECT THE OPERATION OF BOTH SETS OF FLY ASH COLLECTORS, (A & B) FOR BOTH UNITS, ON TOP OF THE SILOS. THEY WILL INSPECT THE FLY ASH SYSTEM TRANSPORT LINES, VACUUM PUMPS, PRECIPITATOR PURGE AIR BLOWERS AND HEATERS, ETC. WHILE THE SYSTEMS ARE IN OPERATION.

4. TWICE A SHIFT CHECK PRECIPITATOR CONTROL ROOM, CABINETS, HEATERS, WIRE AND PLATE RAPPER SYSTEMS, AIR CONDITIONER AND GENERAL CLEANLINESS OF FLY ASH PRECIPITATOR CONTROL ROOM. ANYTHING ABNORMAL SHOULD BE REPORTED TO YOUR SUPERVISOR.

5. ONCE A SHIFT CHECK FLY ASH SILO UNLOADING AREA, AERATION BLOWER AND HEATER UNDER THE SILO AREA.

6. AT LEAST ONCE A SHIFT, OBSERVE AND INSPECT THE OPERATION OF THE ECONOMIZER DRAG CHAIN CONVEYING SYSTEM.

7. OBSERVE AND INSPECT ASH PUMP AND DRAIN PUMP SUMP AREA AT LEAST THREE (3) TIMES A SHIFT.

8. RUN ASH WATER DRAIN SUMP EDUCTORS (2) ONCE A MONTH FOR 30 MINUTES.

9. PULL BOTTOM ASH ONCE EACH SHIFT AT THE BEGINNING OF THE SHIFT. DO NOT LEAVE AREA FOR LONG PERIODS OF TIME WHEN THE SYSTEM IS IN OPERATION. FILL HOPPERS AS SOON AS POSSIBLE. DO NOT LEAVE EMPTY, UNNECESSARILY, FOR ANY LENGTH OF TIME.

10. ONCE A SHIFT, INSPECT PYRITE COLLECTION HOPPERS FOR COAL SPILLAGE, FIRES, TRAMP IRON, PYRITES, ROCKS, ETC. IF ANY COAL SPARKING IS SEEN IN THE PYRITE HOPPERS, NOTIFY SHIFT SUPERVISORS.

11. ONCE A WEEK, THURSDAY ON THE DAY RUN, FILL AND FLUSH PYRITE COLLECTION HOPPER SEAL CYLINDERS.

12. CHECK ASH POND LEVEL AND AREA ONCE A SHIFT.

13. ONCE A WEEK, WALK BOTTOM ASH DISCHARGE WATER LINES TO ASH POND INSPECTING FOR LEAKS.

14. CLEANING ASSIGNMENTS; CLEAN UP AT LEAST ONCE A WEEK OR MORE IF NEEDED

CITY PUBLIC SERVICE
SAN ANTONIO, TEXAS
CALAVERAS UNIT 5

TURNKEY CONTRACT DOCUMENTS

VOLUME 4

POWER PLANT EQUIPMENT AND MATERIAL REQUIREMENTS

BOOK 1

DIV 50 - UNIT DESIGN AND PERFORMANCE
DIV 60 - GENERAL
DIV 61 - STRUCTURAL

DEC 31 1987

UTILITY ENGINEERING CORPORATION
H. B. ZACHRY COMPANY
COMBUSTION ENGINEERING, INC.

Black & Veatch
Engineers-Architects

Section 50.0200 - SITE DESIGN CONDITIONS

1.0 GENERAL. The Calaveras Unit 5 site conditions to be used as design and performance criteria shall be as described herein. These site design conditions shall be used for the design and selection of any equipment or materials furnished unless otherwise stated.

2.0 METEOROLOGY. The climate in the vicinity of the Calaveras Lake site is characteristic of the plains of south Texas. The site ambient conditions are summarized as follows.

Elevation	494 ft msl
Design ambient temperature	110 F maximum 0 F minimum
Dry- and wet-bulb temperature and duration	
Recorded dry-bulb (December - February)	99 percent of time above 25 F 97.5 percent of time above 30 F
Recorded dry-bulb and mean coincident wet-bulb (June - September)	1 percent of time above 99 F/72 F 2.5 percent of time above 97 F/73 F 5 percent of time above 96 F/73 F
Mean daily range (summer)	19 F
Design wet-bulb	1 percent of time above 77 F 2.5 percent of time above 76 F 5 percent of time above 76 F
Mean annual precipitation	29 inches

3.0 NATURAL PHENOMENA DESIGN CRITERIA. The design criteria based on natural phenomena shall be as follows.

3.1 Rainfall. The rainfall design basis may vary for the different systems and system components. The Contractor shall identify each building, system component, and the associated rainfall design basis in the Project Outline. The Project Consultant will provide information to the Contractor regarding the Coal Yard Facilities for inclusion in the Project Outline.

Precipitation amounts to be used with each design basis are listed in Table 50.0200-1 included herein for various durations and return periods. The data were obtained from the Rainfall Frequency Atlas of the United States, May 1961.

3.2 Wind Speed. The design wind speed shall be 80 miles per hour based on ANSI Standard A58.1-1982 for a 50 year recurrence interval. This design wind speed shall be used to determine wind loads for all structures except the concrete chimney. The design wind speed for the concrete chimney design shall be in accordance with the requirements for the chimney included in Section 61.1001 of these contract documents.

3.3 Temperature. Systems and system component design criteria which require ambient temperature extremes shall use the range from 0 F to 110 F for dry-bulb temperatures. Equipment such as oil-filled power transformers shall be designed for a maximum daily average temperature of 100 F.

3.4 Relative Humidity. The average annual relative humidity is 67 percent.

3.5 Barometric Pressure. The average annual barometric pressure is 29.49 inches Hg abs based on a site elevation of 494 feet above mean sea level.

3.6 Frost Depth. The "mean air freezing index" at the Calaveras Lake site is 0 degree-days. The index is defined as the cumulative number of degree-days below 32 F computed on the basis of mean air temperature data.

The "design freezing index" is 50 degree-days. This index is defined as the cumulative number of degree-days with air temperature below 32 F for the coldest year in a 10 year cycle, or the average of the coldest 3 years in a 30 year cycle. (The above information was extracted from the Army Technical Manual TM5-818-2, Pavement Design for Frost Conditions, July 1965.)

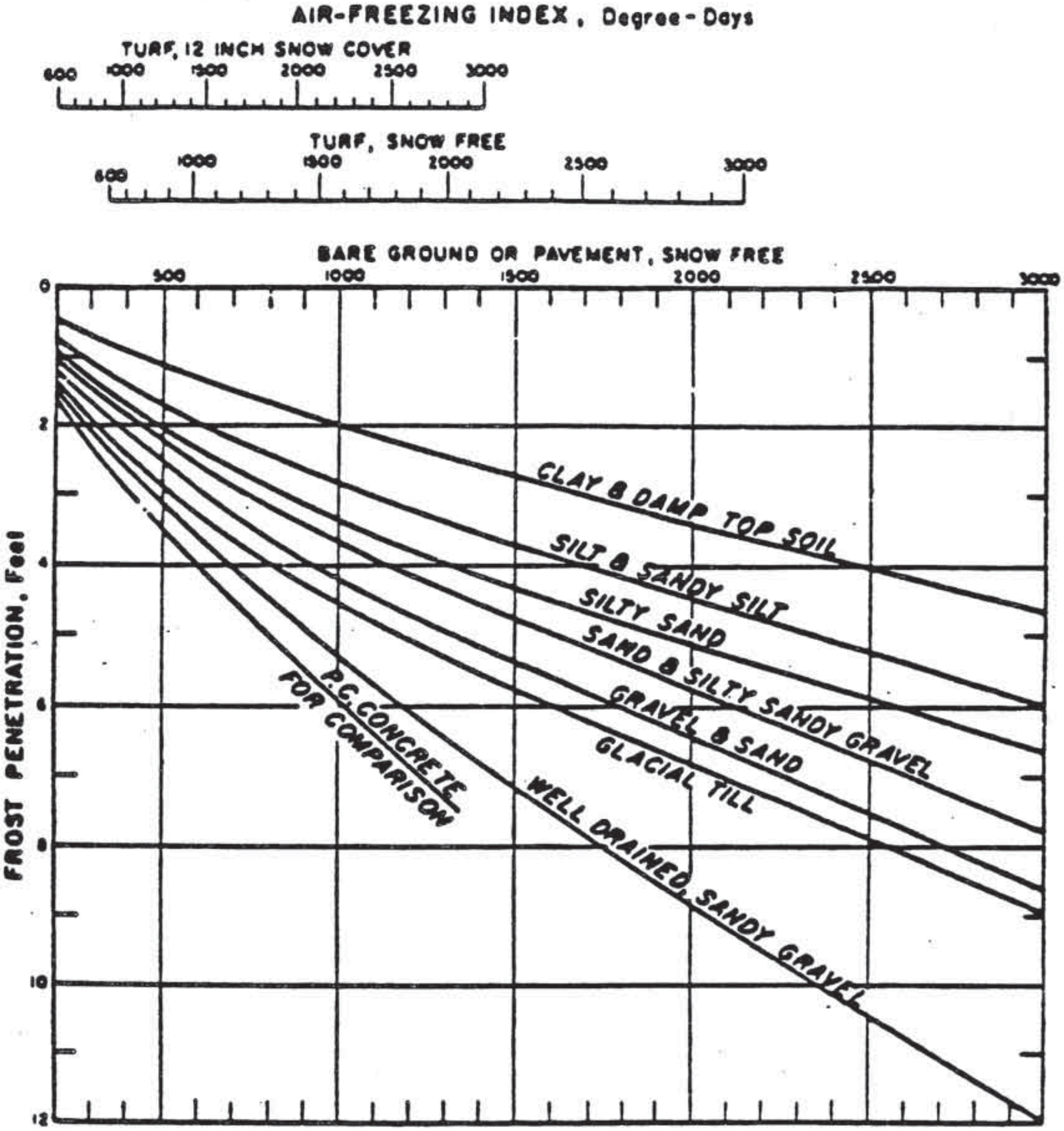
The relationship between air freezing index and frost penetration for various types of soils and surface cover is shown on Figure 50.0200-1 included herein, as extracted from the Army Technical Manual TM5-852-6, January 1966.

Frost protection for footings, pipes, and other frost susceptible structures shall be designed according to the above criteria; however, unless special localized conditions exist, 2 feet shall be used for frost penetration design.

Yard fire water mains shall be installed with top of pipe not less than 1 foot below the design frost penetration depth in accordance with National Fire Protection Association Standard 24.

TABLE 50.0200-1. PRECIPITATION AMOUNTS FOR SELECTED DURATIONS AND RETURN PERIODS EXPECTED IN THE CALAVERAS LAKE SITE AREA

	Return Period				
Duration hours	5 Year inches	10 Year inches	25 Year inches	50 Year inches	100 Year inches
1/2	1.95	2.32	2.68	3.02	3.35
1	2.44	2.92	3.38	3.80	4.25
2	3.03	3.58	4.21	4.69	5.29
3	3.33	3.97	4.63	5.25	5.86
6	4.00	4.77	5.67	6.29	7.13
12	4.75	5.63	6.68	7.64	8.54
24	5.41	6.60	7.75	8.80	9.92



Relationship between air-freezing index, surface cover, and frost penetration into homogeneous soils

FIGURE 50.0200-1

3.7 Seismicity. The Calaveras Lake site is located in Risk Zone 0, as determined from Figure 13 of ANSI Standard A58.1-1982.

3.8 Soil Resistivity. An onsite soil resistivity survey shall be performed by the Contractor. Information regarding soil resistivity is required for design of the station grounding system and to determine the requirements for cathodic protection of underground piping. The results of the survey shall be documented in the Project Outline to be provided by the Contractor as described in Volume 2.

3.9 Soil Borings. The Contractor shall be responsible for all soil borings and geotechnical analysis of soil borings. Any soil boring information provided by the Owner is for the Contractor's information only. Information regarding soil borings and their effect on design of the power plant systems shall be documented in the Project Outline to be provided by the Contractor as described in Volume 2.

4.0 DESIGN WATER QUALITY. The water supplies to the Calaveras Lake site are from the lake and from a city water main.

4.1 Lake Water. The design water quality to be used for all equipment, materials, and processes using untreated lake water shall be as follows.

Constituent	Design Value	Typical Range
Calcium, mg/l as $CaCO_3$	120	100 - 135
Magnesium, mg/l as $CaCO_3$	107	95 - 115
Sodium, mg/l as $CaCO_3$	182	85 - 230
Potassium, mg/l as $CaCO_3$	24	20 - 27
Alkalinity, mg/l as $CaCO_3$	156	140 - 180
Sulfate, mg/l as $CaCO_3$	111	95 - 120
Chloride, mg/l as $CaCO_3$	166	35 - 225
Silica, mg/l as SiO_2	0.3	0.1 - 0.5
Iron, mg/l as Fe	0.14	0.07 - 0.22
pH	8.8	7.3 - 9.1
Conductivity, mmho/cm	847	820 - 875

Lake water temperature for design and performance guarantees shall be 95 F.

4.2 City Water. The design water quality to be used for all equipment, materials, and processes using city water shall be as follows.

Constituent	Design Value	Typical Range
Calcium, mg/l as $CaCO_3$	187	175 - 195
Magnesium, mg/l as $CaCO_3$	59	55 - 65
Sodium, mg/l as $CaCO_3$	15	10 - 20
Alkalinity, mg/l as $CaCO_3$	213	200 - 225
Sulfate, mg/l as $CaCO_3$	26	23 - 30
Chloride, mg/l as $CaCO_3$	21	18 - 23
Nitrate, mg/l as $CaCO_3$	1	1 - 2
Silica, mg/l as SiO_2	13	10 - 15
Iron, mg/l as Fe	<0.03	-
pH	7.7	7.2 - 8.1

Appendix D

Photographs

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 1: NP - North Embankment crest, looking east.

Photo 2: NP- North embankment interior slope, looking east.

Photo 3: NP - North embankment interior slope, looking east.

Photo 4: NP - North embankment exterior slope, looking north.

Note: NP - photographs related to the North Bottom Ash Pond
SP - photographs related to the South Bottom Ash Pond
NP/SP - photographs related to both the North and South Bottom Ash Ponds

CDM Smith

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 5: NP - North embankment exterior slope, looking northeast. Note erosion near fence post.

Photo 6: NP - North embankment interior slope, looking east.

Photo 7: NP - Outlet structure at northeast corner, looking east.

Photo 8: NP - North embankment exterior slope, looking north. Calaveras Lake in distance.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 9: NP - East embankment exterior slope, looking south.

Photo 10: NP - East embankment crest, looking south.

Photo 11: NP - Outlet structure at northeast corner, looking west. Outlet riser pipe.

Photo 12: NP - East interior slope, looking south.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 13: NP - East embankment interior slope, looking west. Note vegetation on slope.

Photo 14: NP - Loose ash material at east embankment interior slope.

Photo 15: NP - East embankment exterior slope, looking south.

Photo 16: NP - East embankment exterior slope, looking west.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 17: NP - East embankment interior slope, looking south. Note erosion rills in ash material.

Photo 18: NP - Inlet piping, looking northwest. Piping includes one 8-inch diameter and two 12-inch-diameter pipes.

Photo 19: NP - Exterior slope at southeast corner, looking east.

Photo 20: NP - Interior slope at southeast corner, looking west.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012


Photo 21: NP/SP - Common embankment crest, looking west.


Photo 22: NP/SP – Common embankment south slope, looking west.


Photo 23: NP/SP – Erosion of ash material on common embankment north slope.


Photo 24: NP/SP – Erosion of ash material on common embankment south slope, looking northwest.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 25: NP/SP – Vegetation and ash material on common embankment south slope.

Photo 26: NP/SP – Erosion of ash material on common embankment south slope, looking west.

Photo 27: NP/SP – Common embankment north slope, looking west.

Photo 28: NP/SP – Common embankment north slope, looking east. Slope measured approximately 3H:1V.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 29: NP/SP - Common embankment crest, looking west.

Photo 30: NP/SP – Common embankment south slope, looking west.

Photo 31: NP/SP – Common embankment south slope, looking west.

Photo 32: NP/SP – Common embankment north slope, looking west.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 33: NP – Inlet pipes at southwest corner. Piping includes one 8-inch diameter and two 12-inch-diameter pipes.

Photo 34: NP – 24-inch-diameter Plant return outlet, looking north.

Photo 35: NP – West embankment interior slope, looking northeast.

Photo 36: NP – North embankment interior slope, looking northeast.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 37: NP – West embankment exterior slope, looking south.

Photo 38: NP – Erosion rill in ash material at west embankment interior slope.

Photo 39: NP – West embankment exterior slope, looking northeast.

Photo 40: NP – West embankment interior slope, looking northeast.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 41: NP – West embankment exterior slope, looking north. Note area of loose soil/ash material.

Photo 42: NP – West embankment crest, looking northeast.

Photo 43: NP – Erosion of ash material at west embankment interior slope.

Photo 44: NP – West embankment exterior slope, looking north.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 45: NP – West embankment interior slope, looking northeast. Note area of ash material on slope near northwest corner.

Photo 46: NP – Northwest corner exterior slope, looking south.

Photo 47: NP – Vegetation on north embankment exterior slope, looking north.

Photo 48: NP – North embankment exterior slope, looking west.

Photo 49: NP – North embankment exterior slope, looking west.

Photo 50: NP – North embankment exterior slope, looking west.

Photo 51: NP – Erosion on north embankment exterior slope, looking north.

Photo 52: NP – Erosion at fence post on north embankment exterior slope.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012


Photo 53: SP – East embankment exterior slope, looking south.


Photo 54: SP – East embankment interior slope, looking south.


Photo 55: NP/SP – Common embankment south slope, looking west.


Photo 56: SP - East embankment crest, looking south.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 57: SP – Ash/soil pile on east embankment interior slope, looking south.

Photo 58: SP - East embankment exterior slope, looking south.

Photo 59: SP – East embankment interior slope, looking south.

Photo 60: SP – Exterior slope at southeast corner, looking south.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 61: SP – Outlet structure at southeast corner interior slope, looking northwest.

Photo 62: SP - South embankment exterior slope, looking west.

Photo 63: SP – Approximately 3H:1V side slope at south embankment exterior slope.

Photo 64: SP - South embankment interior slope, looking west.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 65: SP – South embankment crest, looking west.

Photo 66: SP – South embankment interior slope, looking west.

Photo 67: SP - Drainage ditch at south embankment exterior toe, looking west.

Photo 68: SP – South embankment exterior slope, looking west. Note equipment working in pond to replace inlet piping.

CDM Smith

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 69: SP – Inlet piping at southwest corner interior slope, looking north.

Photo 70: SP – West embankment interior slope, looking north.

Photo 71: SP – Inlet piping at southwest corner interior slope, looking northeast.

Photo 72: SP – Exterior slope at southwest corner, looking west.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 73: SP – West embankment crest, looking north.

Photo 74: SP – West embankment exterior slope, looking north.

Photo 75: SP – Spillway between SRH Pond and South Bottom Ash Pond at west embankment crest, looking north.

Photo 76: SP - Spillway between SRH Pond and South Bottom Ash Pond at west embankment interior slope, looking east.

CDM Smith

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 77: SP - Spillway between SRH Pond and South Bottom Ash Pond at west embankment exterior slope, looking west.

Photo 78: SP – SRH Pond clarifier structure at west embankment crest, looking north.

Photo 79: SP – Spillway between SRH Pond and South Bottom Ash Pond at west embankment crest, looking north.

Photo 80: SP - Spillway between SRH Pond and South Bottom Ash Pond at west embankment interior slope, looking east.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 81: SP - Spillway between SRH Pond and South Bottom Ash Pond at west embankment exterior slope, looking west.

Photo 82: SP – West embankment exterior slope, looking north.

Photo 83: SP – 24-inch-diameter Plant return outlet, looking east.

Photo 84: NP/SP – Common embankment south slope, looking east.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 85: NP/SP – Discharge outfall 103C into Plant intake canal.

Photo 86: NP/SP – 12-inch-diameter piping at outfall 103C.

Photo 87: NP/SP – Discharge outfalls 103A and 103B into Plant intake canal.

Photo 88: NP – 12-inch-diameter piping at outfall 103A.

EPA Assessment - North and South Bottom Ash Pond Photos August 27 and 28, 2012

Photo 89: SP – 12-inch-diameter piping at outfall 103B.

EPA Assessment - Evaporation Pond Photos August 28, 2012


Photo 90: East Embankment crest, looking north.


Photo 91: East embankment interior slope, looking north.


Photo 92: Loose soils on east embankment exterior slope.


Photo 93: East embankment exterior slope, looking north.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 94: Loose soils on east embankment exterior slope.

Photo 95: East embankment exterior toe, looking north.

Photo 96: Loose soils near east embankment exterior toe.

Photo 97: East embankment exterior slope measured approximately 4H:1V.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 98: North embankment exterior slope, looking west.

Photo 99: North embankment exterior slope, looking west.

Photo 100: North embankment crest, looking west.

Photo 101: North embankment interior slope, looking west.

CDM Smith

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 102: East embankment interior slope, looking south.

Photo 103: North embankment exterior slope, looking east.

Photo 104: North embankment exterior slope, looking east. Note trees near exterior toe.

Photo 105: Trees at north embankment exterior toe, looking east.

EPA Assessment - Evaporation Pond Photos August 28, 2012


Photo 106: West embankment interior slope, looking south.


Photo 107: West embankment exterior slope, looking south.


Photo 108: West embankment crest, looking south.


Photo 109: West embankment exterior slope, looking southwest.

CDM Smith

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 110: Approximately 18-inch-deep animal burrow at west embankment exterior slope.

Photo 111: West embankment interior slope, looking south.

Photo 112: West embankment exterior slope, looking south.

Photo 113: Pond signage near southwest corner.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 114: South embankment crest, looking east.

Photo 115: South embankment interior slope, looking east.

Photo 116: South embankment exterior slope, looking southeast.

Photo 117: Exposed soil at south embankment exterior slope, looking north.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 118: South embankment exterior slope measured approximately 3H:1V.

Photo 119: South embankment exterior slope, looking east.

Photo 120: South embankment interior slope, looking east.

Photo 121: South embankment exterior slope, looking east.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 122: Interior slope at southeast corner, looking northwest.

Appendix D
Photo GPS Locations

Site: J.T. Deely Power Plant
Datum: NAD 1983
Coordinate Units: Degrees Decimal Minutes

Photo No.	Latitude	Longitude
1	N 29 18.566'	W 98 18.980'
2	N 29 18.565'	W 98 18.979'
3	N 29 18.565'	W 98 18.973'
4	N 29 18.572'	W 98 18.968'
5	N 29 18.574'	W 98 18.967'
6	N 29 18.568'	W 98 18.948'
7	N 29 18.565'	W 98 18.920'
8	N 29 18.569'	W 98 18.914'
9	N 29 18.567'	W 98 18.904'
10	N 29 18.565'	W 98 18.907'
11	N 29 18.563'	W 98 18.909'
12	N 29 18.560'	W 98 18.907'
13	N 29 18.550'	W 98 18.907'
14	N 29 18.547'	W 98 18.908'
15	N 29 18.543'	W 98 18.892'
16	N 29 18.538'	W 98 18.890'
17	N 29 18.528'	W 98 18.907'
18	N 29 18.526'	W 98 18.908'
19	N 29 18.489'	W 98 18.908'
20	N 29 18.486'	W 98 18.908'
21	N 29 18.483'	W 98 18.909'
22	N 29 18.481'	W 98 18.910'
23	N 29 18.484'	W 98 18.919'
24	N 29 18.478'	W 98 18.922'
25	N 29 18.479'	W 98 18.921'
26	N 29 18.479'	W 98 18.920'
27	N 29 18.484'	W 98 18.929'
28	N 29 18.483'	W 98 18.931'
29	N 29 18.483'	W 98 18.942'
30	N 29 18.481'	W 98 18.946'
31	N 29 18.480'	W 98 18.956'
32	N 29 18.483'	W 98 19.002'
33	N 29 18.484'	W 98 19.040'
34	N 29 18.484'	W 98 19.041'
35	N 29 18.487'	W 98 19.044'
36	N 29 18.496'	W 98 19.042'
37	N 29 18.501'	W 98 19.047'
38	N 29 18.506'	W 98 19.028'
39	N 29 18.509'	W 98 19.028'
40	N 29 18.510'	W 98 19.023'
41	N 29 18.517'	W 98 19.023'
42	N 29 18.521'	W 98 19.012'
43	N 29 18.528'	W 98 19.008'
44	N 29 18.540'	W 98 19.007'
45	N 29 18.550'	W 98 18.987'
46	N 29 18.561'	W 98 18.985'

Appendix D
Photo GPS Locations

Site: J.T. Deely Power Plant
Datum: NAD 1983
Coordinate Units: Degrees Decimal Minutes

Photo No.	Latitude	Longitude
47	N 29 18.568'	W 98 18.898'
48	N 29 18.574'	W 98 18.901'
49	N 29 18.574'	W 98 18.907'
50	N 29 18.573'	W 98 18.938'
51	N 29 18.572'	W 98 18.951'
52	N 29 18.572'	W 98 18.957'
53	N 29 18.483'	W 98 18.896'
54	N 29 18.476'	W 98 18.909'
55	N 29 18.478'	W 98 18.914'
56	N 29 18.471'	W 98 18.905'
57	N 29 18.461'	W 98 18.910'
58	N 29 18.451'	W 98 18.903'
59	N 29 18.452'	W 98 18.909'
60	N 29 18.429'	W 98 18.908'
61	N 29 18.417'	W 98 18.911'
62	N 29 18.413'	W 98 18.913'
63	N 29 18.412'	W 98 18.909'
64	N 29 18.416'	W 98 18.916'
65	N 29 18.415'	W 98 18.923'
66	N 29 18.415'	W 98 18.947'
67	N 29 18.406'	W 98 18.973'
68	N 29 18.418'	W 98 19.001'
69	N 29 18.419'	W 98 19.040'
70	N 29 18.422'	W 98 19.040'
71	N 29 18.421'	W 98 19.044'
72	N 29 18.424'	W 98 19.044'
73	N 29 18.430'	W 98 19.044'
74	N 29 18.436'	W 98 19.048'
75	N 29 18.449'	W 98 19.046'
76	N 29 18.451'	W 98 19.047'
77	N 29 18.454'	W 98 19.045'
78	N 29 18.456'	W 98 19.045'
79	N 29 18.468'	W 98 19.047'
80	N 29 18.473'	W 98 19.052'
81	N 29 18.473'	W 98 19.048'
82	N 29 18.474'	W 98 19.046'
83	N 29 18.479'	W 98 19.043'
84	N 29 18.481'	W 98 19.043'
85	N 29 18.403'	W 98 19.128'
86	N 29 18.399'	W 98 19.128'
87	N 29 18.384'	W 98 18.936'
88	N 29 18.376'	W 98 18.939'
89	N 29 18.380'	W 98 18.939'
90	N 29 19.396'	W 98 18.843'
91	N 29 19.406'	W 98 18.848'
92	N 29 19.407'	W 98 18.835'

Appendix D
Photo GPS Locations

Site: J.T. Deely Power Plant
Datum: NAD 1983
Coordinate Units: Degrees Decimal Minutes

Photo No.	Latitude	Longitude
93	N 29 19.404'	W 98 18.836'
94	N 29 19.438'	W 98 18.839'
95	N 29 19.441'	W 98 18.829'
96	N 29 19.453'	W 98 18.831'
97	N 29 19.453'	W 98 18.836'
98	N 29 19.493'	W 98 18.852'
99	N 29 19.501'	W 98 18.850'
100	N 29 19.487'	W 98 18.852'
101	N 29 19.480'	W 98 18.858'
102	N 29 19.483'	W 98 18.858'
103	N 29 19.487'	W 98 18.948'
104	N 29 19.497'	W 98 18.923'
105	N 29 19.496'	W 98 18.909'
106	N 29 19.479'	W 98 18.928'
107	N 29 19.472'	W 98 18.938'
108	N 29 19.474'	W 98 18.932'
109	N 29 19.447'	W 98 18.932'
110	N 29 19.448'	W 98 18.937'
111	N 29 19.435'	W 98 18.923'
112	N 29 19.411'	W 98 18.926'
113	N 29 19.397'	W 98 18.919'
114	N 29 19.393'	W 98 18.909'
115	N 29 19.396'	W 98 18.910'
116	N 29 19.392'	W 98 18.906'
117	N 29 19.385'	W 98 18.907'
118	N 29 19.387'	W 98 18.906'
119	N 29 19.390'	W 98 18.891'
120	N 29 19.395'	W 98 18.882'
121	N 29 19.392'	W 98 18.870'
122	N 29 19.398'	W 98 18.847'

Assessment of Dam Safety Report – J.K. Spruce Power Plant

Attachment 3

Environmental Resources Management Southwest, Inc.
CityCentre Four
840 W. Sam Houston Pkwy. N. – Suite 600
Houston, Texas 77024
(281) 600-1000

ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS FINAL REPORT

CPS Energy
J.K. Spruce Power Plant
San Antonio, Texas

Prepared for
U.S. Environmental Protection Agency
Washington, D.C.

February 2014
Revised May 2014
Revised June 2014

CDM Smith Project No.:
93083.1801.044.SIT.SPRCE

CDM Smith

Table of Contents

Appendices

Tables

Figures

Section 1

Introduction, Summary Conclusions and Recommendations

1.1 Introduction

On December 22, 2008, the dike of a coal combustion waste (CCW) ash pond dredging cell failed at a facility owned by the Tennessee Valley Authority in Kingston, Tennessee. The failure resulted in a spill of over one billion gallons of coal ash slurry, which covered more than 300 acres, damaging infrastructure and homes. In light of the dike failure, the United States Environmental Protection Agency (USEPA) is assessing the stability and functionality of existing CCW impoundments at coal-fired electric utilities to ensure that lives and property are protected from the consequences of a failure.

This assessment of the stability and functionality of the CPS Energy J.K. Spruce Power Plant ash CCW impoundments is based on a review of available documents, site assessments conducted by CDM Smith on August 27 and 28, 2012, and technical information provided subsequent to the site visit. In summary, the Sludge Recycle Holding (SRH) Pond's and Evaporation Pond's embankments are classified as **SATISFACTORY** based on static and seismic engineering studies following the best professional engineering practice to support acceptable safety factors under normal loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria.

It is critical to note that the condition of the embankment(s) depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the embankment(s) will continue to represent the condition of the embankment(s) at some point in the future. Only through continued care and inspection can there be likely detection of unsafe conditions.

1.2 Purpose and Scope

CDM Smith was contracted by the USEPA to perform site assessments of selected surface impoundments. As part of this contract, CDM Smith conducted site assessments of the SRH Pond and Evaporation Pond at the J.K. Spruce Power Plant (Plant) site owned by CPS Energy (CPS). These ponds are located on the east and north sides of the site. The purpose of this report is to provide the results of the assessments and evaluations of the conditions, and potential for waste release from the CCW impoundments

Site visits were conducted by CDM Smith representatives on August 27 and 28, 2012 to collect relevant information, inventory the impoundments, and perform visual assessments of the impoundments.

1.3 Conclusions and Recommendations

1.3.1 Conclusions

Conclusions are based on visual observations during site assessments on August 27 and 28, 2012 and review of technical documentation provided by CPS.

1.3.1.1 Conclusions Regarding Structural Soundness of the CCW Impoundments

A May 7, 2014 geotechnical report, prepared by Raba Kistner Consultants, Inc. (RKCI), was provided that included slope stability analyses for steady-state and seismic loading conditions of the SRH Pond and Evaporation Pond embankments. The RKCI 2014 report supersedes RKCI's November 12, 2012 report referenced in the CDM Smith's December 2012 "*Assessment of Dam Safety of Coal Combustion Surface Impoundments*, *CPS Energy, J.K. Spruce Power Plant*". The RKCI report is included in **Appendix A**. The calculated factors of safety presented in the RKCI 2014 report, for the loading conditions analyzed, met minimum required factors of safety outlined by the USACE in EM 1110-2-1902, Table 3-1 and seismic factors of safety by FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams. The RKCI 2014 report did not present analyses for liquefaction potential, end-of-construction, and rapid drawdown loading conditions. RKCI stated in the 2014 report that the end-of-construction condition was not evaluated due to the age of the ash ponds. RKCI also stated that both rapid drawdown and erosion failures are considered to be of very low risk due to the embankment toe elevations (above EL 490 feet) with respect to the target pool elevation (EL 485 feet) and because they would pose no risk of environmental contamination, because the pond must empty for this condition to occur.

RKCI indicated in their May 2014 report that the soils beneath the existing berms have a very low risk of experiencing liquefaction due to earthquake. In their seismic slope stability analyses, RKCI used the mapped spectral response acceleration of 0.098g from the USGS web site calculator. RKCI further indicated in their 2014 report that the applied horizontal seismic load had a 4-to-6 % probability of exceedance in 50 years. USEPA guidelines specify that the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years be used in seismic slope stability analyses. CDM Smith used USGS referenced maps, published in the 2010 ASCE-7 Standard, to determine the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years. CDM Smith found the spectral response acceleration for the Spruce site to be 0.075g. Accordingly, in CDM Smith's opinion, the spectral response acceleration employed in RKCI's seismic analyses conforms to USEPA standards.

No apparent structural damage or evidence of previous repairs was observed in the CCW impoundments during CDM Smith's site visit. From visual observations, the embankments appeared structurally sound; however high water and solids level in Evaporation Pond prevented observation of the interior embankment slopes during CDM Smith's visual observations and site assessments.

CDM Smith agrees with RKCI's rationale regarding embankment stability for end-of-construction, liquefaction potential, and rapid drawdown conditions.

1.3.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of CCW impoundments

Hydrologic/hydraulic (H & H) documentation provided by CPS included precipitation amounts for selected storm durations and return periods expected in the Calaveras Lake site area. A preliminary H & H evaluation performed by CDM Smith suggests there is enough storage capacity at current operating pool levels for the SRH Pond and the Evaporation Pond to safely store precipitation from the

FEMA recommended rainfall events (0.1-percent annual chance exceedance flood for the significant hazard potential SRH Pond and 1--percent annual chance exceedance flood for the low hazard potential Evaporation Pond). Based on CDM Smith's preliminary evaluation, the hydrologic/hydraulic safety of the impoundments appears to be adequate.

1.3.1.3 Conclusions Regarding Adequacy of Supporting Technical Documentation

CDM Smith has the following conclusions based on our review of the documentation provided by CPS:

- The RKCI documentation of the stability analyses for the SRH Pond and Evaporation Pond is considered adequate based on the following:
  - ✓ Steady-state and seismic stability analyses for of the SRH Pond and Evaporation Pond embankments are documented.
  - ✓ RKCI provided assessments of the embankments' liquefaction potential, and structural stability applicable for end of construction and sudden drawdown loading conditions. RKCI did not analyze liquefaction potential, end of construction and sudden drawdown loading conditions. As described above, CDM Smith agrees with RKCI's rationale for not performing analyses for these loading conditions.

- The hydrologic and hydraulic supporting documentation of SRH Pond and Evaporation Pond is considered inadequate based on the following:
  - ✓ H & H documentation provided by CPS included precipitation amounts for selected storm durations and return periods expected in the Calaveras Lake site area. No documentation was provided by CPS on the ability of the impoundments to store the FEMA-recommended design floods.
  - ✓ An evaluation to determine the required IDF and of the capacity of the SRH Pond and Evaporation Pond to withstand the design hydrologic/hydraulic events, without overtopping has not been provided.

1.3.1.4 Conclusions Regarding Description of the CCW impoundments

The record drawings and descriptions of the CCW impoundments provided by CPS representatives appear to be consistent with the visual observations by CDM Smith during site assessment.

1.3.1.5 Conclusions Regarding Field Observations

The exterior slopes of the Evaporation Pond are covered in grassy vegetation approximately 2 feet high and a few small trees and bushes with diameters less than 6 inches. Areas of loose soil were observed at the east embankment exterior slope of the Evaporation Pond and an animal burrow was observed at the west embankment exterior slope. Trees up to 12 inches in diameter were located at the toe of all embankments of the Evaporation Pond. Visible portions of interior slopes of the Evaporation Pond and SRH Pond did not include riprap or other armoring.

1.3.1.6 Conclusions Regarding Adequacy of Maintenance and Methods of Operation

Current maintenance and operation procedures appear to be generally adequate, though they are not documented. There was no existing evidence of previous spills or release of impounded liquids outside the plant property.

1.3.1.7 Conclusions Regarding Adequacy of Surveillance and Monitoring Program

No surveillance and monitoring procedures exist for the SRH Pond and Evaporation Pond. Instrumentation is not present for the SRH Pond or Evaporation Pond.

1.3.1.8 Conclusions Regarding Suitability for Continued Safe and Reliable Operation

Main embankments do not show evidence of unsafe conditions requiring immediate remedial efforts.

CPS' operating procedures for the SRH Pond include methods of controlling the water levels in the north and south sections of the SRH Pond, but no formal documentation was provided to CDM Smith. There were no documented operating procedures for the Evaporation Pond.

1.3.2 Recommendations

Based on CDM Smith's visual assessment of SRH Pond and Evaporation Pond and review of documentation provided by CPS, CDM Smith offers the following recommendations for consideration.

1.3.2.1 Recommendations Regarding the Hydrologic/Hydraulic Safety

It is recommended that a qualified professional engineer determine the required Inflow Design Flood (IDF) and evaluate the hydrologic and hydraulic capacity of the SRH Pond and Evaporation Pond to withstand design hydrologic/hydraulic events, without overtopping, as recommended by FEMA.

1.3.2.2 Recommendations Regarding the Technical Documentation for Structural Stability

None

1.3.2.3 Recommendations Regarding Field Observations

None; no significant deficiencies were observed at the SRH Pond and Evaporation Pond.

1.3.2.4 Recommendations Regarding Adequacy of Maintenance and Methods of Operation

CDM Smith recommends that vegetation on the SRH Pond and Evaporation Pond embankments be cut on a regular basis to help ensure that adequate visual observations can be made by CPS' personnel during routine inspections. CDM Smith also recommends trees (including the root ball) located at and within 15 feet of the toe of all embankments of the Evaporation Pond be removed and the excavations filled with compacted fill under the supervision of a qualified dam engineer. Animal control measures should be implemented to reduce embankment disturbance. All affected areas should be backfilled with compacted fill, graded to match the surrounding topography, and seeded with appropriate non-invasive grassy vegetation. It is also recommended that riprap be placed on interior embankment slopes in areas with little or no armoring.

1.3.2.5 Recommendations Regarding Surveillance and Monitoring Program

CPS Energy is required by Texas Commission on Environmental Quality (TCEQ) under National Pollutant Discharge Elimination System (NPDES) Permit No. WQ0001514000 to monitor discharge of wastewater into Calaveras Lake. Surveillance procedures should be in accordance with the TCEQ – NPDES Permit. According to CPS, no surveillance procedures exist for the SRH Pond and Evaporation Pond.

It is recommended that CPS prepare formal surveillance and monitoring procedures for the SRH and Evaporation Pond.

1.3.2.6 Recommendations Regarding Continued Safe and Reliable Operation

Inspections should be made following periods of heavy and/or prolonged rainfall, and the occurrence of these events should be documented. Inspection procedures should be documented and inspection records should be retained at the facility for a minimum of three years.

Major repairs and slope restoration should be designed by a registered professional engineer experienced with earthen dam design.

The above recommendations should be implemented to help maintain continued safe and reliable operation of the CCW impoundments.

1.4 Participants and Acknowledgment

1.4.1 List of Participants

CDM Smith representatives, Jamal Daas, P.E. and Bevin Barringer, P.E, were accompanied at all times during visual assessment by Gregg Tieken, CPS Environmental Manager.

1.4.2 Acknowledgement and Signature

CDM Smith acknowledges that the CCW impoundments referenced herein were assessed by Jamal Daas, P.E. and Bevin Barringer, P.E. Based on the documentation provided, the SRH Pond and Evaporation Pond are rated **SATISFACTORY**.

We certify that the CCW impoundments referenced herein have been assessed on August 27 and 28, 2012.

Jamal Daas

JAMAL F. DAAS
112062

Jamal Daas, P.E.
Geotechnical Engineer
Texas Registration No. 1120

Bevin Barringer

Bevin Barringer, P.E.
Geotechnical Engineer

Section 2

Description of the Coal Combustion Waste (CCW) Impoundment(s)

2.1 Location and General Description

The J.K. Spruce Power Plant (Plant), owned by CPS Energy (CPS) is located in Bexar County at 12940 U.S. Highway 181 South, San Antonio, Texas (Latitude: 29° 18' 25.93" N, Longitude: 98° 19' 12.71" W), as shown on **Figure 2-1**. Critical infrastructure within approximately five miles downgradient of the Plant is shown on **Figure 2-2**. The Plant site is surrounded by open grassy areas with patches of trees, as shown on **Figure 2-3**. The Plant is surrounded by CPS-owned Calaveras Lake on the west, south, and east sides. Land to the north of the Plant property boundary is rural. The Plant site is shared with the J.T. Deely Power Plant also owned by CPS.

The Plant has two Coal Combustion Waste (CCW) impoundments: the Sludge Recycle Holding (SRH) Pond just east of the plant units and the Evaporation Pond approximately 1 mile northeast of the plant units as shown on Figure 2-2. Both ponds were constructed as diked impoundments. The SRH Pond includes a divider wall that can separate the pond into a north and south section but includes a gate that is open during normal operating procedures. The SRH Pond is located to the east of Plant property, between the main Plant site and Calaveras Lake. The Evaporation Pond receives boiler chemical cleaning waste from CPS's J.K. Spruce Power Plant and their J.T. Deely Power Plant. Accordingly, the assessment of the Evaporation Pond is also included in a separate report by CDM Smith prepared for the J.T. Deely Power Plant. The Evaporation Pond is located to the north of the CPS property in an undeveloped area surrounded by trees.

The North and South Bottom Ash Ponds, also located at the site, are used to store CCW from the J.T. Deely Power Plant. The South Bottom Ash Pond is located east of the SRH Pond, and shares a common embankment that includes spillways. The assessment of the North and South Bottom Ash Ponds is included in a separate report by CDM Smith prepared for the J.T. Deely Power Plant. Other impoundments at the site that do not store CCW include the Coal Pile Runoff pond used to store stormwater runoff from the coal storage area, #1 Stormwater Runoff Pond used to store stormwater runoff from the plant site, and the 5-year Landfill Runoff Pond used to store runoff from the fly ash disposal landfill and Class I landfill. The #1 Stormwater Runoff Pond is located just north of the SRH Pond and shares a common embankment. The layout of the ponds is shown on Figure 2-3.

The SRH Pond has a total perimeter of approximately 1,550 feet and an approximate surface area of 3.5 acres. The Evaporation Pond has a total perimeter of approximately 1,800 feet and an approximate surface area of 4.5 acres. **Table 2-1** shows a summary of the approximate size and dimensions of the impoundments.

Table 2-1 – Summary of Impoundments Approximate Dimension and Size

	Impoundment	
	SRH Pond	**Evaporation Pond**
Dam Height (feet)	8	22
Average Crest Width (feet)	15	20
Length (feet)	1,550	1,800
Interior Slopes, H:V	3:1	2:1
Exterior Slopes, H:V	3:1	3:1

Note: All dimensions were obtained from construction drawings.

2.1.1 Horizontal and Vertical Datum

Project drawings provided by CPS to CDM Smith did not include reference to the horizontal datum used. Based on the coordinates shown on the drawings, the date of the drawings, and the datum in general use at the time, it is likely that the drawings were referenced to the North American Datum of 1983 (NAD 83). Elevations included on the drawings are referenced to mean sea level (MSL). Elevations noted herein are in feet and are referenced to the datum used for the project drawings, MSL, unless otherwise noted.

2.1.2 Site Geology

The J.K. Spruce Electric Plant is located in southeastern Bexar County, Texas. Based on review of the USGS Topographic Map, natural ground surface elevations in the area of the Plant range from approximately El. 490 to El. 530 feet referenced to the North American Vertical Datum of 1988. According to the Quaternary Geologic Map of the Austin 4 x 6 Quadrangle published by the United States Geological Survey, the Plant is located on clayey sand and sandy clay decomposition residuum from the Quaternary and Tertiary Periods. These deposits consist of gray, light brown, brown, or orange clayey, fine to medium quartz sand to fine sandy silty clay with subrounded sandstone pebbles, colluviums, and small bedrock outcrops in some localized areas. According to the United States Department of Agriculture, surface soils in the area are comprised of fine sand, loamy fine sand, and sandy clay loam.

Soil boring information was provided in a report prepared by Raba Kistner Consultants, Inc. (RKCI) dated May 7, 2014. In the RKCI report, the embankment fill is described as sandy clay and clayey sand. The subgrade stratigraphy includes sandy clay and clayey sand with isolated tan and gray clay seams. The 2014 RKCI report is included in **Appendix A**.

2.2 Coal Combustion Residue Handling

The SRH Pond receives flue gas desulphurization (FGD) scrubber sludge from Spruce Units 1 & 2. The pond also receives low-volume waste, stormwater from the material storage area, quench water, and metal cleaning waste. Solids are excavated from the pond every other year, on average, and disposed of in an on-site Plant-owned landfill approximately 1.5 miles north of the SRH Pond.

The Evaporation Pond receives boiler chemical cleaning waste that is trucked to the pond. The Evaporation Pond was constructed on top of a fly ash landfill that was converted into an ash impoundment in 1996. The ash landfill and impoundment were used to store ash materials at some time in the past but no further documentation was provided regarding the nature or amount of ash materials stored. Because it is unknown if the underlying pond was used to store CCW, a full assessment was performed on the Evaporation Pond. A geotechnical engineering study, performed by

RKCI, dated May 2014, included four borings through the Evaporation Pond embankments and into the underlying soils. As per the investigation's boring logs, soils underlying the embankment consisted of medium dense to very dense clayey sand.

Bottom ash from the Plant is stored in CPS' JT Deely bottom ash ponds. Bottom ash excavated from the ponds is recycled. Fly ash from the Plant is stored in on-site silos. From the silos, fly ash is transported by vehicle for use in cement. During periods of low demand for cement, the fly ash is transferred to the landfill for temporary storage. Boiler slag from the Plant is mixed with bottom ash and recycled.

2.3 Size and Hazard Classification

According to the United States Army Corps of Engineers (USACE) Guidelines for Safety Inspection of Dams (1979) (ER 1110-2-106), impoundments are categorized per **Table 2-2.**

Table 2-2 – USACE ER 1110-2-106 Size Classification

Category	Impoundment	
	Impoundment Storage Capacity (acre-feet)	Embankment Height (feet)
Small	50 to < 1000	25 to < 40
Intermediate	1000 to < 50,000	40 to < 100
Large	> 50,000	> 100

The total storage capacity of the SRH Pond and Evaporation Pond is approximately 28 and 99 acre-feet, respectively. Therefore, the SRH Pond embankment is not classified as a dam and the Evaporation Pond embankment is classified as a small dam, as defined in ER 1110-2-106. The impoundment capacities were estimated by CDM Smith based on the geometry shown on the original construction drawings provided by CPS.

It is not known if the Plant impoundments currently have an assigned Hazard Potential Classification. Based on the USEPA classification system as presented on Page 2 of the USEPA checklist (**Appendix B**) and CDM Smith's review of the site and downstream areas, recommended hazard ratings have been assigned to the impoundments as summarized in **Table 2-3**:

Table 2-3 – Recommended Impoundment Hazard Classification Ratings

Ash Pond Unit	Recommended Hazard Rating	Basis
SRH Pond	Significant Hazard	▪ Failure or miss-operation would result in flow toward the main plant facilities resulting in in damage to plant infrastructure, operations, and utilities. ▪ Loss of human life is not anticipated.
Evaporation Pond	Low Hazard	▪ Failure or miss-operation would results in low economic and/or environmental losses. ▪ Losses would be limited to the owner's property ▪ Loss of human life is not anticipated.

2.4 Amount and Type of Residuals Currently Contained in the Unit(s) and Maximum Capacity

According to CPS representatives, accumulated solids in the SRH Pond are removed approximately every other year and disposed of in an on-site landfill. The pool area of the SRH Pond is approximately 3.5 acres, and liquids from the pond are treated at a clarifier and discharged to Calaveras Lake.

CPS did not have any information of the amount or types of CCW that may have been stored beneath the existing Evaporation Pond. The Evaporation Pond is approximately 4.5 acres, nearly full of solids, and is used to store and dewater, through evaporation, boiler chemical cleaning waste that is trucked to the pond.

2.5 Principal Project Structures

Principal structures of the SRH Pond include the following:

- A center concrete divider wall with a gate opening dividing the SRH Pond into north and south sections;
- Two 8-inch-diameter welded steel inlet pipes on the center divider wall, one into the north section and one into the south section, discharging liquids from Plant drains;
- Two 6-inch-diameter welded steel inlet pipes on the center divider wall, one into the north section and one into the south section, discharging liquids from the waste slurry sump;
- Two 8-inch-diameter and two 6-inch-diameter welded steel inlet pipes near the east embankment interior slope, one of each at the north section and one of each at the south section, discharging liquids from the clarifier;
- Four 6-inch-diameter welded steel inlet pipes on the center divider wall, two into the north section and two into the south section, discharging liquids from Plant sumps;
- Two 6-inch-diameter welded steel inlet pipes on the center divider wall, one into the north section and one into the south section, discharging liquids from the limestone prep area;
- Two 6-inch-diameter welded steel inlet pipes on the center divider wall, one into the north section and one into the south section, discharging liquids from the thickener sump;
- Two 6-inch-diameter welded steel inlet pipes on the center divider wall, one into the north section and one into the south section, discharging reclaim water;
- Two 4-inch-diameter welded steel inlet pipes on the center divider wall, one into the north section and one into the south section, discharging liquids from the transfer tower sump;
- Two 6-inch-diameter and six 4-inch-diameter unlabeled welded steel inlet pipes on the center divider wall;
- Two 18-inch-diameter welded steel outlet pipes near the west embankment interior slope, one at the north section and one at the south section, where liquids are pumped from the pond to the clarifier; and

- Earthen perimeter embankments composed of sandy clay and clayey sand fill, with interior slopes and pond bottom covered with a 30-mil High-density polyethylene (HDPE) liner and 6-inch-thick concrete slab.

Principal structures of the Evaporation Pond include the following:

- Earthen perimeter embankments composed of sandy clay and clayey sand fill.

2.6 Critical Infrastructure within Five Miles Downgradient

Based on available topographic maps, surface drainage in the vicinity of the Plant appears to be toward Calaveras Lake. Critical infrastructure within five miles downgradient of the impoundments includes the Town of Elmendorf, TX, located just south of Calaveras Lake and approximately 3.5 miles south of the Plant. The only known infrastructure within 5 miles downgradient of the Plant included places of worship, as shown on Figure 2-1. However discharge at any of the impoundments would ultimately be contained in Calaveras Lake, due its large size covering approximately 3,000 acres.

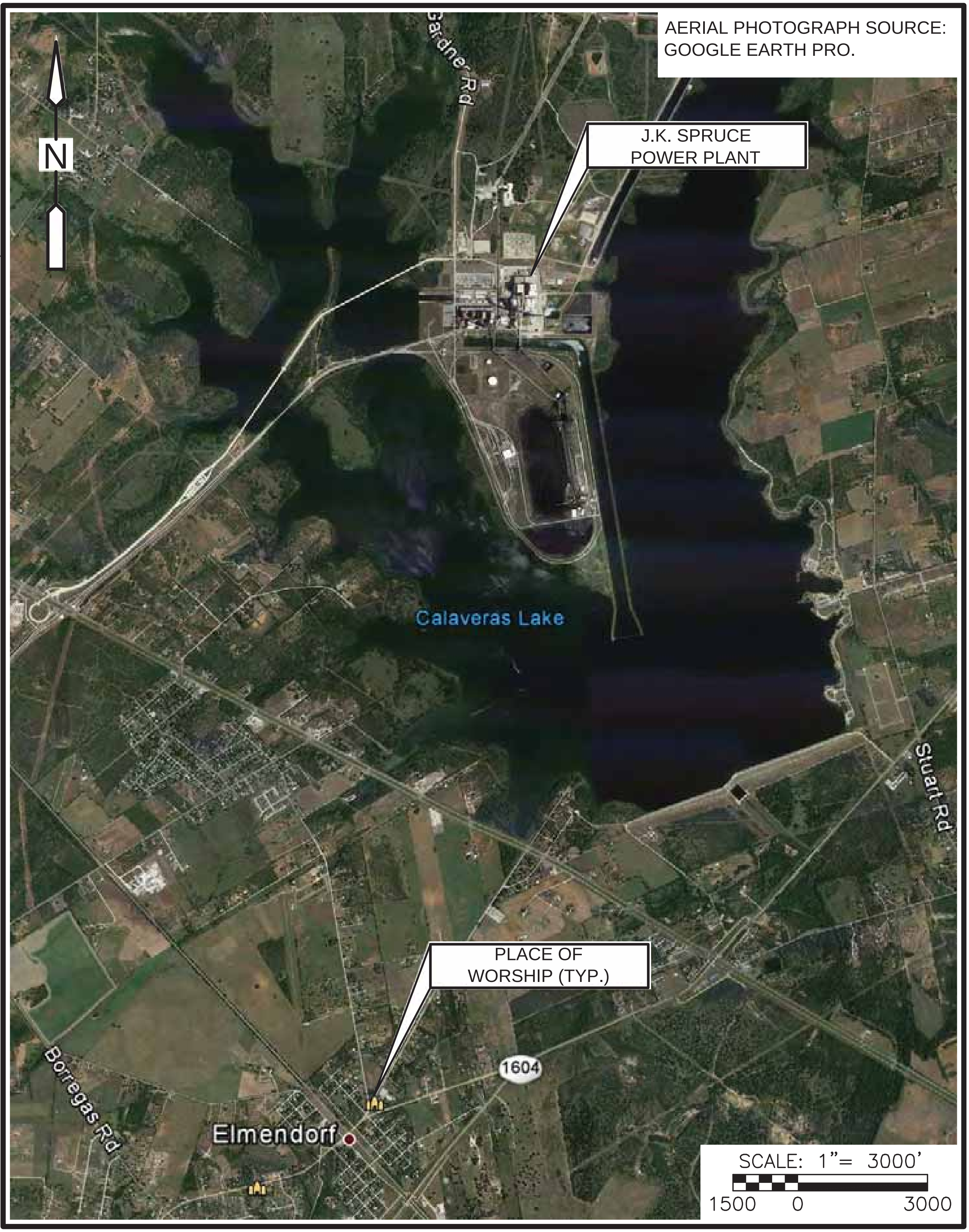
Due to its proximity to the main Plant site, failure of the SRH Pond impoundment would likely result in flow toward the Plant facilities and would result in damage to plant infrastructure, operations, and utilities. Loss of human life is not anticipated.. A breach of the impoundment embankments would most likely impact Plant property and Calaveras Lake.

Because of its relatively remote location, failure or misoperation of the Evaporation Pond would likely result in discharge to the surrounding wooded area and eventually flow into Calaveras Lake.

AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

CDM Smith

J.K. SPRUCE POWER PLANT
SAN ANTONIO, TEXAS
VICINITY MAP
FIGURE 2-1



CDM Smith

J.K. SPRUCE POWER STATION
SAN ANTONIO, TEXAS
CRITICAL INFRASTRUCTURE PLAN
FIGURE 2-2

AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

CDM
Smith

J.K. SPRUCE POWER PLANT
SAN ANTONIO, TEXAS
SITE PLAN
FIGURE 2-3

Section 3

Summary of Relevant Reports, Permits and Incidents

3.1 Summary of Reports on the Safety of the Management Units

Safety reports for the CCW impoundments were not available for CDM Smith's review during the course of this investigation. CPS indicated that to their knowledge no formal inspections of the impoundments have been performed and no safety reports prepared.

CPS representatives indicated to their knowledge there have been no known structural or operational problems associated with the CCW impoundments.

3.2 Summary of Local, State, and Federal Environment Permits

Currently, the CCW impoundments are regulated by the Texas Commission on Environmental Quality (TCEQ).

The J.K. Spruce Power Plant was issued a permit by TCEQ under the National Pollutant Discharge Elimination System (NPDES) which includes outfalls for the SRH Pond. The Plant discharges liquids from the SRH Pond into Calaveras Lake under this permit. The permit, WQ0001514000, was issued on October 18, 2011 and expires on March 1, 2015. Because the Evaporation Pond does not include outlet structures, it is not included in the NPDES permit.

3.3 Summary of Spill/Release Incidents

According to CPS representatives, no releases or spills have occurred at the SRH Pond and Evaporation Pond.

Section 4

Summary of History of Construction and Operation

4.1 Summary of Construction History

4.1.1 Impoundment Construction and Historical Information

The J.K. Spruce Power Plant Unit 1 began operation in 1992 and Unit 2 began operation in 2011. The Plant has two coal fired units and generates electricity with a total capacity of approximately 1300 megawatts of power.

The SRH Pond was constructed in 1992. Historical information on the SRH Pond available for review included original construction drawings provided in **Appendix C**. The SRH Pond was constructed between the existing J.T. Deely South Bottom Ash Pond and the main Plant site. Construction drawings show that the SRH Pond includes perimeter embankments approximately 8-foot-high, 15-ft-wide crests, with interior and exterior side slopes at 3 horizontal to 1 vertical (3H:1V). Crests were constructed to El. 500 and the bottom of the pond to El. 492. Construction documents appear to indicate the embankments were constructed with on-site excavated material however the location for the source of the embankment fill is unknown. Interior slopes and the bottom of the pond were lined with a 6-inch-thick concrete slab underlain by a 30-mil HDPE liner sandwiched between 10 oz geotextile. A concrete divider wall was constructed along the center of the SRH Pond, dividing the impoundment into a north and south section. The divider wall includes a gate which is left open during normal operating procedures. Interior slopes of the north and south embankments include 15-ft-wide concrete driveway ramps down into the north and south sections of the impoundment. Pond sumps and piping are located at the west embankment interior slope. A clarifier pad was constructed on the east embankment crest. Two, 8-foot-wide concrete spillways, with invert El. 499.5, into the existing South Bottom Ash Pond were constructed on the east embankment. No historical subsurface soil information in the vicinity of the SRH Pond was provided. Borings performed in 2012 by RKCI indicate that the embankments consist of sandy clay and clayey sand fill material, and underlying native material consists of sandy clay and clayey sand with isolated tan and gray clay seams.

The Evaporation Pond was constructed on top of an area that was previously used as a fly ash landfill and fly ash impoundment. Based on information provided by CPS the embankments were originally constructed sometime in the past for use as a fly ash landfill. No documentation on the original construction of the fly ash landfill was provided. In 1996 the landfill was converted into a fly ash impoundment. Construction drawings dated 1990 show the existing embankments with a crest elevation at El. 522 and bottom of the impoundment at El. 500. These construction drawings are included in Appendix C. The exterior and interior slopes are shown at 3H:1V. The crest is shown as 6 feet wide at the south embankment, 20 feet wide at the west and east embankments, and 30 feet wide at the north embankment. The 1990 construction drawings show a 30-mil PVC liner was added to the interior slopes of the embankments. The function of the fly ash impoundment changed from storing fly ash to dewatering boiler chemical cleaning waste at some time after 1996.

4.1.2 Significant Changes/Modifications in Design since Original Construction

Based on information provided by CPS, there have been no significant changes or modifications to the SRH Pond since original construction.

Based on information provided by CPS representatives, changes/modifications to the Evaporation Pond include converting it from a fly ash landfill into a fly ash impoundment, and then using it as an evaporation pond for boiler chemical cleaning wastes. No documentation on the original construction of the fly ash landfill was provided. The only changes/modifications documented include the addition of the PVC liner shown on the 1990 construction drawings. Based on the visual observations during the site assessment, it appears the current configuration of the Evaporation Pond is consistent with the 1990 drawings.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

According to information provided by CPS no significant repairs or rehabilitation have been made to the SRH Pond and Evaporation Pond.

4.2 Summary of Operational Procedures

4.2.1 Original Operating Procedures

The SRH Pond has historically been used as clarifier and settling ponds for FGD scrubber sludge received from the Plant. Waste water streams discharged into the SRH Pond have included:

- FGD scrubber sludge
- Low volume waste
- Metal cleaning waste
- Stormwater from material storage
- Quench water

The fly ash impoundment underlying the Evaporation Pond has historically been use as a fly ash landfill and fly ash impoundment to store fly ash generated by the J.T. Deely and J.K. Spruce Power Plants. Recently the Evaporation Pond has been used to dewater, through evaporation, boiler chemical cleaning wastes. Waste stored in the Evaporation Pond has included:

- Fly ash
- Boiler chemical cleaning wastes

4.2.2 Significant Changes in Operational Procedures and Original Startup

No significant changes in operational procedures had been made to the SRH Pond. There was no documentation provided that indicates different.

As previously mentioned the Evaporation Pond's function and operational procedures have changed over the years. Previously the Evaporation Pond's embankments contained a fly ash landfill and fly ash impoundment. Currently the impoundment only receives boiler chemical cleaning wastes that are transported to the pond by truck.

4.2.3 Current CCW Impoundment Configuration

The SRH Pond and Evaporation Pond are currently configured as previously described and as shown on Figure 2-3. The approximate crest elevations of the embankments and pond areas are shown on **Table 4-1** below.

Table 4-1 – Approximate Crest Elevations and Surface Areas

Ash Pond	Approximate Crest Elevation (Feet)	Approximate Pond Surface Area (Acres)
SRH Pond	500	3.5
Evaporation Pond	522	4.5

Over the life of the impoundment, solids have been excavated from the SRH Pond approximately every other year. Solids in the northern and southern portions of the SRH Pond were reportedly last excavated in 2011. The Evaporation Pond was previously used to store fly ash, and during the site assessment solids in the impoundment were up to 0.5 to 2 feet below the crest elevation.

Under normal operating conditions, liquids are discharged into the north and south sections of the SRH Pond through several pipes discharging along the center divider wall. Outlet structures include an 18-inch-diameter outlet pipe at both the north and south section of the pond with invert elevations El. 492.5 that is used to pump water from the pond to the clarifier. After passing through the clarifier, liquids from the pond are discharged into Calaveras Lake through outfall 109 located at the Plant's intake canal just south of the pond.

Under normal operating conditions boiler chemical cleaning wastes are transported by truck to the Evaporation Pond. The cleaning wastes are stored in the pond and dewatered, through evaporation, and no liquids are discharged from the impoundment.

4.2.4 Other Notable Events since Original Startup

Based on furnished information, there are no other notable events since original startup of the SRH Pond and Evaporation Pond to report at this time.

Section 5

Field Observations

5.1 Project Overview and Significant Findings (Visual Observations)

CDM Smith performed visual assessments of the impoundments at the J.K. Spruce site. Impoundments assessed included the SRH Pond and the Evaporation Pond. The SRH Pond is located between the generating units and Calaveras Lake. The Evaporation Pond is located approximately 1 mile northeast of the generating units. The perimeter embankments of the SRH Pond are approximately 1,550 feet in length, and approximately 8 feet in height. The perimeter embankments of the Evaporation Pond are approximately 1,800 feet in length and approximately 22 feet in height. The assessments were completed following the general procedures and considerations contained in Federal Emergency Management Agency's (FEMA's) Federal Guidelines for Dam Safety (April 2004) to make observations concerning settlement, movement, erosion, seepage, leakage, cracking, and deterioration. A Coal Combustion Dam Inspection Checklist and Coal Combustion Waste (CCW) Impoundment Inspection Form, developed by USEPA, was completed for each of the aforementioned impoundments. Copies of these forms are included in Appendix B. Photograph locations are shown on **Figures 5-1** through **5-2**, and photographs are included in **Appendix D**. Photograph locations were logged using a handheld GPS device. The photograph coordinates are listed in Appendix D.

CDM Smith visited the plant on August 27 and 28, 2012, to conduct visual assessments of the impoundments. The weather was generally sunny with daytime high temperatures up to 100 degrees Fahrenheit. The daily total precipitation prior to the site visit is shown in **Table 5-1**. The data was obtained from the National Oceanic and Atmospheric Administration (NOAA) station at the San Antonio Stinson Municipal Airport, approximately 9 miles west of the Plant.

Table 5-1 – Approximate Precipitation Prior to Site Visit

Date of Site Visit – August 27 and 28, 2012		
Day	**Date**	**Precipitation (inches)**
Monday	August 26	0
Sunday	August 25	0
Saturday	August 24	0
Friday	August 23	0
Thursday	August 22	0
Wednesday	August 21	0
Tuesday	August 20	0
Monday	August 19	2.05
Total	**(August 19-26, 2012)**	**2.05**
Total	**Month Prior to Site Visit (July 26 – August 26, 2012)**	**2.38**

Note: Precipitation data from NOAA. Station Location: San Antonio Stinson Municipal Airport. Lat. 28.3389; Lon. -98.472; EL.571 ft.

5.2 SRH Pond

At the time of the assessment, the SRH Pond contained solids and liquids with approximately 5 feet of freeboard. An overview of the photographs taken at the SRH Pond during the CDM Smith site assessment is included in Figure 5-1.

5.2.1 Crest

The crest of the SRH Pond appeared to be in satisfactory condition (Photographs 3, 13, 20, and 50). The crest was approximately 15 feet wide at all embankments except at the east embankment where it widened to approximately 50 feet to accommodate the clarifier pad (Photograph 8). Two spillways that connect the SRH and South Bottom Ash Ponds were located on the east embankment crest (Photographs 5 and 9). Supports for overhead piping were located at the west embankment crest (Photograph 22). The crest of the embankments consists of compacted granular soils and gravel and is exposed to minimal vehicle traffic. No depressions or evidence of settlement were observed on the crest.

5.2.2 Interior Slopes

Interior slopes of the SRH Pond appear to be in fair condition (Photographs 4, 12, 14, 19, 45, and 51). Interior slopes were at 3H:1V and covered in a layer of granular material and other solids. Some sparse vegetation was observed in limited areas on the east and north embankment interior slopes (Photographs 4, 8, 9, and 17). Concrete roadway ramps into the pond for equipment access were located at the north and south embankment interior slopes (Photographs 17 and 53). Two spillway inlets were located on the east embankment interior slope (Photograph 7 and 11). Piping and sump pumps were located on a concrete pad built into the west embankment interior slope (Photograph 19 and 25). Visible portions of interior slopes did not include riprap or other armoring.

5.2.3 Exterior Slopes

Exterior slopes of the SRH Pond appear to be in fair condition (Photographs 1, 15, 21, 46, and 52). The exterior slopes of the north, west, and south embankments are approximately 3H:1V and covered in grassy vegetation approximately 3 inches tall. The north embankment is shared with the #1 Stormwater Runoff Pond (Photograph 15). The east embankment is shared with the South Bottom Ash Pond and is covered in ash material and vegetation (Photographs 1, 6, and 10). Two spillway outlets were located on the east embankment exterior slope (Photograph 6 and 10). No areas of erosion or indications of seepage were observed at the spillways.

5.2.4 Inlet Piping

Several inlet pipes discharge liquids near into the north section of the SRH Pond; four 4-inch-diameter, eight 6-inch-diameter and two 8-inch-diameter metal pipe (Photographs 33, 38, 39, 40, 41, 42, 43, and 44). Inlet pipes discharging liquids into the south section of the SRH Pond include; four 4-inch-diameter, eight 6-inch-diameter and two 8-inch-diameter metal pipe (Photographs 26, 28, 30, 31, 32, 34, 35, 36, and 37).

5.2.5 Outlet Structures

The outlet structure near the west embankment interior slope consists of two 18-inch-diameter steel outlet pipes, one is located in the north section of the pond and one is in the south section. The outlet pipes were submerged during the site assessment (Photographs 24 and 27). CCW is pumped through the outlet pipes to the clarifier located at the east embankment crest (Photograph 8). Liquids from the clarifiers are discharged to outfall 109 at the Plant intake canal (Photographs 55, 56, and 57).

5.3 Evaporation Pond

At the time of the assessment, the Evaporation Pond contained solids and boiler chemical cleaning wastes that were being dewatered in the impoundment with approximately 2 feet of freeboard. An overview of the photographs taken at the Evaporation Pond during the CDM Smith site assessment is included in Figure 5-2.

5.3.1 Crest

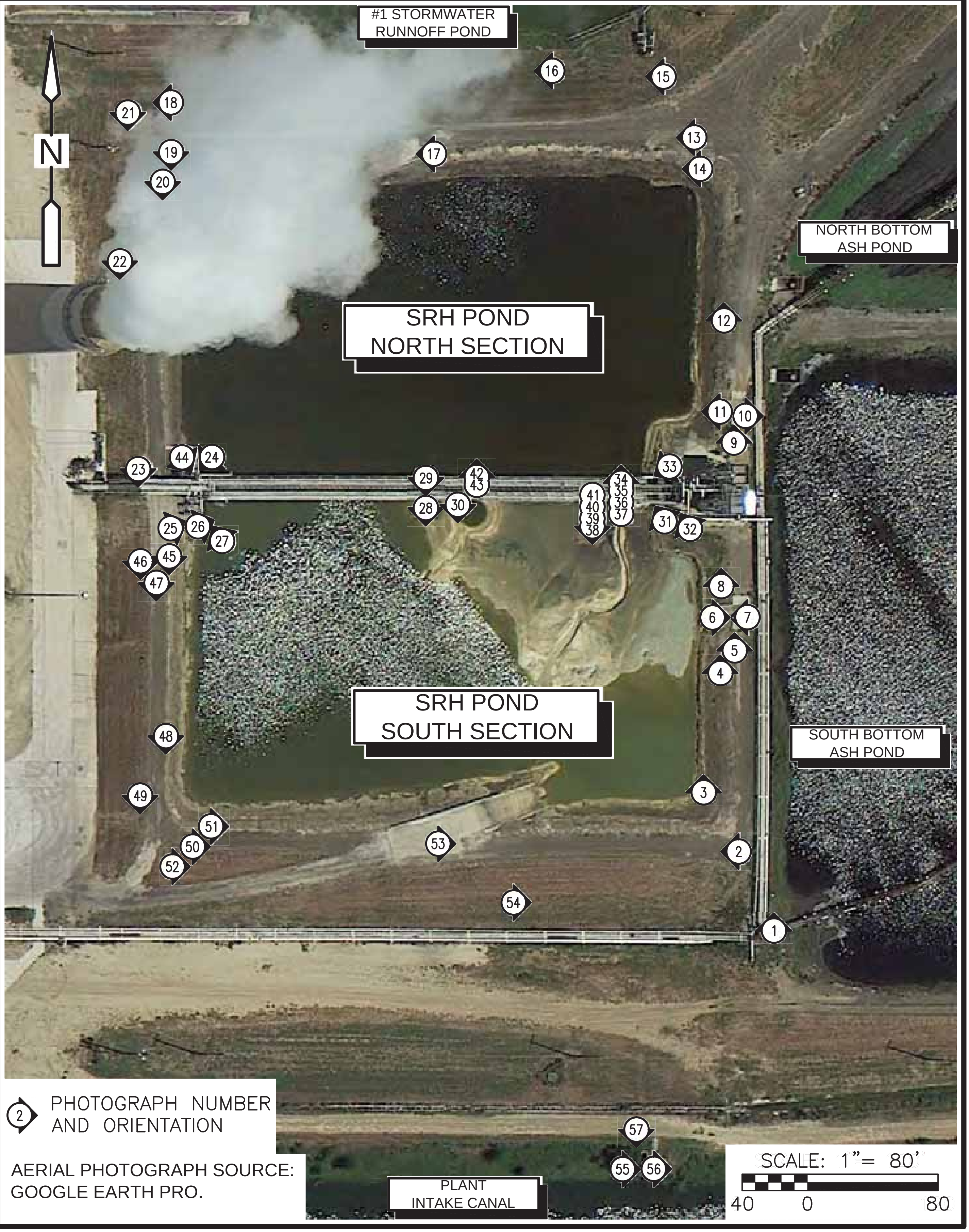
The embankment crest of the Evaporation Pond appeared to be in satisfactory condition (Photographs 58, 68, 76, and 82). The crest was approximately 15 feet wide at all embankments except the north embankment which measured approximately 50 feet wide. The crest of the embankment consists of a compacted gravel drive and grass. The surface is exposed to minimal vehicle traffic. No depressions or evidence of settlement were observed on the crest.

5.3.2 Interior Slopes

Due to the level of solids and water in the Evaporation Pond during the assessment, only the upper 0.5 to 2 ft of the interior slopes were visible (Photographs 59, 69, 70, 74, and 83). Vegetation covered some portions of the west and south embankment interior slopes (Photographs 79, 83, and 88). Ash and other solid material extend up to the crest near the southeast corner interior slope and on the east embankment interior slope (Photographs 59 and 90). Visible portions of interior slopes did not include riprap or other armoring.

5.3.3 Exterior Slopes

The exterior slopes appear to be in satisfactory condition and are covered in grassy vegetation approximately 2 feet high and a few small trees and bushes with diameters less than 6 inches in diameter (Photographs 61, 66, 77, and 87). Areas of loose soil were observed at the east embankment exterior slope (Photographs 60, 62, and 64) and an animal burrow was observed at the west embankment exterior slope (Photograph 78). An area of exposed soil was observed at the south embankment exterior slope (Photograph 85). Based on construction drawings, the exterior slopes are 3H:1V at all embankments, though slopes measured in the field ranged from 3H:1V to 4H:1V (Photographs 65 and 86). Trees up to 12 inches in diameter were located at the toe of all embankments (Photographs 63, 73, 80, and 87).



AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

PW:\PW_XM1\Documents\51119\93083_Spruce\03 Reports and Studies\09 CADD Figures and Graphics\B004PHFG.DWG

CDM
Smith

J.K. SPRUCE POWER PLANT
SAN ANTONIO, TEXAS
SRH POND
FIGURE 5-1

CDM
Smith

J.K. SPRUCE POWER PLANT
SAN ANTONIO, TEXAS
EVAPORATION POND
FIGURE 5-2

Section 6

Hydrologic/Hydraulic Safety

6.1 Impoundment Hydraulic Analysis

Because they are off-channel impoundments, coal combustion waste impoundments are not classified as dams by the TCEQ. TCEQ regulates coal combustion waste impoundments as industrial waste impoundments and provides recommendations for construction, operation, and maintenance of all nonhazardous surface impoundments in "Technical Guideline No. 4, Topic: Nonhazardous Industrial Solid Waste Surface Impoundments", dated June 12, 2009. The guidelines include the Hydrologic/hydraulic recommendation that surface water diversion dikes with a minimum height equal to two (2) feet above the 100-year flood water elevation should be constructed around industrial solid waste surface impoundments located within the 100-year flood plain. Industrial solid waste impoundments located above the 100-year flood water elevation, should include surface water diversion dikes that are, at a minimum, capable of diverting all rainfall runoff from a 24-hour, 25-year storm.

FEMA guidance, as described in "*Selecting and Accommodating Inflow Design Floods for Dams; FEMA P-94 /August 2013*", recommends hydrologic design of impoundments to consider discharge and storage capacities, reservoir regulation plans, land requirements, and wind/wave effects. FEMA guidelines recommend site-specific hydrologic design for high hazard impoundments which take into consideration the inflow design flood (IDF). FEMA recommends that dams with a low hazard potential be designed for a 1-percent annual chance of exceedance flood (average return frequency of no less than once in 100 years) and that dams with a significant hazard potential be designed for a 0.1-percent annual chance of exceedance flood (average return frequency of no less than once in 1,000 years).

The SRH Pond was classified as a significant hazard impoundment and the Evaporation Pond was classified as a low hazard impoundment. Documentation provided by CPS included Turnkey Contract Documents prepared by Black & Veatch and dated December 31, 1987. These documents included precipitation amounts for selected storm durations and return periods expected in the Calaveras Lake area. Black & Veatch reported a precipitation of 7.75 inches for a 24-hour, 25-year storm, and precipitation ranging from 3.35 inches to 9.92 inches for 100-year storms ranging in duration from ½ hour to 24 hours. No documentation was provided by CPS on the site-specific IDF.

The drainage area contributing to the SRH Pond and the Evaporation Pond appears to be limited to the surface area of the impoundments. A preliminary evaluation performed by CDM Smith suggests there is enough storage capacity under current operating pool levels for the SRH Pond to safely store precipitation from a 0.1-percent annual chance exceedance (1,000-year) flood. A preliminary evaluation performed by CDM Smith suggests there is enough storage capacity under current operating pool levels for Evaporation Pond to safely store precipitation from a 1-percent annual chance exceedance (100-year) flood.

6.2 Adequacy of Supporting Technical Documentation

The hydrologic and hydraulic supporting documentation of the SRH Pond and Evaporation Pond is considered inadequate based on the following:

- H & H documentation provided by CPS included precipitation amounts for selected storm durations and return periods expected in the Calaveras Lake site area. No documentation was provided by CPS on the ability of the impoundments to store the FEMA-recommended design floods.

- An evaluation to determine the required IDF and of the capacity of the SRH Pond and Evaporation Pond to withstand the design hydrologic/hydraulic events, without overtopping have not been provided.

6.3 Assessment of Hydrologic/Hydraulic Safety

Hydrologic and hydraulic safety of the SRH Pond and Evaporation Pond is considered adequate based on the following:

- CDM Smith's preliminary evaluation of the CCW impoundments suggests the SRH Pond and the Evaporation Pond have adequate storage capacity, based on normal operating conditions, to store the recommended floods.

It should be noted that during visual observations and site assessments, no signs of plugged, collapsed, or blocked pipes, or other detrimental conditions were observed.

Section 7

Structural Stability

7.1 Supporting Technical Documentation

The available information regarding slope stability of the SRH Pond and the Evaporation Pond consists of a report titled "Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas", prepared by Raba Kistner Consultants, Inc., (RKCI) and dated May 7, 2014. The RKCI May 2014 report supersedes RKCI's November 12, 2012 report referenced in CDM Smith's December 2012 "*Assessment of Dam Safety of Coal Combustion Surface Impoundments , CPS Energy, J.K. Spruce Power Plant*". RKCI's 2014 report included slope stability analyses for steady-state and seismic loading conditions of the SRH Pond and Evaporation Pond embankments. The calculated factors of safety presented in the RKCI 2014, for the load conditions analyzed, met minimum required factors of safety outlined by the USACE in EM 1110-2-1902, Table 3-1 and seismic factors of safety by FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams. The RKCI 2014 report did not present analyses for liquefaction potential, end-of-construction, and rapid drawdown loading conditions. RKCI stated in the 2014 report that the end-of-construction condition was not evaluated due to the age of the ash ponds. RKCI also stated that both rapid drawdown and erosion failures are considered to be of very low risk due to the embankment toe elevations (above EL 490 feet) with respect to the target pool elevation (EL 485 feet) and because they would pose no risk of environmental contamination, because the pond must empty for this condition to occur. The RKCI May 7, 2014 report is included in Appendix A. A summary of the RKCI 2014 analyses is provided in the following sections.

7.1.1 Stability Analyses and Load Cases

TCEQ recommendations related to embankment stability of coal ash impoundments are included in "Technical Guideline No. 4, Topic: Nonhazardous Industrial Solid Waste Surface Impoundments", dated June 12, 2009. TCEQ's Technical Guideline No. 4 recommends all permanent earthen dikes that are used to retain waste or waste waters above ground level should have a top width of at least eight (8) feet and side slopes that are not steeper than one (1) foot vertical to three (3) feet horizontal. TCEQ's recommended factor of safety against dike slope failure is at least 1.4. In situations where a backup system is not used for potential catastrophic failure of the dikes, TCEQ recommends a minimum factor of safety of 1.5.

Procedures established by the United States Army Corps of Engineers (USACE), the United States Bureau of Reclamation, the Federal Energy Regulatory Commission, and the Natural Resources Conservation Service are generally accepted engineering practice. Minimum required factors of safety outlined by the USACE in EM 1110-2-1902, Table 3-1 and seismic factors of safety by FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams (pgs. 31, 32 and 38, May 2005) are provided in **Table 7-1**.

Table 7-1 - Recommended Minimum Safety Factors

Load Case	Minimum Required Factor of Safety
Steady-State Condition at Normal Pool or Maximum Storage Pool Elevation	1.5
Rapid Drawdown Condition from Normal Pool Elevation	1.3
Maximum Surcharge Pool	1.4
End of Construction	1.3
Seismic Condition at Normal Pool Elevation	1.0
Liquefaction	1.3

RKCI performed slope stability analyses for each of the embankments at the SRH Pond (Sections J, K, L, and M) and each of the Evaporation Pond embankments (Sections A, B, C, and D). Slope stability analyses were performed for steady-state seepage conditions at normal pool and maximum storage pool elevations, using effective stress analyses and for seismic conditions using total stress analyses. Analyses were performed with two feet of freeboard and pond water levels at the top of the crest, corresponding to normal pool and maximum surcharge loading conditions, respectively. Design parameters used in the seismic slope stability analyses included the mapped spectral response acceleration for an earthquake with a 0.098g applied horizontal seismic load. RKCI indicated, in their 2014 report, that the applied horizontal seismic load had a 4-to-6 % probability of exceedance in 50 years. USEPA guidelines specify that the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years be used in seismic slope stability analyses. CDM Smith used USGS referenced maps, published in the 2010 ASCE-7 Standard, to determine the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years. CDM Smith found the spectral response acceleration for the Spruce site to be 0.075g.

According to the 2014 RKCI report, rapid drawdown load conditions were not analyzed for slope stability, because the impoundments would be emptied for this condition to occur. The end-of-construction condition was not analyzed because the ponds have been in place for many years. According to information provided by RKCI, slope stability analyses for liquefaction potential were not performed because liquefaction is very unlikely at the site due to the subsurface conditions and low seismic hazard level at the Plant site. As described in Section 1, CDM Smith agrees with RKCI's rationale for not performing these analyses.

7.1.2 Design Parameters and Dam Materials

CPS provided RKCI with field survey drawings for the embankments analyzed. According to the RKCI report, Pape Dawson Engineers, Inc. (PDE) spot-checked the existing embankments and surveyed cross-sections where the existing conditions did not closely resemble the earlier survey data. RKCI performed test soil borings at the embankment crests of the SRH Pond and Evaporation Pond. Four borings were performed at the SRH Pond and four were performed at the Evaporation Pond. Soil and groundwater information obtained from these test borings were used in RKCI's slope stability analyses. The soil properties and strength parameters used in RKCI's steady-state seepage and seismic slope stability analyses are included in **Tables 7-2** and **7-3**, respectively. RKCI refers to the SRH Pond as Pond 1, and the Evaporation Pond as Pond 3.

Table 7-2 - Soil Parameters Used in RKCI's Steady-State Slope Stability Analyses

Pond ID	Clay Fraction %	Assumed Liquid Limit	Normal Stress, psf			
			0	1,044	2,089	8.354
Pond 1						
Embankment Soil (CL)	47	42	0	647	1,158	4,057
Sandy Clay (CL)	52	52	0	561	972	3,281
Clayey Sand (ML)	36	33	0	669	1,197	4,240
Pond 3						
Embankment Fill (CL)	45	45	0	640	1,145	4,023
Sandy Clay (CL)	50	54	0	557	963	3,247
Clayey Sand (ML)	34	55	0	618	1,105	3,859

Source: RKCI May 7, 2014 report, "Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas".

Table 7-3 - Soil Parameters Used in RKCI's Seismic Slope Stability Analyses

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)
Embankment Fill	120	350	20
Clayey Sand	120	400	20
Clayey Sand Below Water Table	57.6	400	20
Sandy Clay	120	500	20
Sandy Clay Below Water Table	57.6	500	20

Source: RKCI May 7, 2014 report, "Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas".

According to the RKCI report, strength parameters for steady-state seepage analyses were selected based on consolidated undrained triaxial compression test results at four different normal stresses and published correlations. The strength parameters selected for the seismic analyses were based on unconfined compressive strength results and experience with similar soils.

7.1.3 Uplift and/or Phreatic Surface Assumptions

According to the 2014 RKCI report, steady-state seepage analyses were performed for each profile using finite element groundwater module within SLIDE, a software program developed by RocScience. The seepage analyses were performed for each embankment cross-section with water levels at the embankment crests. Results of the seepage analyses were used for the steady-state seepage and seismic slope stability analyses.

7.1.4 Factors of Safety and Base Stresses

A summary of factors of safety computed for the different cases of the SRH Pond (Sections J, K, L, and M) and Evaporation Pond (Sections A, B, C, and D) is included in **Table 7-4**.

Table 7-4, Computed Factors of Safety for Various Stability Conditions

Embankment Cross-Section		Factor of Safety Steady-State Stability Analyses(1)		Required Safety Factor	Factor of Safety Factor of Safety(2)		Required Safety Factor	Factor of Safety Seismic Stability Analyses		Required Safety Factor
		Interior Slope	Exterior Slope		Interior Slope	Exterior Slope		Interior Slope	Exterior Slope	
SRH Pond	J	>2	>2	1.5	>2	>2	1.4	>2	>2	1.0
	K	>2	>2		>2	>2		>2	>2	
	L	>2	>2		>2	>2		>2	>2	
	M	>2	1.7		>2	1.6		>2	1.6	
Evaporation Pond	A	>2	>2		>2	>2		>2	>2	
	B	>2	>2		>2	>2		>2	>2	
	C	>2	1.5		>2	>2		>2	>2	
	D	>2	1.9		>2	>2		>2	>2	

Source: RKCI May 7, 2014 report, “Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas”.

1. Normal Pool
2. Maximum Surcharge

7.1.5 Liquefaction Potential

CDM Smith was not provided documentation on liquefaction analysis. RKCI stated that liquefaction is very unlikely at the site due to the subsurface soil and groundwater conditions, and seismic conditions at the Plant site. As reported by RKCI, there is less than a 0.1% chance of an earthquake with magnitude of 5.0 or greater in 50 years. Because the site contains significant quantities of relatively stiff clay, RKCI believes the soils beneath the existing embankments have a very low risk of experiencing liquefaction due to an earthquake. Available subsurface information indicates the soils below the embankments consist of fill underlain by medium dense to very dense sandy soils and/or very stiff sandy clay. The liquefaction susceptibility of the dense sandy soils and the stiff clay is generally considered to be low.

7.1.6 Critical Geological Conditions

According to the Quaternary Geologic Map of the Austin 4 x 6 Quadrangle published by the United States Geological Survey, geology in the vicinity of the Plant consists of gray, light brown, brown, or orange clayey, fine to medium quartz sand to fine sandy silty clay with subrounded sandstone pebbles, colluviums, and small bedrock outcrops in some localized areas. According to the United States Department of Agriculture, surface soils in the area are comprised of fine sand, loamy fine sand, and sandy clay loam.

7.2 Adequacy of Supporting Technical Documentation

Existing conditions and visual observations yield a satisfactory rating for structural stability of both the SRH Pond and Evaporation Pond based on the following:

- Steady state and seismic stability analyses for of the SRH Pond and Evaporation Pond embankments are documented.
- RKCI did not analyze liquefaction potential, end-of-construction and sudden drawdown loading conditions. As described in Section 1, CDM Smith agrees with RKCI’s rationale for not performing these analyses.

- In their seismic slope stability analyses, RKCI used the mapped spectral response acceleration of 0.098g from the USGS web site calculator. RKCI performed a probabilistic assessment of the likelihood of the project site experiencing a magnitude 5 or larger earthquake within a 50 year period. RKCI's assessment indicated that the probability of occurrence was 4 to 6 percent. USEPA guidelines specify that the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years be used in seismic slope stability analyses. CDM Smith used USGS referenced maps, published in the 2010 ASCE-7 Standard, to determine the mapped spectral response acceleration for an earthquake with 2% probability of exceedance in 50 years. CDM Smith found the spectral response acceleration for the Spruce site to be 0.075g. Accordingly, in CDM Smith's opinion, the response acceleration employed in RKCI's seismic analyses conforms to USEPA standards.

7.3 Assessment of Structural Stability

Based on the review of the stability analyses and visual observations made during the site visit, CDM Smith considers the condition rating to be satisfactory for structural stability of the SRH Pond and Evaporation Pond.

During CDM Smith's visual observations and site assessment of the Evaporation Pond, the high water and solids level in the impoundments prevented observation of the interior slopes.

Section 8

Adequacy of Maintenance and Methods of Operation

8.1 Operating Procedures

During normal operating procedures the SRH Pond receives FGD scrubber sludge, low-volume waste, stormwater from the material storage area, quench water, and metal cleaning waste from the J.K. Spruce Power Plant. Liquids are discharged into the north and south sections of the SRH Pond through several inlet pipes located near the center divider wall. Liquids are pumped from two 18-inch-diameter outlet pipes, one in the north section and one in the south section of the SRH Pond, to the clarifier. Liquids from the clarifier are discharged to outfall 109 at the Plant intake canal located just south of the SRH Pond. Settled solids are periodically excavated from the SRH Pond and disposed of in an on-site Plant landfill located approximately 1.5 miles north of the impoundment. During the site assessment the SRH Pond contained water and solids. CPS indicated that solids had last been removed in 2011.

During normal operating procedures, the Evaporation Pond receives boiler chemical cleaning wastes generated by the J.T. Deely Power Plant and J.K. Spruce Power Plant that are trucked to the pond. The wastes are dewatered through evaporation. No liquids are discharged from the Evaporation Pond. During the site assessment, solids in the impoundment were up to 0.5 to 2 feet below the crest elevation.

8.2 Maintenance of the Dam and Project Facilities

CPS indicated during the site assessment by CDM Smith on August 27 and 28, 2012, that no formal visual inspections are performed for the SRH Pond and Evaporation Pond.

Regular maintenance operations include mowing adjacent to the SRH Pond and Evaporation Pond.

8.3 Assessment of Maintenance and Methods of Operations

8.3.1 Adequacy of Operating Procedures

Based on CDM Smith's visual observations and review of documents provided by CPS, operating procedures appear to be generally adequate for the impoundments. There is no readily available indication that suggests that the SRH Pond and Evaporation Pond primary purposes are not being accomplished.

8.3.2 Adequacy of Maintenance

Based on CDM Smith's visual observations and review of documents provided by CPS, maintenance of the SRH Pond and the Evaporation Pond appear to be generally adequate. There were no significant maintenance issues at the SRH Pond. Maintenance issues on the exterior slopes of the Evaporation Basin included areas of loose soil and exposed soil, and an animal burrow.

Section 9

Adequacy of Surveillance and Monitoring Program

9.1 Surveillance Procedures

CPS Energy is required by Texas Commission on Environmental Quality (TCEQ) under National Pollutant Discharge Elimination System (NPDES) Permit No. WQ0001514000 to monitor discharge of wastewater into Calaveras Lake. Surveillance procedures should be in accordance with the TCEQ – NPDES Permit.

According to CPS, no surveillance procedures exist for the SRH Pond and Evaporation Pond.

9.2 Instrumentation Monitoring

The SRH Pond and Evaporation Pond do not include any instrumentation monitoring. Water levels are not monitored in the SRH Pond and Evaporation Pond.

The SRH Pond and Evaporation Pond embankments do not have an instrumentation monitoring system to monitor structural stability, seepage or ground displacement.

9.3 Assessment of Surveillance and Monitoring Program

9.3.1 Adequacy of Inspection Programs

The CPS surveillance program for the SRH Pond and Evaporation Pond is inadequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

The CPS instrumentation monitoring program for the SRH Pond and Evaporation Pond is inadequate. CPS representatives confirmed the absence of instrumentation to monitor impoundment conditions. Detrimental conditions or indications for potential failure of embankments were not observed at the SRH Pond or Evaporation Pond.

Section 10

Reports and References

The following is a list of reports and drawings that were provided by CPS and were used during the preparation of this report and the development of the conclusions and recommendations presented herein.

1. Turnkey Contract Documents Volume 4 by Utility Engineering Corporation, dated December 31, 1987,
2. J.K. Spruce Unit 1 Construction Drawings by Utility Engineering Corporation, dated 1989.
3. J.T. Deely/J.K. Spruce Construction Drawings by Frank Tobar, dated 1990.
4. J.K. Spruce Unit 1 Construction Drawings by Untility Engineering Corporation, dated 1992.
5. Raba Kistner Consultants, Inc. Geotechnical Engineering Study, Ash Pond Berms – Spruce/Deely Generation Units, dated November 20, 2012.
6. Raba Kistner Consultants, Inc. Geotechnical Engineering Study, Ash Pond Berms – Spruce/Deely Generation Units, dated May, 2014.

Appendix A

RKCI Geotechnical Engineering Study

RABA KISTNER

GEOTECHNICAL ENGINEERING STUDY

FOR

ASH POND BERMS - SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

RABA
KISTNER
CONSULTANTS

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

Project No. ASA12-098-00 (Revised)
May 7, 2014

Mr. Eric R. Olson
CPS Energy
c/o Mr. Steven Dean, P.E.
Pape-Dawson Engineers, Inc.
555 East Ramsey
San Antonio, Texas 78216

RE: Geotechnical Engineering Study
Ash Pond Berms – Spruce/Deely Generation Units
San Antonio, Texas

Dear Mr. Dean:

Raba Kistner Consultants Inc. (RKCI) is pleased to submit the revised report of our Geotechnical Engineering Study for the above-referenced project. This study was performed in accordance with RKCI Proposal No. PSA12-168-00 (3rd Revision), dated October 4, 2012, and comments provided in a conference call on April 17, 2014. The purpose of this study was to drill borings within the existing ash pond berms, to perform laboratory testing to classify and characterize subsurface conditions, and to prepare an engineering report presenting slope stability analyses for the existing berms.

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.

R. Blake Wright

R. Blake Wright, E.I.T.
Graduate Engineer

ERIC J. NEUNER
116311
5/7/2014

Eric J. Neuner, P.E.
Manager, San Antonio Engineering

RBW/JAF/EJN

Attachments

Copies Submitted: Above (4)

GEOTECHNICAL ENGINEERING STUDY

For

ASH POND BERMS – SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

Prepared for

PAPE-DAWSON ENGINEERS, INC.
San Antonio, Texas

Prepared by

RABA KISTNER CONSULTANTS, INC.
San Antonio, Texas

PROJECT NO. ASA12-098-00 (Revised)

May 7, 2014

RABAKISTNER

TABLE OF CONTENTS

TABLE OF CONTENTS

ATTACHMENTS

Appendix A (Field Data)

Appendix B (Laboratory Test Results)

Appendix C (Slope Stability Analyses)

Appendix D (Seismic Analyses)

INTRODUCTION

Raba Kistner Consultants Inc. (RKCI) has completed the authorized subsurface exploration and slope stability analyses for the existing ash pond berms at the Spruce/Deely Generation Units in San Antonio, Texas. This report briefly describes the procedures utilized during this study and presents our findings along with our recommendations for maintaining the existing ash pond berms.

PROJECT DESCRIPTION

The structures being considered in this study include the existing ash pond berms located at the Spruce/Deely Generation Units, which is operated by CPS Energy. Specifically, three ponds were studied and are denoted on the Boring Location Map, Figure 1. Our understanding of the slope profile at each berm, as well as the existing site topography, is based on several drawings provided to us on September 14, November 1, 2012, and May 6, 2014 by Mr. Steven Dean, P.E., with Pape-Dawson Engineers, Inc.

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 existing ash pond berms at the Spruce/Deely Generation Units .

The geotechnical properties of the soils encountered in this study involve variability. This variability includes some spatial variability; however, the spatial variability appears to occur over relatively short distances. It is important to note that berms differ from other types of structures, such as drilled piers or driven piles, in that the performance of the berm involves local, not average, soil conditions.[1] 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 all slope stability analyses. We believe that the combination of observed conditions and probable failure modes justifies this approach.

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.

---

[1] Focht, J.A. Jr. and Focht, J.A. III, "Factor of Safety and Reliability in Geotechnical Engineering, Discussion and Closure", ASCE JGGE Vol. 127 No. 8, pp.700-721, August 2001.

The recommendations submitted in this report are based on the data obtained from 14 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.

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.

BORINGS AND LABORATORY TESTS

Subsurface conditions at the site were evaluated by 14 borings drilled at the locations shown on the Boring Location Map, Figure A-1. These locations are approximate and distances were measured using a recreational-grade, hand-held GPS locator; tape; angles; pacing; etc. Ground surface elevations were estimated from the topography depicted on the above-referenced drawings provided by Mr. Dean. The estimated 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 No.	Ground Surface Elevation (ft, MSL)	Boring Bottom Elevation (ft, MSL)
B-1	522	472
B-2	523	473
B-3	522	472
B-4	523	473
B-5	501	461
B-6	500	460
B-7	500	470
B-8	501	461
B-9	499	469
B-10	496	456
B-11	496	466
B-12	500	470
B-13	496	456
B-14	501	461

The borings were drilled using a truck-mounted drilling rig. During drilling operations, the following samples were collected:

Type of Sample	Number Collected
Split-Spoon (with Standard Penetration Test)	126
Undisturbed Shelby Tube	28

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 following tests:

Type of Test	Number Conducted
Natural Moisture Content	151
Atterberg Limits	29
Percent Passing a No. 200 Sieve	33
Direct Shear	2
Consolidated-Undrained ($\overline{\text{CU}}$) Triaxial	10
Unconfined Compression	17
Dry Unit Weight	17

With the exception of the $\overline{\text{CU}}$ 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 A-2 through A-15. A key to classification terms and symbols used on the logs is presented on Figure A-16. The results of the laboratory and field testing are also tabulated on Figure B-1 for ease of reference.

Standard penetration test results are noted as "blows per ft" on the boring logs and Figure B-1, 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 B-1.

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.

pH TESTING

Seepage from the ash ponds would most likely result in an increase pH in the embankment soils. As a part of our laboratory study, we evaluated the collected soil samples using a phenolphthalein solution. We customarily screen for pH in order to prevent chemical burns to our laboratory staff, who typically work with the samples bare-handed.

No reaction to the phenolphthalein solution was noted in any of the samples tested. This would indicate that all samples tested had a pH value of less than 8.

$\overline{\text{CU}}$ TESTS

Multi-stage $\overline{\text{CU}}$ tests were used to measure both total and effective soil strength parameters of harvested samples from the project site. During $\overline{\text{CU}}$ testing, each stage was subjected to a range of effective consolidation pressure.

The following table presents the results of our multi-stage $\overline{\text{CU}}$ tests:

Boring No.	Depth (ft)*	Effective		Total		Stress Path	
		Friction Angle, ϕ' (degrees)	Cohesion, c' (psf)	Friction Angle, ϕ (degrees)	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Cohesion, c (psf)
B-2	13-15	18.6	1,350	20.2	1,390	19.1	1,310
B-3	18-20	21.7	1,130	22.7	1,220	25.9	1,060
B-5	8-10	28.0	730	30.0	1,020	29.5	720
B-7	8-10	28.3	2,040	-	-	36.2	560
B-9	8-10	33.6	0.0	38.6	0.0	24.0	1,070
B-12	8-10	27.2	1,160	34.9	1,090	31.3	860

*Depth below the top of berm surface elevation existing at the time of our field study.

DIRECT SHEAR TESTS

Direct shear tests were performed on two samples collected during drilling operations. The results of these tests are presented in the table below:

Boring No.	Depth (ft)	Apparent Cohesion (psf)	Phi (degrees)
B-3	28.5 - 30	62	27
B-5	38.5 – 40	72	34

LIQUID DENSITY TESTS

Three one-gallon liquid samples were collected at the site on April 22, 2014. These samples were collected from the Evaporation Pond, North Bottom Ash Pond, and the North SRH Pond. The densities of these liquids are presented in the following table:

Sample Location	Density (pcf)
Evaporation Pond	61.0
North Bottom Ash Pond	60.6

Sample Location	Density (pcf)
North SRH Pond	60.7

FLY ASH SPECIFIC GRAVITY TESTING

Two samples of fly ash sludge were collected at the site on April 22, 2014 to calculate the specific gravity of the fly ash. The calculated specific gravities are presented in the table below:

Sample Location	Specific Gravity
North Bottom Ash Pond	2.59
South Bottom Ash Pond	2.60

MOISTURE-DENSITY TESTING

The density of the at surface material in the dry portions of the ponds was measured on April 22, 2014 using a nuclear density gauge. The results of these tests are presented in the tables below:

Pond	Sample Location	Wet Density (pcf)	Moisture Content (%)	Dry Density (pcf)
Evaporation Pond	West Edge of Pond	94.2	33.3	70.7
		92.9	40.0	66.4
		92.0	31.1	70.2
		95.2	31.5	72.4
		92.6	35.5	68.4
		94.4	34.5	70.2
North Bottom Ash Pond	East and Southeast Edge of Pond	106.3	18.0	90.1
		111.2	19.0	93.4
		107.3	24.2	86.4
		112.9	17.9	95.8
		110.7	21.5	91.1
		107.6	24.9	86.2
South Bottom Ash Pond	Center of Pond	118.0	18.0	100.0
		122.2	16.3	105.1
		119.5	16.2	102.9
		114.6	19.2	96.2
		106.7	23.6	86.4
		115.5	17.7	98.1

GENERAL SITE CONDITIONS

SITE DESCRIPTION

The project site is a tract of developed land located at the Spruce/Deely Generation Units , which is operated by CPS Energy. The ash ponds considered in this study are located east and northeast of the existing main power plant facility. The entire facility is bounded to the west, south, and east by Calaveras Lake. The topography generally slopes downward toward Calaveras Lake. CPS maintains the Calaveras Lake at a target pool elevation of Elevation 485 feet 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 the rain event.

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

The subsurface stratigraphy at this site varies from pond to pond, and berm to berm. However, the embankment fill soils typically consist of sandy clay or clayey sand. It is difficult to distinguish between these two soil types in the berms because the percent passing a No. 200 sieve ranges within about 10 percentage points higher and lower than 50%. The subgrade stratigraphy is also generally composed of interbedded sandy clay and clayey sand. There were also isolated tan and gray clay seams encountered in our borings. 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. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual, which vary within a relatively narrow combined range of Plasticity Index and -200 values.

GROUNDWATER

The depth to groundwater was measured in all borings except Boring B-1. The groundwater level in Boring B-1 could not be measured due to the introduction of drilling fluids in this boring.

Upon completion of the drilling operations, groundwater levels ranged from 11 to 17 ft below the existing ground surface in the borings drilled for Ponds 1 and 2. Groundwater levels ranged from 40 to 42 ft below the existing ground surface in the borings drilled for Pond 3 (with the exception of Boring B-1).

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. Fluctuations in groundwater levels are possible due to variations in rainfall and surface water run-off.

EARTHEN BERMS

DESIGN CONSIDERATIONS

The existing berms should meet three important criteria: they should be resistant to the forces of erosion, should exhibit a suitable slope stability design allowable factor of safety with respect to long-term, short-term, and sudden drawdown conditions, as well as performance type scenarios such as underseepage. The berm structure must meet these criteria so that the calculated risk of failure is consistent with criteria established by the USACE guidelines.

Probable failure modes

Our review of the site and expected conditions for the Calaveras Power Plant ash ponds indicates that the following major modes of failure could affect the berms:

- Slope stability
- Underseepage
- Embankment Seepage

The following sections address each of these failure modes, as well as slope erosion and liquefaction.

Slope Stability Based on our review of available data and our visual observations during drilling, the existing embankments exhibit slopes ranging from about 3:1 (horizontal:vertical) or flatter, while a few limited areas exhibit slopes of about 2.5:1.

In general, slopes flatter than 3:1 would be expected to exhibit the required factors of safety for a normal (non-flood) seepage condition with the area water table near Elevation 485 feet.

Underseepage We generally consider underseepage to be a very low risk for the existing berms. Underseepage consists of water flowing beneath the embankment as a result of water seeping out of the ash ponds. The principal failure mechanism related to underseepage occurs when the upward force of the water equals or exceeds the buoyant weight of the soil. This does not appear likely to occur at this project site.

Berm Seepage Embankment seepage consists of water flowing through the berm as a result of seepage through the berm. The principal failure mechanism related to embankment seepage occurs when the horizontal force of the water equals or exceeds the effective shear strength of the soil. This mode of failure is not expected to occur at this project site.

Slope Erosion The existing embankments are generally composed of cohesive soils, while the underlying soils are generally composed of cohesive soils with layers semi-cohesive soils. It appears that the existing embankments were constructed using the soils available at the project site. These materials are generally considered acceptable to good materials to use when constructing berms, dams 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.

Liquefaction Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soils most susceptible to liquefaction are clean, loose, saturated, uniformly graded, and fine-grained sands. Empirical evidence indicates that loose silty sands are also potentially liquefiable. When seismic ground shaking occurs, the soil is subjected to cyclic shear stresses that can cause excess hydrostatic pressures to develop. If excess hydrostatic pressures reach the effective confining stress from the overlying soil, the sand may undergo deformations. If the sand undergoes virtually unlimited deformation without developing significant resistance, it is said to have liquefied, and if the sand consolidates or vents to the surface during and following liquefaction, ground settlement may occur.

The soils contain significant quantities of clay, and are relatively dense. Even when groundwater is present, the berms have a very low potential for liquefaction during earthquake events, particularly since the USGS online resources indicate there is less than 0.1 percent chance of experiencing a magnitude 5.0 or greater earthquake at this site during a 50 year period. In addition, calculations performed using the Seed and Idriss method indicate the most susceptible tested sample must experience a ground acceleration in excess of 0.44g before liquefaction will occur. Based on these findings, RKCI believes the soils beneath the existing berms have a very low risk of experiencing liquefaction due to an earthquake.

SLOPE STABILITY

This section presents our slope stability analyses performed for this study. In general, the procedures described in USACE EM 1110-2-1902 *Slope Stability* were followed. As such, our analysis focused on embankment stability, settlement, interior drainage, and slope protection.

The slope configurations analyzed, method of analysis, loading conditions, and soil properties used in the analyses are discussed in the following paragraphs.

Minimum Factor of Safety

For a given slope configuration, the forces that "drive" slope failure (including gravity, groundwater seepage pressure, and possible excess pore water pressures from external loading conditions) are compared to the slope's resistance to failure, which is a function of dewatering controls and internal shear strength (cohesion and internal angle of friction) of both the foundation soils and the fill soils utilized for construction of the embankment.

The USACE has specified minimum safety factors against slope failure with respect to loading conditions. The minimum acceptable factors of safety for berms at end of construction, rapid drawdown, and steady state conditions, provided in Table 3-1 on Page 3-2 of EM 1110-2-1902, are listed in the following table. The minimum safety factor against slope failure during an earthquake is customarily assumed to be a calculated value greater than 1.0 where the risk of loss of life is low and the structure is not deemed critical in nature (hospitals, emergency services, etc.)

Condition	Required Factor of Safety
End of Construction	1.3
Sudden Drawdown	1.1 to 1.3
Long Term (Steady Seepage)	1.4
Earthquake	Greater than 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.

Slope Configurations

At the time this technical report was prepared, field surveys drawings of the existing berms had been performed by Pape Dawson Engineers, Inc. As a part of their work, we understand that Pape Dawson spot-checked the existing berms, and only provided surveyed cross-sections where the existing condition did not closely resemble the original drawings. As such, we have provided the original design geometry for the purposes of our study for the select berms. Figure C-1 shows the profiles that were surveyed and those that are based on the design drawings.

We recognized four general soil conditions along the length of the alignment that may be considered as worst-case boundary conditions. As such, four cases were analyzed based on these boundary conditions.

Method of Analysis

The slope stability analyses for this study were conducted with the aid of a computer using the program SLIDE developed by RocScience. The SLIDE computer program randomly generates trial failure surfaces and evaluates the factor of safety for each trial surface. The program allows a large number of potential shear surfaces to be investigated to determine the critical failure surface for each of the analyzed slope configurations.

The portions of the program used in this study employed both the Morgenstern-Price and Spencer computational methods. These methods were used to make calculations of the stability of slopes where non-circular failure surfaces were permitted. In each case, the computed factor of safety is the ratio of the forces resisting movement to the driving forces. A factor of safety of 1.0 or less implies the slope is unstable, while a factor of safety greater than 1.0 implies the slope is stable.

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.

Liquid/Sludge Loads Based on the results of the density testing performed on the samples collected on April 22, 2014, we have included additional loads on the analyses conducted for the "dry side" 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 sludge and/or liquid in the ponds. The increase in the pressure due to this material is modeled in our analysis.

These loads were not applied to the "pond side" analyses due to the increase in factors of safety from this loading condition.

End of Construction The short-term (undrained) loading condition models the slope immediately following construction. For this loading condition, the pore pressures developed during construction have not had the opportunity to dissipate. We did not analyze this condition since the berms have been in place for many years.

Steady State Seepage The long term (drained), steady-state seepage loading condition was analyzed. This loading condition models the ash ponds with 2 ft of freeboard along the berm crest and assumes that the berm soils are fully saturated and a condition of steady state seepage occurs through the embankment. For this loading condition, effective stress soil parameters were used in the analysis.

Maximum Pool The analyses for "Maximum Pool" consider those given for "Steady State" but assume that the pond is completely full.

The maximum pool condition represents a more severe condition than an assumed steady state analysis with the pond level 2 ft below the top of the embankment. Provided the analyses meet the relevant criteria for slope stability and seepage, a separate steady state analysis for normal operating conditions is not required.

Sudden Drawdown from Design Flood Stage This condition represents the situation when the water within the pond is drained at such a rapid rate that the saturated berm soils do not have time to drain. Consequently, excess pore water pressures result in the soil. We did not model this condition since it would pose no risk of environmental contamination, because the pond must be empty for this condition to occur.

SOIL PARAMETERS

Drained soil parameters (drained cohesion and drained friction angle) were selected for each soil stratum based on the laboratory and field test data collected during our study as well as correlations published by Stark and Hussain (2010)[2]. The fully softened soil strength envelopes were compared to the stress path strength envelopes developed from the $\overline{CU}$ tests performed for this study. With the possible exception of the multi-stage $\overline{CU}$ test performed on a sandy clay sample harvested from Boring B-2 at 13 to 15 feet, all of the stress path strength envelopes developed from the $\overline{CU}$ tests exceeded the Stark and Hussain fully softened soil strength envelopes. We assumed that soil behavior was represented by the fully softened soil condition, and also evaluated Profile D using both the relevant fully softened soil strength envelope and the stress path strength envelope developed from the referenced $\overline{CU}$ test. We did not employ the residual strength soil properties since we found no evidence of pre-existing failure surfaces, and are unaware of any prior slope failures in the berm slopes. For purposes of our slope stability analyses, we have assigned the material properties presented in the following table.

Drained Fully Softened Shear Stresses from Equations Developed by Stark and Hussain (2010)

North and South SRH Ponds	Clay Fraction %	Assumed Liquid Limit	Normal Stress, psf				Equivalent Upper-Bound Soil Parameters	
			0	1,044	2,089	8,354	c (psf)	Phi (degrees)
Embankment Soil (CL)	47	42	0	647	1,158	4,075	186	25.0
Sandy Clay (CL)	52	52	0	561	972	3,281	202	20.2
Clayey Sand (ML)	36	33	0	669	1,197	4,240	183	25.9

---

[2] Stark, T.D. and M. Hussain, "Shear Strength in Pre-existing Landslides," *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, 136(7), July, 2010, pp. 957-962.

North and South Bottom Ash Ponds	Clay Fraction %	Assumed Liquid Limit	Normal Stress, psf				Equivalent Upper-Bound Soil Parameters	
			0	1,044	2,089	8,354	c (psf)	Phi (degrees)
Embankment Soil (CL)	45	35	0	664	1,188	4,202	184	25.7
Sandy Clay (CL)	61	51	0	563	976	3,298	202	20.3
Clayey Sand (ML)	43	33	0	669	1,197	4,240	183	25.9

Evaporation Pond	Clay Fraction %	Assumed Liquid Limit	Normal Stress, psf				Equivalent Upper-Bound Soil Parameters	
			0	1,044	2,089	8,354	c (psf)	Phi (degrees)
Embankment Soil (CL)	45	45	0	640	1,145	4,023	186	24.7
Sandy Clay (CL)	50	54	0	557	963	3,247	202	20.0
Clayey Sand (ML)	34	55	0	618	1,105	3,859	187	23.7

The tables obtained from Stark and Hussain can be used to estimate equivalent c-phi linear shear strength parameters that have been traditionally used in slope stability analyses. These values are also tabulated in the three tables presented above. Please note that the c-phi values tend to overestimate the available soil shear strength at low overburden pressures. The Stark and Hussain values correctly predict the likelihood of shallow surface sloughs for clay soils, but the calculated results for the deeper failures contemplated in this study should be essentially the same using either soil model.

Results of Analyses

The following table contains a summary of the results from our slope stability analyses for each loading condition and slope configuration. In general, the point where a potential slide surface was permitted to intersect was not allowed to occur within 3 ft of the relevant top of slope. This limitation was intended to reduce the occurrence of "non-critical" failure surfaces from 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 at the end of this memorandum in Appendix C. The "a" series figures show the critical failure surface on the "dry side" of each berm, while the "b" series figures show the critical failure surface on the "pond side" of each berm.

Computed Factors of Safety for North and South SRH Ponds					
Slope Profile	**End of Construction**	**Steady State on Pond Side**	**Steady State on Dry Side**	**Maximum Pool on Pond Side**	**Maximum Pool on Dry Side**
J	N/A	> 2	> 2	> 2	> 2
K	N/A	> 2	> 2	> 2	> 2
L	N/A	> 2	> 2	> 2	> 2
M	N/A	> 2	1.7	> 2	1.6

Computed Factors of Safety for North and South Bottom Ash Ponds					
Slope Profile	**End of Construction**	**Steady State on Pond Side**	**Steady State on Dry Side**	**Maximum Pool on Pond Side**	**Maximum Pool on Dry Side**
E	N/A	> 2	> 2	> 2	> 2
F	N/A	> 2	> 2	> 2	> 2
G	N/A	1.8	1.3	> 2	1.4
H	N/A	> 2	> 2	> 2	> 2
I	N/A	1.8	1.6	> 2	1.5
N	N/A	1.9	1.6	> 2	1.6

Computed Factors of Safety for the Evaporation Pond					
Slope Profile	**End of Construction**	**Steady State on Pond Side**	**Steady State on Dry Side**	**Maximum Pool on Pond Side**	**Maximum Pool on Dry Side**
A	N/A	2	> 2	> 2	> 2
B	N/A	> 2	> 2	> 2	> 2
C	N/A	> 2	1.5	> 2	> 2
D	N/A	> 2	1.9	> 2	> 2

SEEPAGE ANALYSIS

We performed steady-state seepage analyses for each slope profile using the finite element groundwater module within SLIDE. Our seepage analyses were performed assuming that the soil properties observed in our borings exhibited a 5:1 ratio of permeability (horizontal:vertical) with the assumed permeability values presented in the following table.

Soil	Assumed Permeability, cm/second	
	Horizontal	Vertical
Clay	$1x10^{-7}$	$2x10^{-8}$
Sandy Clay	$1x10^{-6}$	$2x10^{-7}$
Clayey Sand	$1x10^{-4}$	$2x10^{-5}$

EARTHQUAKE ANALYSES

Each berm profile was also evaluated for earthquake conditions utilizing a design spectral acceleration of 0.098g. The assumed seismic force was calculated using the USGS web site calculator; in general, these analyses are considered to be very conservative since the nearest documented active fault is roughly 385 miles from the project site. A probabilistic assessment of the likelihood of the project site experiencing a magnitude 5 or larger earthquake within a 50 year period was also performed. This assessment indicated that the probability of occurrence was only 4 to 6 percent, which is considerably less than the 10 percent required by USEPA regulations. Graphical representations of these analyses are presented in Appendix D. The “a” series figures show the critical failure surface on the “dry side” of each berm, while the “b” series figures show the critical failure surface on the “pond side” of each berm.

Quasi-static analyses were performed, with soil behavior modeled using total stress soil strength values. The assumed values of shear strength used in our models consisted of both a cohesion intercept and angle of internal friction, with the cohesion intercept values chosen based on the unconfined compressive strength testing performed for this study as well as prior area experience. The strength values chosen are considered lower bound for the soils encountered at the project site.

The soil properties utilized for these analyses are presented in the following table:

Material	Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)
Embankment Fill	120	350	20
Clayey Sand	120	400	20
Clayey Sand Below Water Table	57.6	400	20
Sandy Clay	120	500	20
Sandy Clay Below Water Table	57.6	500	20

Results of Quasi-Static (Seismic) Analyses

Global stability analyses were also performed for each slope analyzed for steady state conditions. The results of our analyses are summarized below and are graphically presented in Appendix D at the end of this report.

Computed Factors of Safety for North and South SRH Ponds					
Slope Profile	End of Construction	Steady State on Pond Side	Steady State on Dry Side	Maximum Pool on Pond Side	Maximum Pool on Dry Side
J	N/A	> 2	> 2	> 2	> 2
K	N/A	> 2	> 2	> 2	> 2
L	N/A	> 2	> 2	> 2	> 2
M	N/A	> 2	1.7	> 2	1.6

Computed Factors of Safety for North and South Bottom Ash Ponds					
Slope Profile	End of Construction	Steady State on Pond Side	Steady State on Dry Side	Maximum Pool on Pond Side	Maximum Pool on Dry Side
E	N/A	> 2	> 2	> 2	> 2
F	N/A	> 2	> 2	> 2	> 2
G	N/A	> 2	1.9	> 2	1.9
H	N/A	> 2	> 2	> 2	> 2
I	N/A	> 2	> 2	> 2	> 2
N	N/A	> 2	> 2	> 2	> 2

Computed Factors of Safety for the Evaporation Pond					
Slope Profile	End of Construction	Steady State on Pond Side	Steady State on Dry Side	Maximum Pool on Pond Side	Maximum Pool on Dry Side
A	N/A	> 2	> 2	> 2	> 2
B	N/A	> 2	> 2	> 2	> 2
C	N/A	> 2	1.5	> 2	> 2
D	N/A	> 2	1.9	> 2	> 2

RESULTS

In general, the global stability analyses for steady state conditions resulted in calculated factors of safety in excess of 2 for both long term and earthquake conditions. Three sections exhibited calculated factors of safety of less than 2, and one section (“G”) exhibited a calculated factor of safety of 1.2 for the “dry” slope. Review of Figure C-8a revealed that the critical failure surface for this analysis was relatively thin and did not appear to threaten the ash pond reservoir. A second analysis of this section was then performed, with the top of the assumed surfaces limited to intersecting the ground surface at the top of slope of the “wet” slope or farther from the “dry” slope. Surfaces in this portion of the berm would not threaten containment of the ash pond's contents. The results of this analysis are presented on Figure C-8c, and indicate the calculated factor of safety for this analysis was 1.4.

Global stability analyses for the assumed earthquake conditions resulted in calculated factors of safety that exceeded 1.5 in the evaluated cases. These results indicate that pond failures due to seismic forces do not pose a significant threat to the ash ponds at this site.

CONCLUSIONS

The existing berms were constructed of lean sandy clays and/or clayey sands over competent sandy clays and clayey sands. Liquefaction is considered a very low risk issue at this site. The results of our seepage analyses indicate that no significant risk of an erosion or piping-type failure beneath the ash pond embankments exists. The results of our earthquake analyses indicate that no significant risk of embankment failure due to seismic forces exists at this site. Global stability analyses of steady state conditions indicate that acceptable calculated factors of safety were obtained for reasonable failure surfaces through the embankments at this site, even though the analyses were performed using fully softened soil strength envelopes that were lower than $\overline{\text{CU}}$ tests indicate are available at the project site.

The end-of-construction condition was not evaluated due to the age of the ash ponds, and both rapid drawdown and erosion failures are considered to be of very low risk due to the embankment toe elevations (above EL 490 feet) with respect to the target pool elevation (EL 485 feet). We do not consider embankment seepage or underseepage to pose a significant risk to the berm based on both the long-term performance of the berms and the results of the seepage analyses, which was indirectly confirmed by the pH testing performed on all of the harvested soil samples. The results of our slope stability analyses indicate that all of the berm slopes meet or exceed both USEPA and USACE criteria for stability under steady state (long term) and seismic (earthquake) conditions.

* * * * * * * * * * * * * * * * * *

The following appendices are attached and complete this report:

Field Data	Appendix A
Laboratory Test Results	Appendix B
Slope Stability Analyses	Appendix C
Seismic Analyses	Appendix D

ATTACHMENTS

APPENDIX A

FIELD DATA

RABA KISTNER CONSULTANTS

Raba Kistner Consultants, Inc.
12821 West Golden Lane
San Antonio, Texas 78249
P 210 :: 699 :: 9090
F 210 :: 699 :: 6426
www.rkci.com
TBPE Firm Number 3257

SOURCE: 2011 Aerial Photograph Provided by the City of San Antonio (COSA)

BORING & MONITORING WELL LOCATION MAP

ASH POND BERMS - SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

REVISIONS:

No.	DATE	DESCRIPTION

PROJECT No.:
ASA12-098-00

ISSUE DATE:	10/10/2012
DRAWN BY:	CCL
CHECKED BY:	RBW
REVIEWED BY:	GLB

FIGURE
A-1

LOG OF BORING NO. B-1

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

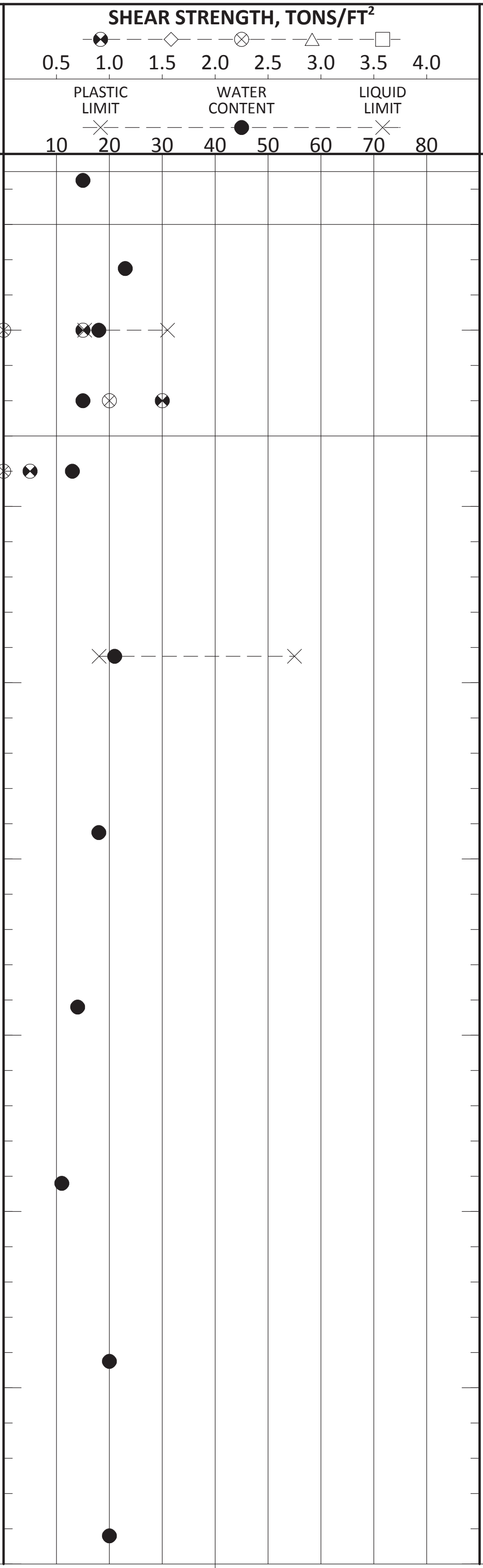
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32477; W 98.31464

SURFACE ELEVATION: 522 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
BASE MATERIAL (6 in.)				
FILL MATERIAL: SAND, Medium Dense, Tan	11			
FILL MATERIAL: CLAY, Sandy, Firm, Reddish-Tan, with gray mottling	7			50
		106	16	
		110		
SAND, Clayey, Medium Dense to Very Dense, Tan to Gray		112		40
-with a tan and gray clay seam from 13 to 15 ft	16		37	
-switched to mud rotary at 15 ft				
	22			
	50/11"			
	50/11"			43
	49			
	50/11"			



DEPTH, FT: 5, 10, 15, 20, 25, 30, 35

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.7 ft	**DEPTH TO WATER:**	N/A	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/15/2012	**DATE MEASURED:**	10/15/2012	**FIGURE:**	A-2a

LOG OF BORING NO. B-1

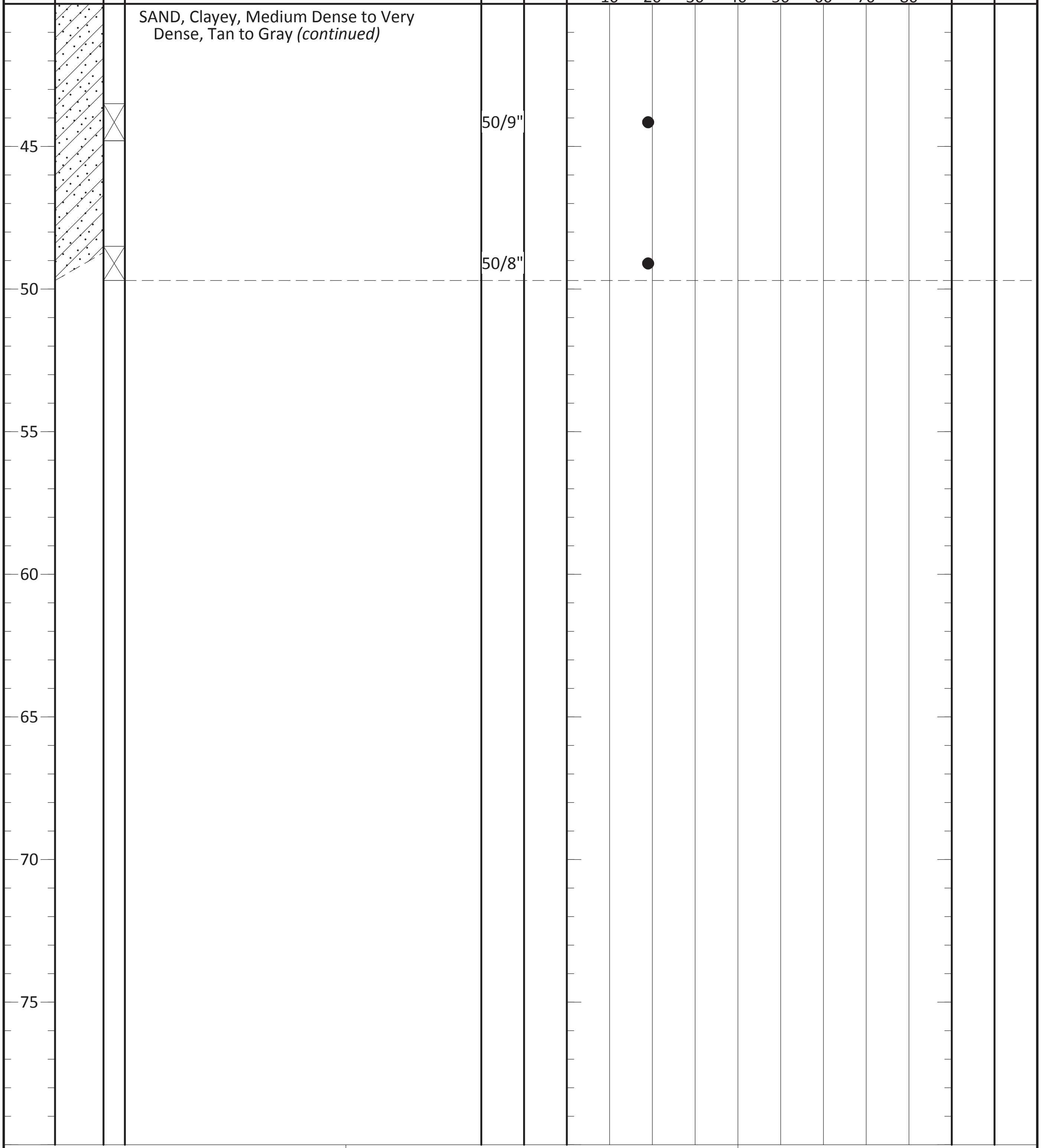
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32477; W 98.31464

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 522 ft	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 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	PLASTICITY INDEX	% -200
			SAND, Clayey, Medium Dense to Very Dense, Tan to Gray *(continued)*					
				50/9"				
				50/8"				



DEPTH DRILLED: 49.7 ft
DATE DRILLED: 10/15/2012
DEPTH TO WATER: N/A
DATE MEASURED: 10/15/2012
PROJ. No.: ASA12-098-00
FIGURE: A-2b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-2

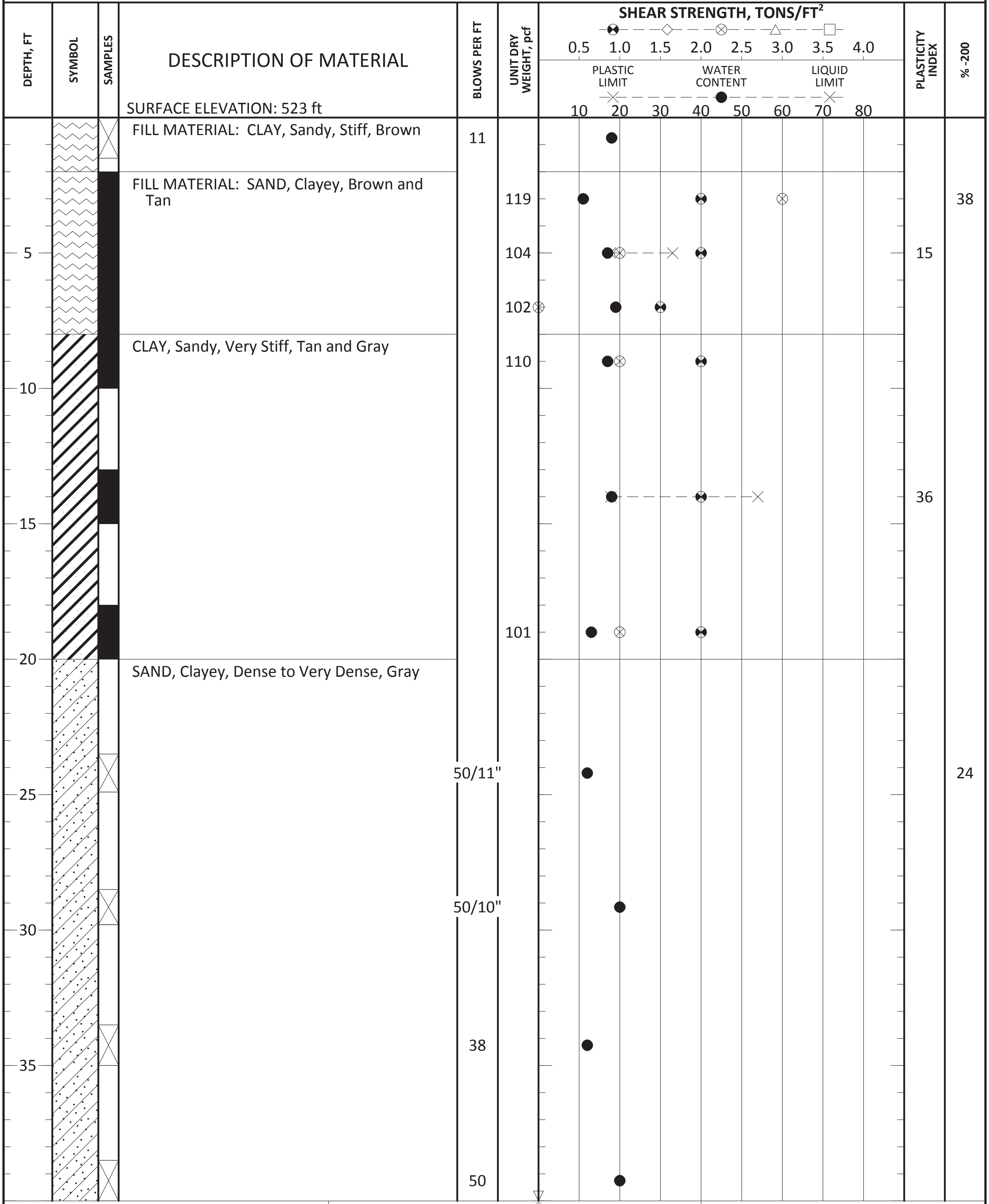
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32378; W 98.31541

SURFACE ELEVATION: 523 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: CLAY, Sandy, Stiff, Brown	11			
FILL MATERIAL: SAND, Clayey, Brown and Tan		119		38
		104	15	
		102		
CLAY, Sandy, Very Stiff, Tan and Gray		110		
			36	
		101		
SAND, Clayey, Dense to Very Dense, Gray				
	50/11"			24
	50/10"			
	38			
	50			

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	40 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/16/2012	**DATE MEASURED:**	10/16/2012	**FIGURE:**	A-3a

LOG OF BORING NO. B-2

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

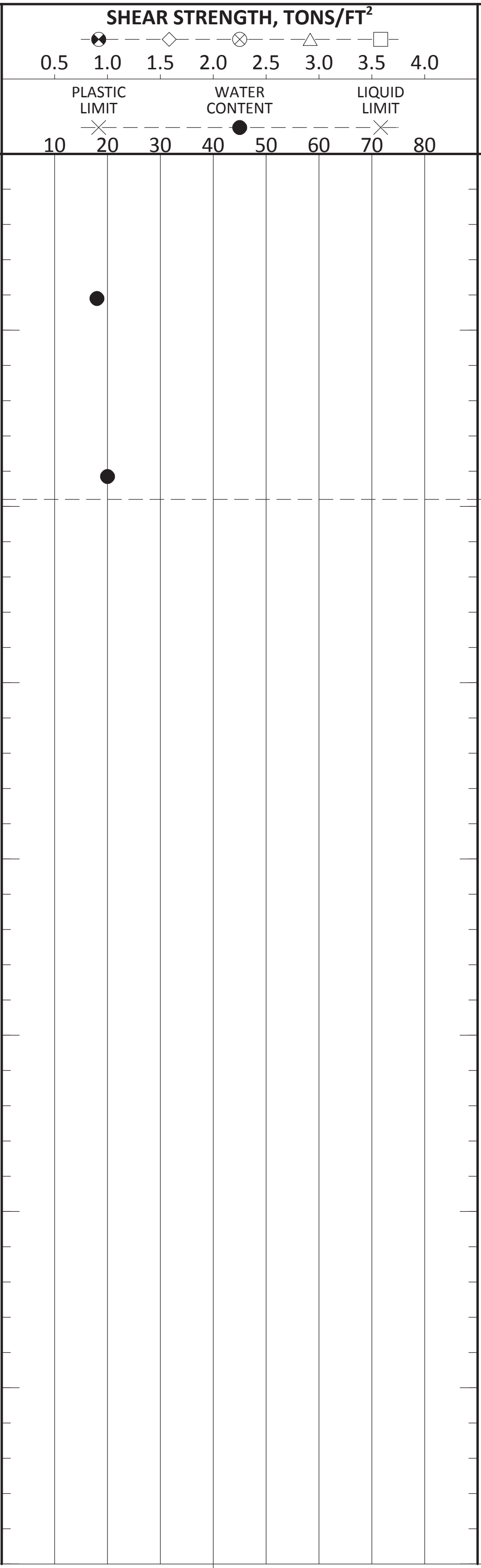
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32378; W 98.31541

SURFACE ELEVATION: 523 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
40–49.8	▨		SAND, Clayey, Dense to Very Dense, Gray *(continued)* -DRILLER'S NOTE: WATER encountered at 40 ft				
44		☒		50/8"			
49		☒		50/9"			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.8 ft
DATE DRILLED: 10/16/2012
DEPTH TO WATER: 40 ft
DATE MEASURED: 10/16/2012
PROJ. No.: ASA12-098-00
FIGURE: A-3b

LOG OF BORING NO. B-3

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

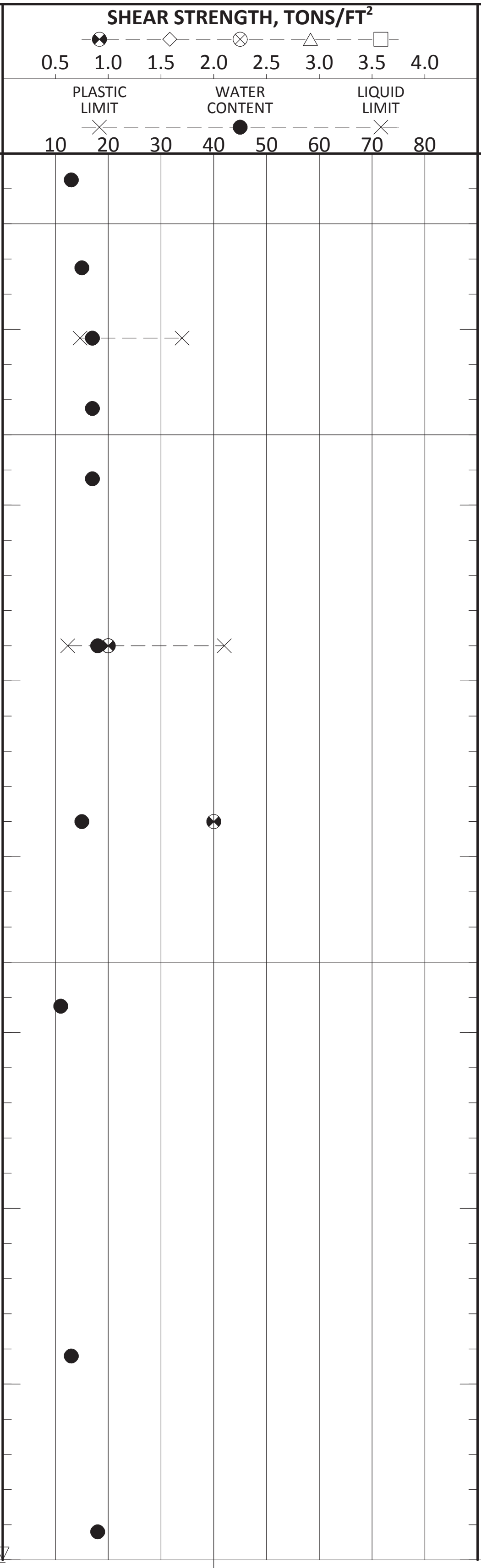
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32401; W 98.31406

SURFACE ELEVATION: 522 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Medium Dense, Brown, with gravel (road material)	24			
FILL MATERIAL: SAND, Clayey, Medium Dense, Tan	12			
	11		19	
	19			41
CLAY, Sandy, Stiff to Very Stiff, Tan and Gray	14			
		112	30	
SAND, Clayey, Dense to Very Dense, Tan to Gray	46			47
	50			
	50/11"			
-DRILLER'S NOTE: WATER encountered at 39 ft	50/11"			33



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.8 ft
DATE DRILLED: 10/15/2012
DEPTH TO WATER: 40 ft
DATE MEASURED: 10/15/2012
PROJ. No.: ASA12-098-00
FIGURE: A-4a

LOG OF BORING NO. B-3

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

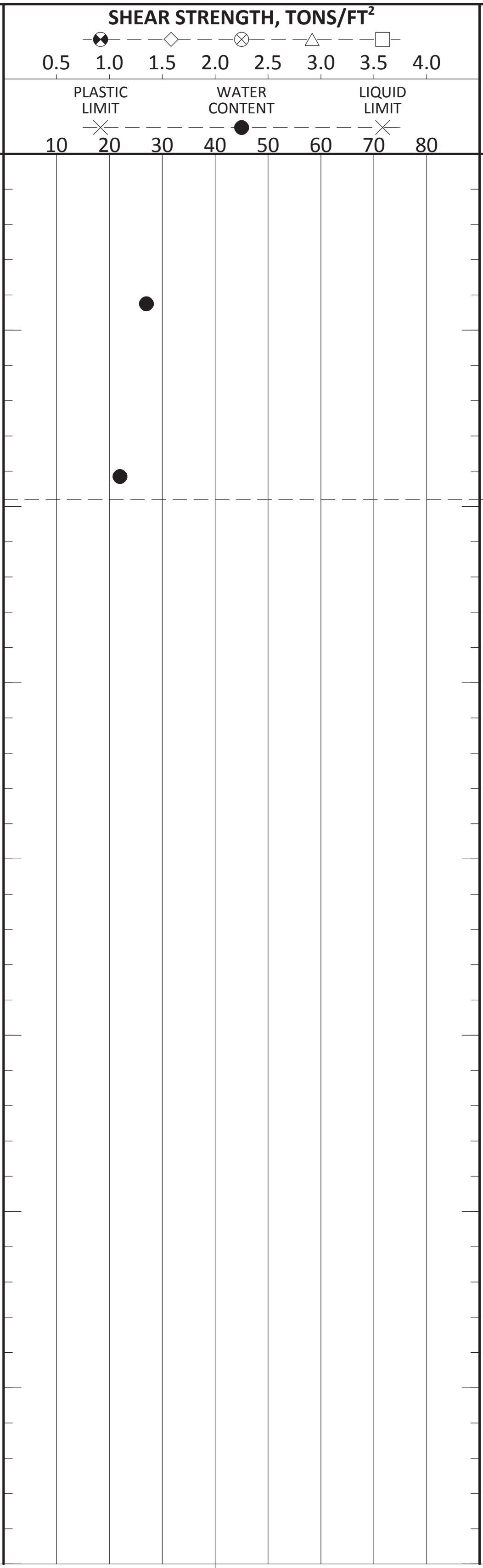
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32401; W 98.31406

SURFACE ELEVATION: 522 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
			SAND, Clayey, Dense to Very Dense, Tan to Gray *(continued)*				
45		☒	-with a tan and gray clay seam from 43 to 45 ft	38			
50		☒		50/10"			



Depth scale: 45, 50, 55, 60, 65, 70, 75

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.8 ft
DATE DRILLED: 10/15/2012

DEPTH TO WATER: 40 ft
DATE MEASURED: 10/15/2012

PROJ. No.: ASA12-098-00
FIGURE: A-4b

LOG OF BORING NO. B-4

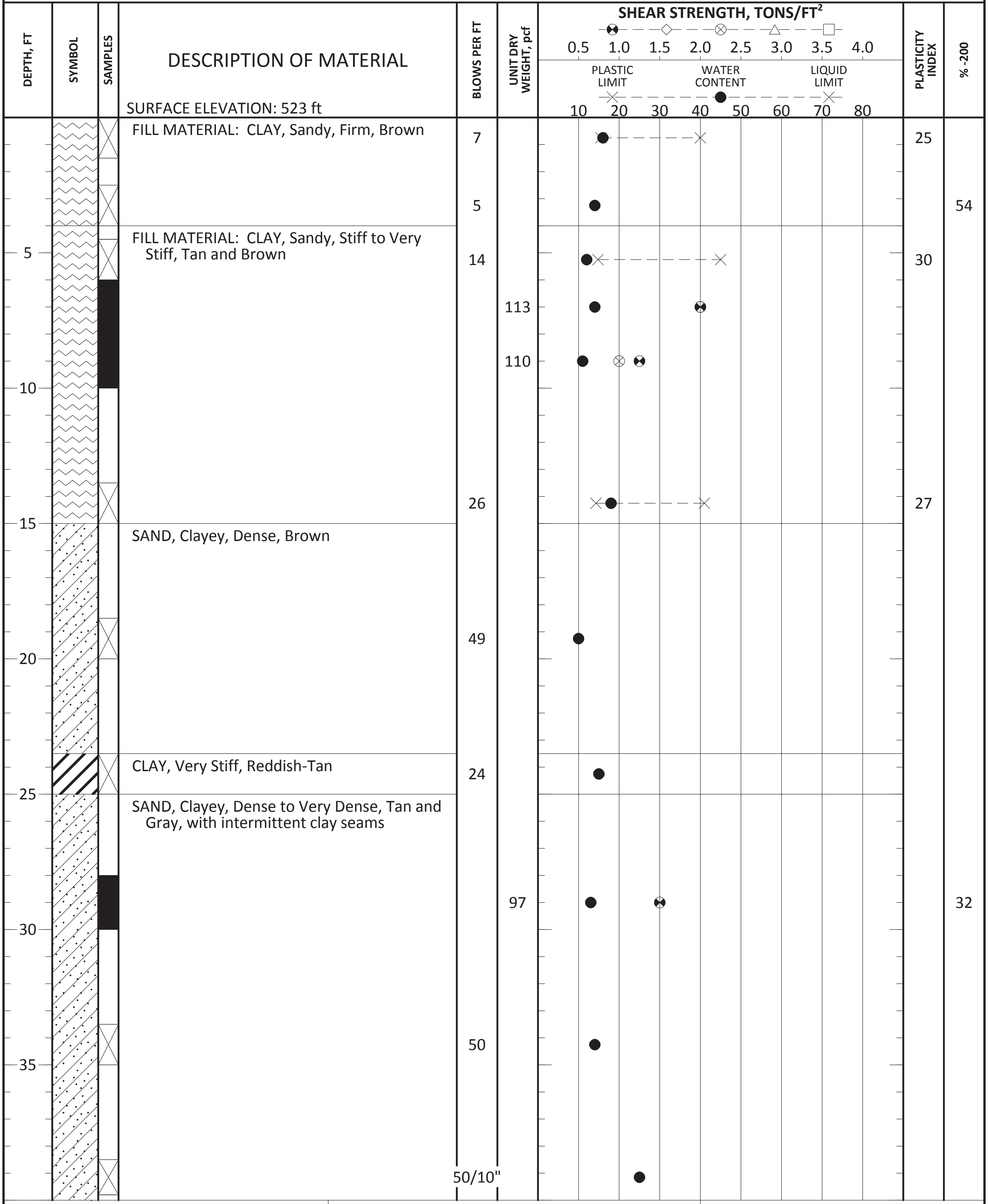
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32322; W 98.31478

SURFACE ELEVATION: 523 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: CLAY, Sandy, Firm, Brown	7		25	
	5			54
FILL MATERIAL: CLAY, Sandy, Stiff to Very Stiff, Tan and Brown	14		30	
		113		
		110		
	26		27	
SAND, Clayey, Dense, Brown	49			
CLAY, Very Stiff, Reddish-Tan	24			
SAND, Clayey, Dense to Very Dense, Tan and Gray, with intermittent clay seams		97		32
	50			
	50/10"			

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	42 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/16/2012	**DATE MEASURED:**	10/16/2012	**FIGURE:**	A-5a

LOG OF BORING NO. B-4

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

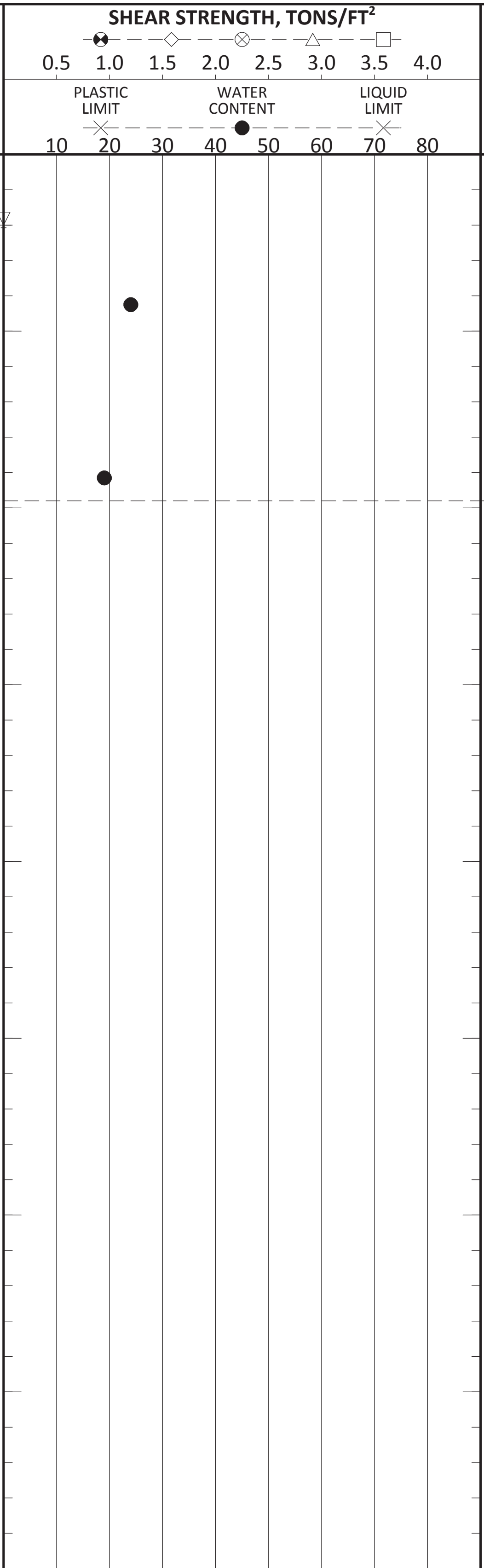
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.32322; W 98.31478

SURFACE ELEVATION: 523 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	SAND, Clayey, Dense to Very Dense, Tan and Gray, with intermittent clay seams *(continued)* -DRILLER'S NOTE: WATER encountered at 42 ft				
45		50			
50		50/9"			23



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.8 ft
DATE DRILLED: 10/16/2012

DEPTH TO WATER: 42 ft
DATE MEASURED: 10/16/2012

PROJ. No.: ASA12-098-00
FIGURE: A-5b

LOG OF BORING NO. B-5

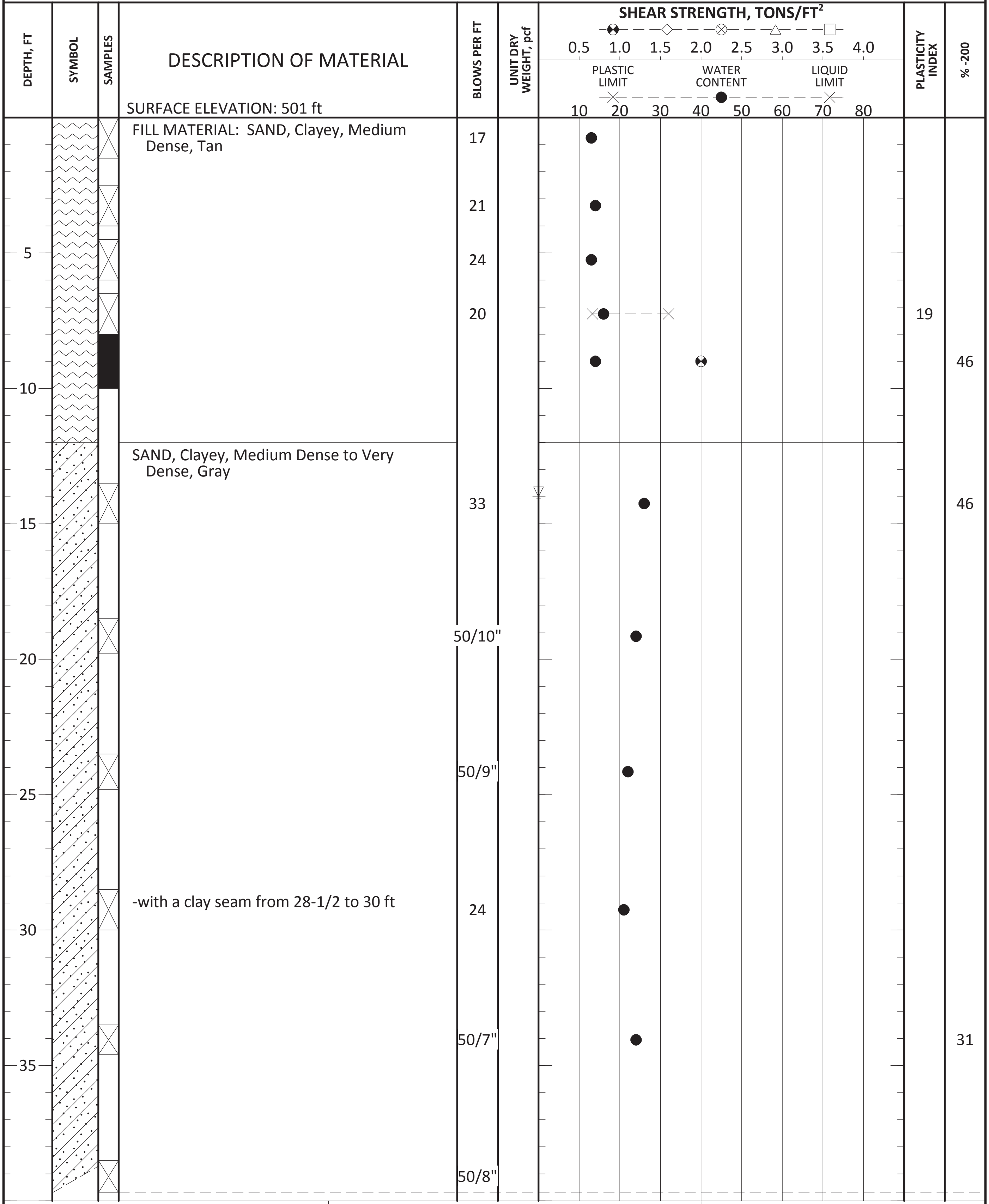
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30947; W 98.31590

SURFACE ELEVATION: 501 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Clayey, Medium Dense, Tan	17			
	21			
	24			
	20		19	
				46
SAND, Clayey, Medium Dense to Very Dense, Gray	33			46
	50/10"			
	50/9"			
-with a clay seam from 28-1/2 to 30 ft	24			
	50/7"			31
	50/8"			

DEPTH DRILLED:	39.7 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/17/2012	**DATE MEASURED:**	10/17/2012	**FIGURE:**	A-6

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-6

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

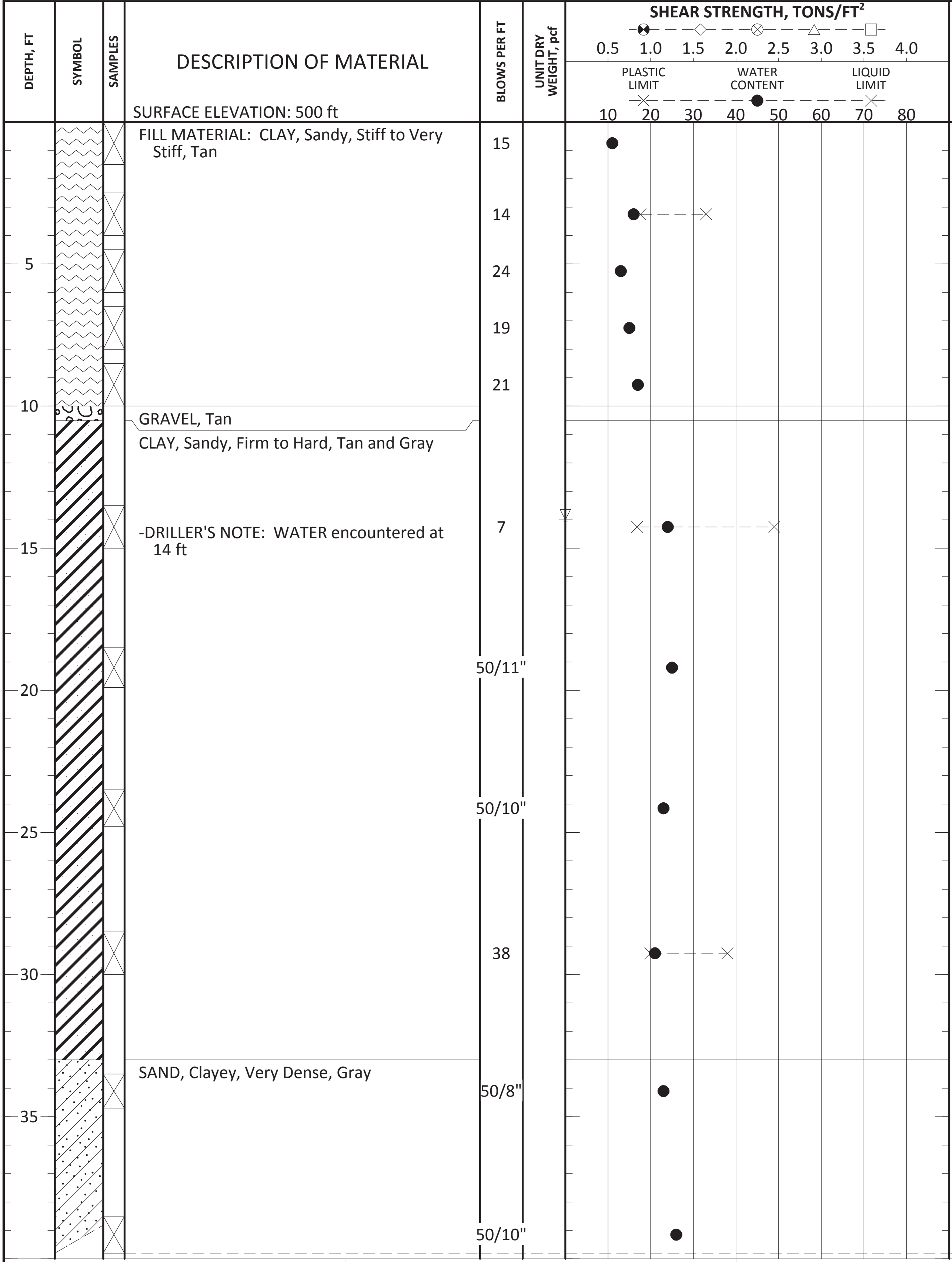
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30837; W 98.31790

SURFACE ELEVATION: 500 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	FILL MATERIAL: CLAY, Sandy, Stiff to Very Stiff, Tan	15			
		14		15	
5		24			50
		19			
		21			
10	GRAVEL, Tan				
	CLAY, Sandy, Firm to Hard, Tan and Gray				
	-DRILLER'S NOTE: WATER encountered at 14 ft	7		32	
15					
		50/11"			51
20					
		50/10"			
25					
		38		18	
30					
	SAND, Clayey, Very Dense, Gray	50/8"			
35					
		50/10"			29



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 39.8 ft	**DEPTH TO WATER:** 14 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED: 10/18/2012	**DATE MEASURED:** 10/18/2012	**FIGURE:**	A-7

LOG OF BORING NO. B-7

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

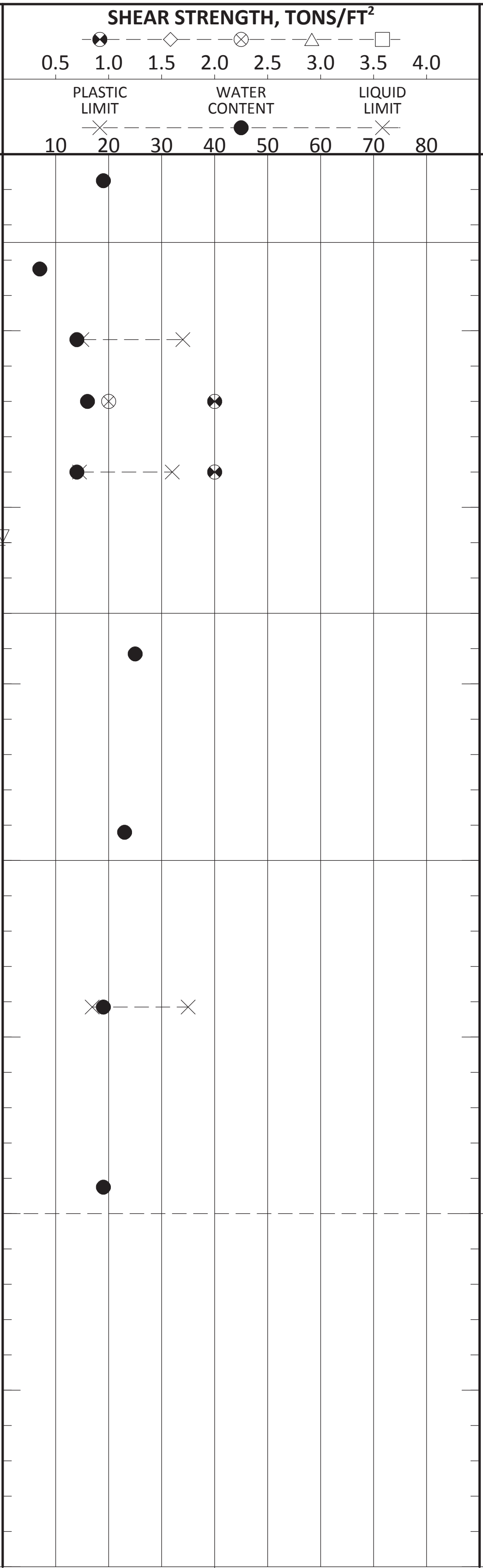
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30899; W 98.31660

SURFACE ELEVATION: 500 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
0–2.5	FILL MATERIAL: SAND, Clayey, Medium Dense, Brown	10			
2.5–13	FILL MATERIAL: CLAY, Sandy, Very Stiff, Tan and Gray	29			
		22		19	
			115		
				17	
	-DRILLER'S NOTE: WATER encountered at 11 ft				
13–20	SAND, Clayey, Very Dense, Tan and Gray	50/9"			47
		50/11"			
20–30	CLAY, Sandy, Hard, Tan and Gray	50/9"		18	
		47			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	30.0 ft	**DEPTH TO WATER:**	11 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/16/2012	**DATE MEASURED:**	10/16/2012	**FIGURE:**	A-8

LOG OF BORING NO. B-8
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

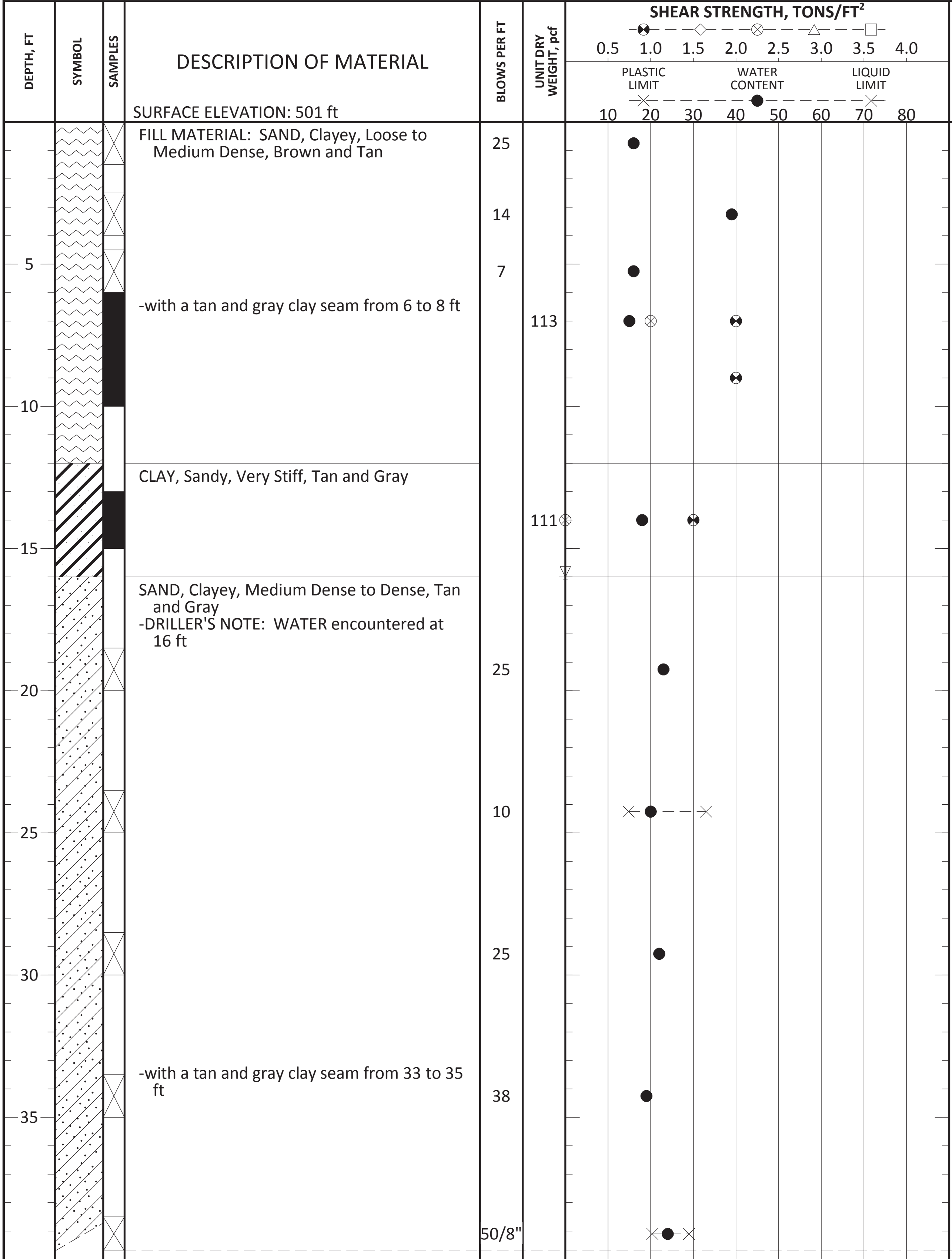
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30884; W 98.31510

SURFACE ELEVATION: 501 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Clayey, Loose to Medium Dense, Brown and Tan	25			
	14		NP	
	7			39
-with a tan and gray clay seam from 6 to 8 ft		113		
CLAY, Sandy, Very Stiff, Tan and Gray		111		
SAND, Clayey, Medium Dense to Dense, Tan and Gray -DRILLER'S NOTE: WATER encountered at 16 ft				
	25			47
	10		18	
	25			
-with a tan and gray clay seam from 33 to 35 ft	38			52
	50/8"		9	



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	39.7 ft	**DEPTH TO WATER:**	16 ft
DATE DRILLED:	10/19/2012	**DATE MEASURED:**	10/19/2012
PROJ. No.:	ASA12-098-00	**FIGURE:**	A-9

LOG OF BORING NO. B-9

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

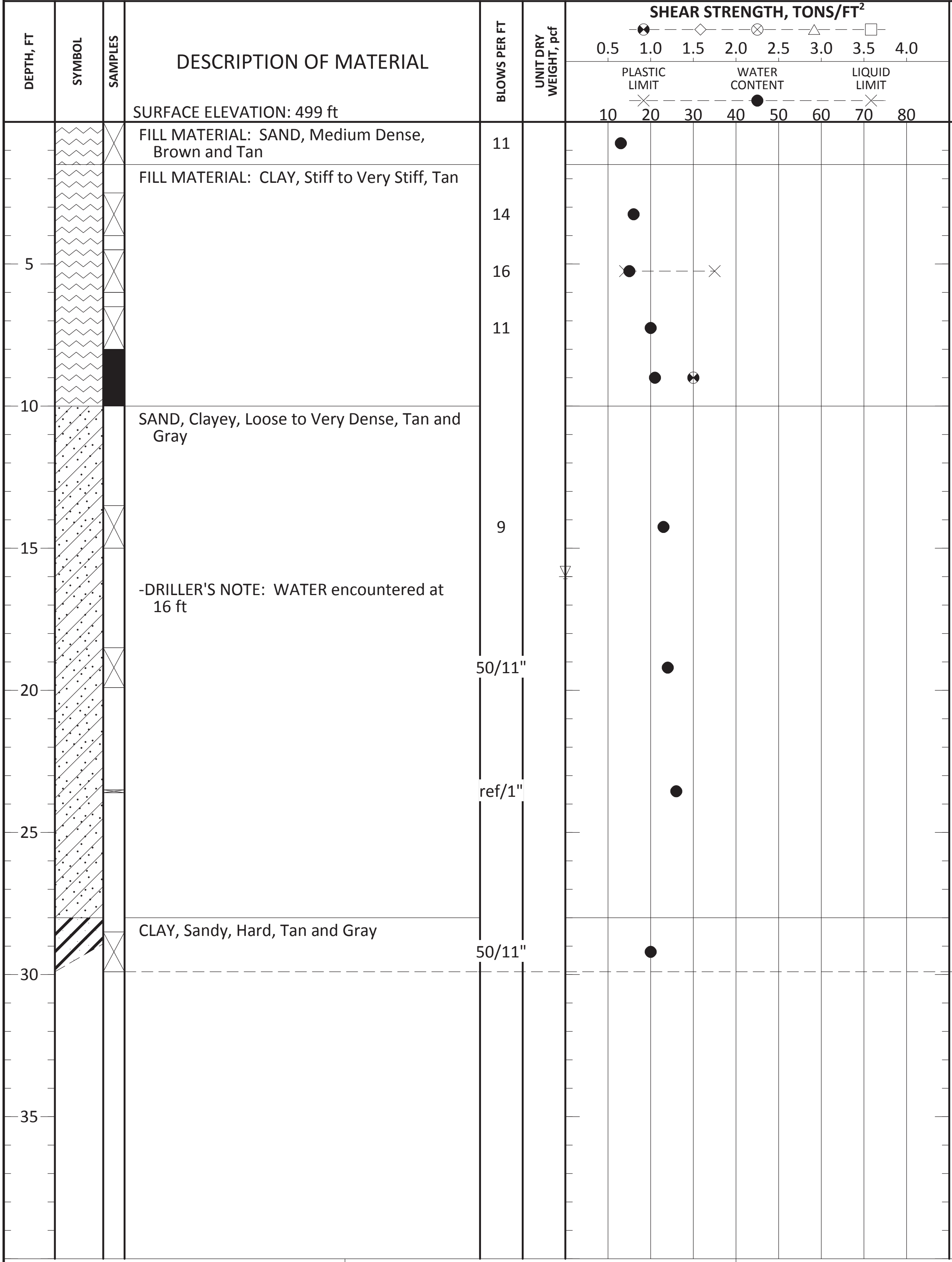
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30802; W 98.31601

SURFACE ELEVATION: 499 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Medium Dense, Brown and Tan	11			
FILL MATERIAL: CLAY, Stiff to Very Stiff, Tan	14			
	16		21	
	11			
SAND, Clayey, Loose to Very Dense, Tan and Gray	9			49
-DRILLER'S NOTE: WATER encountered at 16 ft				
	50/11"			
	ref/1"			
CLAY, Sandy, Hard, Tan and Gray	50/11"			62



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	29.9 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/17/2012	**DATE MEASURED:**	10/17/2012	**FIGURE:**	A-10

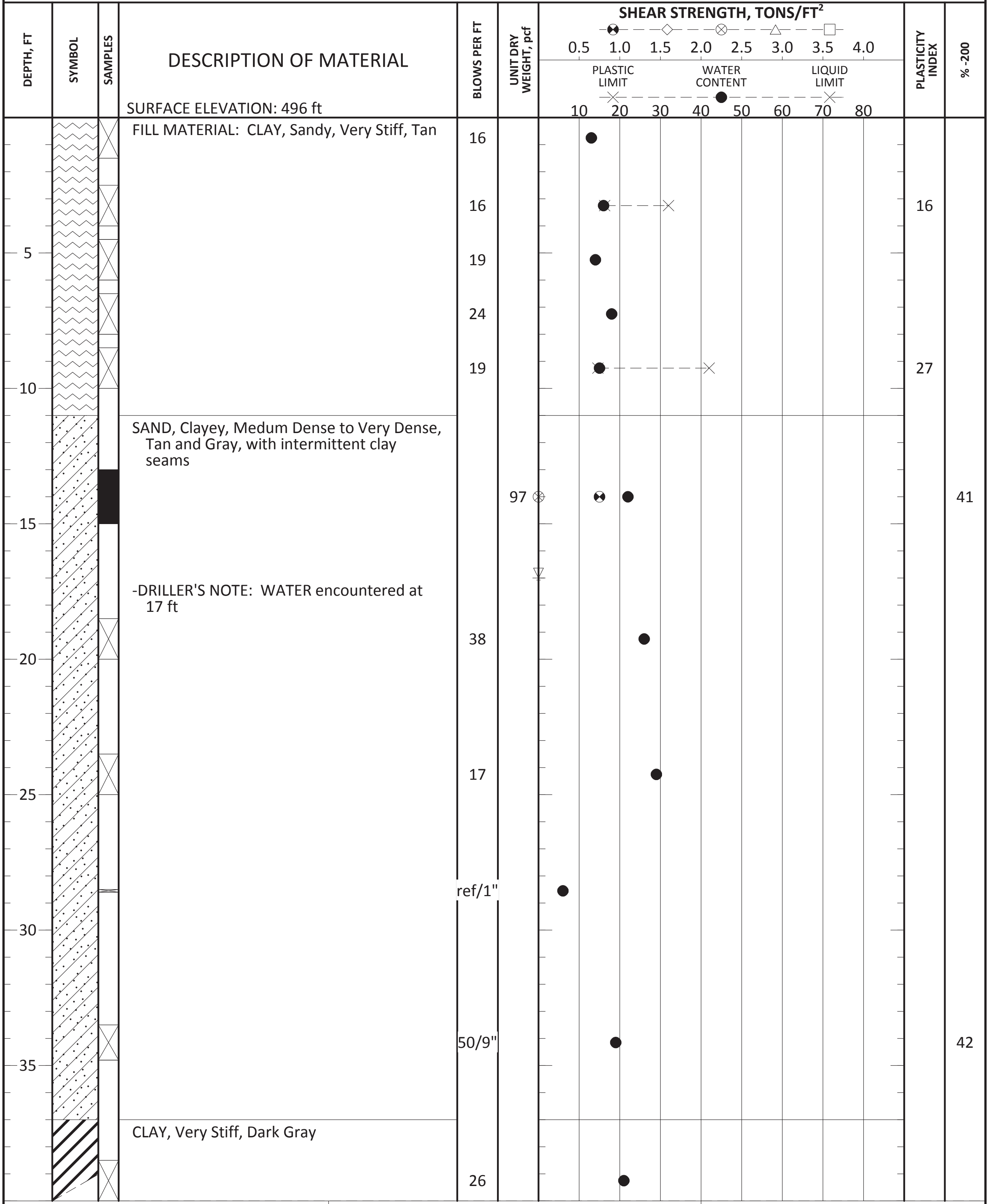
LOG OF BORING NO. B-10

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30769; W 98.31855



SURFACE ELEVATION: 496 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: CLAY, Sandy, Very Stiff, Tan	16			
	16		16	
	19			
	24			
	19		27	
SAND, Clayey, Medum Dense to Very Dense, Tan and Gray, with intermittent clay seams				
		97		41
-DRILLER'S NOTE: WATER encountered at 17 ft				
	38			
	17			
	ref/1"			
	50/9"			42
CLAY, Very Stiff, Dark Gray				
	26			

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	40.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/17/2012	**DATE MEASURED:**	10/17/2012	**FIGURE:**	A-11

LOG OF BORING NO. B-11

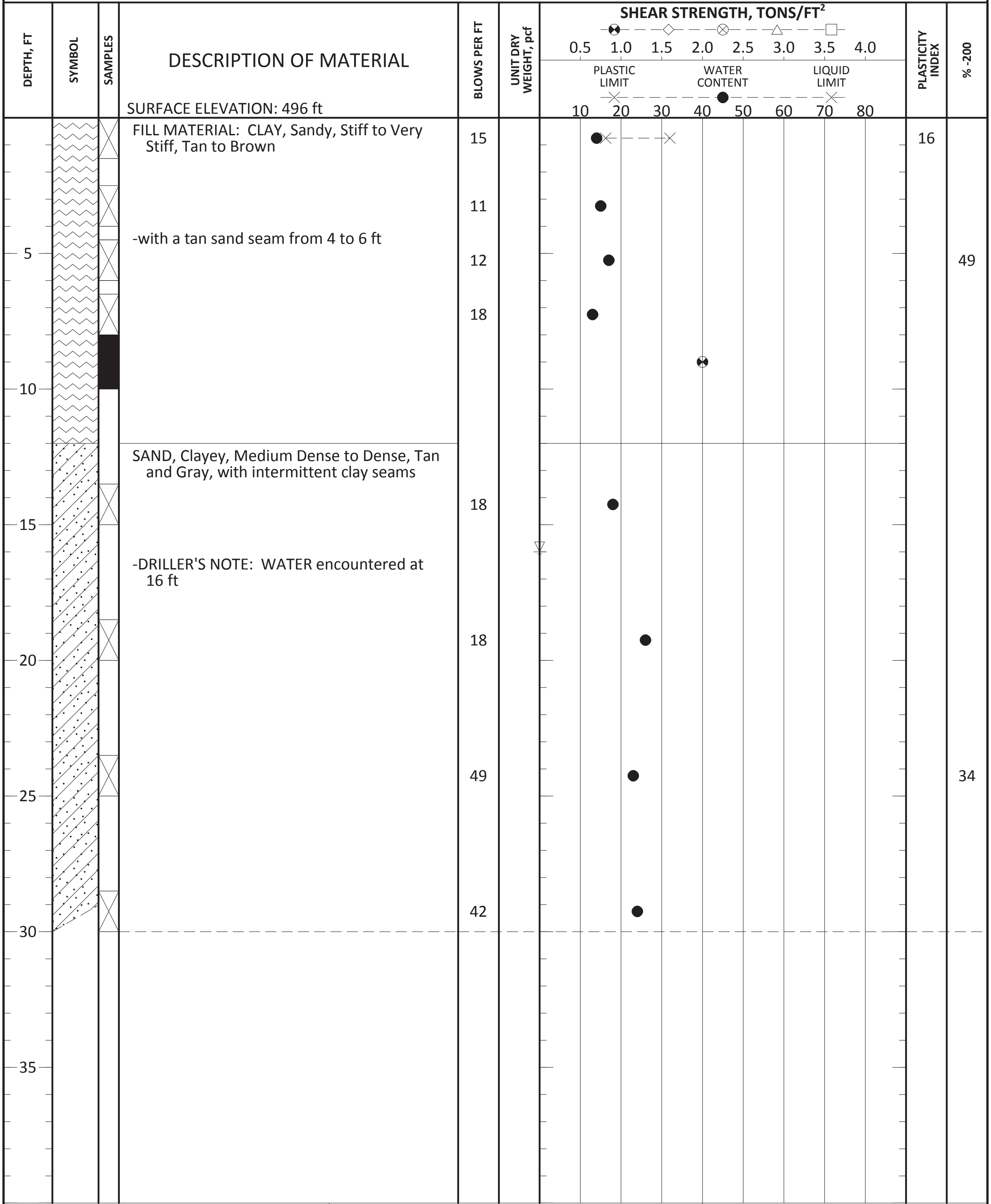
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30737; W 98.31744

SURFACE ELEVATION: 496 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: CLAY, Sandy, Stiff to Very Stiff, Tan to Brown	15		16	
	11			
-with a tan sand seam from 4 to 6 ft	12			49
	18			
SAND, Clayey, Medium Dense to Dense, Tan and Gray, with intermittent clay seams	18			
-DRILLER'S NOTE: WATER encountered at 16 ft				
	18			
	49			34
	42			

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	30.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/18/2012	**DATE MEASURED:**	10/18/2012	**FIGURE:**	A-12

LOG OF BORING NO. B-12

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

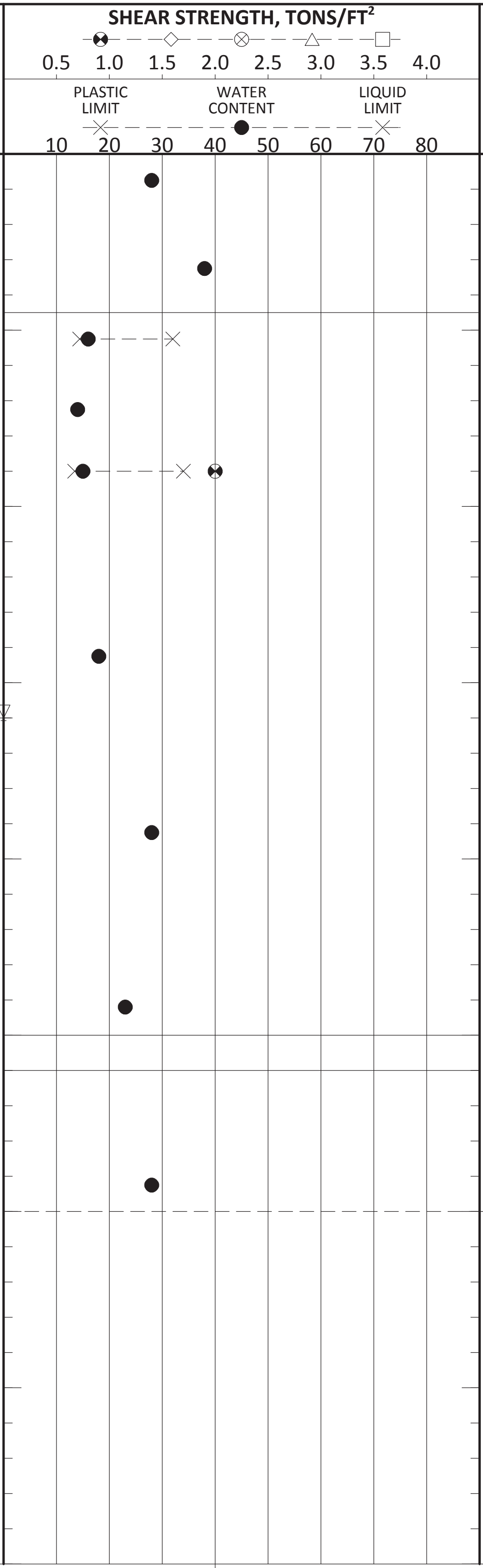
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30757; W 98.31509

SURFACE ELEVATION: 500 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	FILL MATERIAL: SAND, Clayey, Loose to Medium Dense, Brown, with gravel	23			46
		6			
5	CLAY, Sandy, Firm to Hard, Tan to Brown	8		18	
		27			
				21	
10					
15		18			
	-DRILLER'S NOTE: WATER encountered at 16 ft				
20		24			
		50/11"			51
25	SANDSTONE, Hard, Gray				
	SAND, Clayey, Medium Dense, Tan and Gray				
		11			
30					
35					



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	30.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	ASA12-098-00
DATE DRILLED:	10/17/2012	**DATE MEASURED:**	10/17/2012	**FIGURE:**	A-13

LOG OF BORING NO. B-13

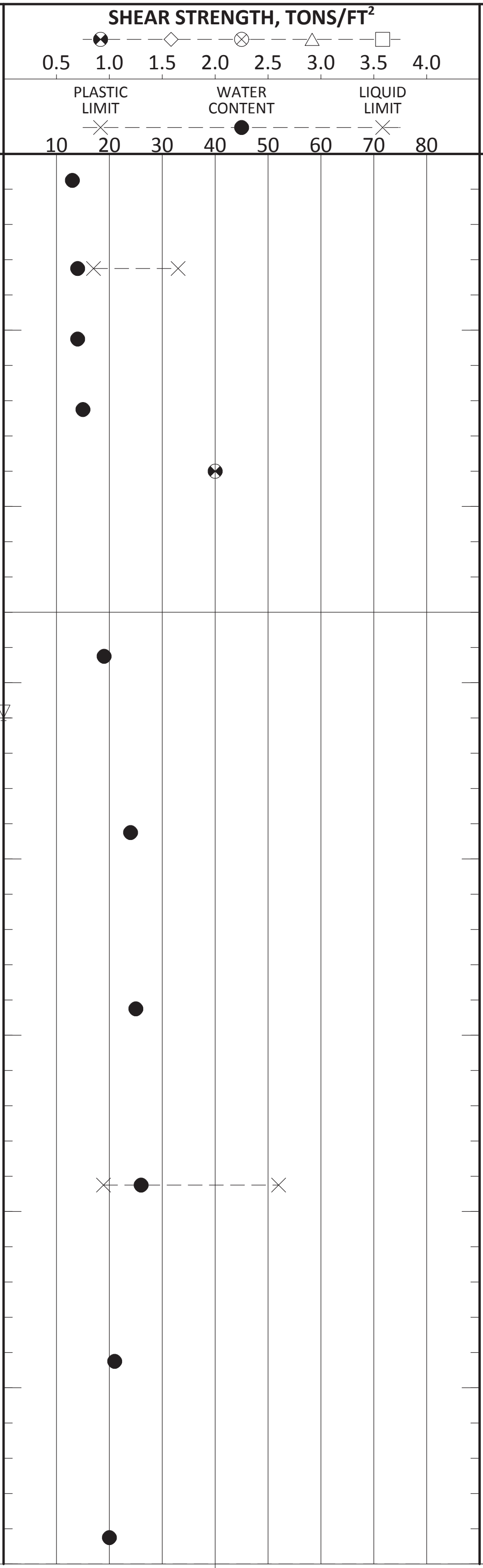
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30715; W 98.31792

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	SURFACE ELEVATION: 496 ft				
	FILL MATERIAL: CLAY, Sandy, Very Stiff to Hard, Tan to Brown	23			
		27		16	
5	-with a tan sand seam from 4 to 6 ft	34			43
		16			
10					
	CLAY, Sandy, Very Stiff to Hard, Tan and Gray	18			
15					
	-DRILLER'S NOTE: WATER encountered at 16 ft				
20		19			53
25		41			
30		34		33	
35		41			
		39			



DEPTH DRILLED: 40.0 ft
DATE DRILLED: 10/18/2012
DEPTH TO WATER: 16 ft
DATE MEASURED: 10/18/2012
PROJ. No.: ASA12-098-00
FIGURE: A-14

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-14

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

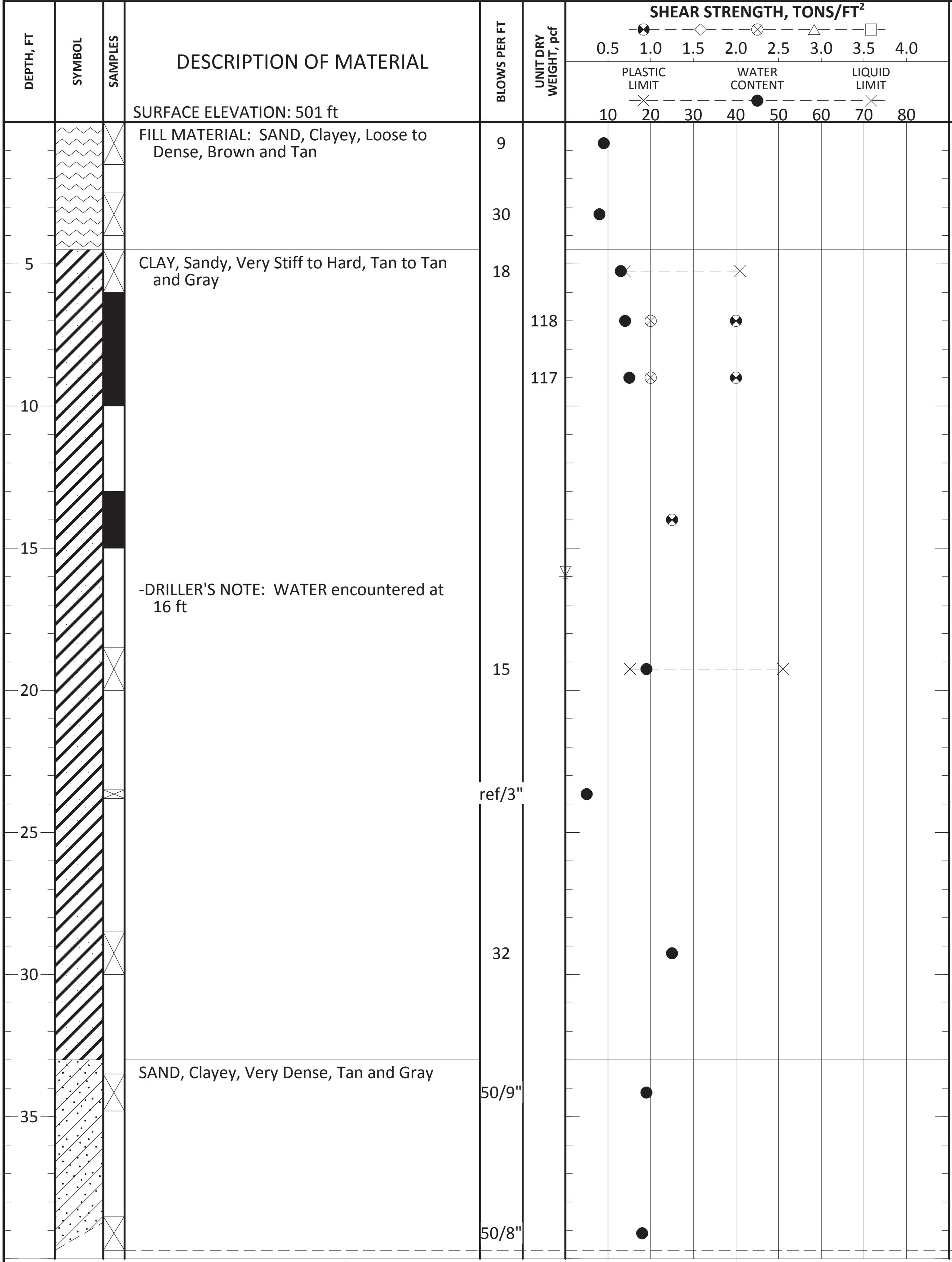
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 29.30684; W 98.31590

SURFACE ELEVATION: 501 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL MATERIAL: SAND, Clayey, Loose to Dense, Brown and Tan	9			
	30			46
CLAY, Sandy, Very Stiff to Hard, Tan to Tan and Gray	18		27	
		118		
		117		
-DRILLER'S NOTE: WATER encountered at 16 ft				
	15		36	
	ref/3"			
	32			72
SAND, Clayey, Very Dense, Tan and Gray	50/9"			
	50/8"			

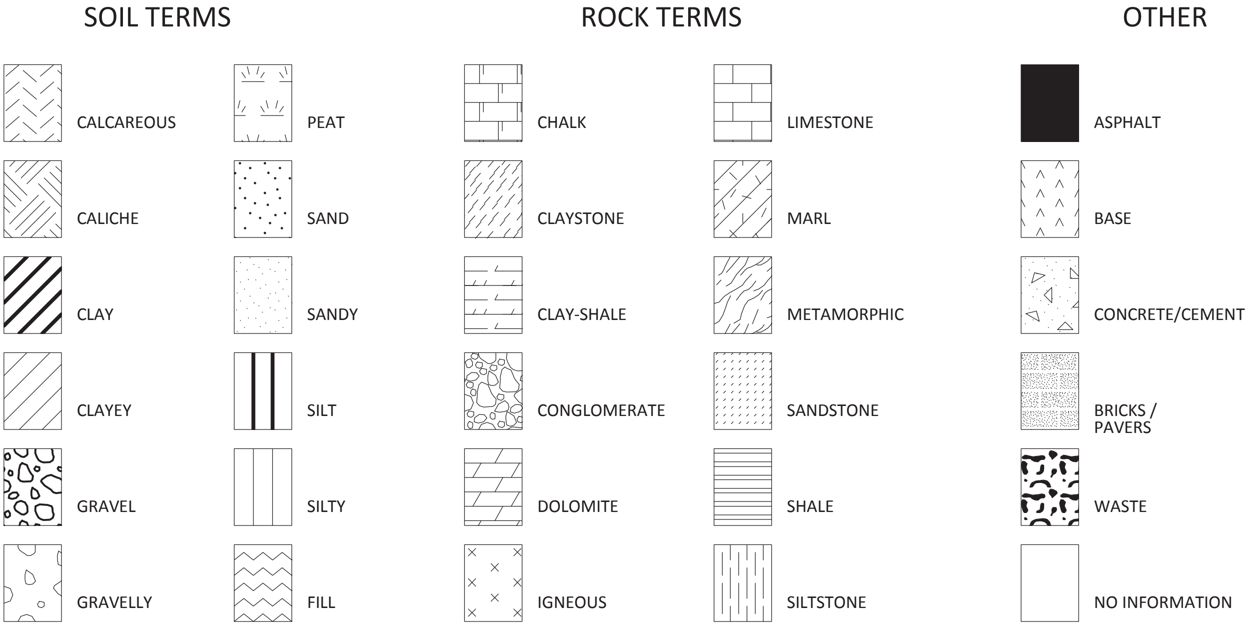


NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

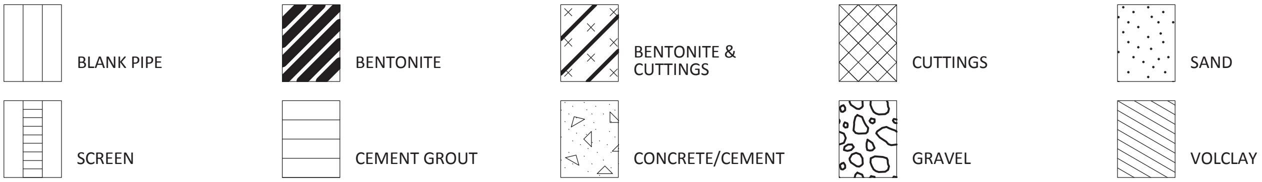
DEPTH DRILLED: 39.7 ft
DATE DRILLED: 10/19/2012
DEPTH TO WATER: 16 ft
DATE MEASURED: 10/19/2012
PROJ. No.: ASA12-098-00
FIGURE: A-15

KEY TO TERMS AND SYMBOLS

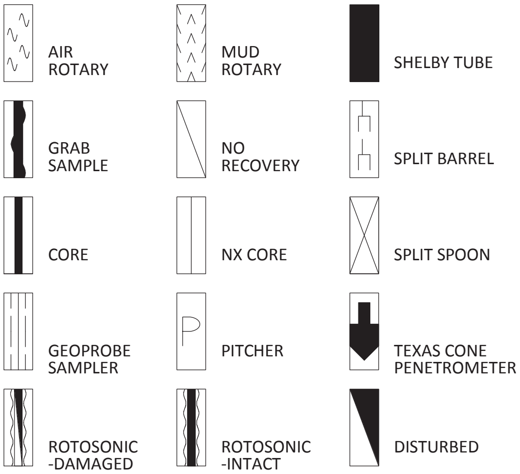
MATERIAL TYPES



WELL CONSTRUCTION AND PLUGGING MATERIALS



SAMPLE TYPES



STRENGTH TEST TYPES

⧓ POCKET PENETROMETER

◇ TORVANE

⊗ UNCONFINED COMPRESSION

△ TRIAXIAL COMPRESSION UNCONSOLIDATED-UNDRAINED

□ TRIAXIAL COMPRESSION CONSOLIDATED-UNDRAINED

NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. ASA12-098-00

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

Penetration Resistance Blows per ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE STRENGTH

Resistance Blows per ft	Consistency	Cohesion TSF
0 - 2	Very Soft	0 - 0.125
2 - 4	Soft	0.125 - 0.25
4 - 8	Firm	0.25 - 0.5
8 - 15	Stiff	0.5 - 1.0
15 - 30	Very Stiff	1.0 - 2.0
> 30	Hard	> 2.0

PLASTICITY

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

ABBREVIATIONS

B = Benzene

T = Toluene

E = Ethylbenzene

X = Total Xylenes

BTEX = Total BTEX

TPH = Total Petroleum Hydrocarbons

ND = Not Detected

NA = Not Analyzed

NR = Not Recorded/No Recovery

OVA = Organic Vapor Analyzer

ppm = Parts Per Million

Qam, Qas, Qal = Quaternary Alluvium

Qat = Low Terrace Deposits

Qbc = Beaumont Formation

Qt = Fluviatile Terrace Deposits

Qao = Seymour Formation

Qle = Leona Formation

Q-Tu = Uvalde Gravel

Ewi = Wilcox Formation

Emi = Midway Group

Mc = Catahoula Formation

EI = Laredo Formation

Kknm = Navarro Group and Marlbrook Marl

Kpg = Pecan Gap Chalk

Kau = Austin Chalk

Kef = Eagle Ford Shale

Kbu = Buda Limestone

Kdr = Del Rio Clay

Kft = Fort Terrett Member

Kgt = Georgetown Formation

Kep = Person Formation

Kek = Kainer Formation

Kes = Escondido Formation

Kew = Walnut Formation

Kgr = Glen Rose Formation

Kgru = Upper Glen Rose Formation

Kgrl = Lower Glen Rose Formation

Kh = Hensell Sand

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.

PROJECT NO. ASA12-098-00

RABAKISTNER

REVISED 04/2012

APPENDIX B

LABORATORY TEST RESULTS

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

FILE NAME: ASA12-098-00.GPJ 11/20/2012

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	11	15								
	2.5 to 4.0	7	23						50		
	4.0 to 6.0		18	31	15	16	CL	106		0.27	UC
	6.0 to 8.0		15					110		1.09	UC
	8.0 to 10.0		13					112	40	0.39	UC
	13.5 to 15.0	16	21	55	18	37	CH				
	18.5 to 20.0	22	18								
	23.5 to 24.9	50/11"	14								
	28.5 to 29.9	50/11"	11						43		
	33.5 to 35.0	49	20								
	38.5 to 39.9	50/11"	20								
	43.5 to 44.8	50/9"	19								
	48.5 to 49.7	50/8"	19								
B-2	0.0 to 1.5	11	18								
	2.0 to 4.0		11					119	38	2.59	UC
	4.0 to 6.0		17	33	18	15	CL	104		0.79	UC
	6.0 to 8.0		19					102		0.28	UC
	8.0 to 10.0		17					110		0.98	UC
	13.0 to 15.0		18	54	18	36	CH			2.00	PP
	18.0 to 20.0		13					101		0.65	UC
	23.5 to 24.9	50/11"	12						24		
	28.5 to 29.8	50/10"	20								
	33.5 to 35.0	38	12								
	38.5 to 40.0	50	20								
	43.5 to 44.7	50/8"	18								
	48.5 to 49.8	50/9"	20								
B-3	0.0 to 1.5	24	13								
	2.5 to 4.0	12	15								
	4.5 to 6.0	11	17	34	15	19	CL				
	6.5 to 8.0	19	17						41		
	8.5 to 10.0	14	17								
	13.0 to 15.0		18	42	12	30	CL	112		0.73	UC
	18.0 to 20.0		15							2.00	PP
	23.5 to 25.0	46	11						47		
	28.5 to 30.0	50									
	33.5 to 34.9	50/11"	13								
	38.5 to 39.9	50/11"	18						33		
	43.5 to 45.0	38	27								
	48.5 to 49.8	50/10"	22								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

FILE NAME: ASA12-098-00.GPJ 11/20/2012

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-4	0.0 to 1.5	7	16	40	15	25	CL				
	2.5 to 4.0	5	14						54		
	4.5 to 6.0	14	12	45	15	30	CL				
	6.0 to 8.0		14					113		1.96	UC
	8.0 to 10.0		11					110		0.71	UC
	13.5 to 15.0	26	18	41	14	27	CL				
	18.5 to 20.0	49	10								
	23.5 to 25.0	24	15								
	28.0 to 30.0		13					97	32	1.50	PP
	33.5 to 35.0	50	14								
	38.5 to 39.8	50/10"	25								
	43.5 to 45.0	50	24								
	48.5 to 49.8	50/9"	19						23		
B-5	0.0 to 1.5	17	13								
	2.5 to 4.0	21	14								
	4.5 to 6.0	24	13								
	6.5 to 8.0	20	16	32	13	19	CL				
	8.0 to 10.0		14						46	2.00	PP
	13.5 to 15.0	33	26						46		
	18.5 to 19.8	50/10"	24								
	23.5 to 24.8	50/9"	22								
	28.5 to 30.0	24	21								
	33.5 to 34.6	50/7"	24						31		
	38.5 to 39.7	50/8"									
B-6	0.0 to 1.5	15	11								
	2.5 to 4.0	14	16	33	18	15	CL				
	4.5 to 6.0	24	13						50		
	6.5 to 8.0	19	15								
	8.5 to 10.0	21	17								
	13.5 to 15.0	7	24	49	17	32	CL				
	18.5 to 19.9	50/11"	25						51		
	23.5 to 24.8	50/10"	23								
	28.5 to 30.0	38	21	38	20	18	CL				
	33.5 to 34.7	50/8"	23								
	38.5 to 39.8	50/10"	26						29		
B-7	0.0 to 1.5	10	19								
	2.5 to 4.0	29	7								
	4.5 to 6.0	22	14	34	15	19	CL				
	6.0 to 8.0		16					115		1.37	UC

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

FILE NAME: ASA12-098-00.GPJ 11/20/2012

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-7	8.0 to 10.0		14	32	15	17	CL			2.00	PP
	13.5 to 14.8	50/9"	25						47		
	18.5 to 19.9	50/11"	23								
	23.5 to 24.8	50/9"	19	35	17	18	CL				
	28.5 to 30.0	47	19								
B-8	0.0 to 1.5	25	16								
	2.5 to 4.0	14	39			NP					
	4.5 to 6.0	7	16						39		
	6.0 to 8.0		15					113		0.78	UC
	8.0 to 10.0									2.00	PP
	13.0 to 15.0		18					111		0.39	UC
	18.5 to 20.0	25	23						47		
	23.5 to 25.0	10	20	33	15	18	CL				
	28.5 to 30.0	25	22								
	33.5 to 35.0	38	19						52		
	38.5 to 39.7	50/8"	24	29	20	9	CL				
B-9	0.0 to 1.5	11	13								
	2.5 to 4.0	14	16								
	4.5 to 6.0	16	15	35	14	21	CL				
	6.5 to 8.0	11	20								
	8.0 to 10.0		21							1.50	PP
	13.5 to 15.0	9	23						49		
	18.5 to 19.9	50/11"	24								
	23.5 to 23.6	ref/1"	26								
	28.5 to 29.9	50/11"	20						62		
B-10	0.0 to 1.5	16	13								
	2.5 to 4.0	16	16	32	16	16	CL				
	4.5 to 6.0	19	14								
	6.5 to 8.0	24	18								
	8.5 to 10.0	19	15	42	15	27	CL				
	13.0 to 15.0		22					97	41	0.23	UC
	18.5 to 20.0	38	26								
	23.5 to 25.0	17	29								
	28.5 to 28.6	ref/1"	6								
	33.5 to 34.8	50/9"	19						42		
	38.5 to 40.0	26	21								
B-11	0.0 to 1.5	15	14	32	16	16	CL				
	2.5 to 4.0	11	15								
	4.5 to 6.0	12	17						49		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

FILE NAME: ASA12-098-00.GPJ 11/20/2012

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-11	6.5 to 8.0	18	13								
	8.0 to 10.0									2.00	PP
	13.5 to 15.0	18	18								
	18.5 to 20.0	18	26								
	23.5 to 25.0	49	23						34		
	28.5 to 30.0	42	24								
B-12	0.0 to 1.5	23	28						46		
	2.5 to 4.0	6	38								
	4.5 to 6.0	8	16	32	14	18	CL				
	6.5 to 8.0	27	14								
	8.0 to 10.0		15	34	13	21	CL			2.00	PP
	13.5 to 15.0	18	18								
	18.5 to 20.0	24	28								
	23.5 to 24.9	50/11"	23						51		
	28.5 to 30.0	11	28								
B-13	0.0 to 1.5	23	13								
	2.5 to 4.0	27	14	33	17	16	CL				
	4.5 to 6.0	34	14						43		
	6.5 to 8.0	16	15								
	8.0 to 10.0									2.00	PP
	13.5 to 15.0	18	19								
	18.5 to 20.0	19	24						53		
	23.5 to 25.0	41	25								
	28.5 to 30.0	34	26	52	19	33	CH				
	33.5 to 35.0	41	21								
	38.5 to 40.0	39	20								
B-14	0.0 to 1.5	9	9								
	2.5 to 4.0	30	8						46		
	4.5 to 6.0	18	13	41	14	27	CL				
	6.0 to 8.0		14					118		1.10	UC
	8.0 to 10.0		15					117		1.15	UC
	13.0 to 15.0									1.25	PP
	18.5 to 20.0	15	19	51	15	36	CH				
	23.5 to 23.8	ref/3"	5								
	28.5 to 30.0	32	25						72		
	33.5 to 34.8	50/9"	19								
	38.5 to 39.7	50/8"	18								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASA12-098-00

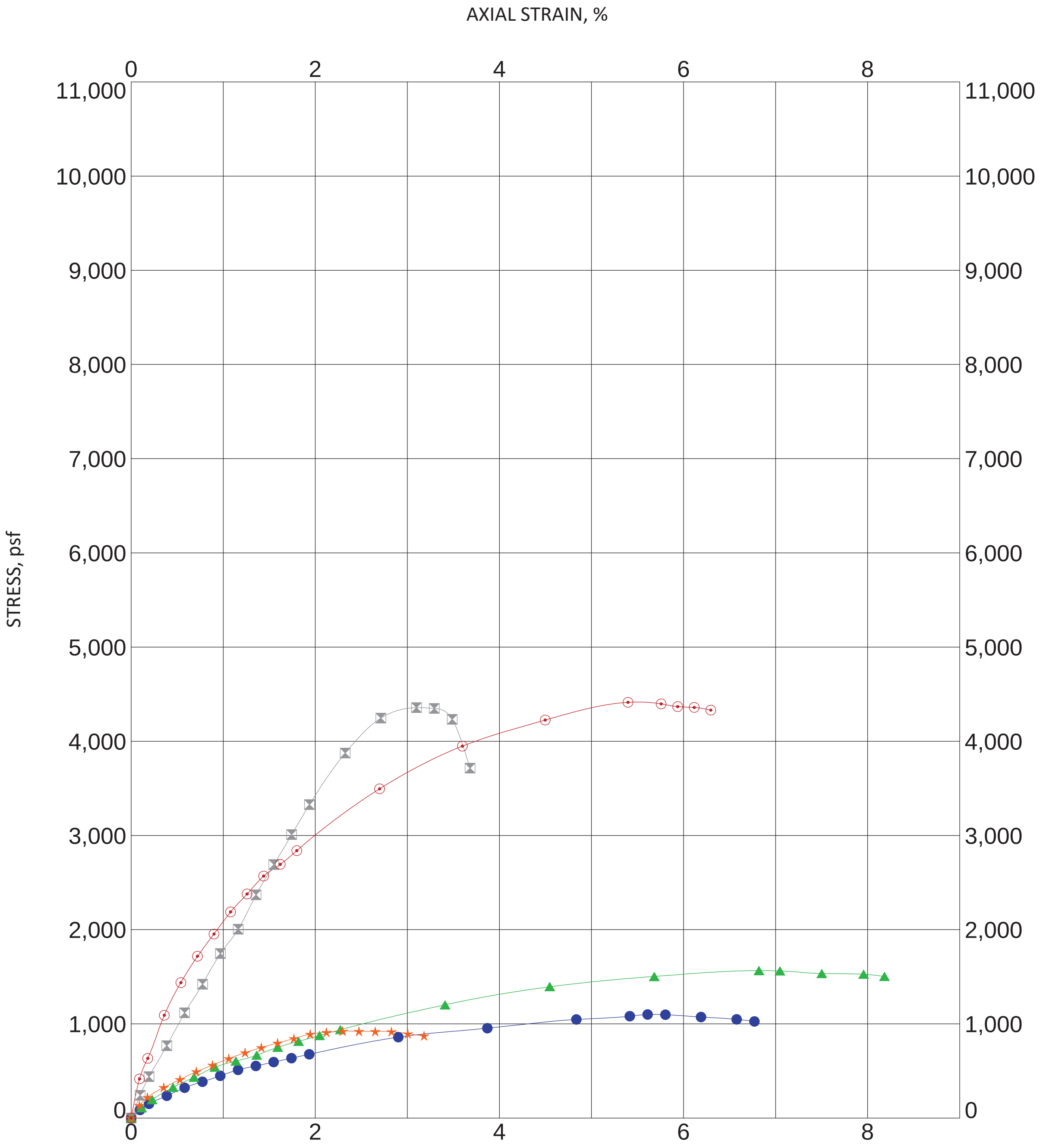


FIGURE B-2

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● B-1	4 ft		0.3	5.6	16	106.0	17.7
⧗ B-1	6 ft		1.1	3.1		109.9	15.4
▲ B-1	8 ft		0.4	6.8		111.8	13.2
★ B-10	13 ft		0.2	2.3		97.4	24.5
⊙ B-14	6 ft		1.1	5.4		117.9	13.6

RABA KISTNER
TBPE Firm Registration No. F-3257

12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

UNCONFINED COMPRESSION

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

PROJECT NO. ASA12-098-00

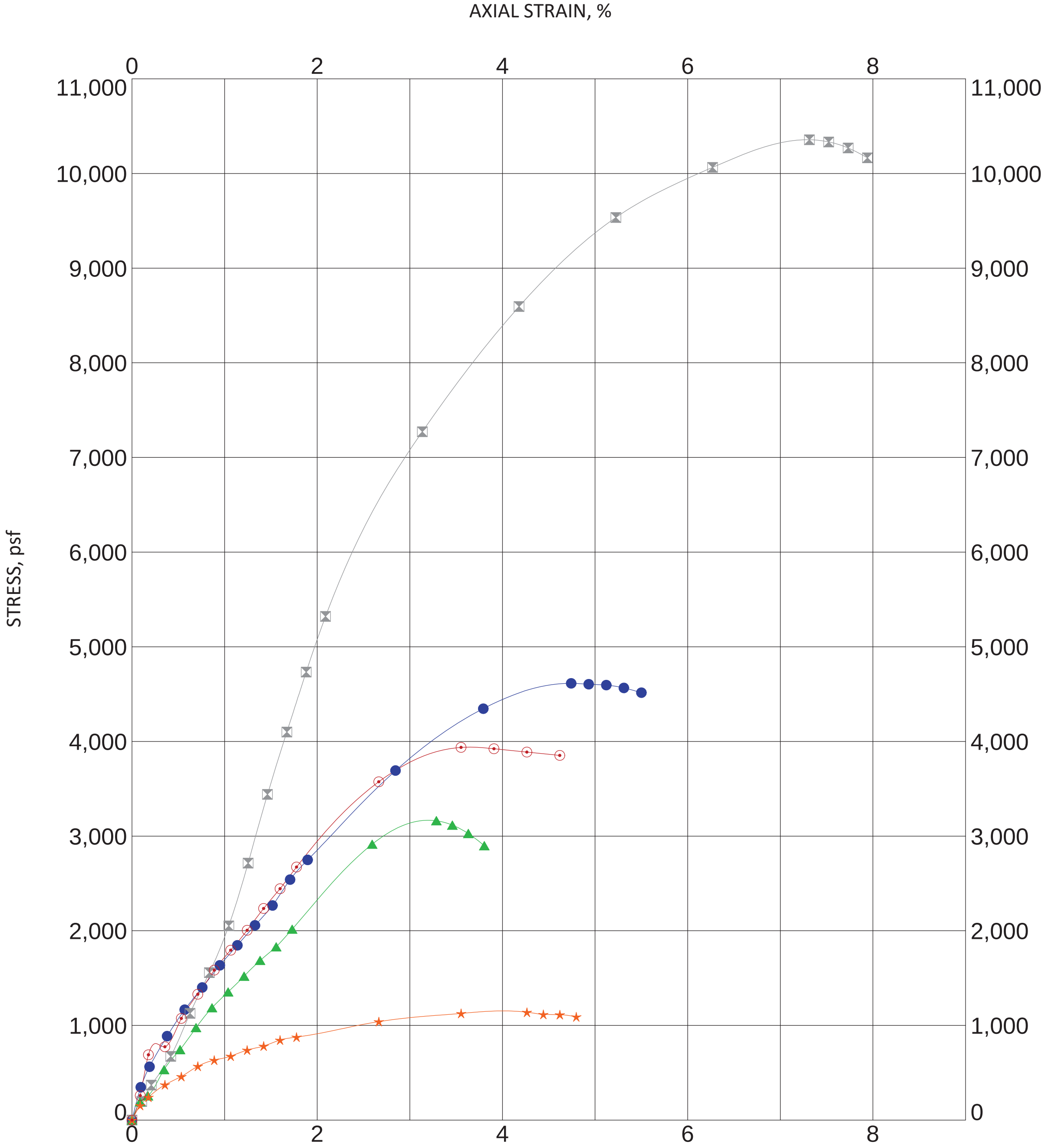


FIGURE B-3

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● B-14	8 ft		1.2	4.7		116.9	14.7
⧗ B-2	2 ft		2.6	7.3		119.3	10.9
▲ B-2	4 ft		0.8	3.3	15	104.0	16.6
★ B-2	6 ft		0.3	4.3		102.1	19.0
⊙ B-2	8 ft		1.0	3.6		110.3	16.9

RABA KISTNER
TBPE Firm Registration No. F-3257

12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

UNCONFINED COMPRESSION

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

R-K UNCONFINED COMPRESSION ASA12-098-00.GPJ RKCI.GDT 11/20/12

PROJECT NO. ASA12-098-00

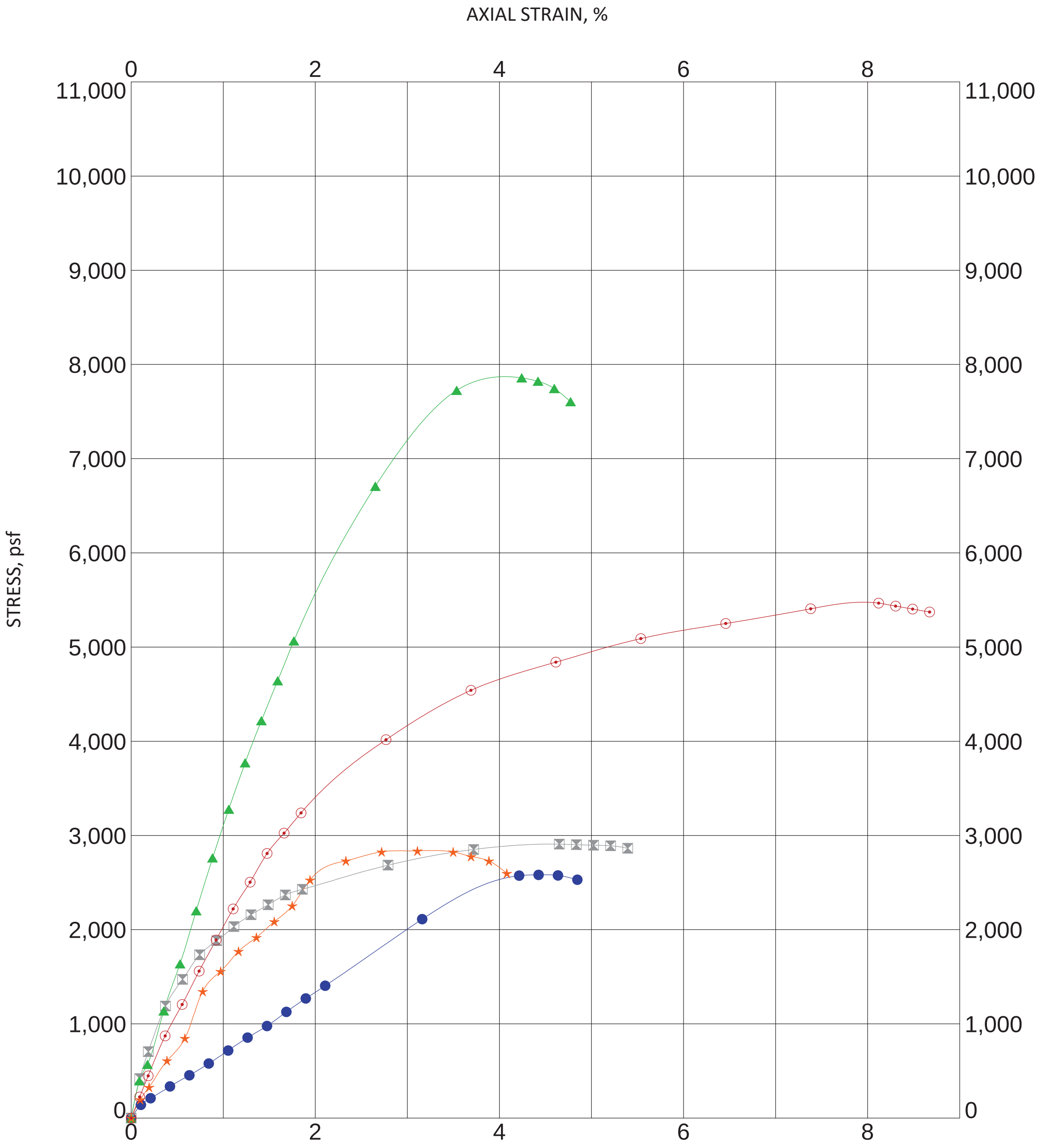


FIGURE B-4

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● B-2	18 ft		0.6	4.4		100.8	13.0
⧗ B-3	13 ft		0.7	4.7	30	112.2	17.6
▲ B-4	6 ft		2.0	4.2		113.1	14.3
★ B-4	8 ft		0.7	3.1		109.8	10.6
⊙ B-7	6 ft		1.4	8.1		115.1	15.7

RABA KISTNER
TBPE Firm Registration No. F-3257

12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

UNCONFINED COMPRESSION

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

R-K UNCONFINED COMPRESSION ASA12-098-00.GPJ RKCI.GDT 11/20/12

PROJECT NO. ASA12-098-00

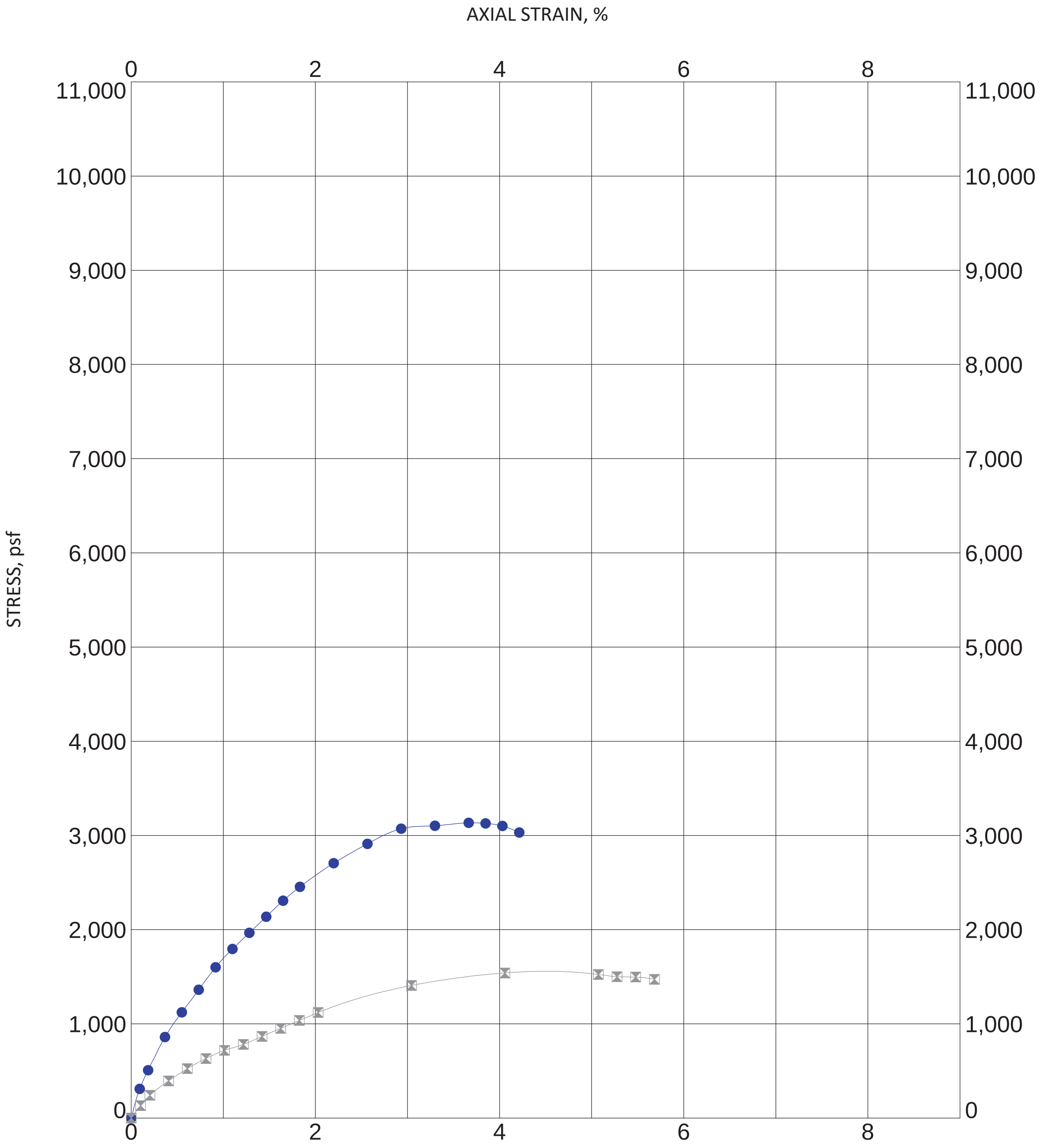


FIGURE B-5

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● B-8	6 ft		0.8	3.7		112.6	15.1
⧗ B-8	13 ft		0.4	4.1		110.8	18.1

RABA KISTNER
TBPE Firm Registration No. F-3257

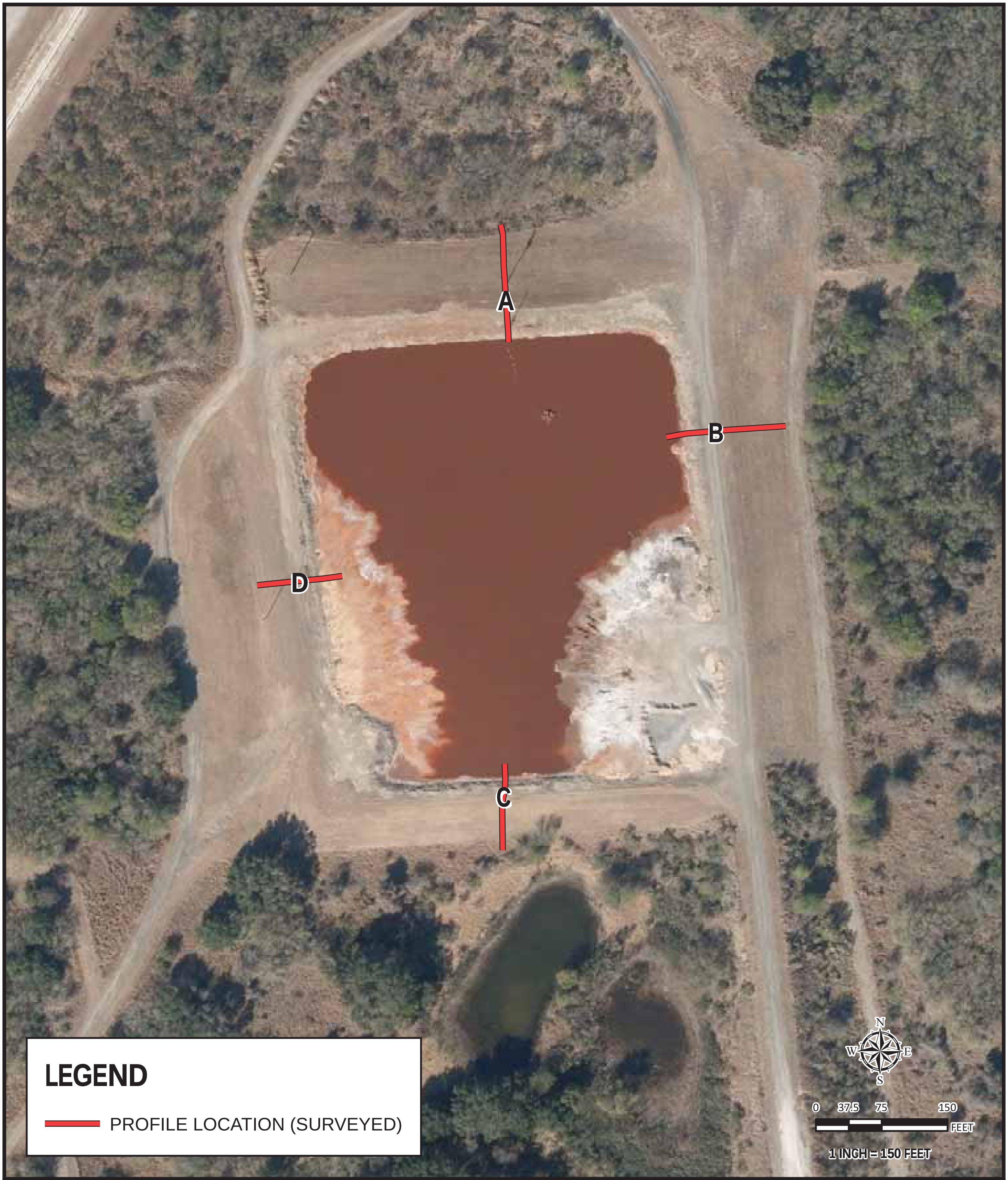
12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

UNCONFINED COMPRESSION

Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

APPENDIX C

SLOPE STABILITY ANALYSES



RABA KISTNER CONSULTANTS

Raba Kistner Consultants, Inc.
12821 West Golden Lane
San Antonio, Texas 78249
P 210 :: 699 :: 9090
F 210 :: 699 :: 6426
www.rkci.com
TBPE Firm Number 3257

SOURCE: 2011 Aerial Photograph Provided by the City of San Antonio (COSA)

SLOPE PROFILE LOCATION MAP

ASH POND BERMS - SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

REVISIONS:

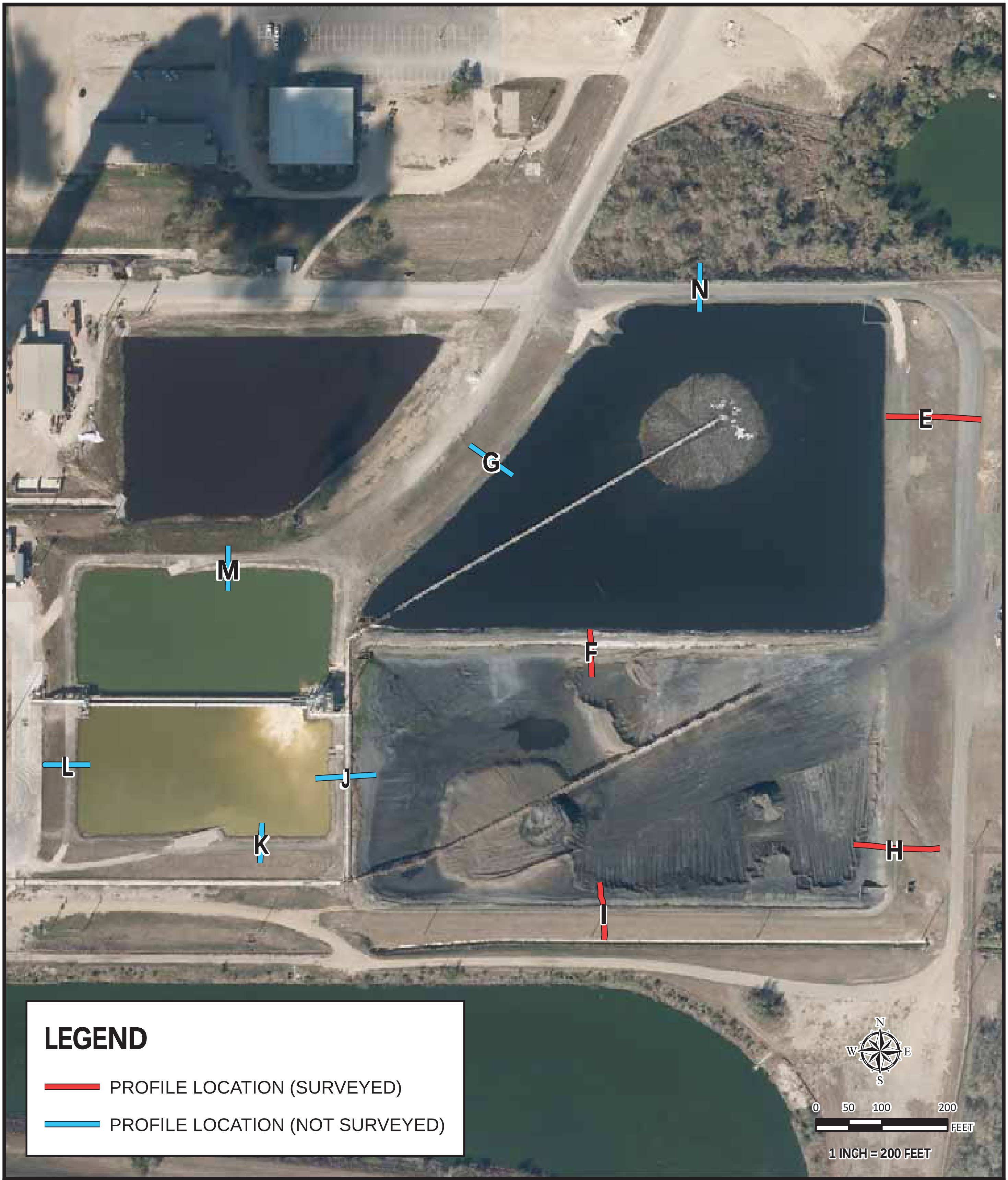
No.	DATE	DESCRIPTION

PROJECT No.:
ASA12-098-00

ISSUE DATE:	11/08/2012
DRAWN BY:	CCL
CHECKED BY:	RBW
REVIEWED BY:	GLB

FIGURE
C-1a

NOTE: This Drawing is Provided for Illustration Only, May Not be to Scale and is Not Suitable for Design or Construction Purposes



RABA KISTNER CONSULTANTS

Raba Kistner Consultants, Inc.
12821 West Golden Lane
San Antonio, Texas 78249
P 210 :: 699 :: 9090
F 210 :: 699 :: 6426
www.rkci.com
TBPE Firm Number 3257

SOURCE: 2011 Aerial Photograph Provided by the City of San Antonio (COSA)

SLOPE PROFILE LOCATION MAP

ASH POND BERMS - SPRUCE/DEELY GENERATION UNITS
SAN ANTONIO, TEXAS

REVISIONS:

No.	DATE	DESCRIPTION

PROJECT No.:
ASA12-098-00

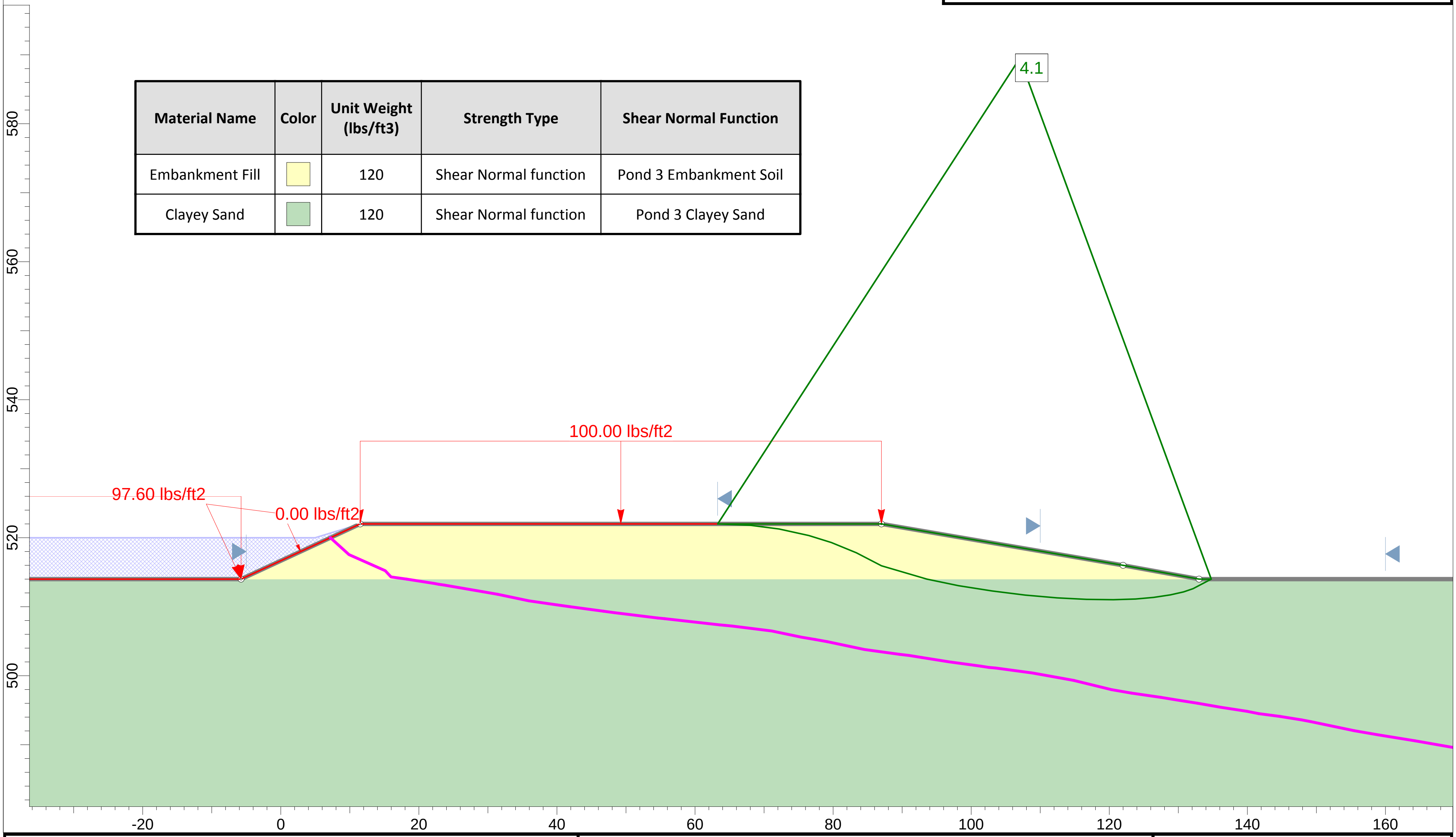
ISSUE DATE:	11/20/2012
DRAWN BY:	CCL
CHECKED BY:	RBW
REVIEWED BY:	GLB

FIGURE

C-1b

NOTE: This Drawing is Provided for Illustration Only, May Not be to Scale and is Not Suitable for Design or Construction Purposes

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand

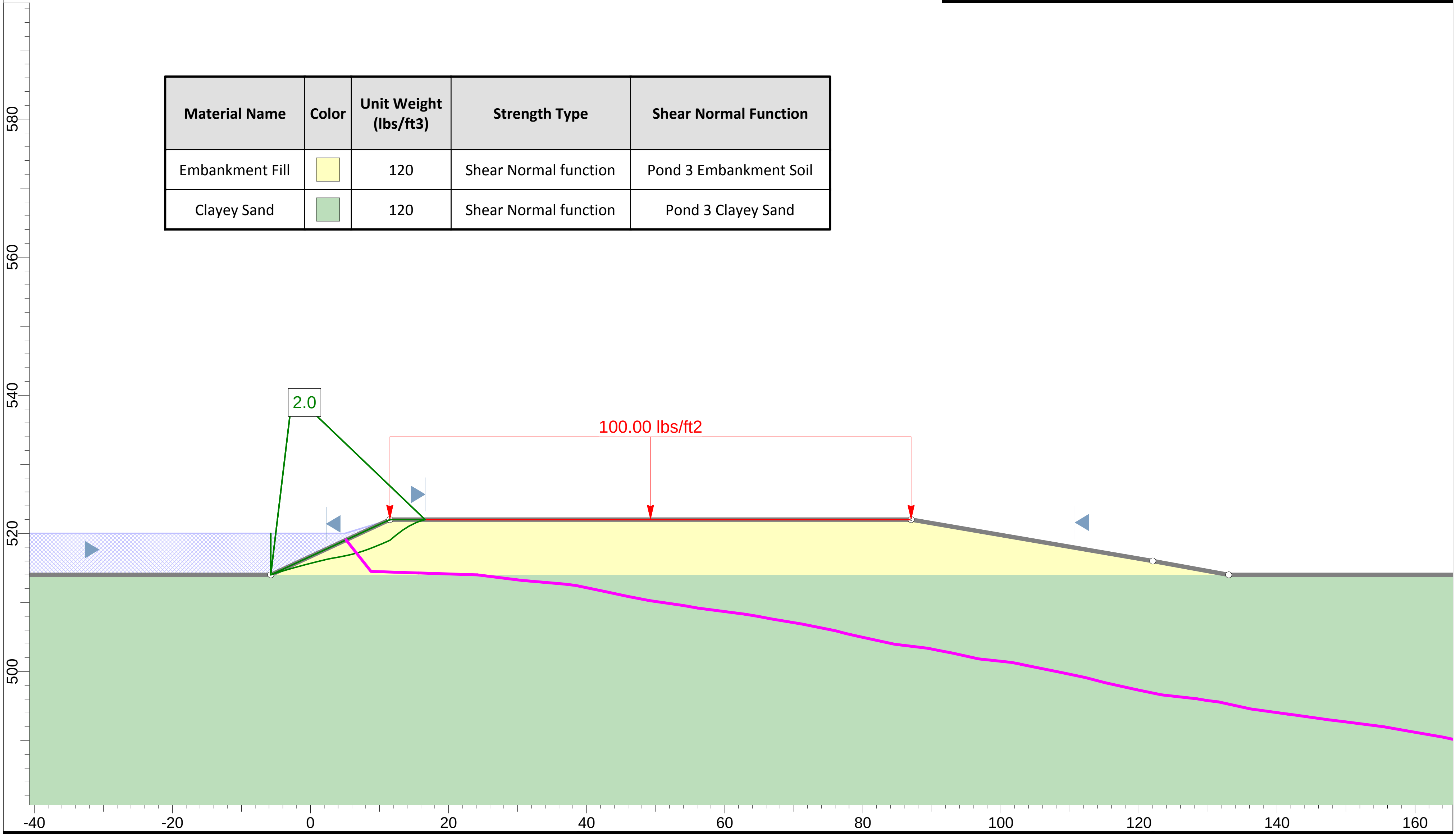
Profile "A" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-2a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



Profile "A" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

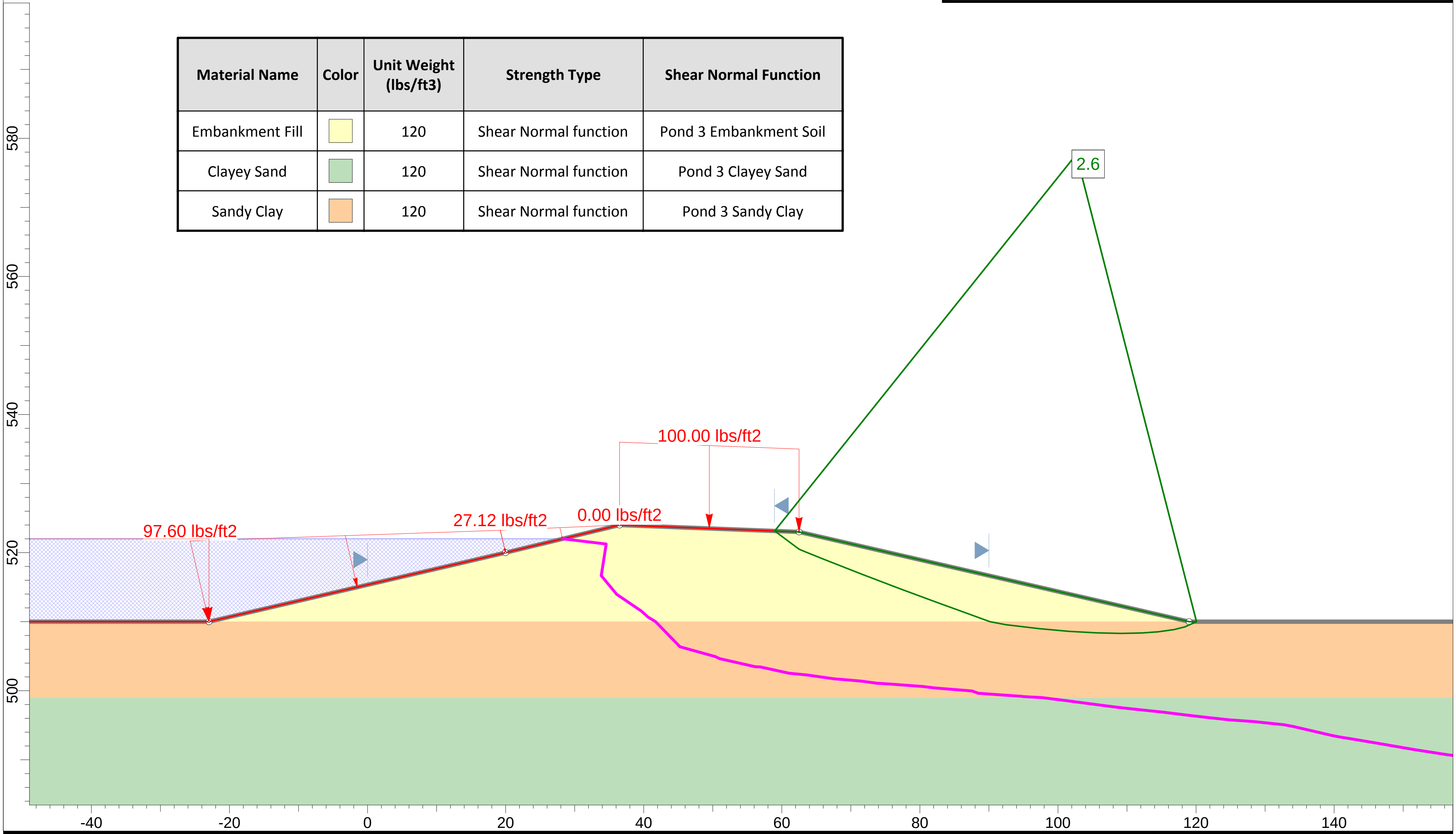
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-2b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

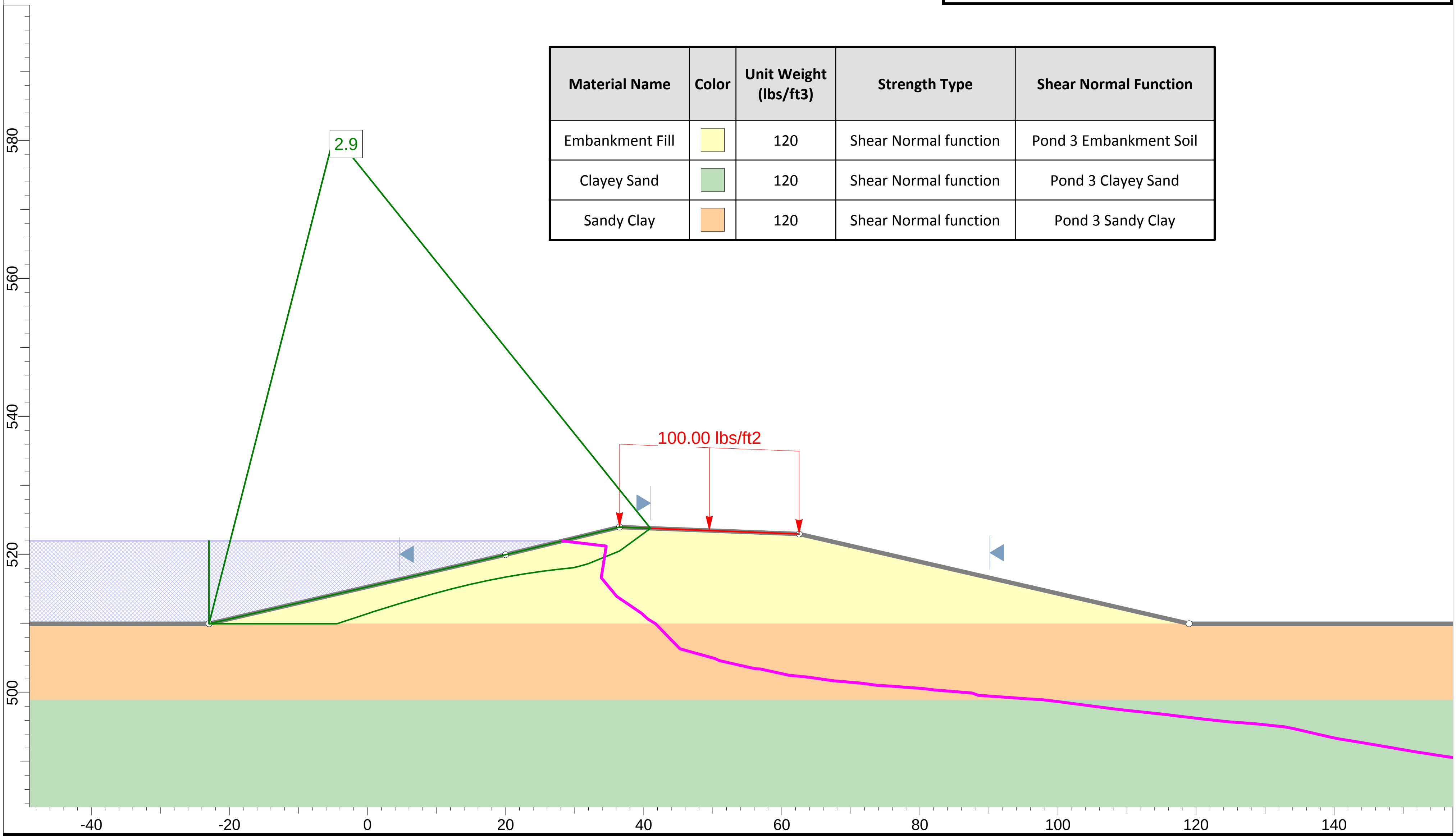


Profile "B" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-3a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

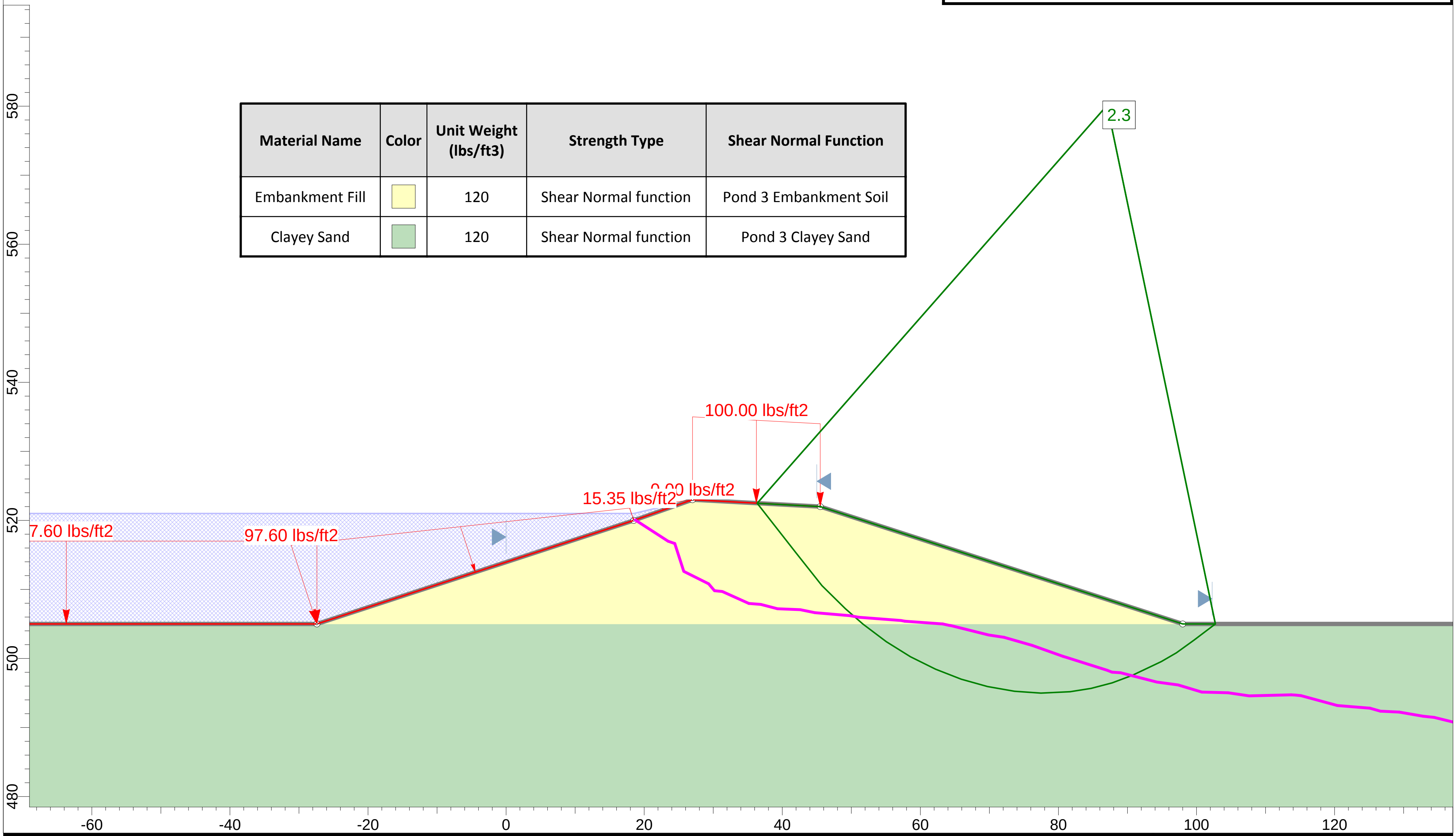
Profile "B" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-3b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand

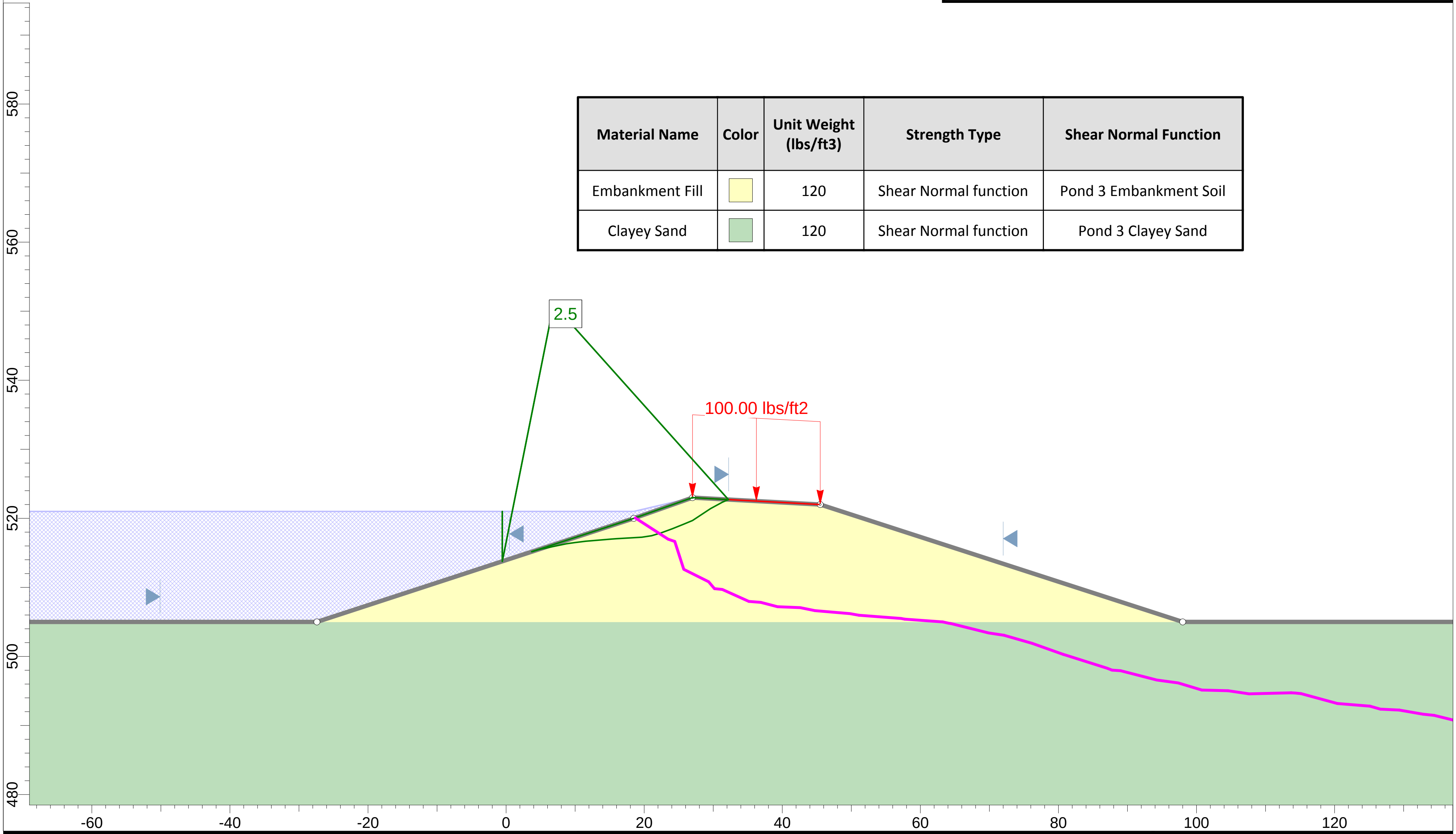
Profile "C" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-4a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



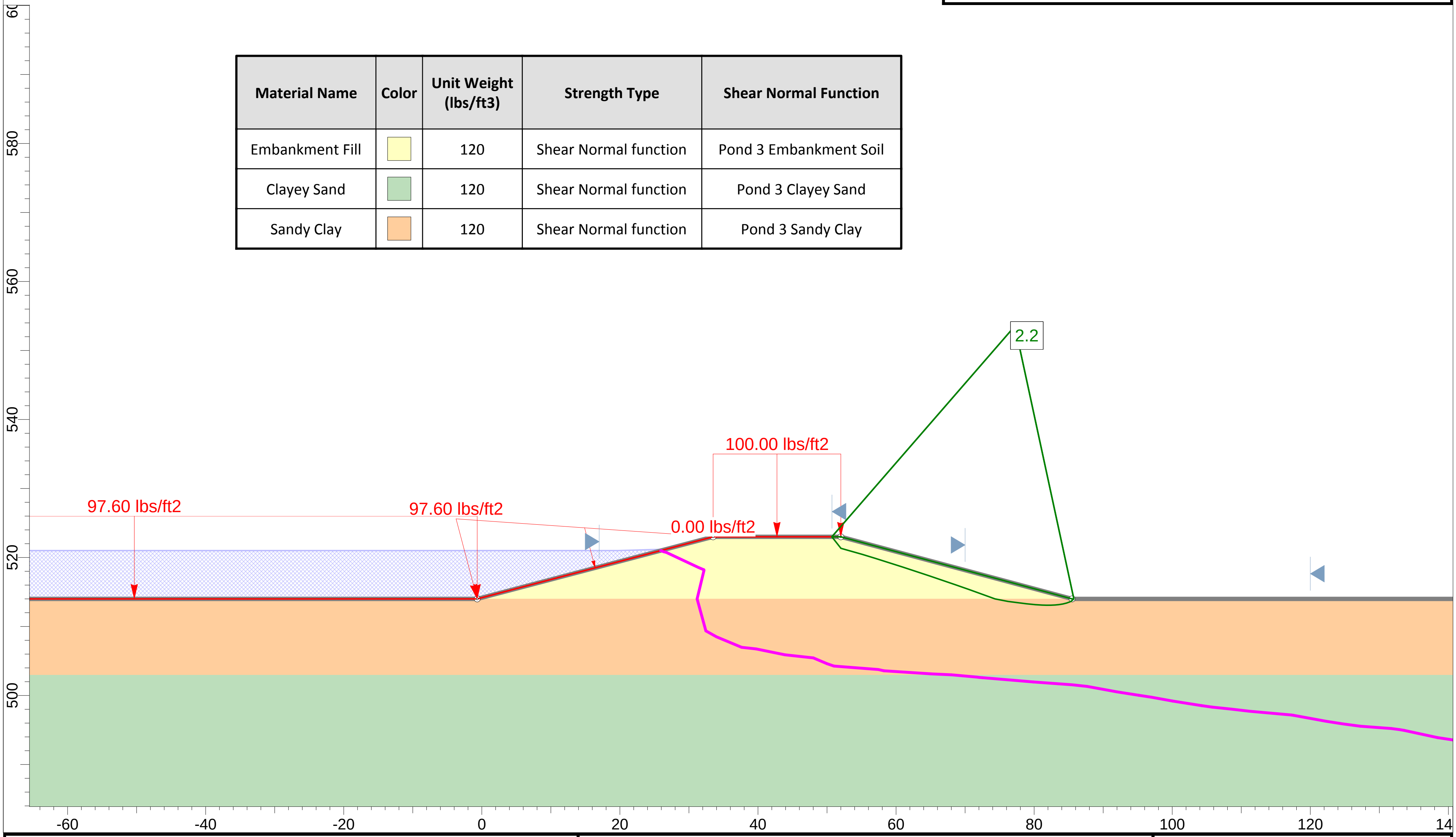
Profile "C" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-4b

RABA KISTNER CONSULTANTS

Global Stability Analysis



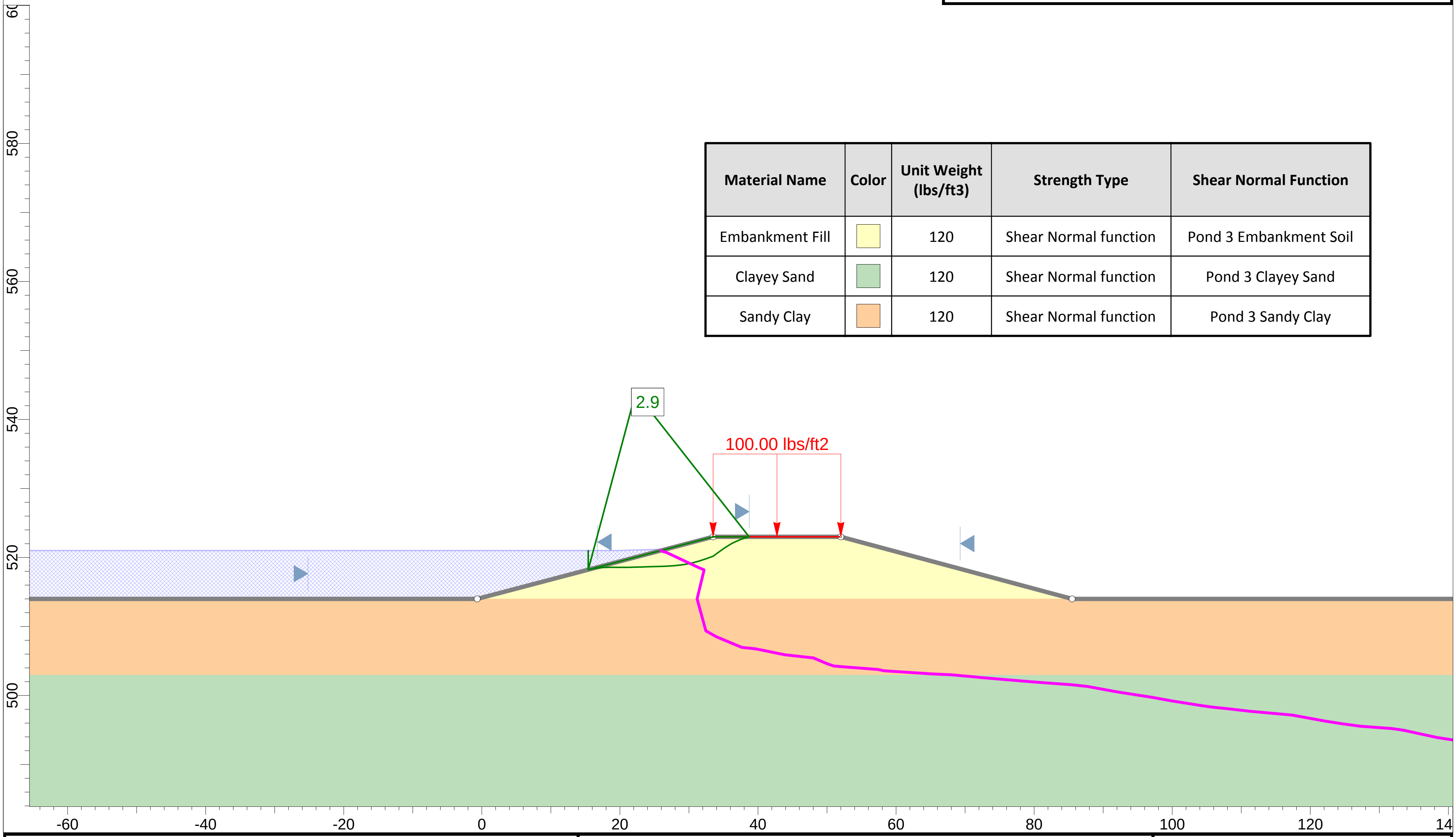
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

Profile "D" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-5a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

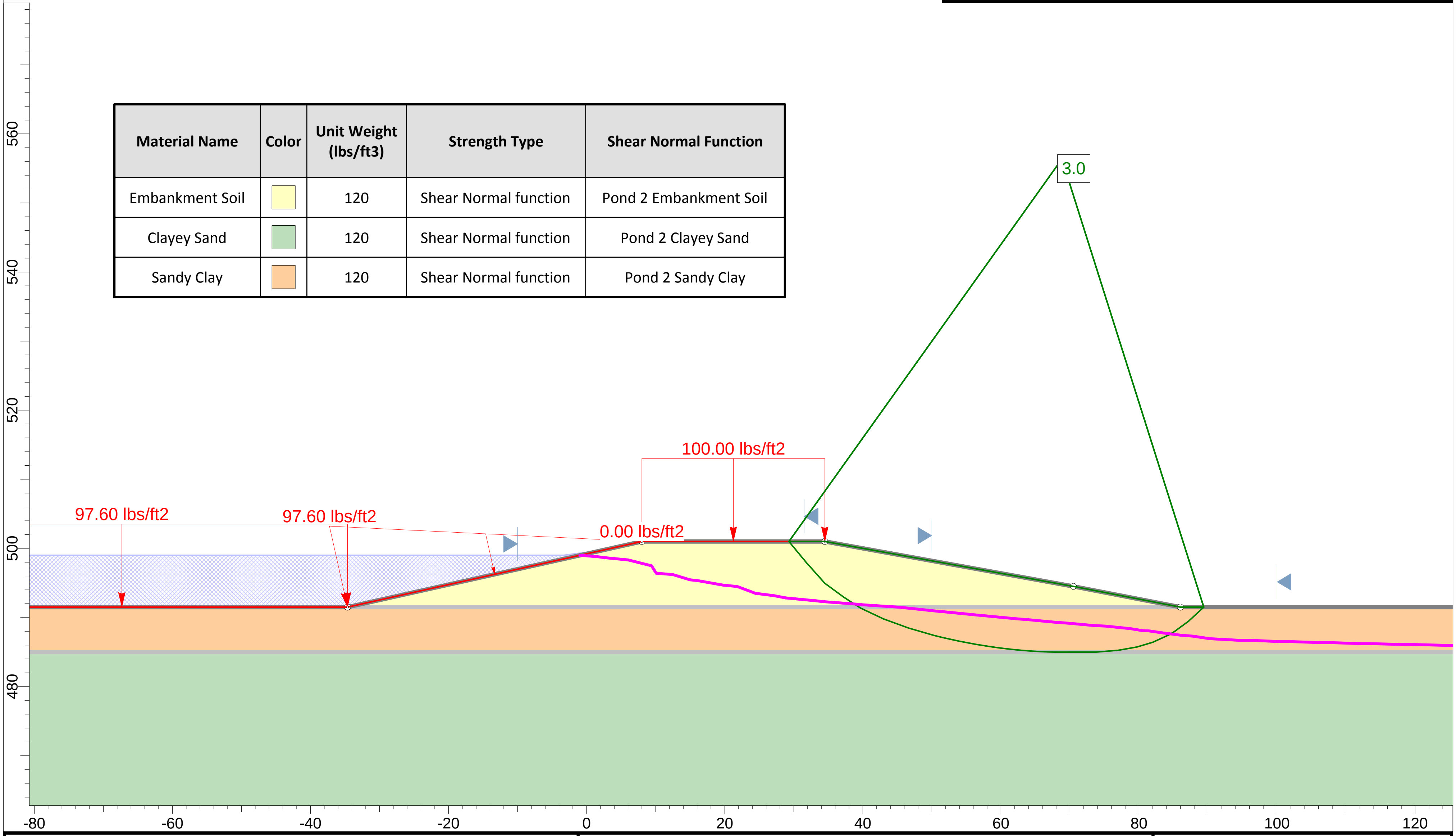
Profile "D" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-5b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Soil	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

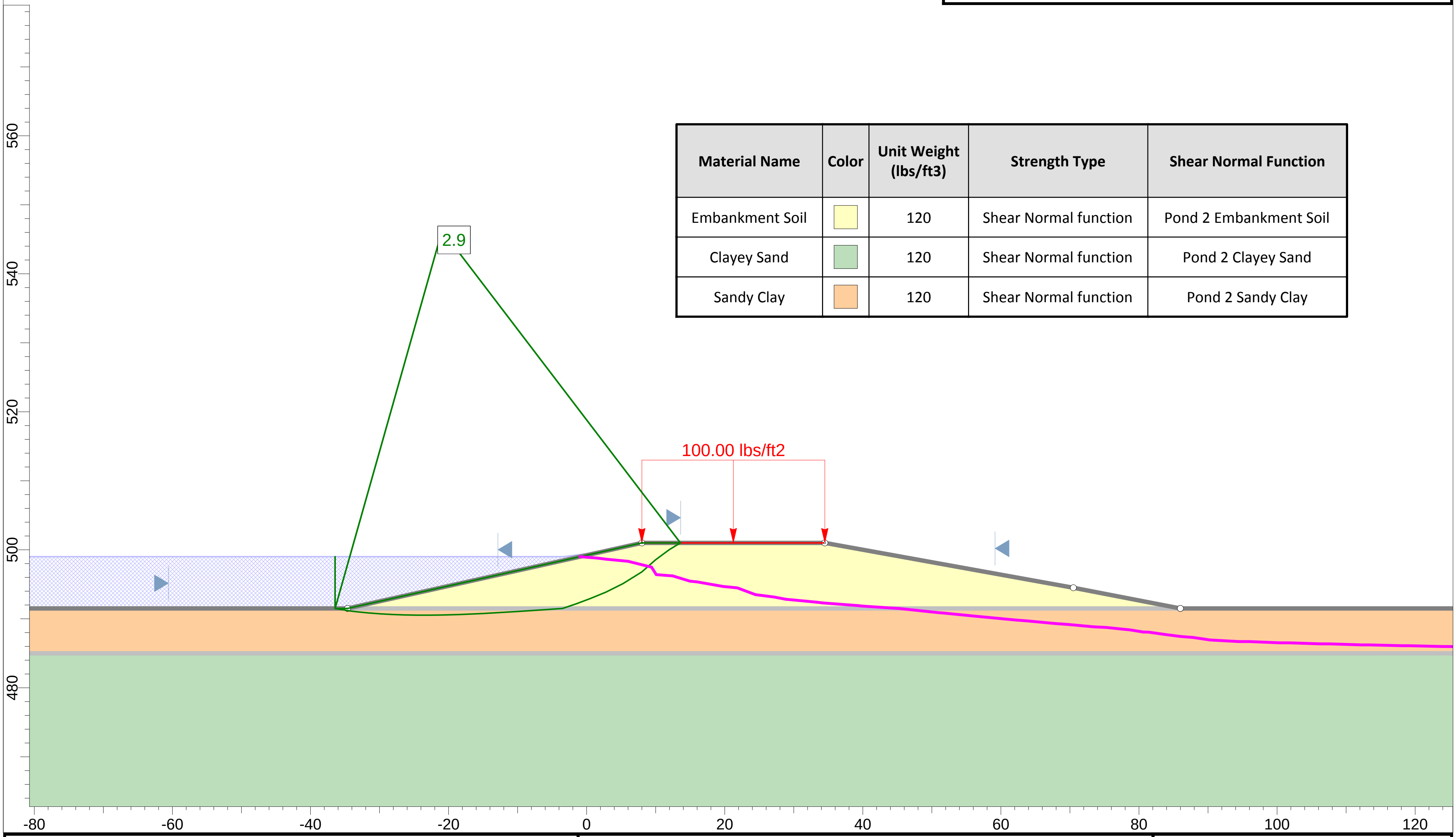
Profile "E" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-6a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Soil	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

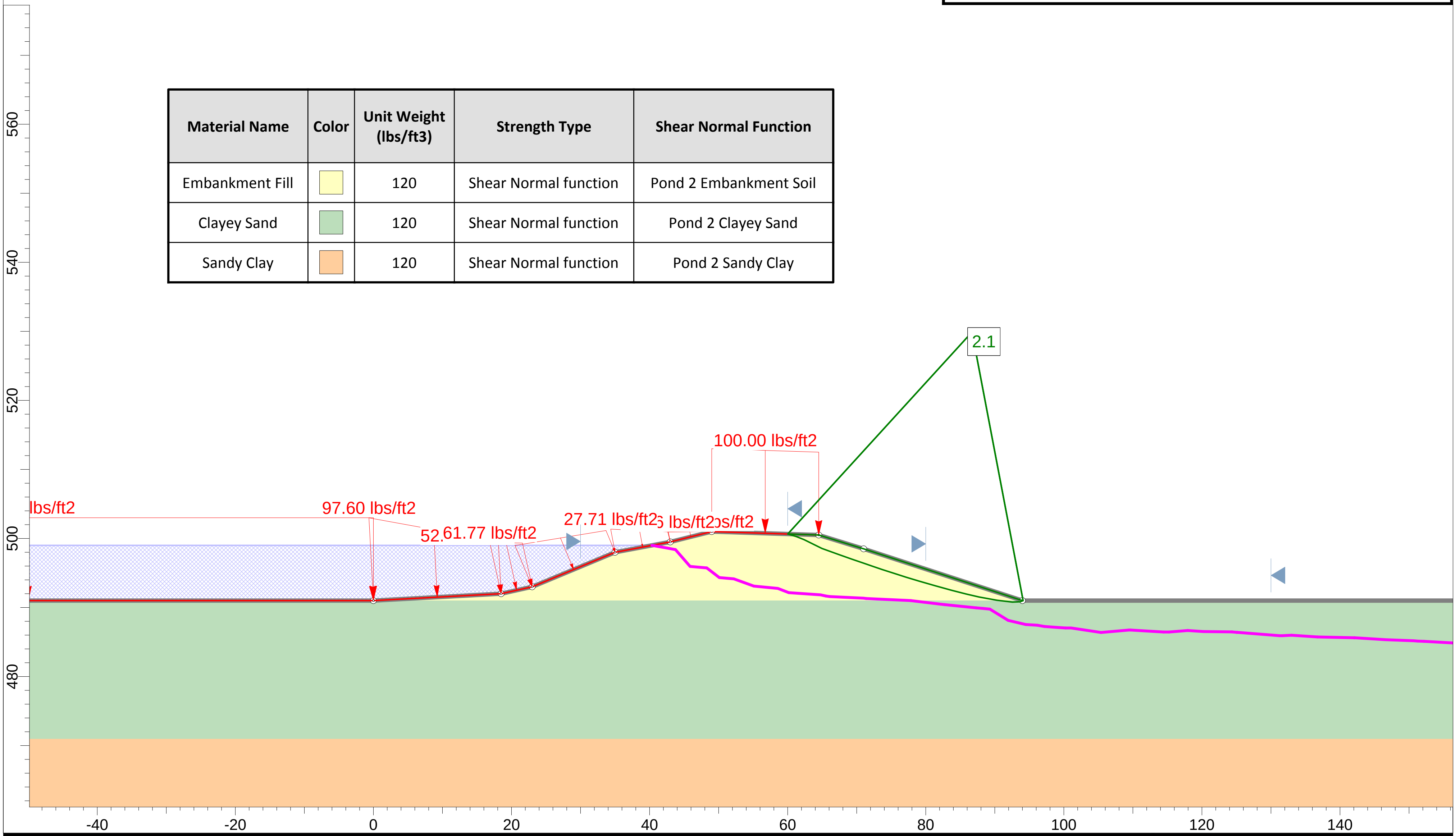
Profile "E" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-6b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

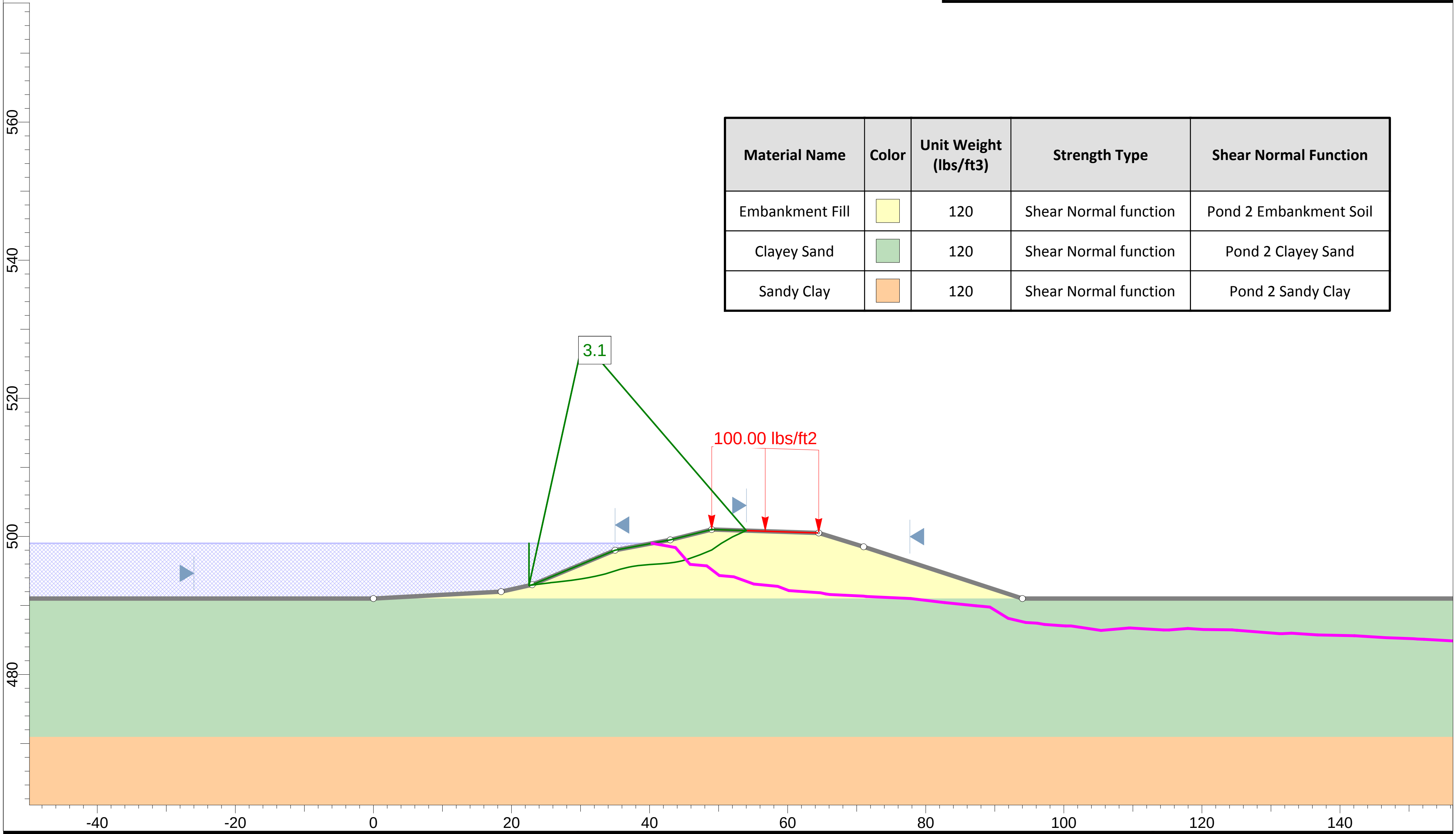


Profile "F" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-7a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "F" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

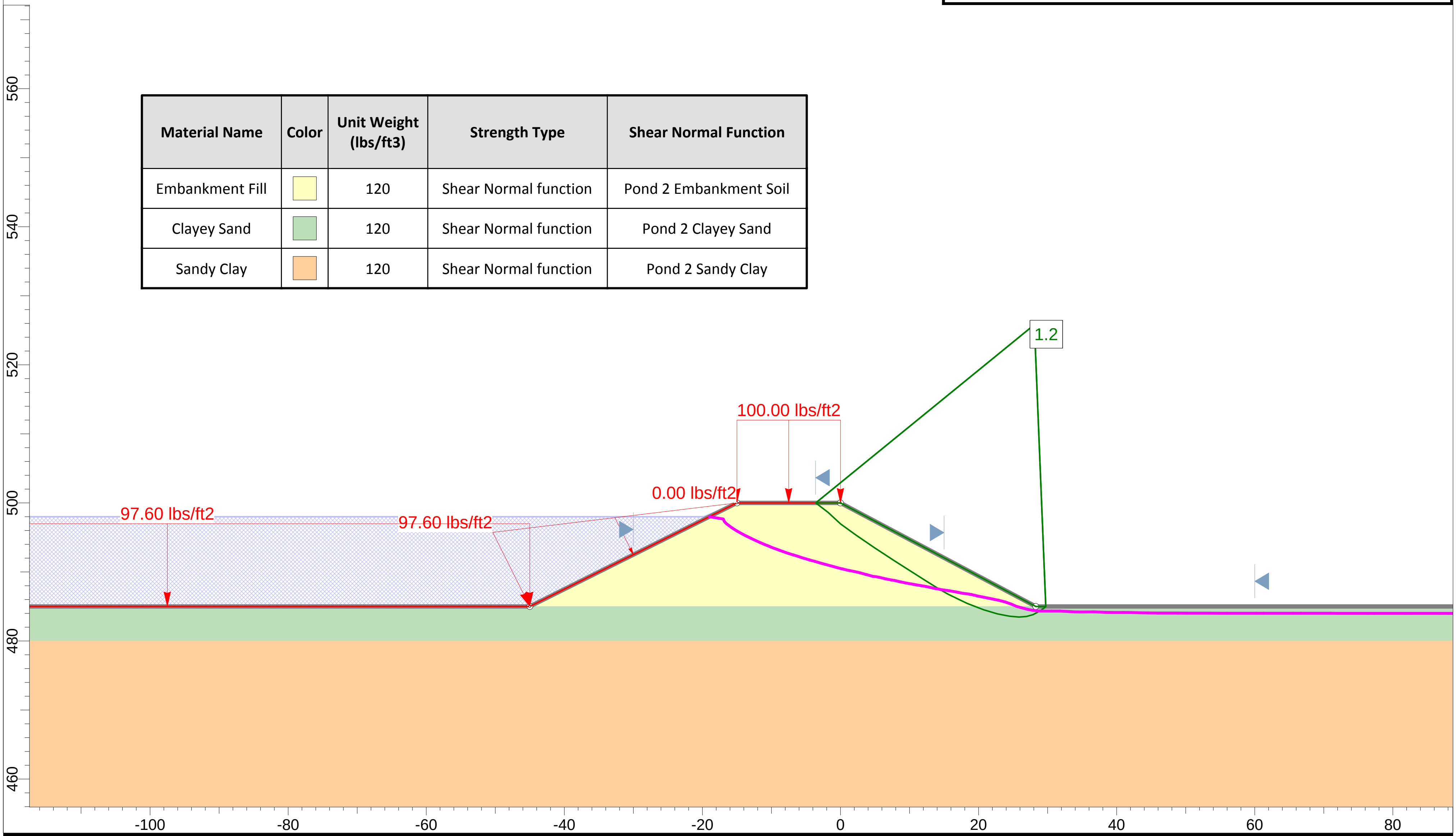
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-7b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay



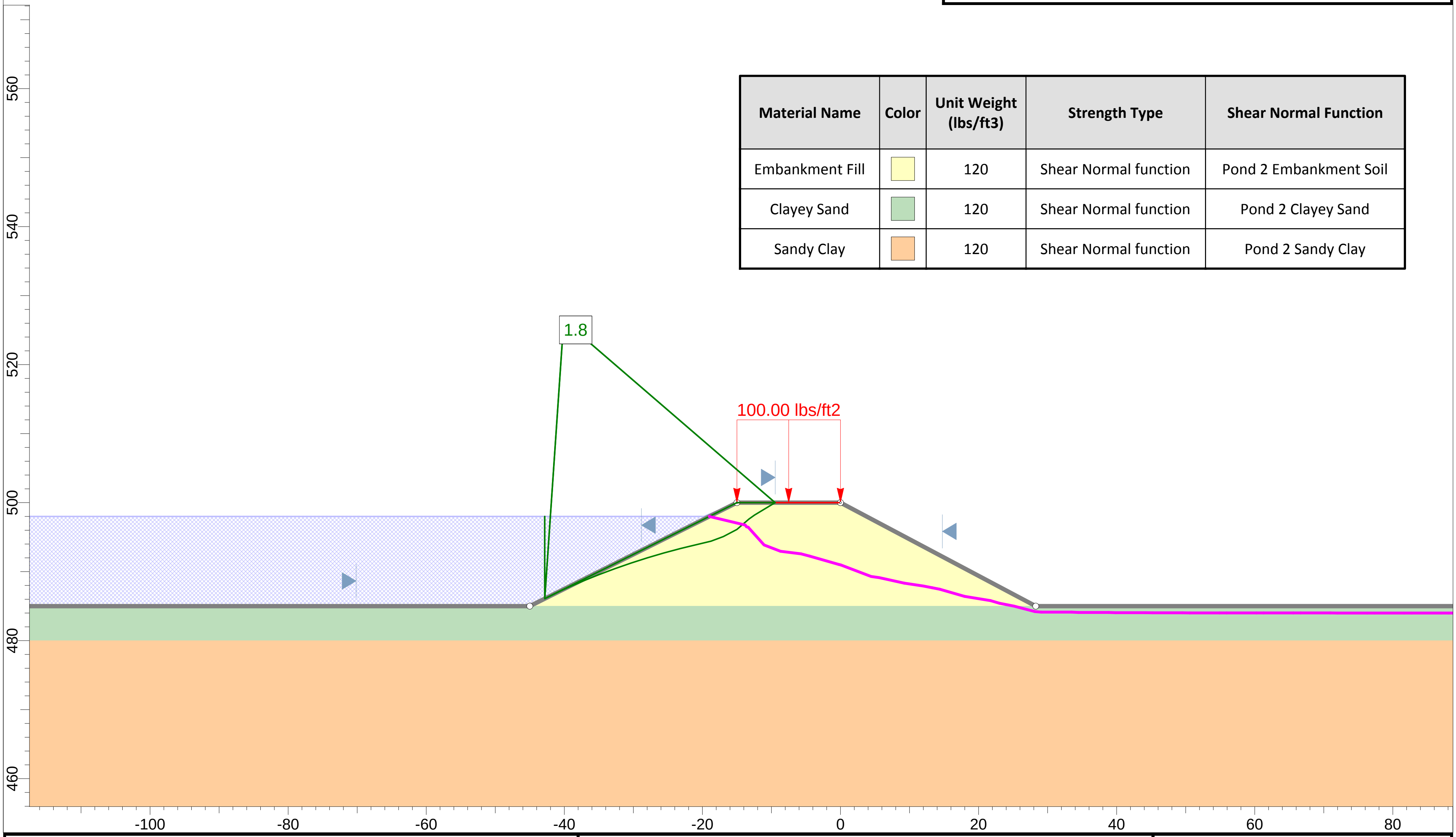
Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-8a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

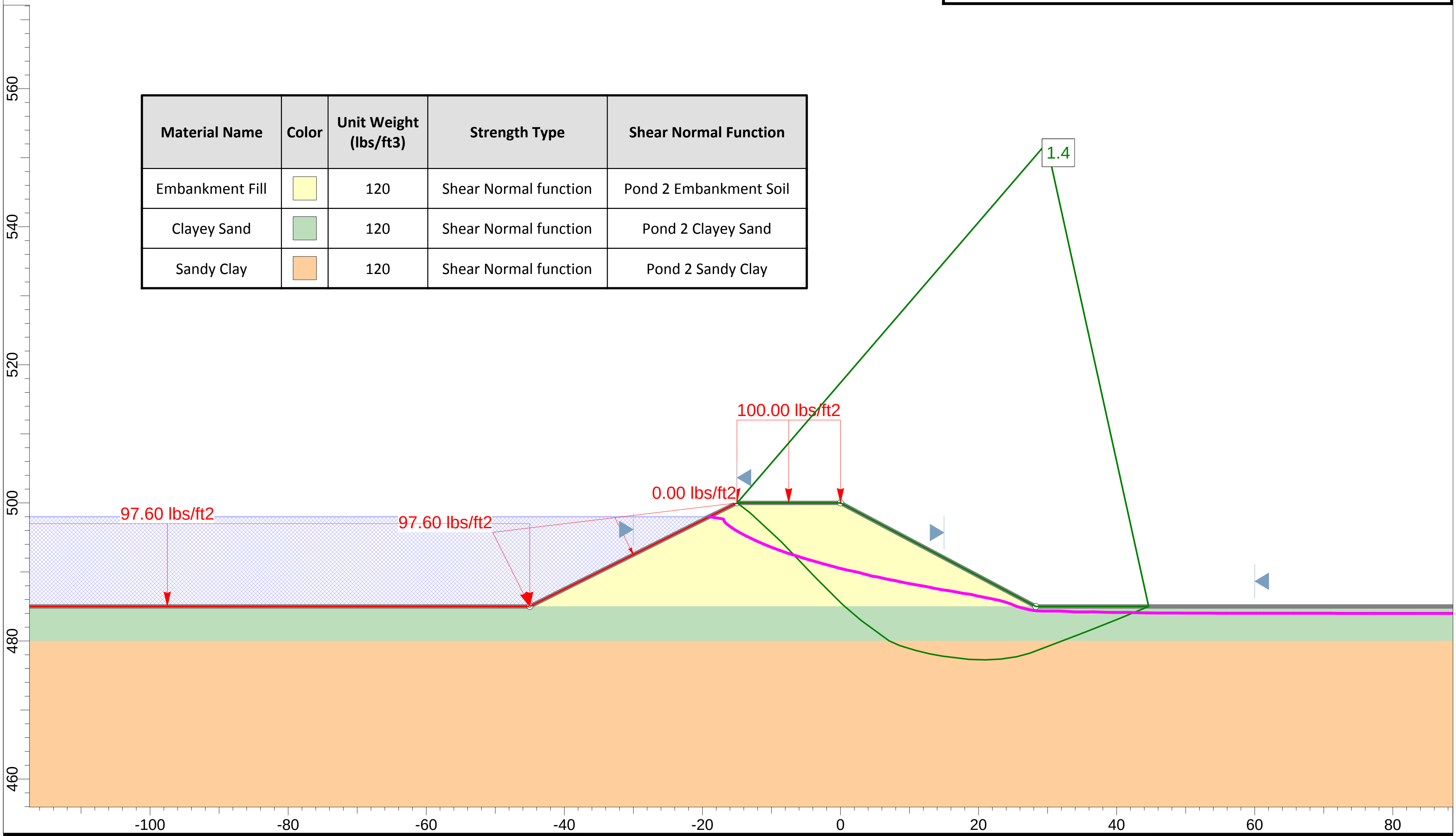
Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-8b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

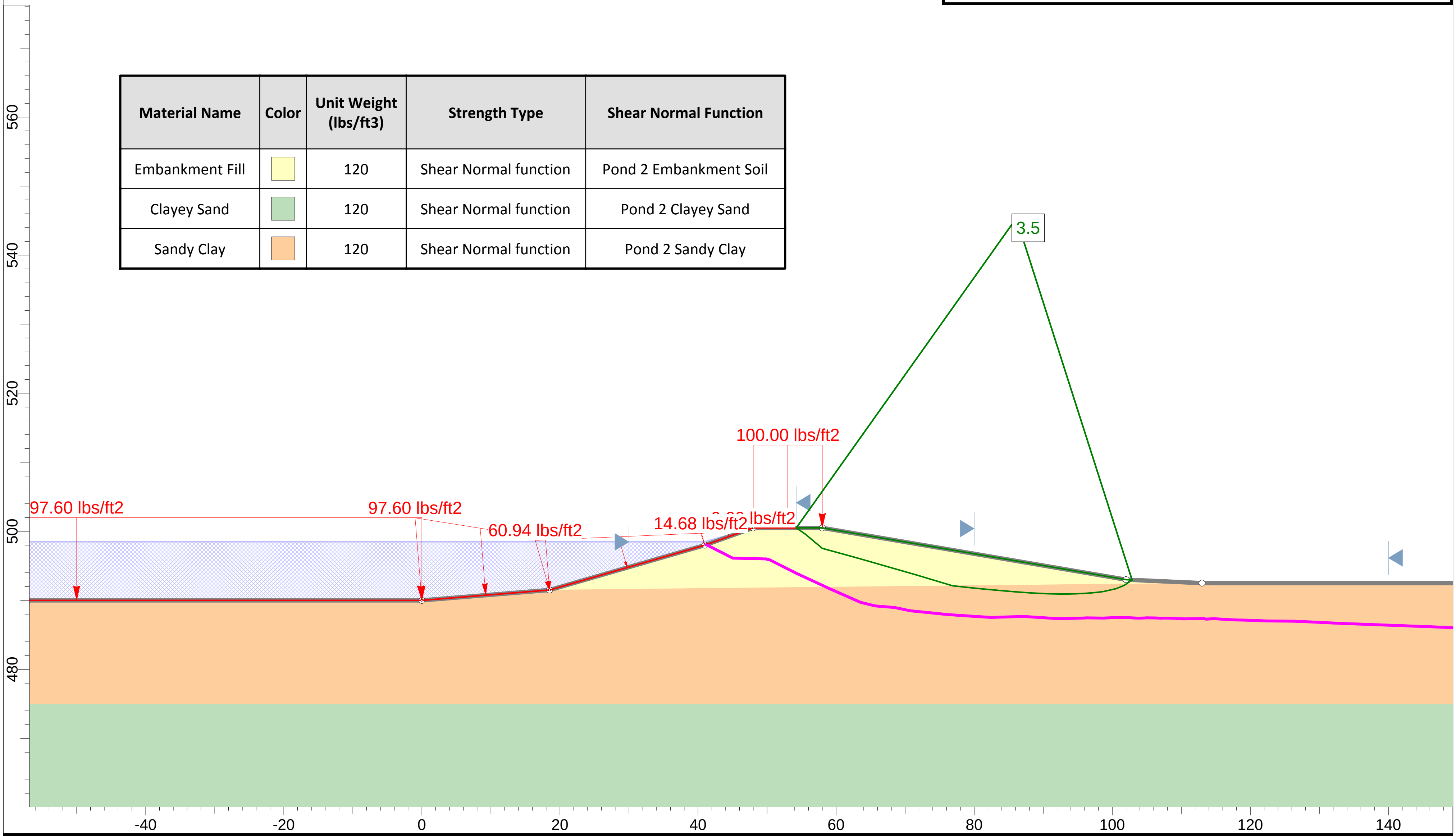
Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-8c

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

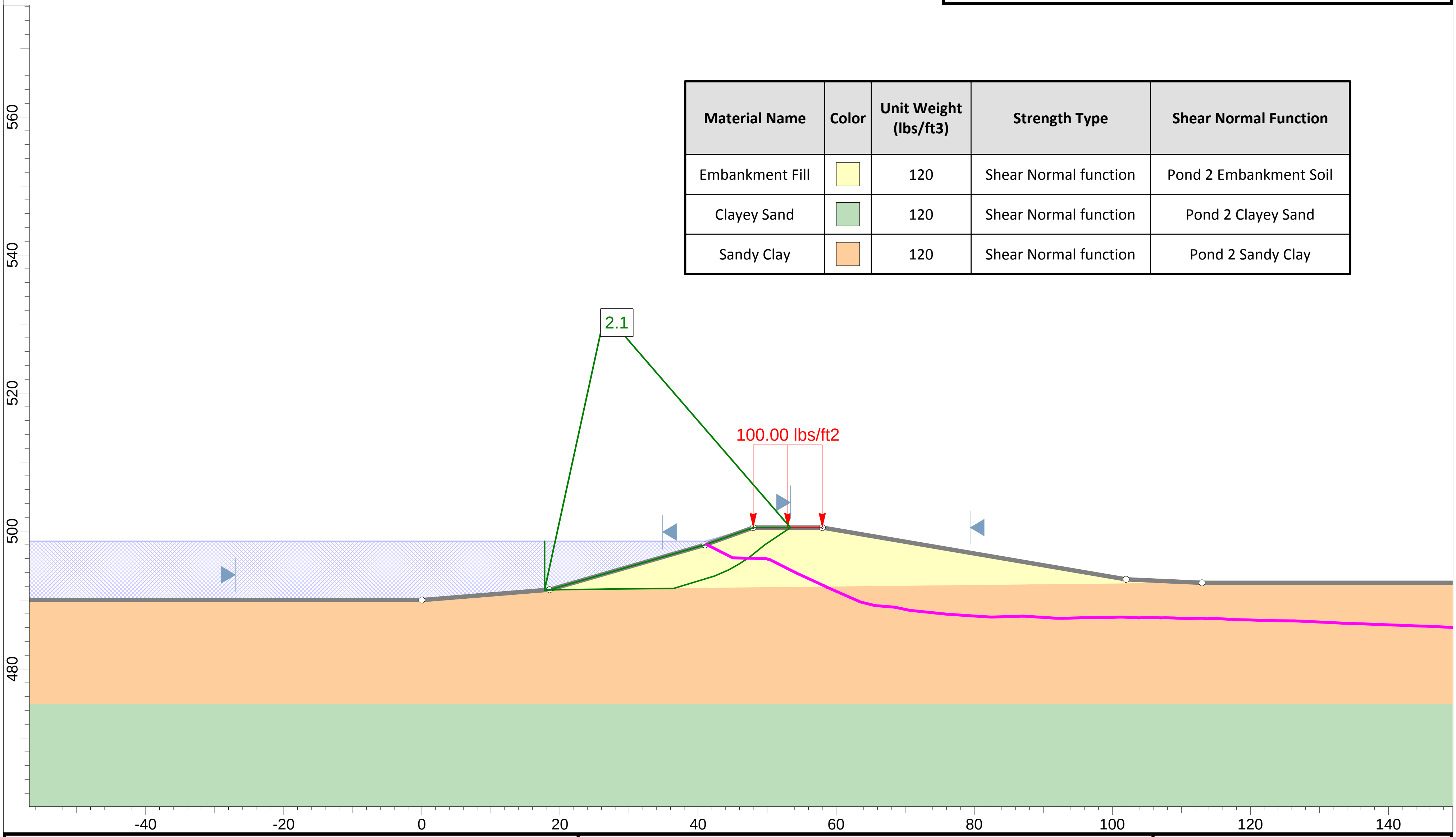
Profile "H" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-9a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "H" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

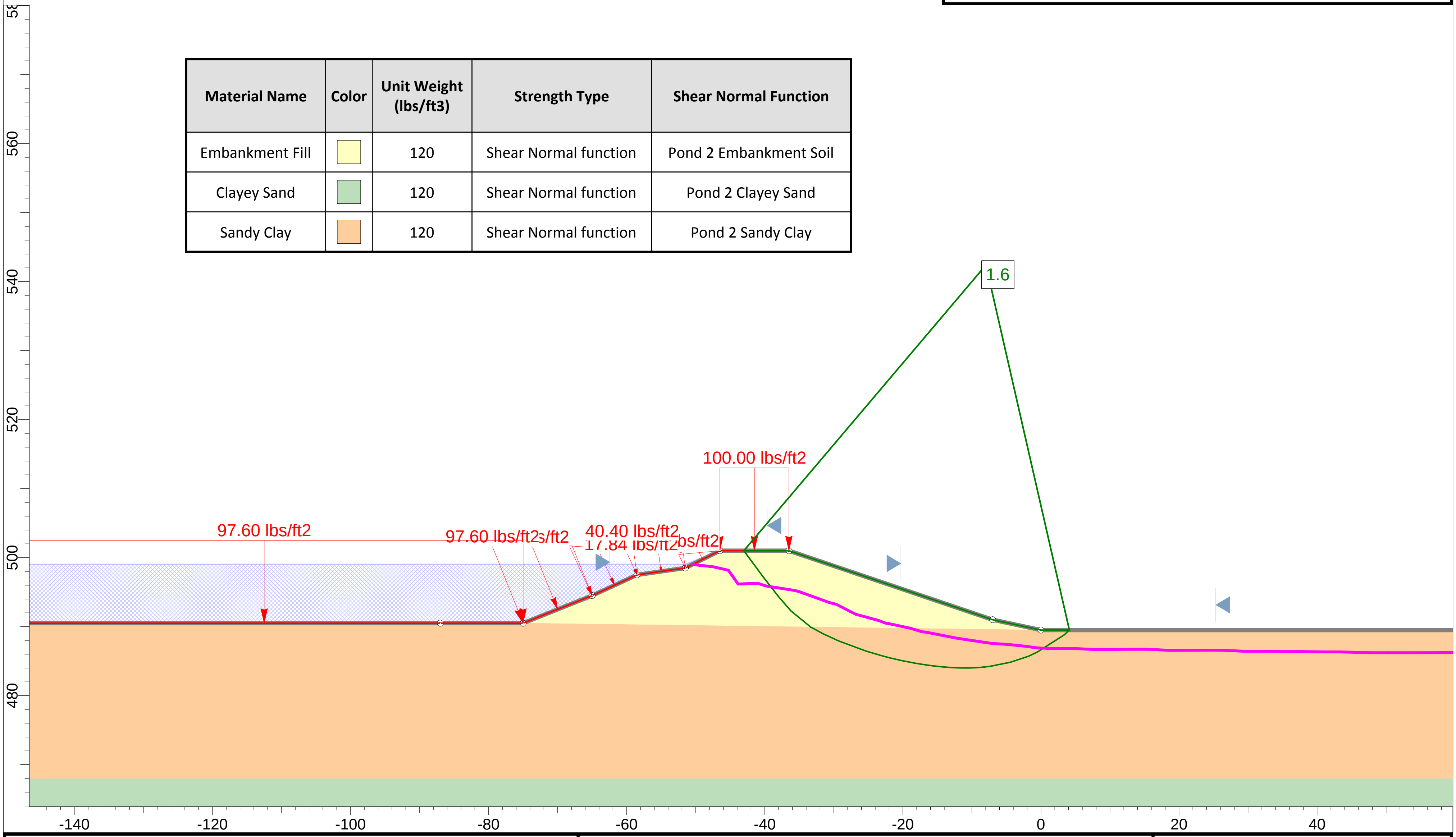
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-9b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

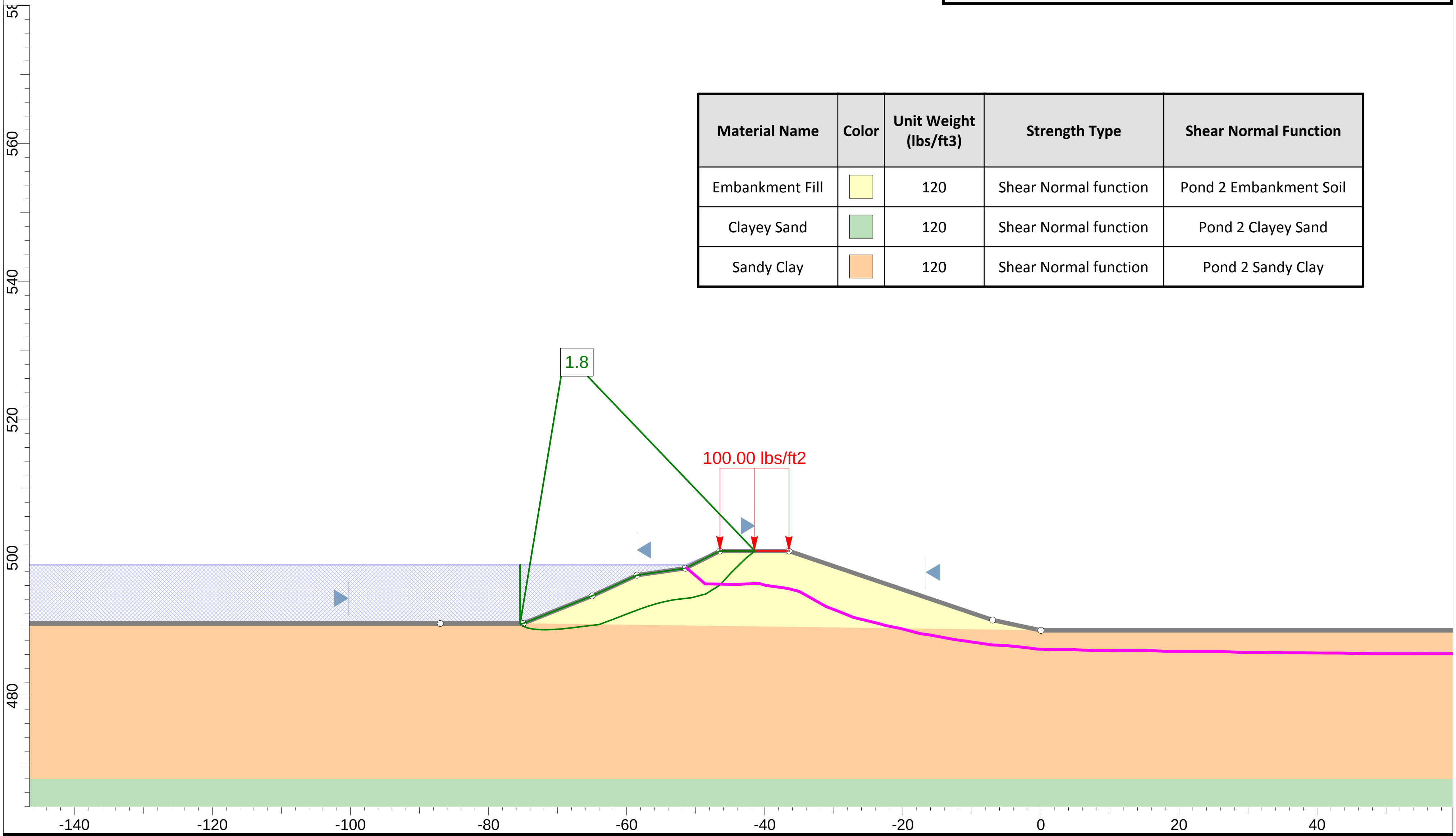


Profile "I" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-10a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

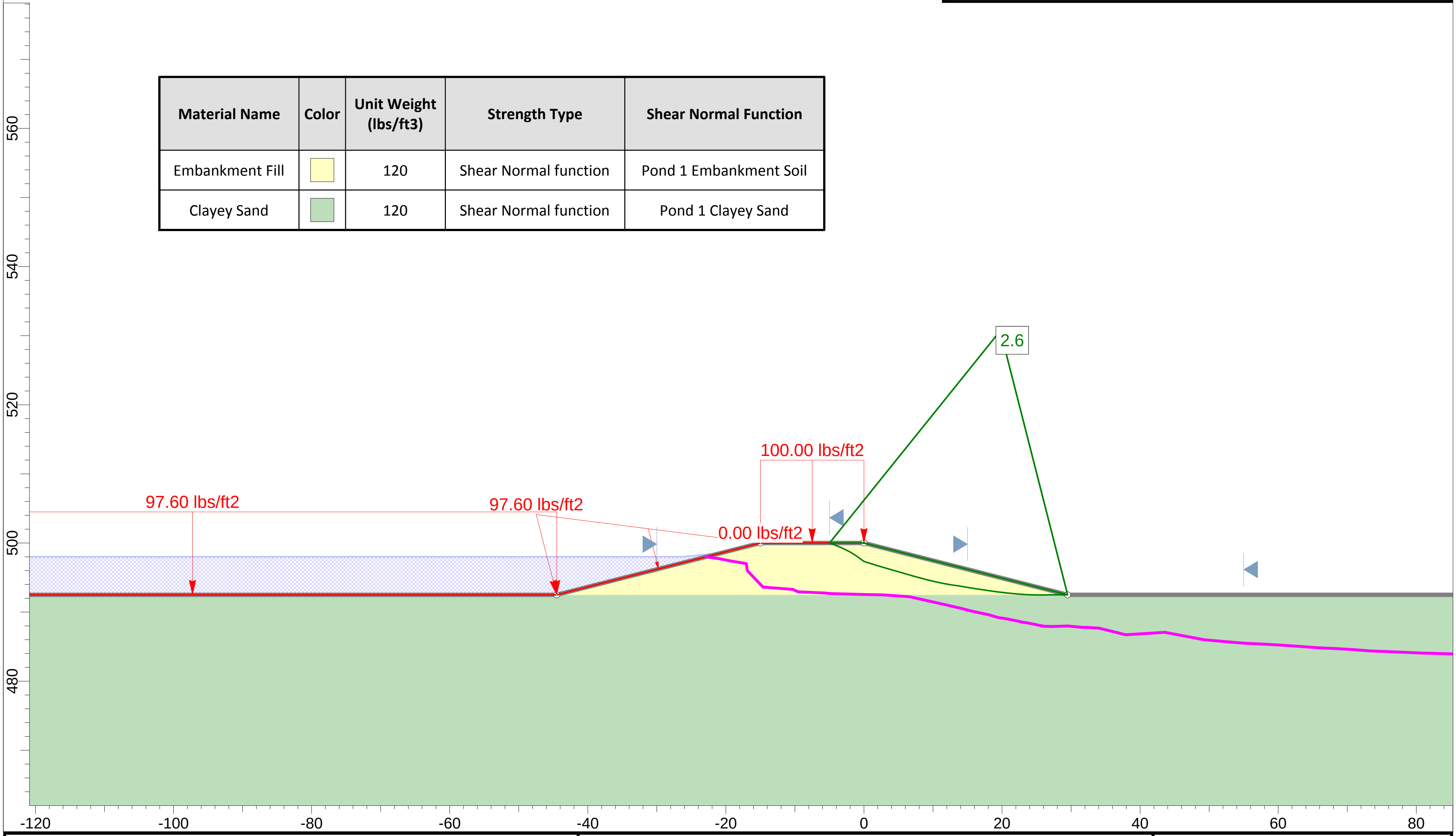
Profile "I" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-10b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand



Profile "J" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

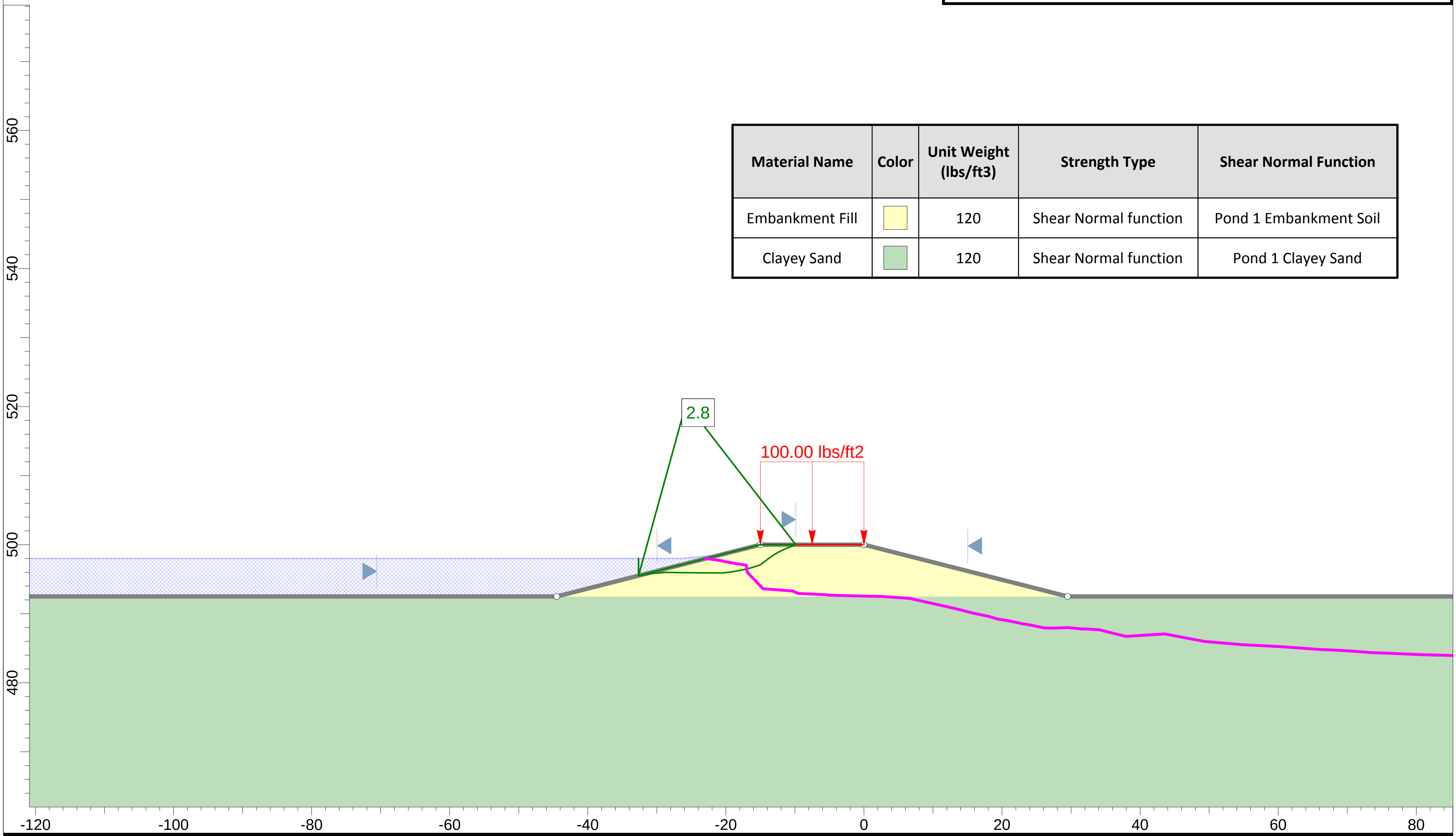
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-11a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand



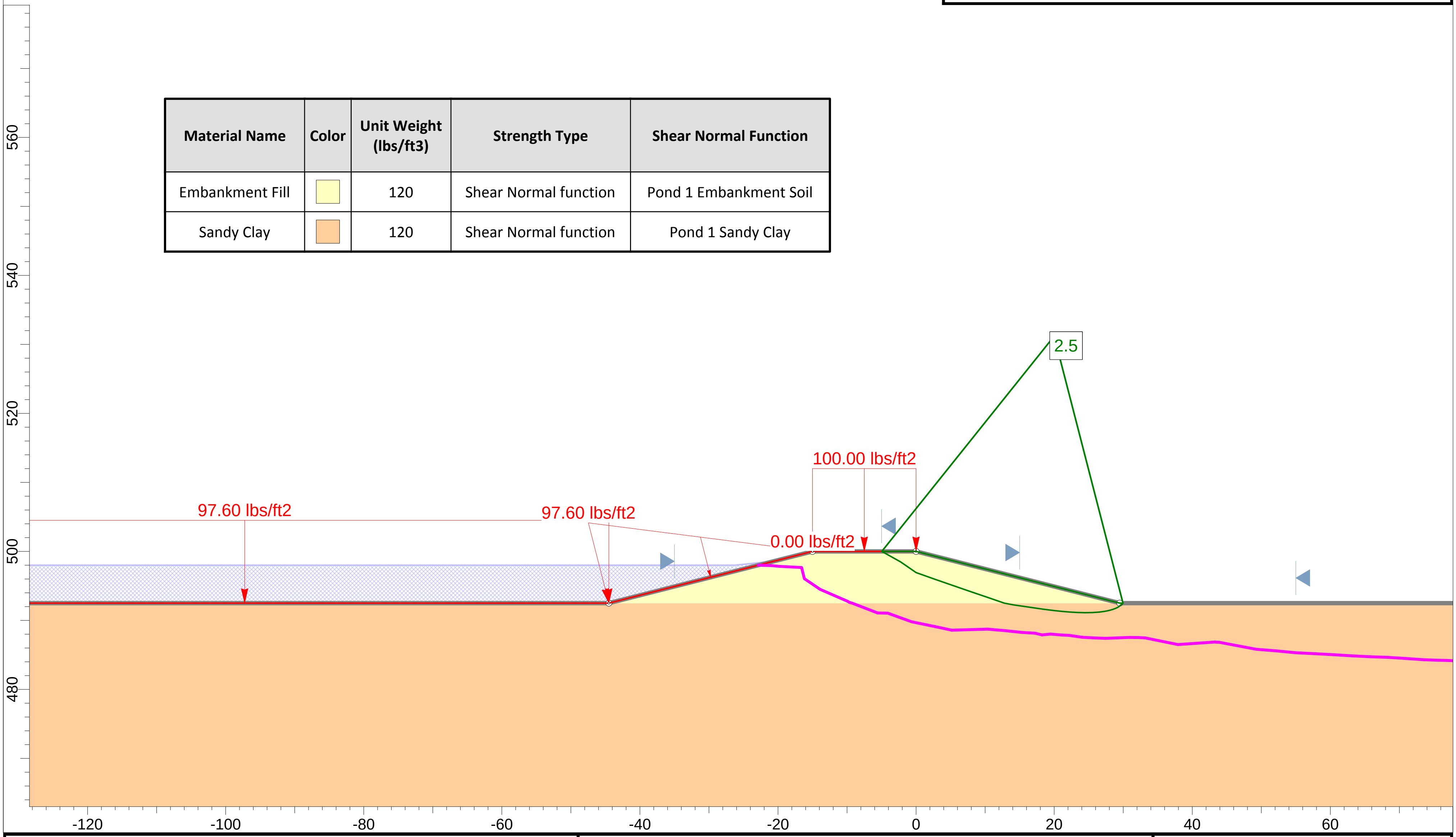
Profile "J" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-11b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay

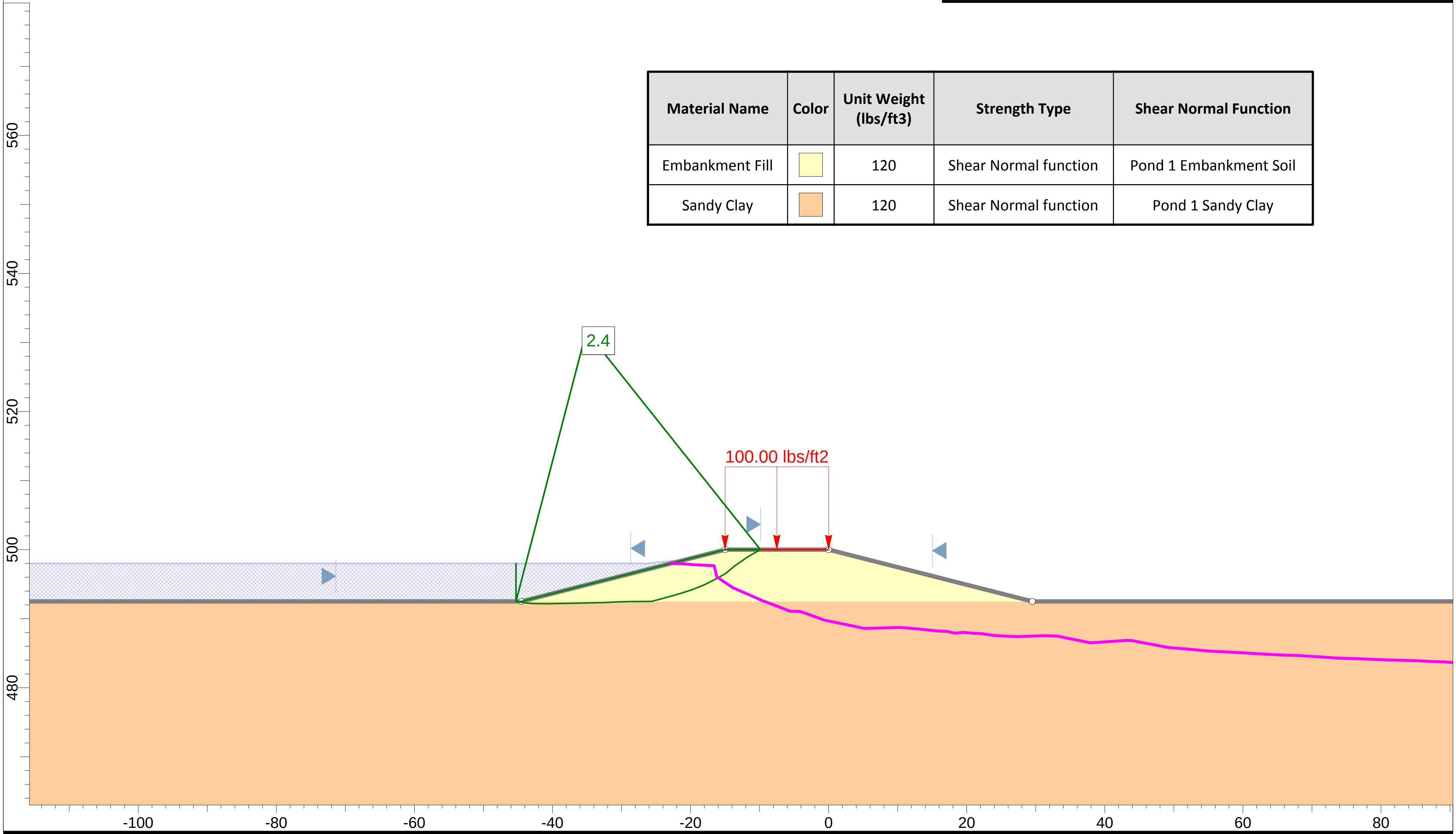


Profile "K" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-12a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay

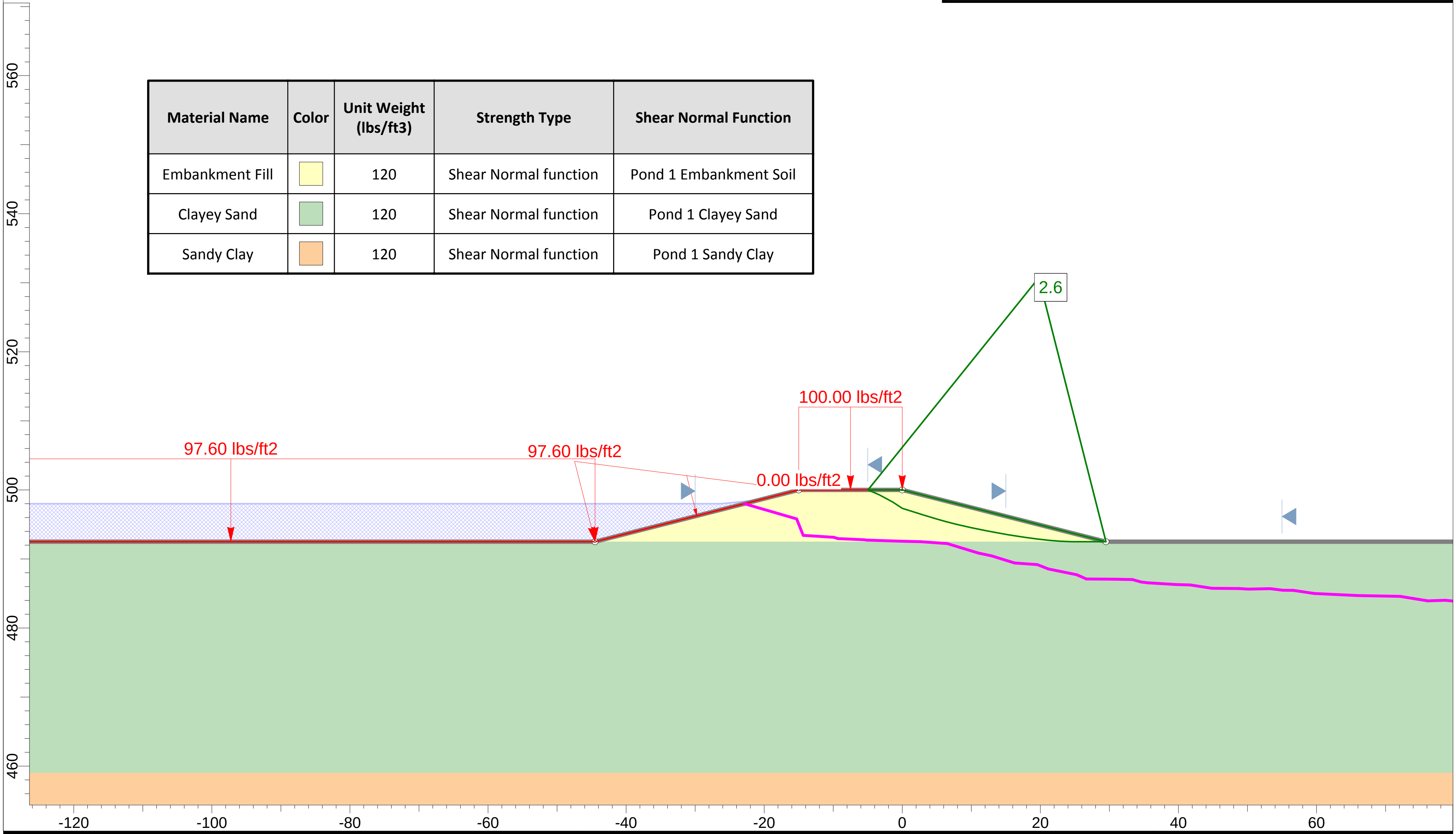
Profile "K" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-12b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay

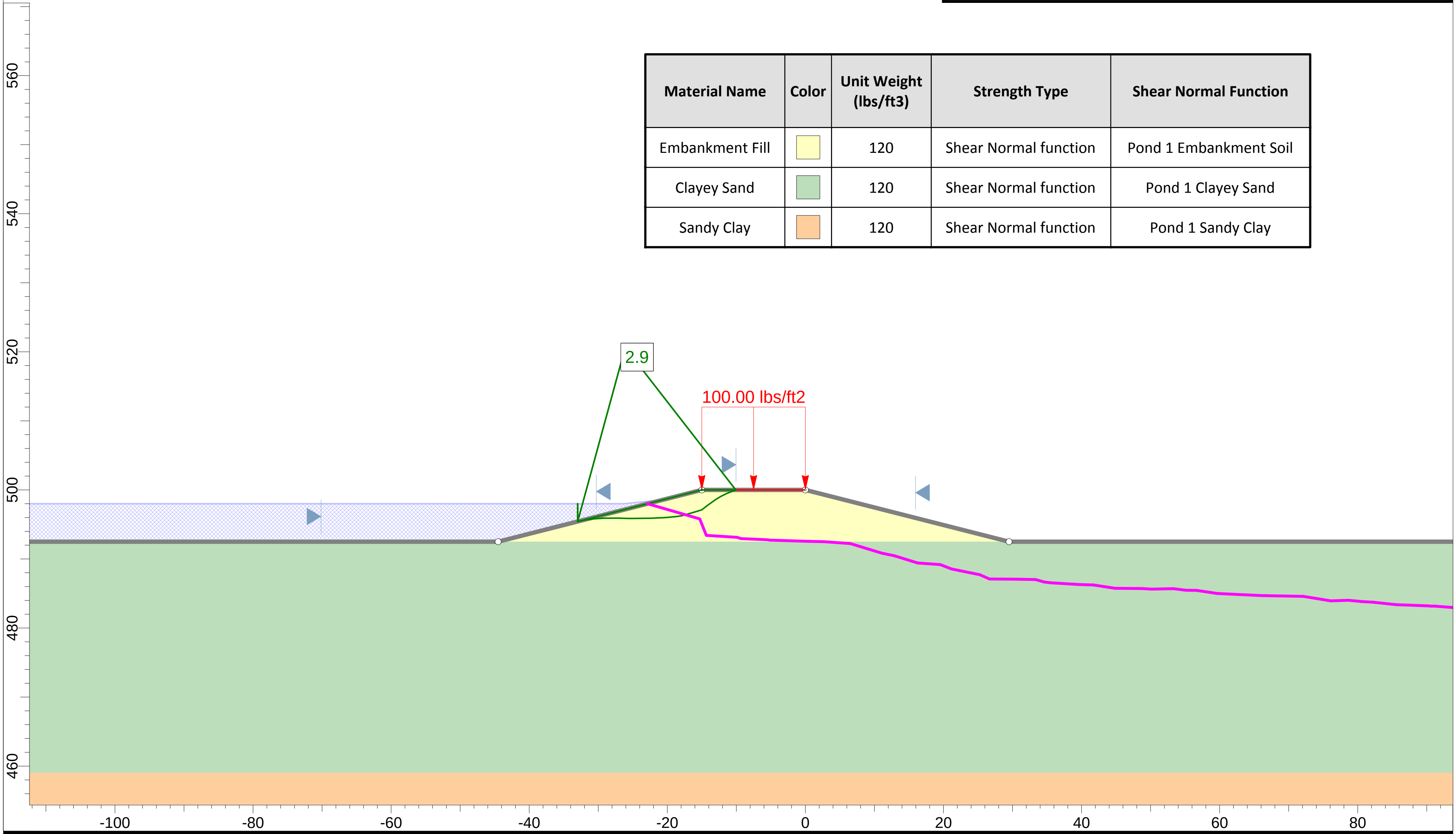
Profile "L" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-13a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay

Profile "L" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

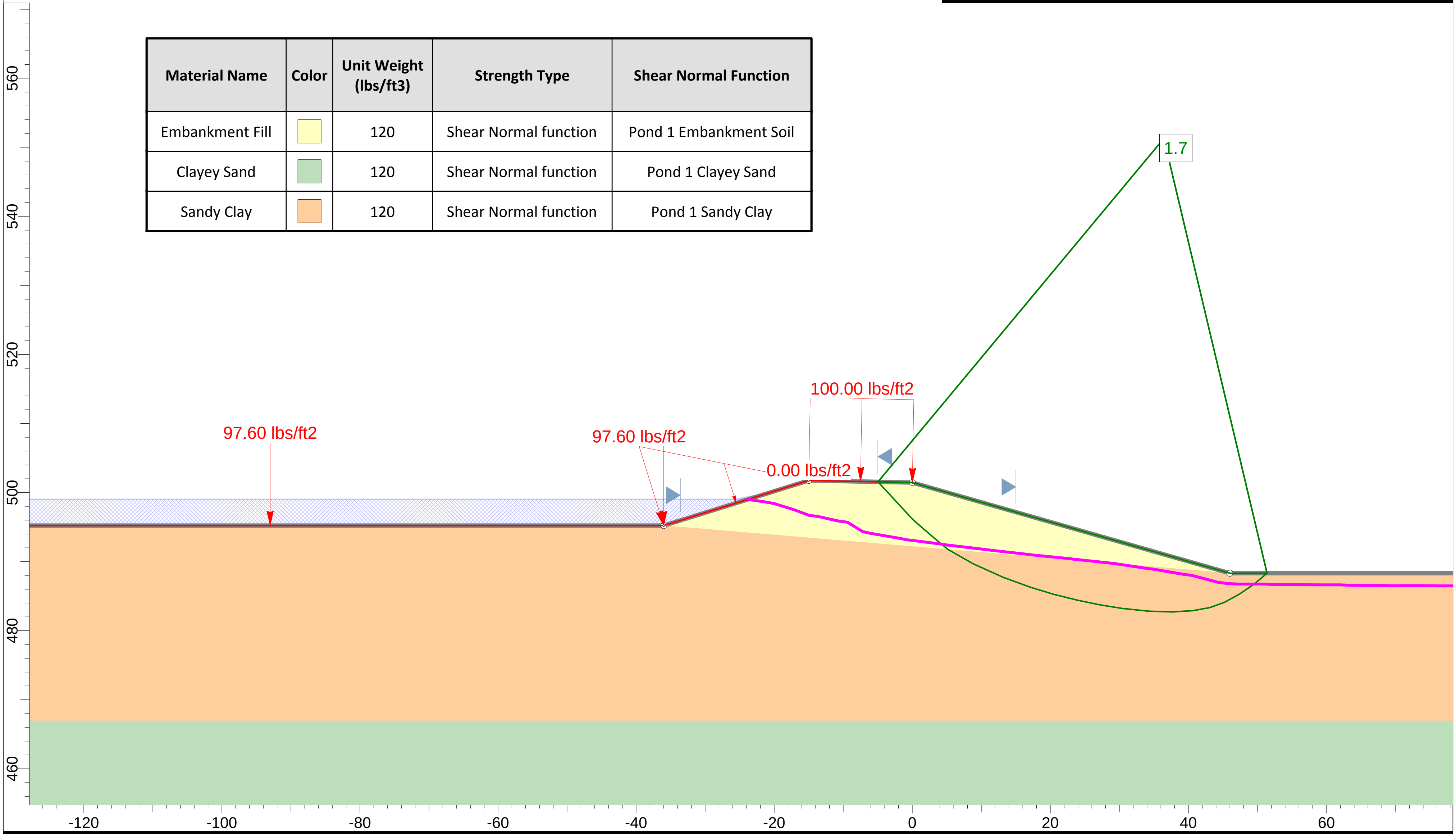
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-13b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



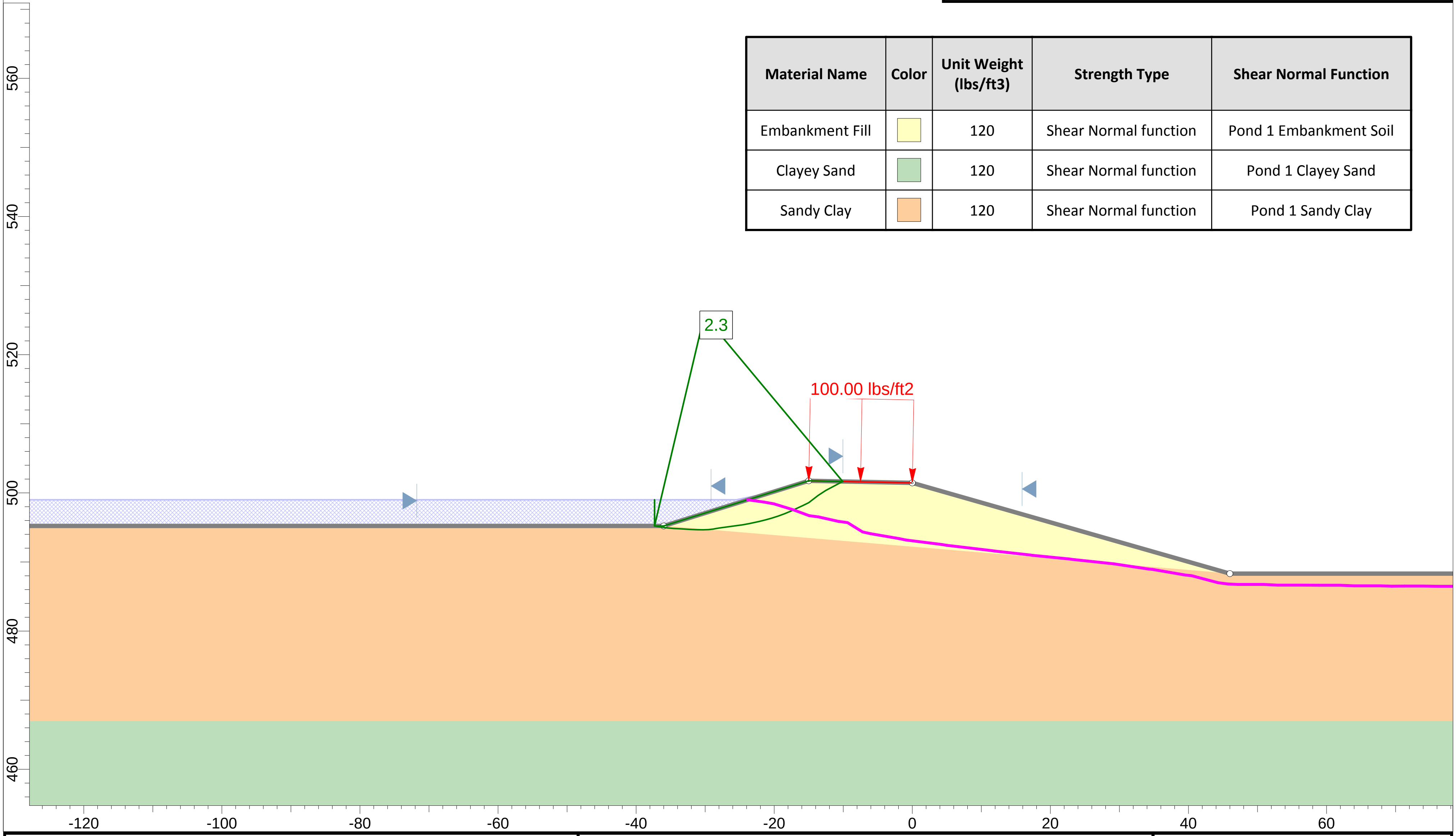
Profile "M" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-14a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



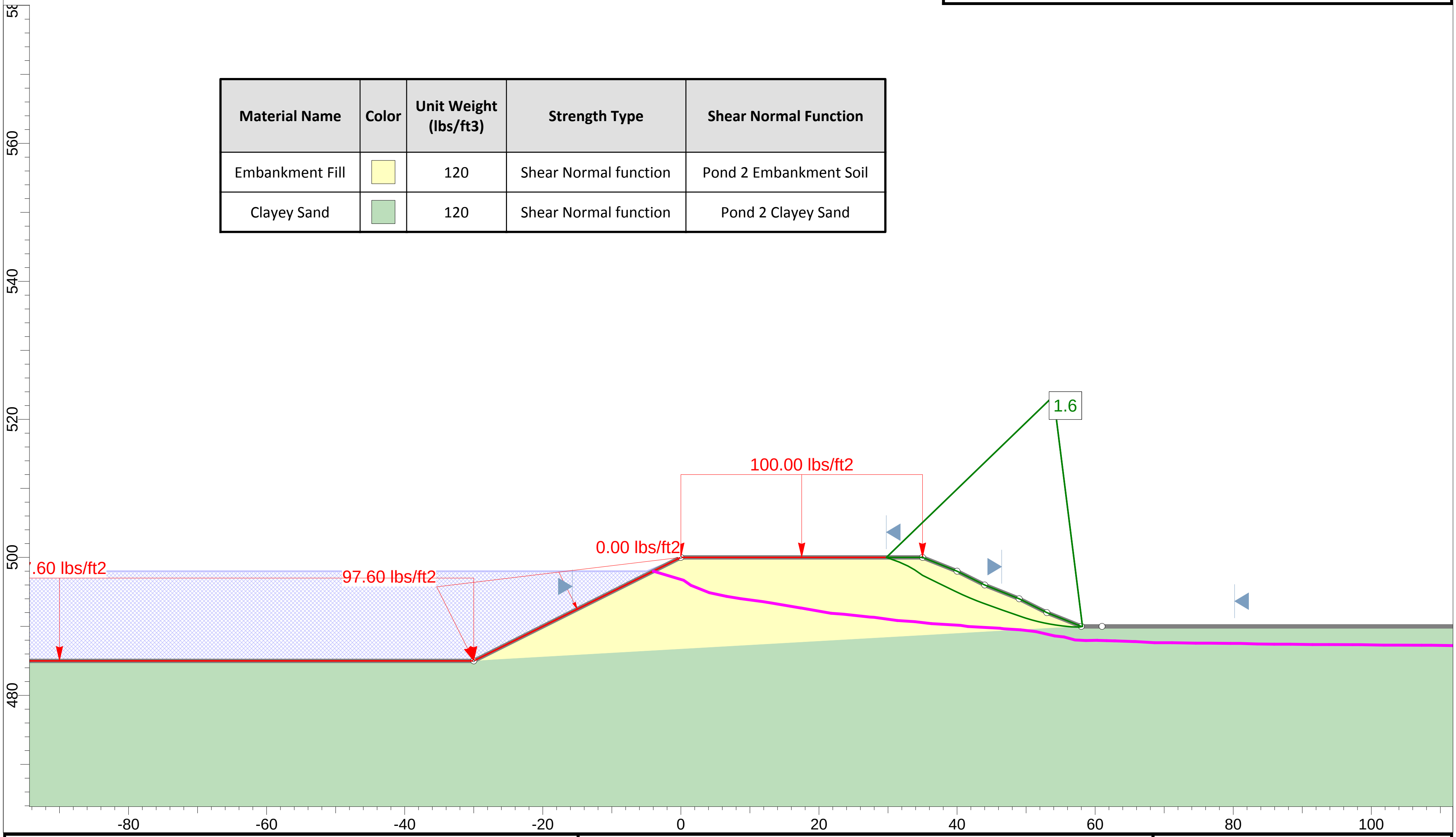
Profile "M" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-14b

RABA KISTNER CONSULTANTS

Global Stability Analysis



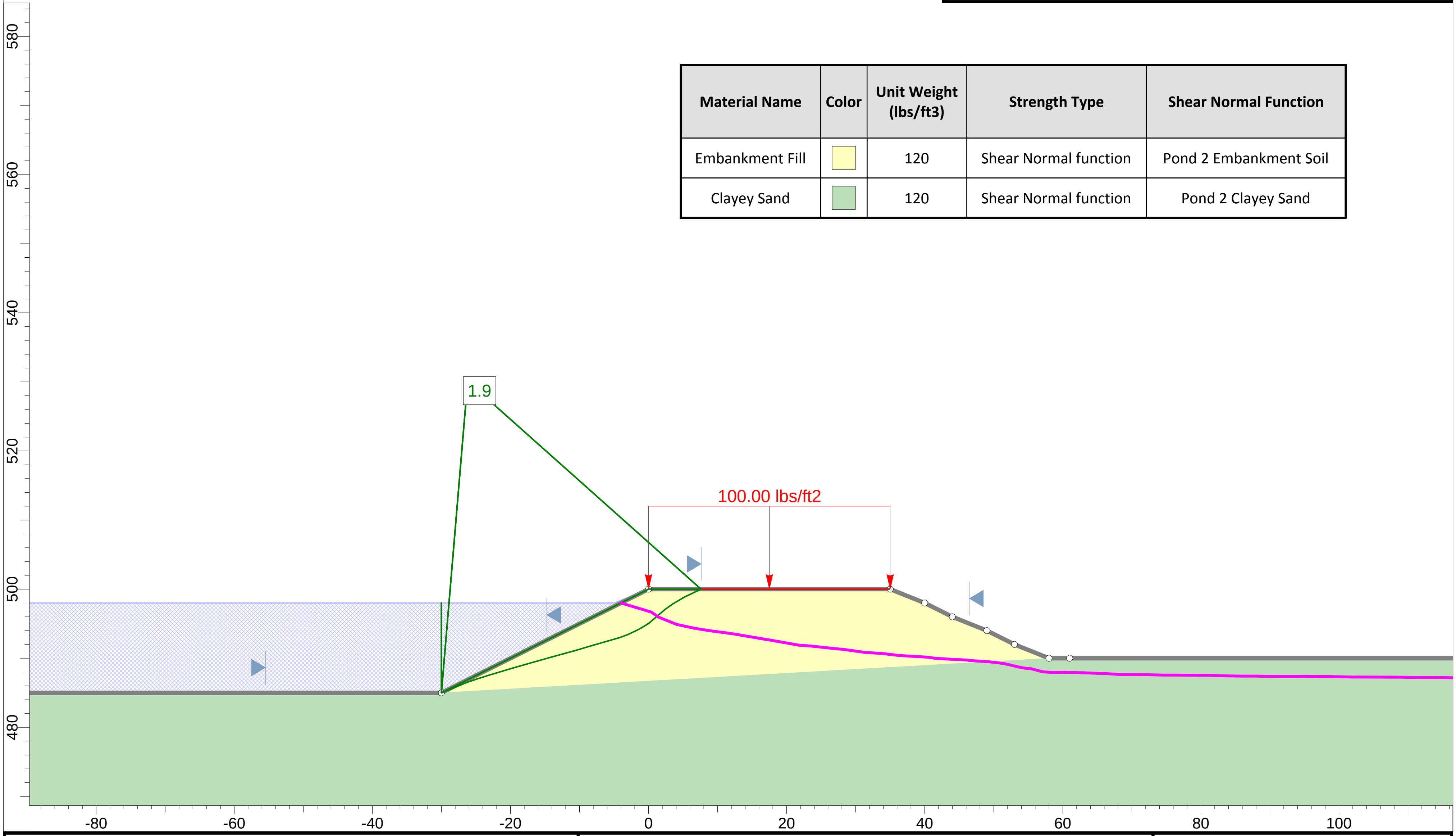
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand

Profile "N" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-15a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand

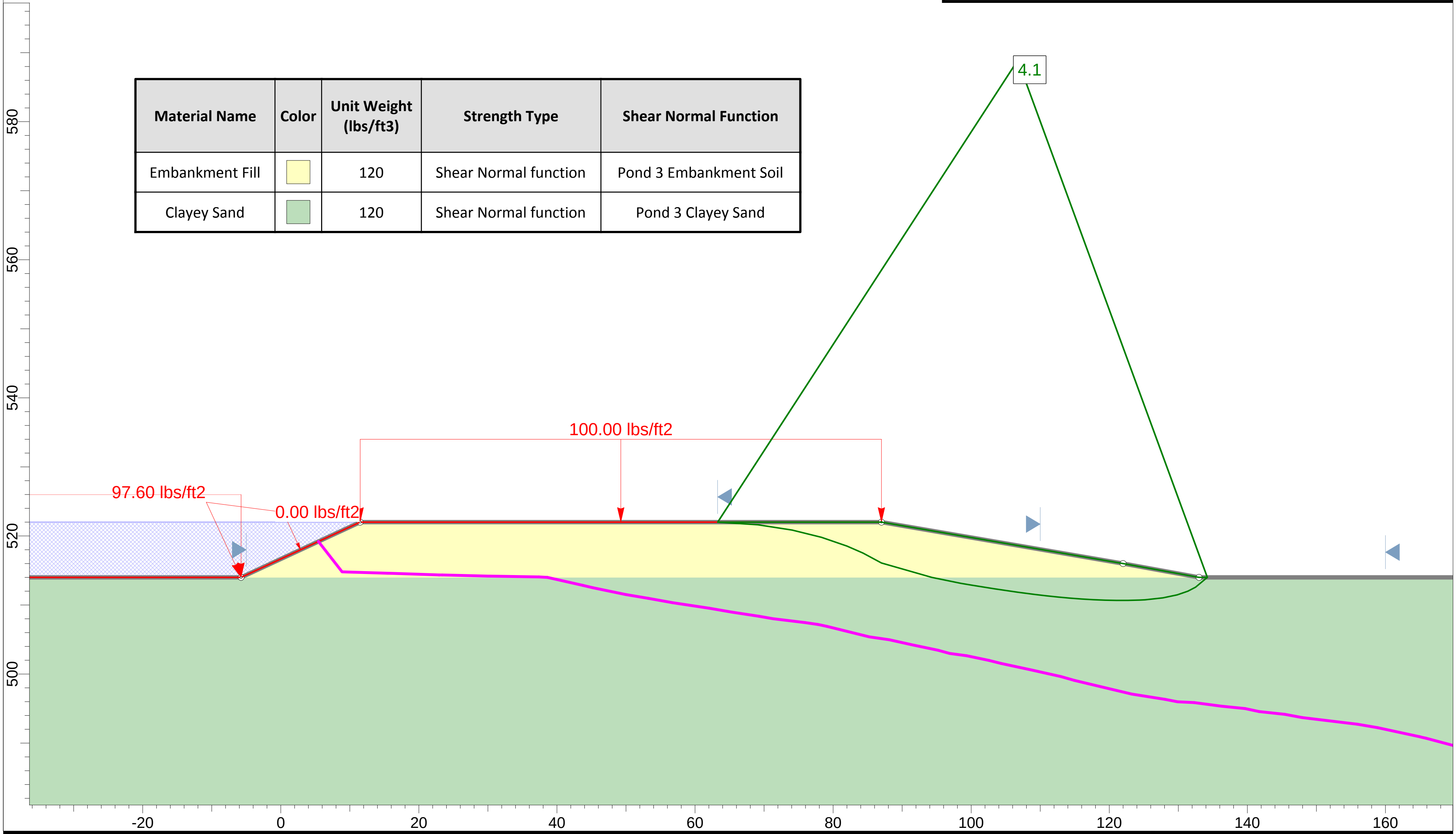
Profile "N" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-15b

RABA KISTNER CONSULTANTS

Global Stability Analysis



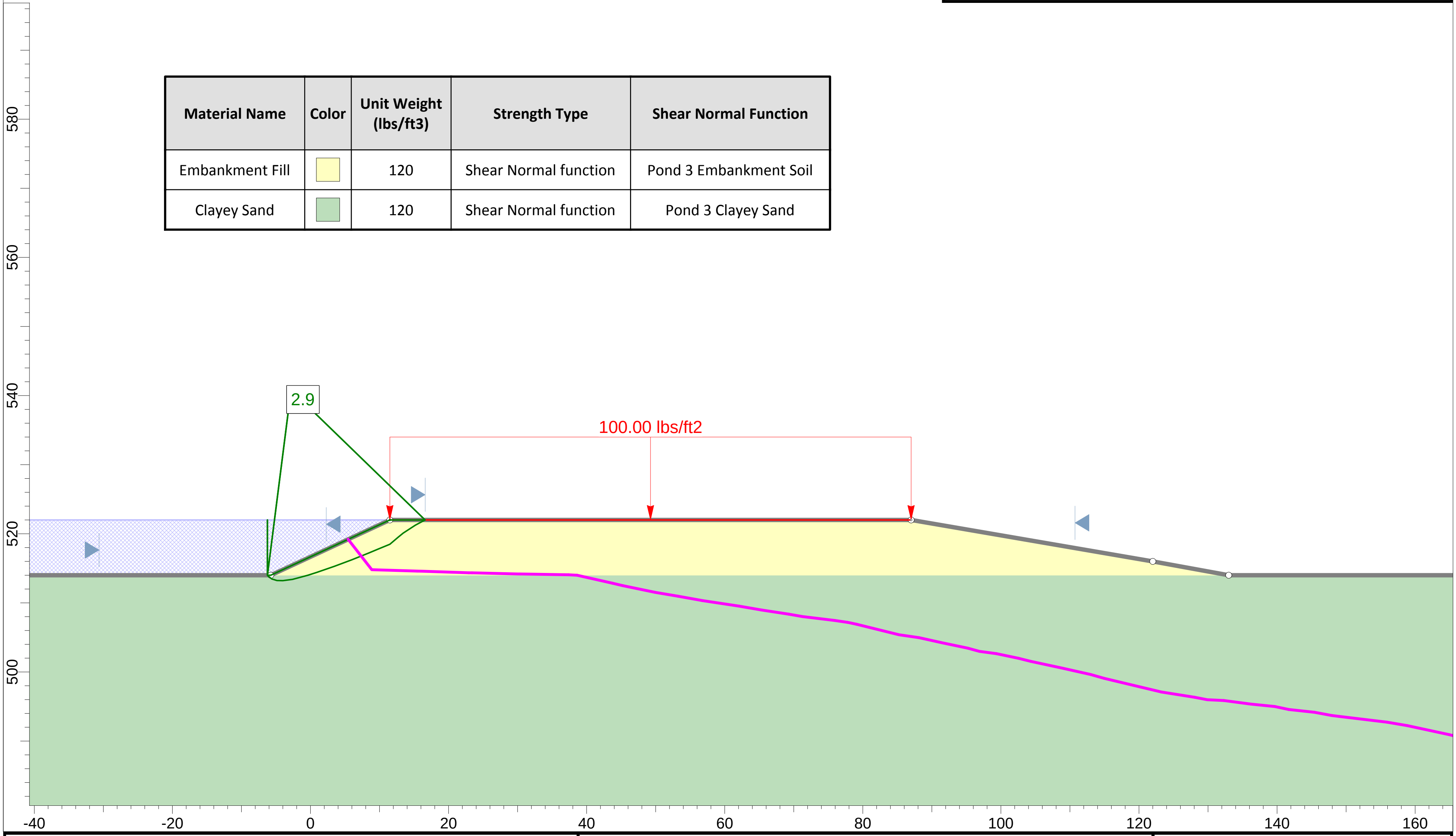
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand

Profile "A" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-16a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand

Profile "A" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

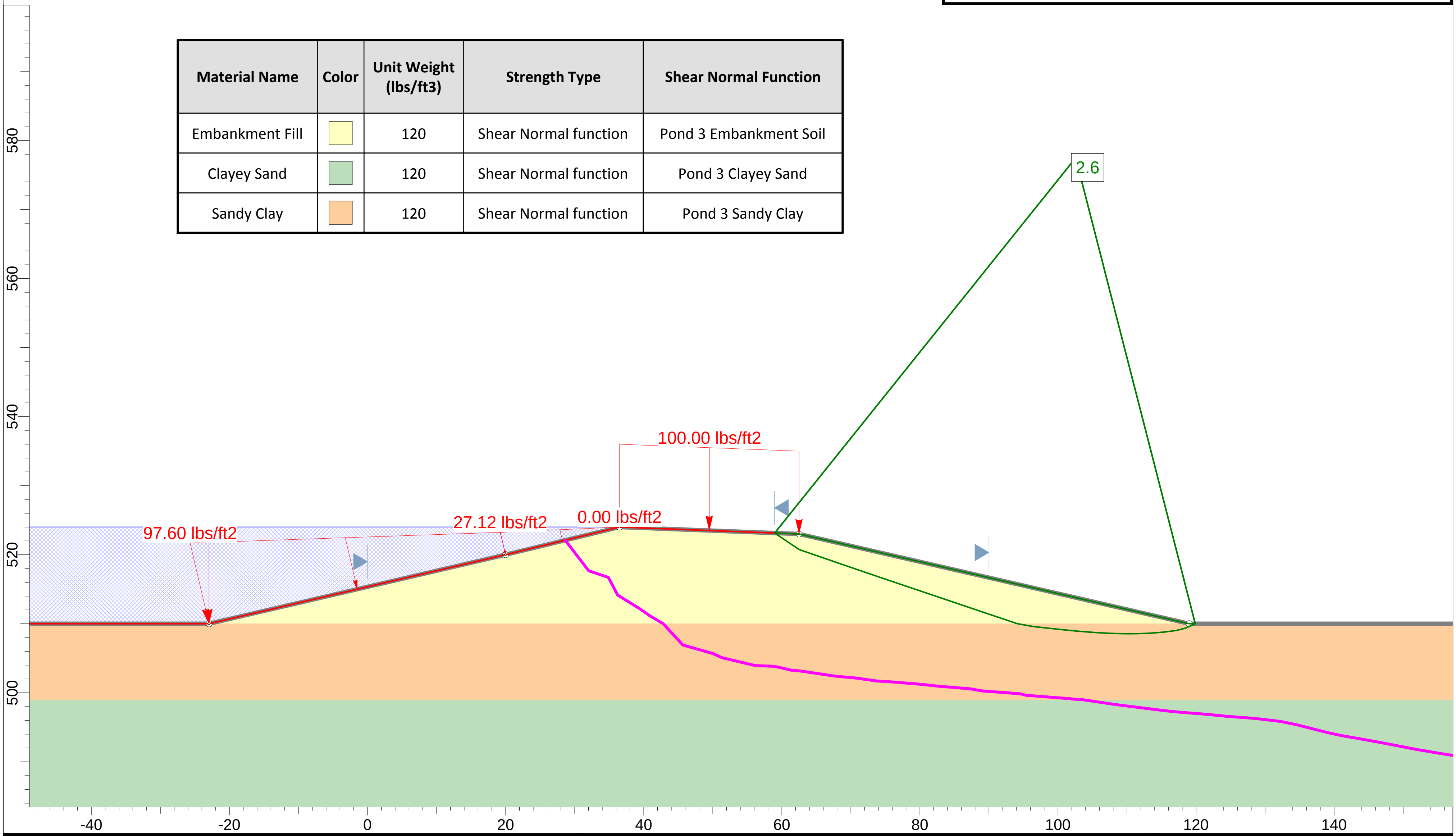
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-16b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay



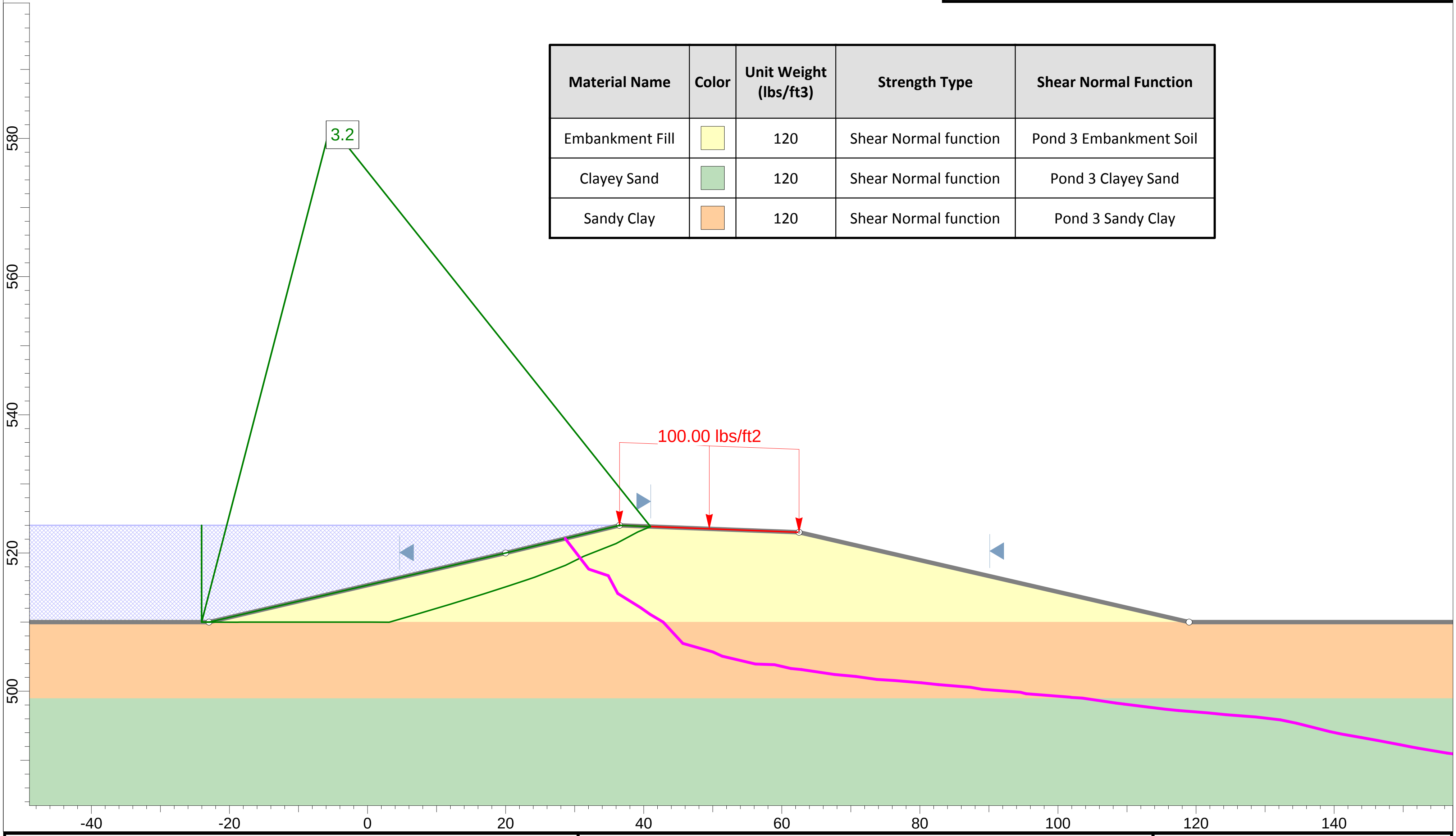
Profile "B" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-17a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay



Profile "B" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

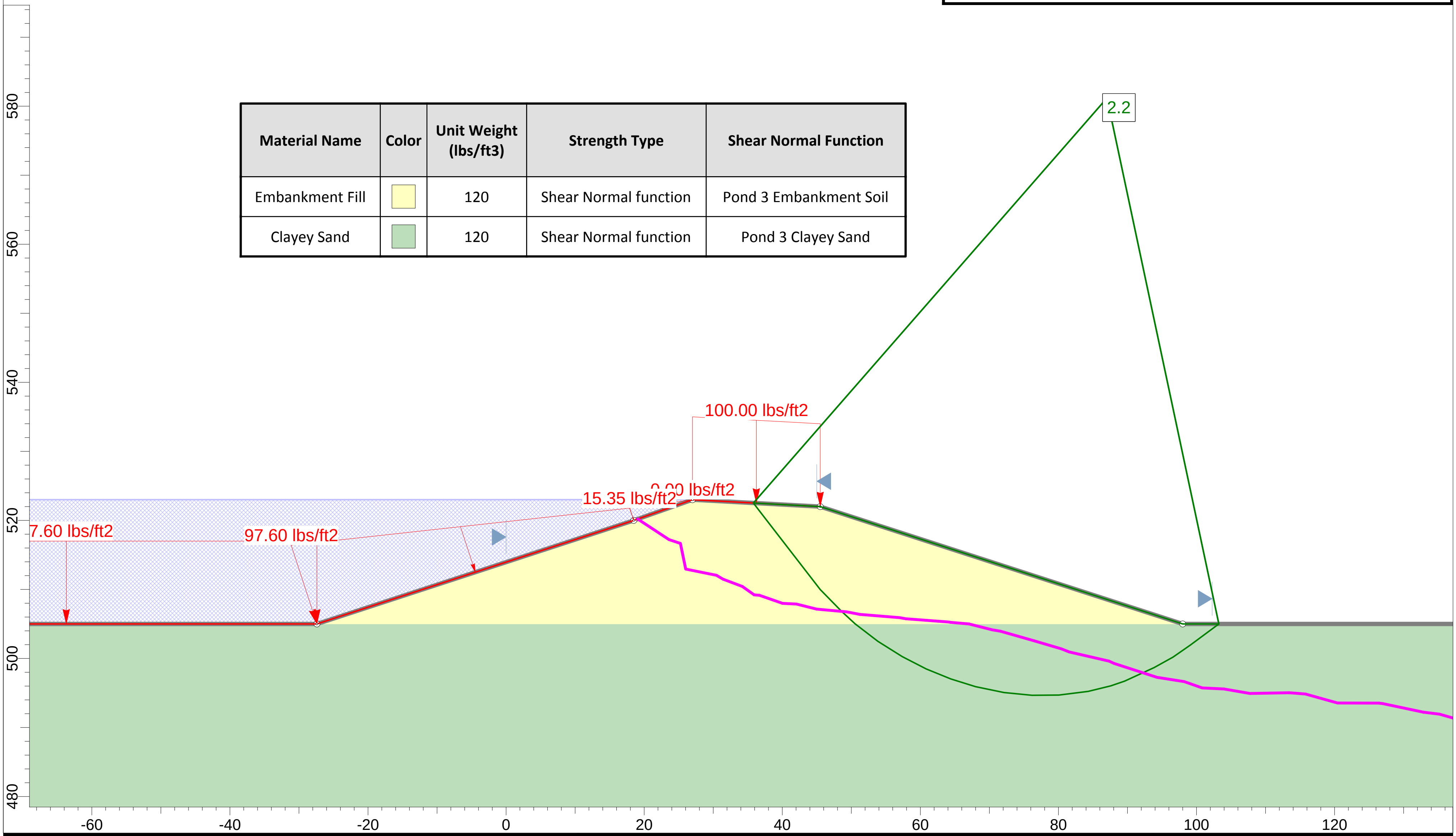
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-17b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand



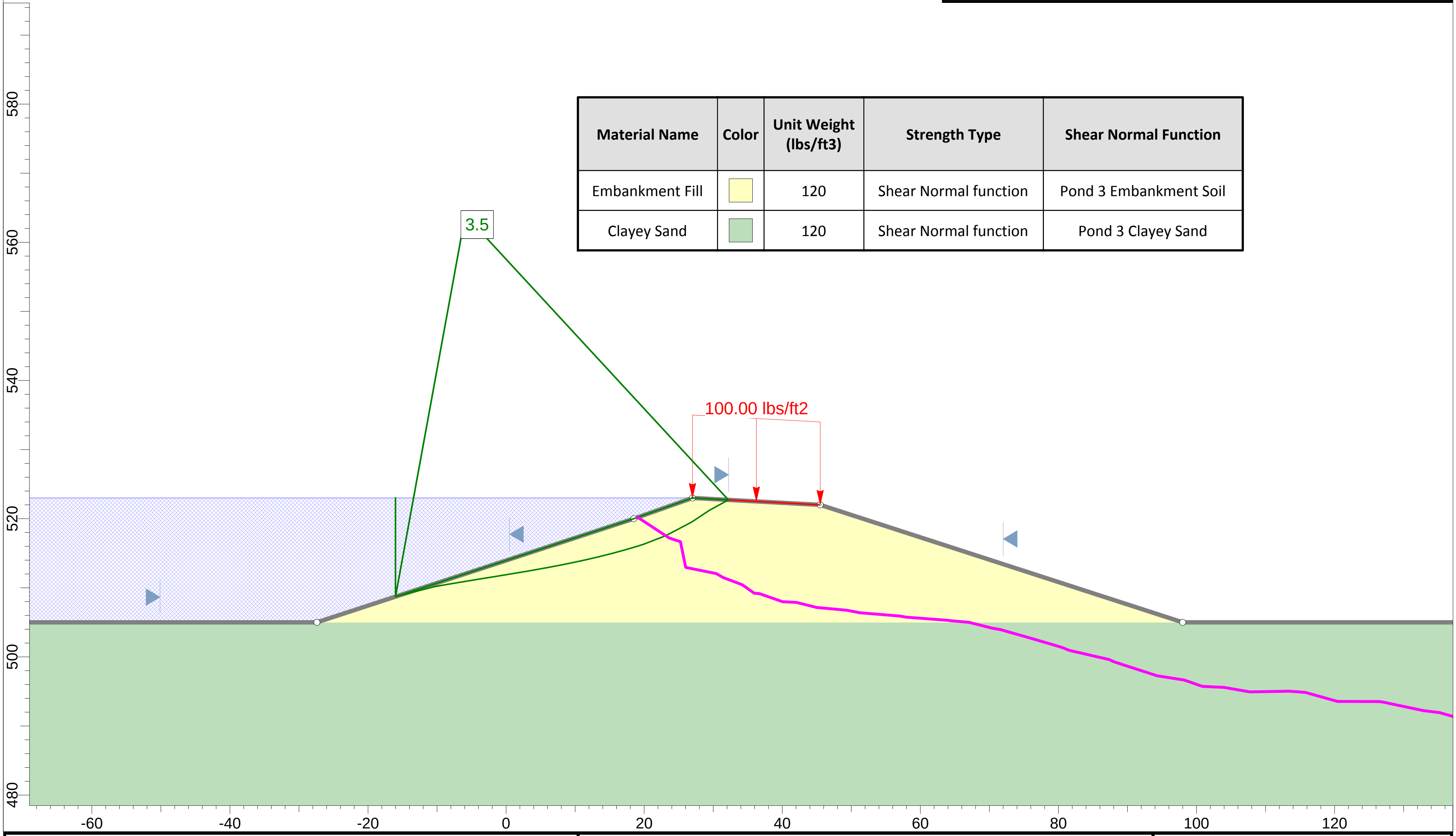
Profile "C" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-18a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand

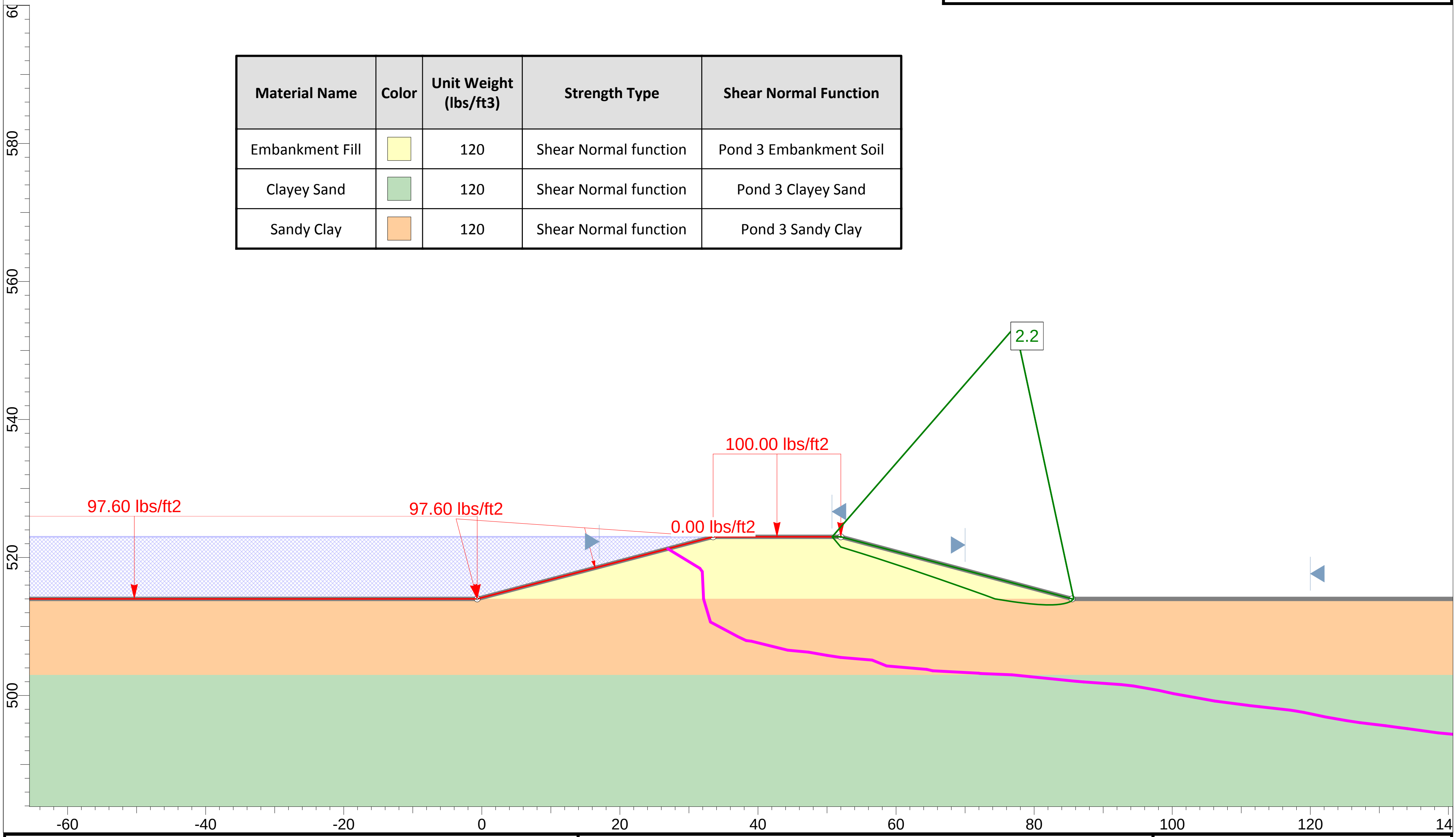
Profile "C" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-18b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay



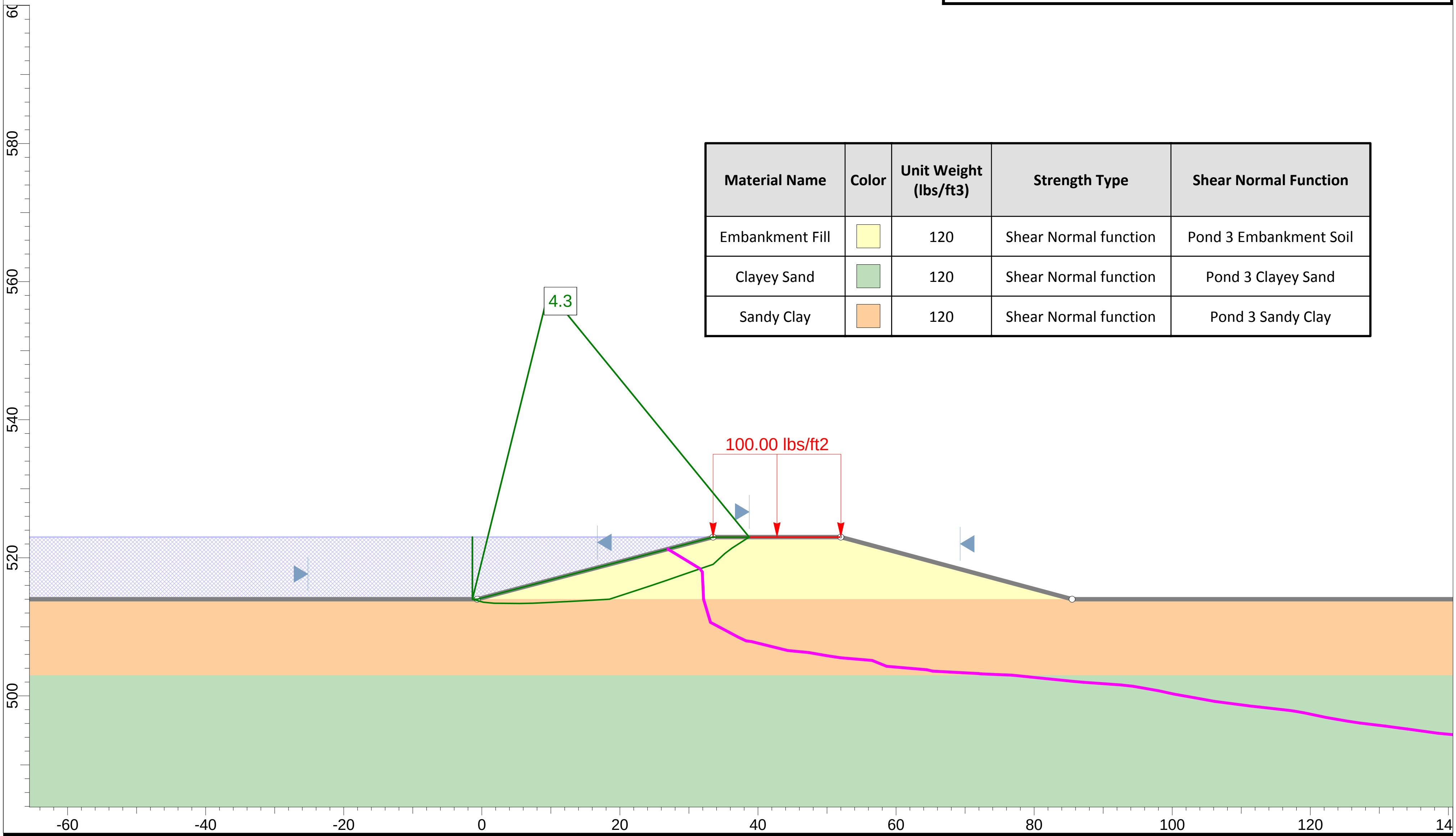
Profile "D" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-19a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 3 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 3 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 3 Sandy Clay

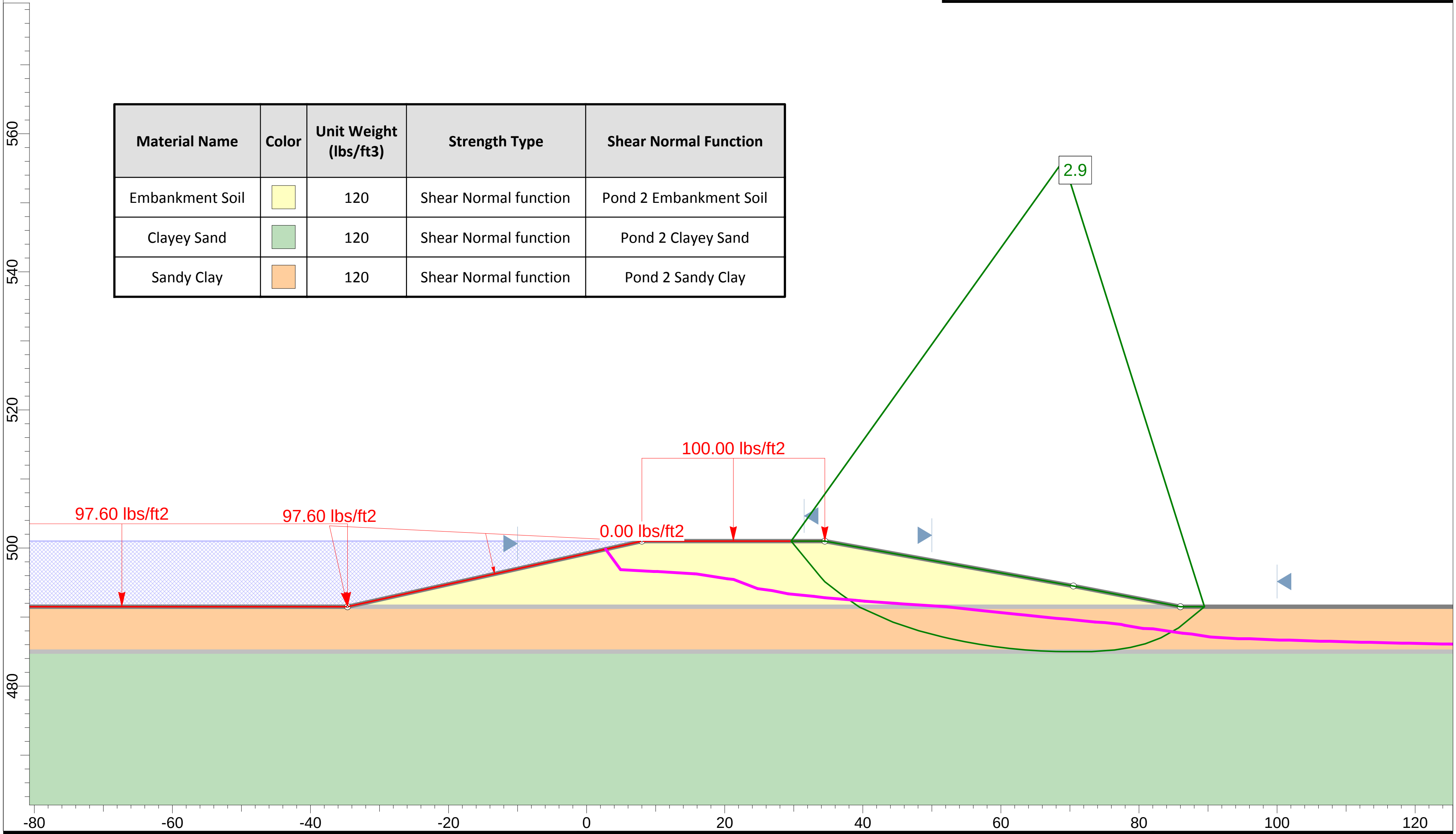
Profile "D" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-19b

RABA KISTNER CONSULTANTS

Global Stability Analysis



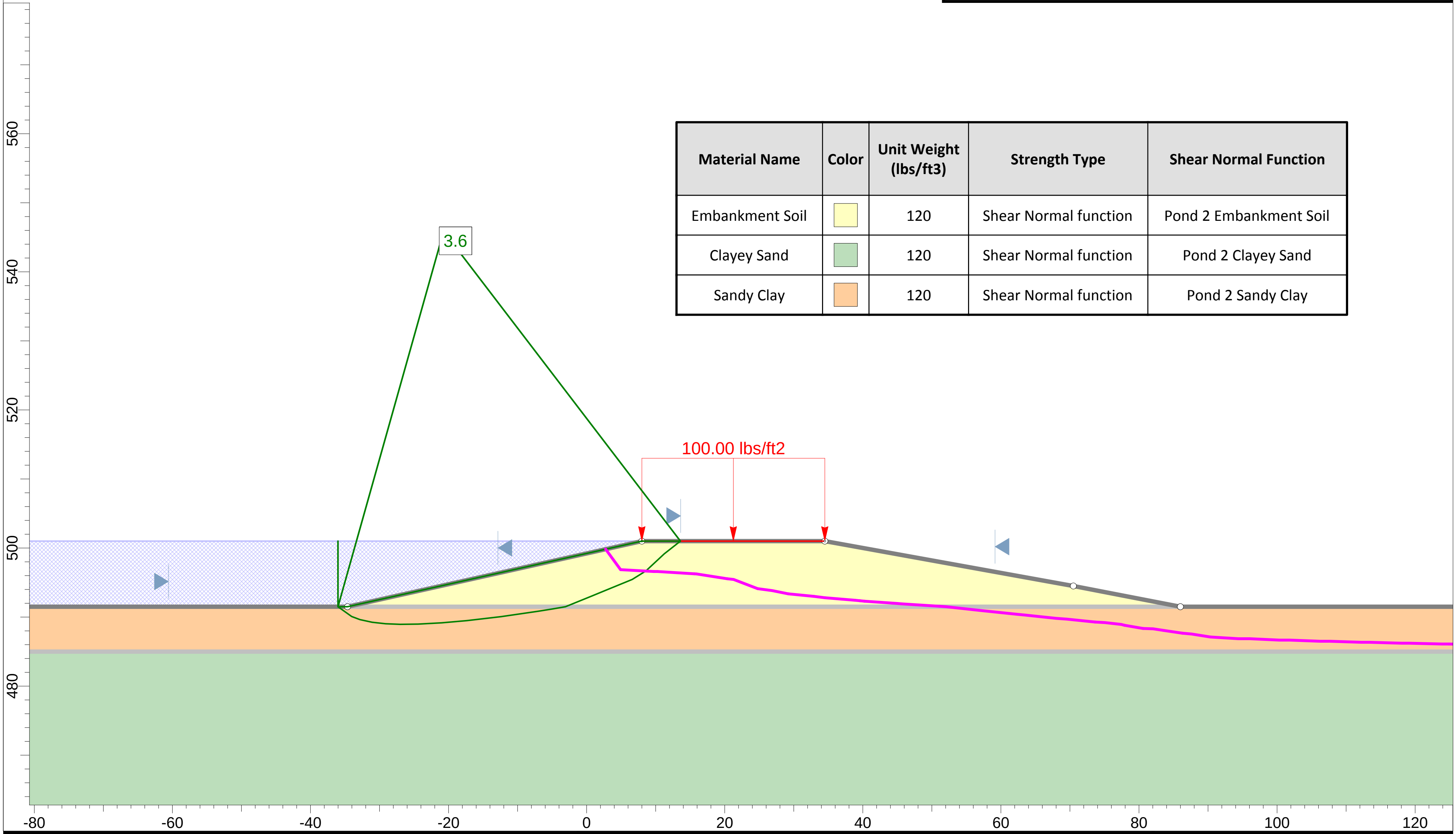
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Soil	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "E" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-20a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Soil	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "E" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

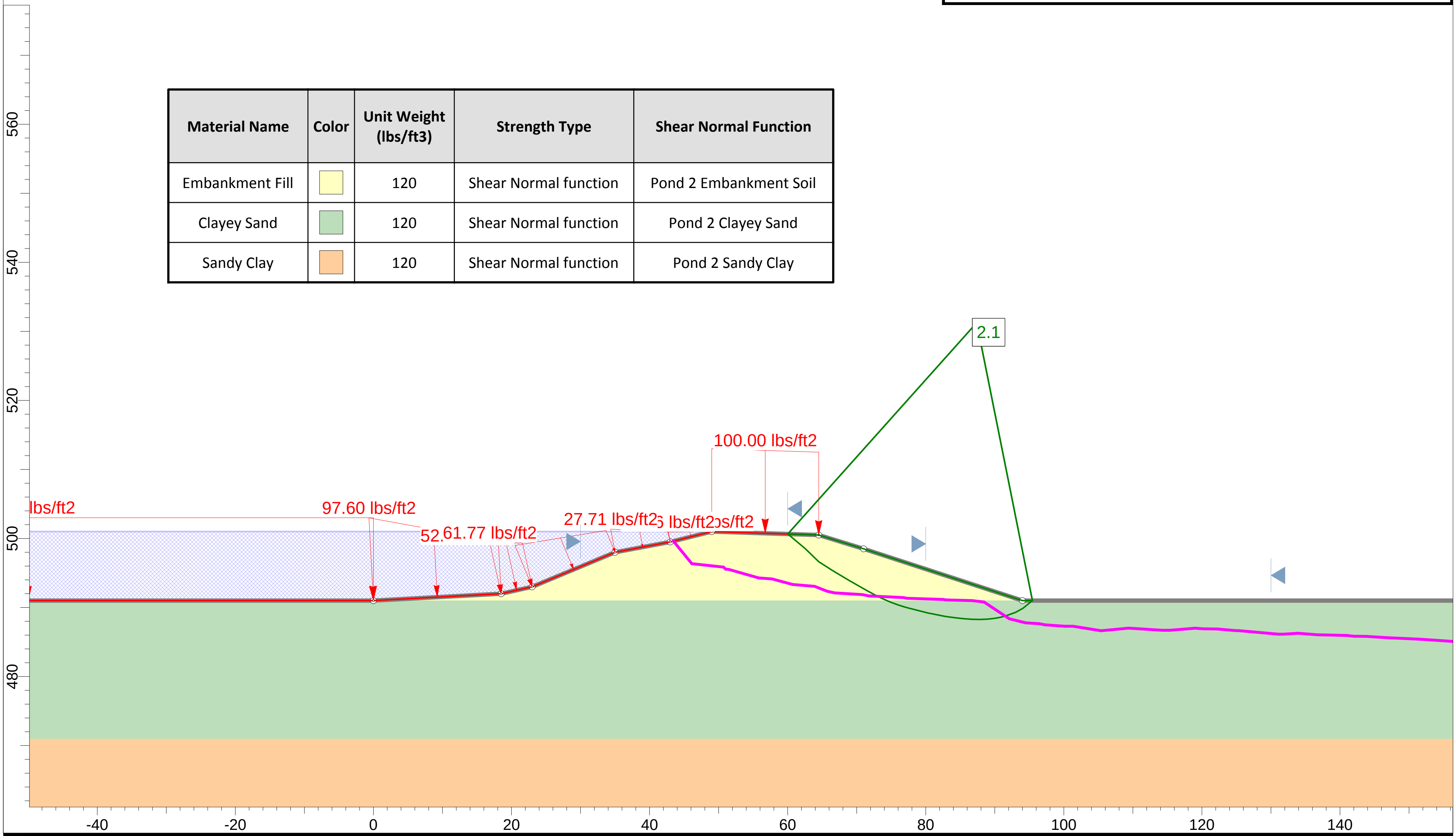
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-20b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay



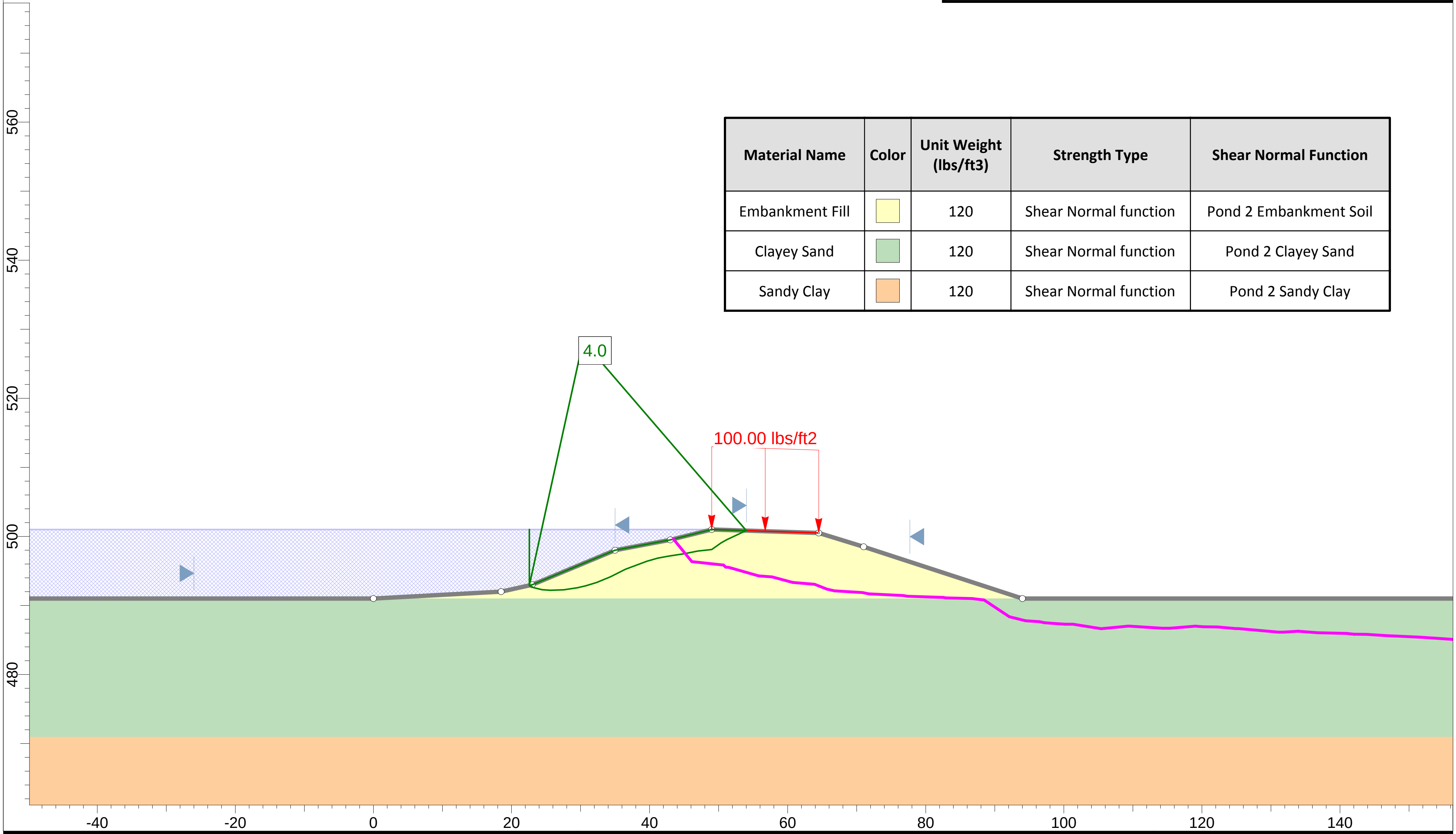
Profile "F" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-21a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

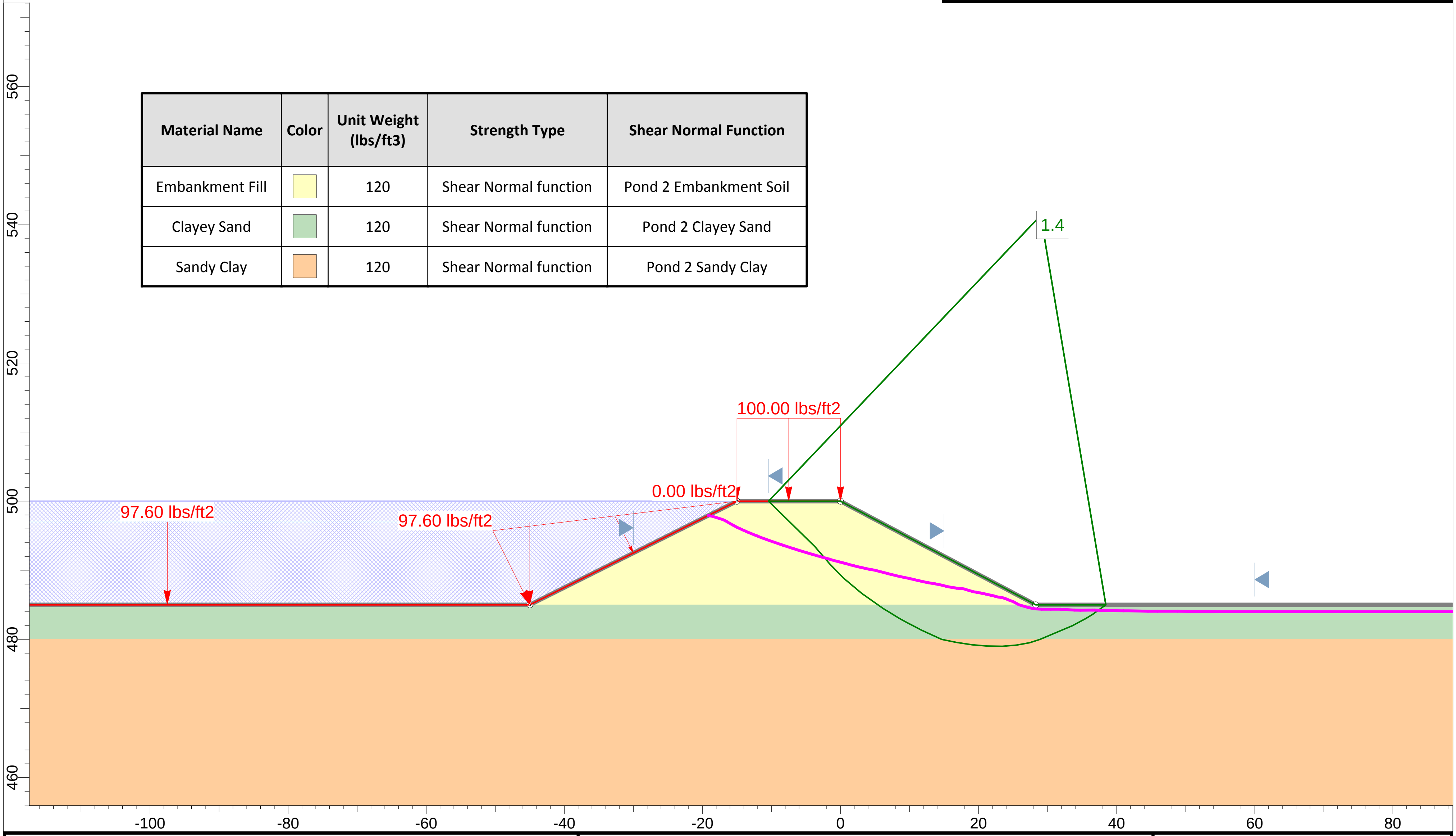
Profile "F" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-21b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay



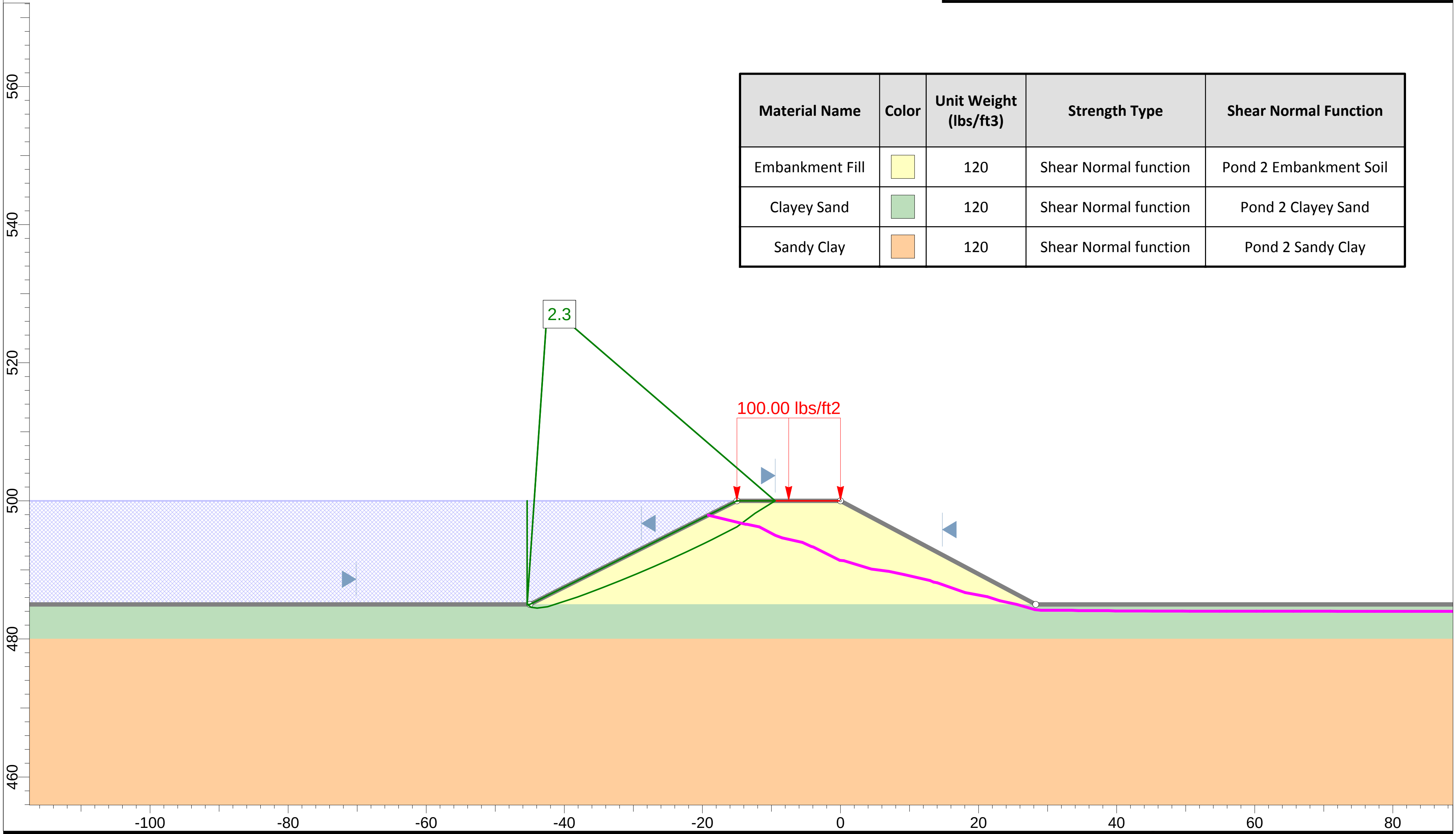
Profile "G" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-22a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay



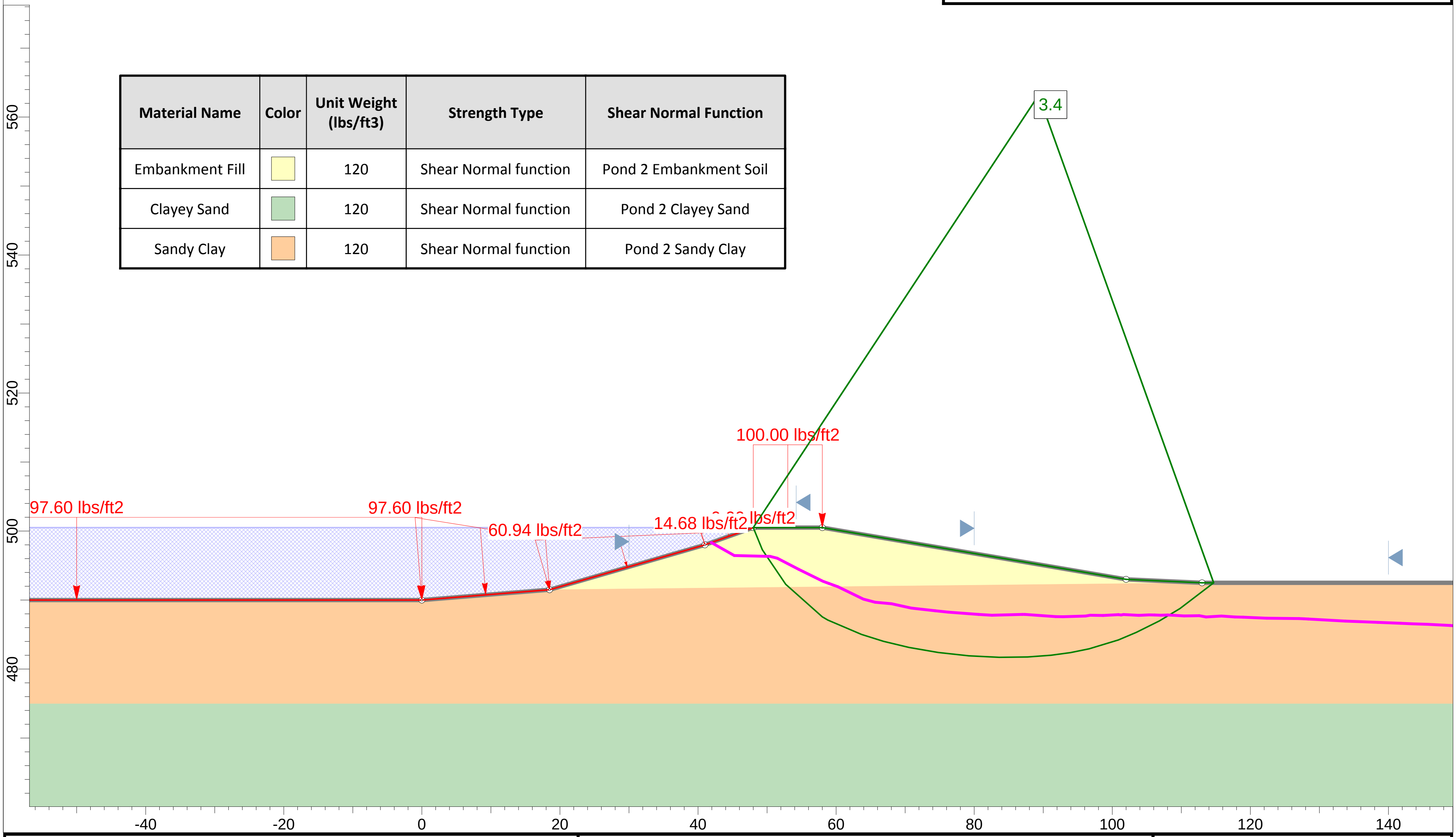
Profile "G" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-22b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

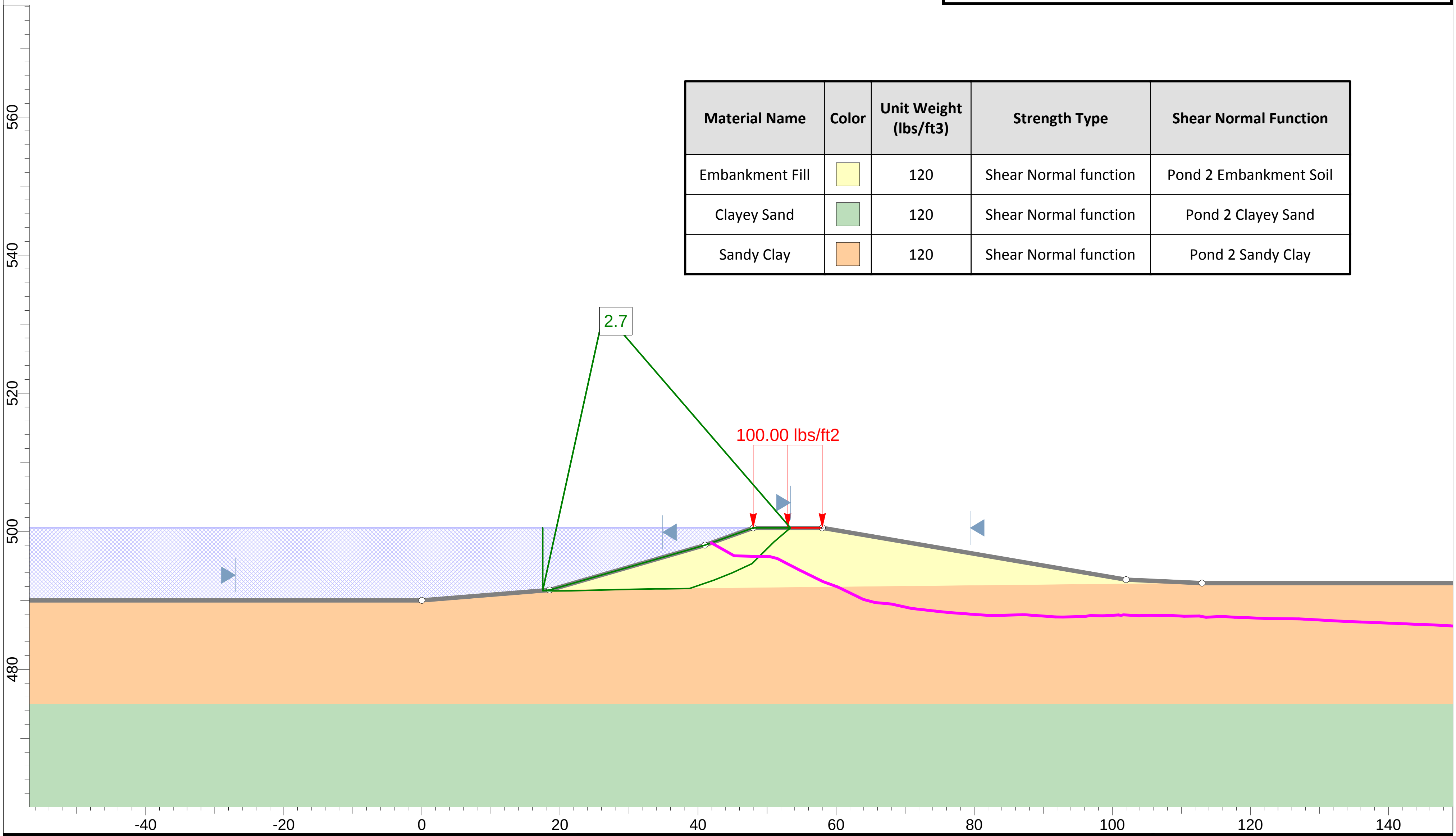
Profile "H" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-23a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "H" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

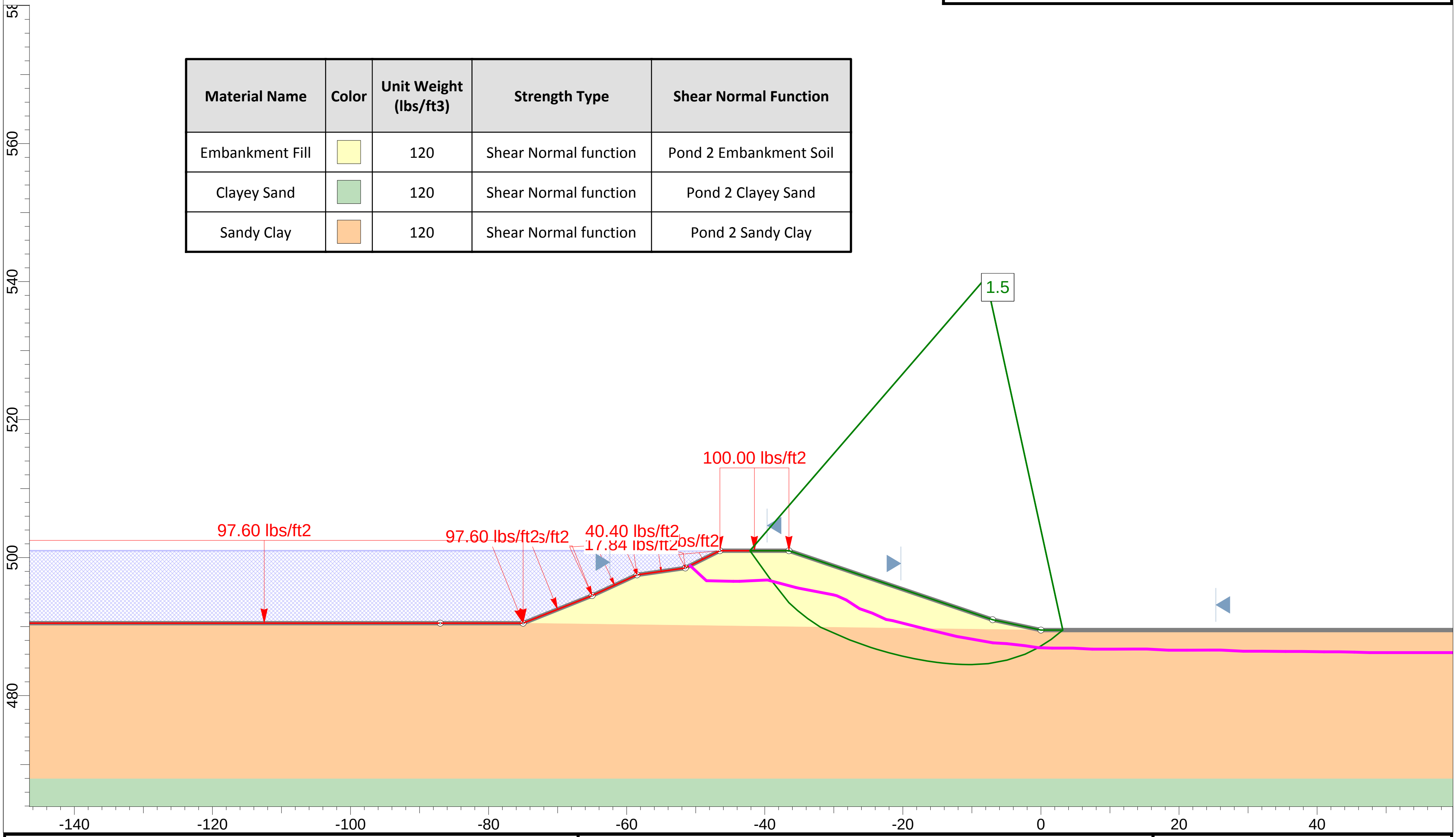
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-23b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

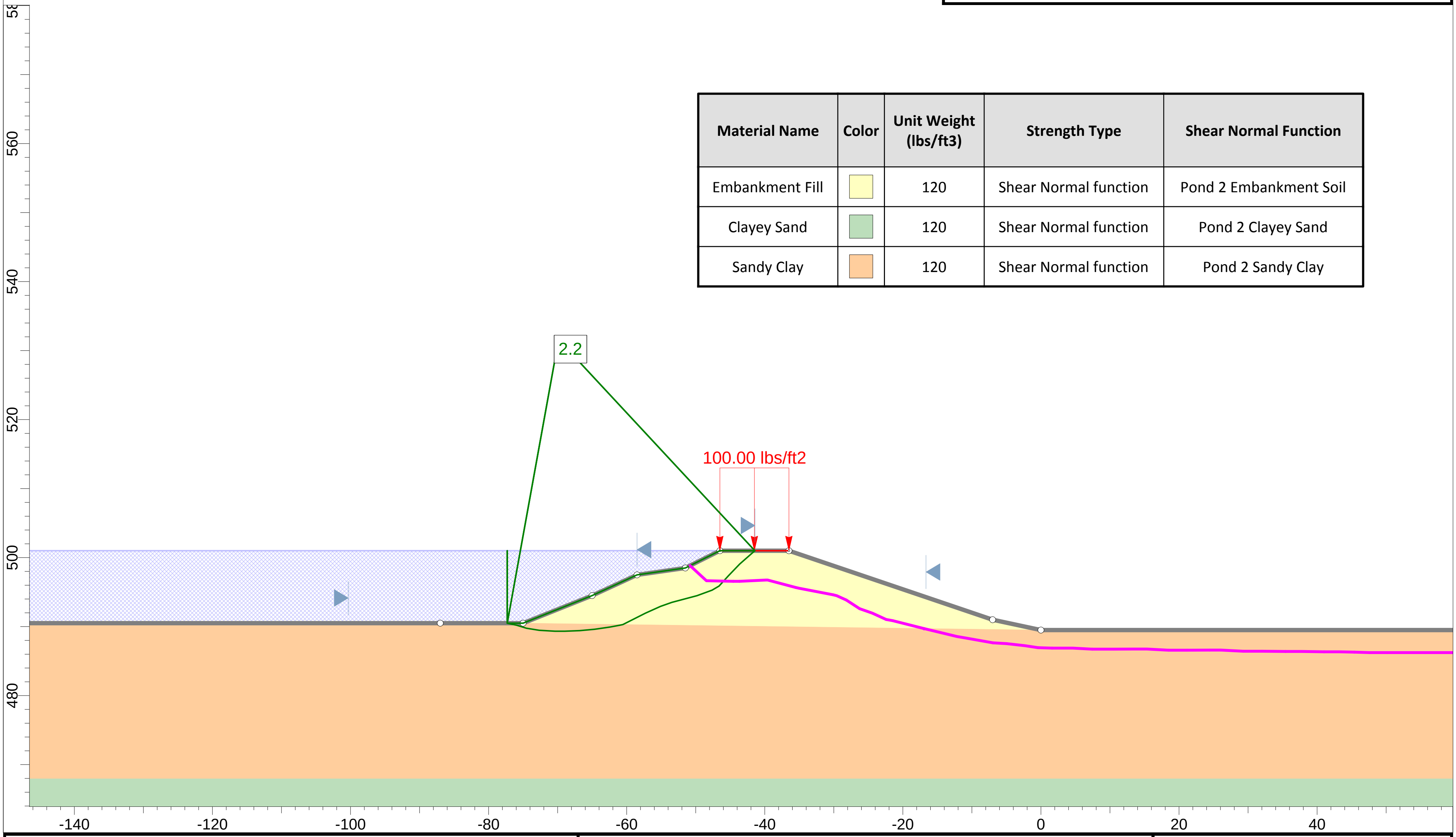


Profile "I" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-24a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 2 Sandy Clay

Profile "I" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

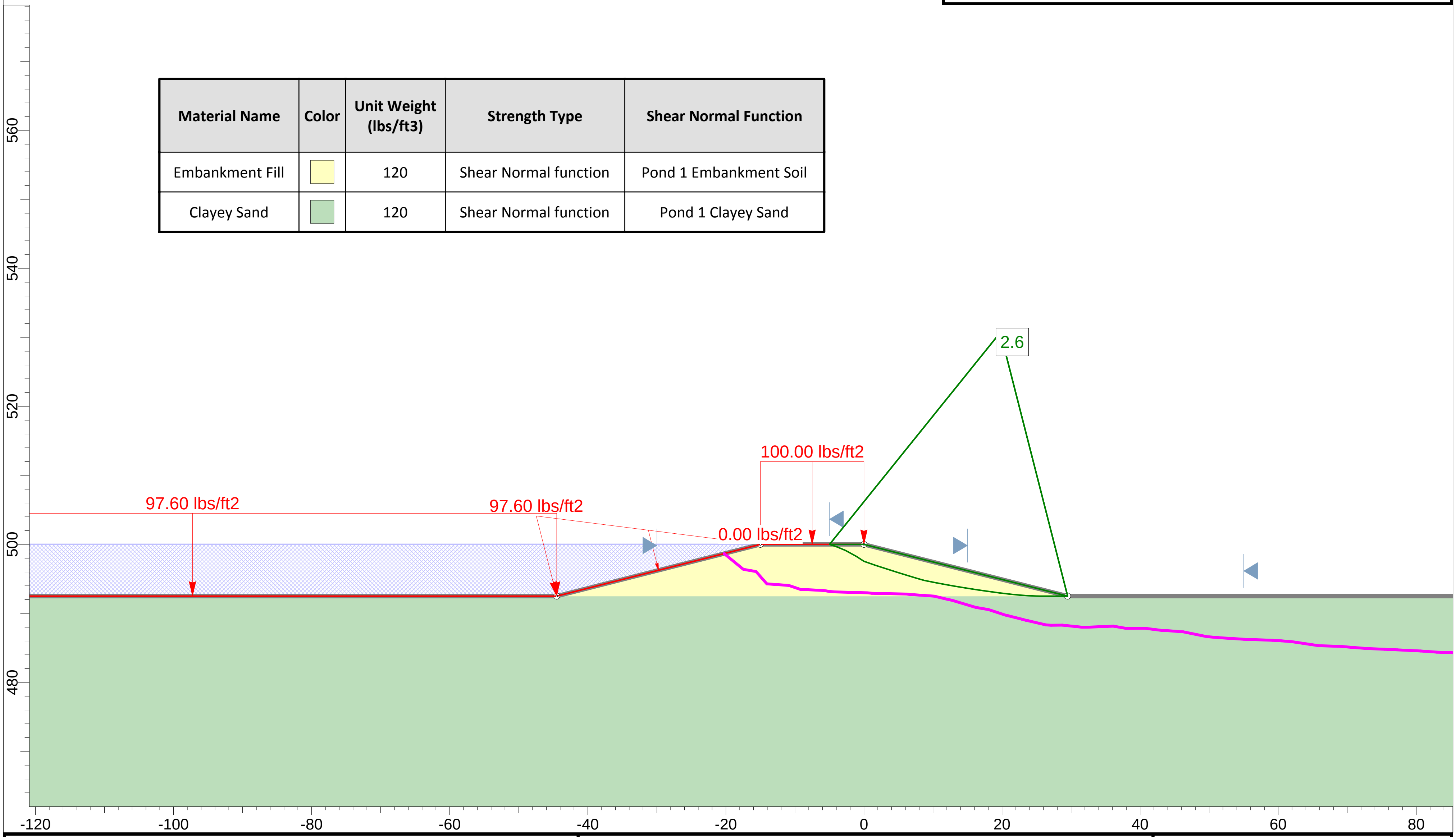
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-24b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand



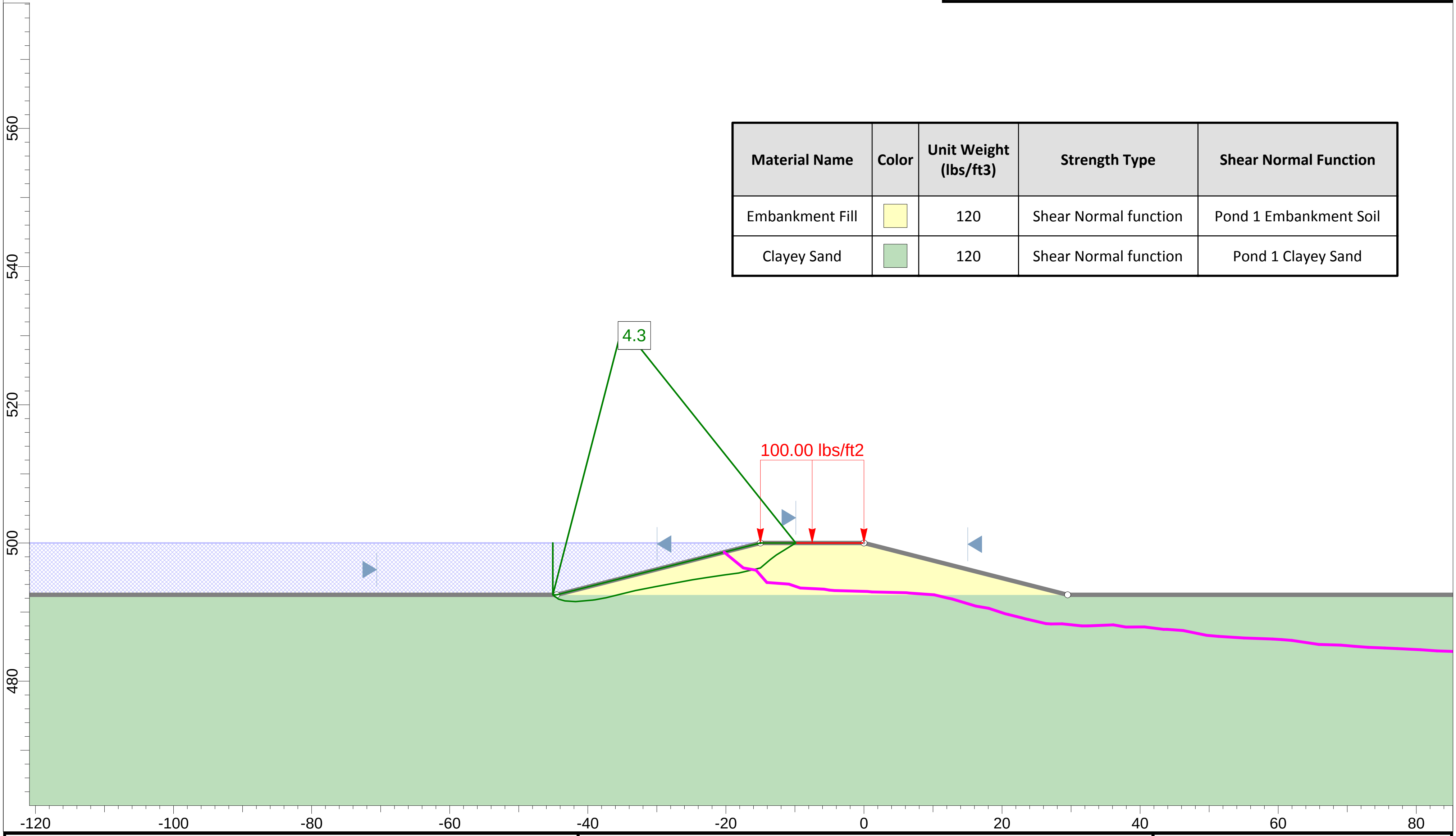
Profile "J" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-25a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand

Profile "J" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

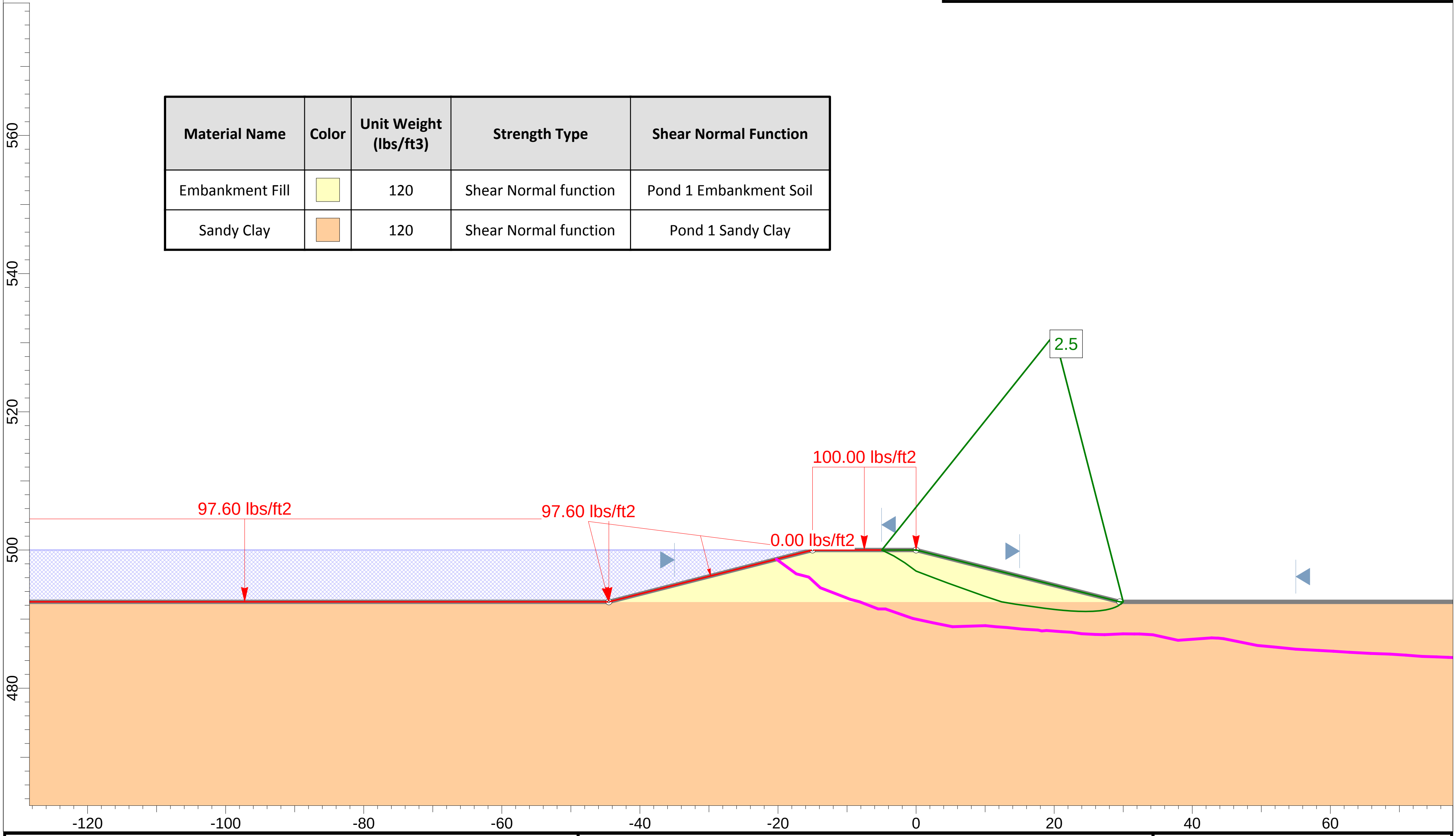
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-25b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



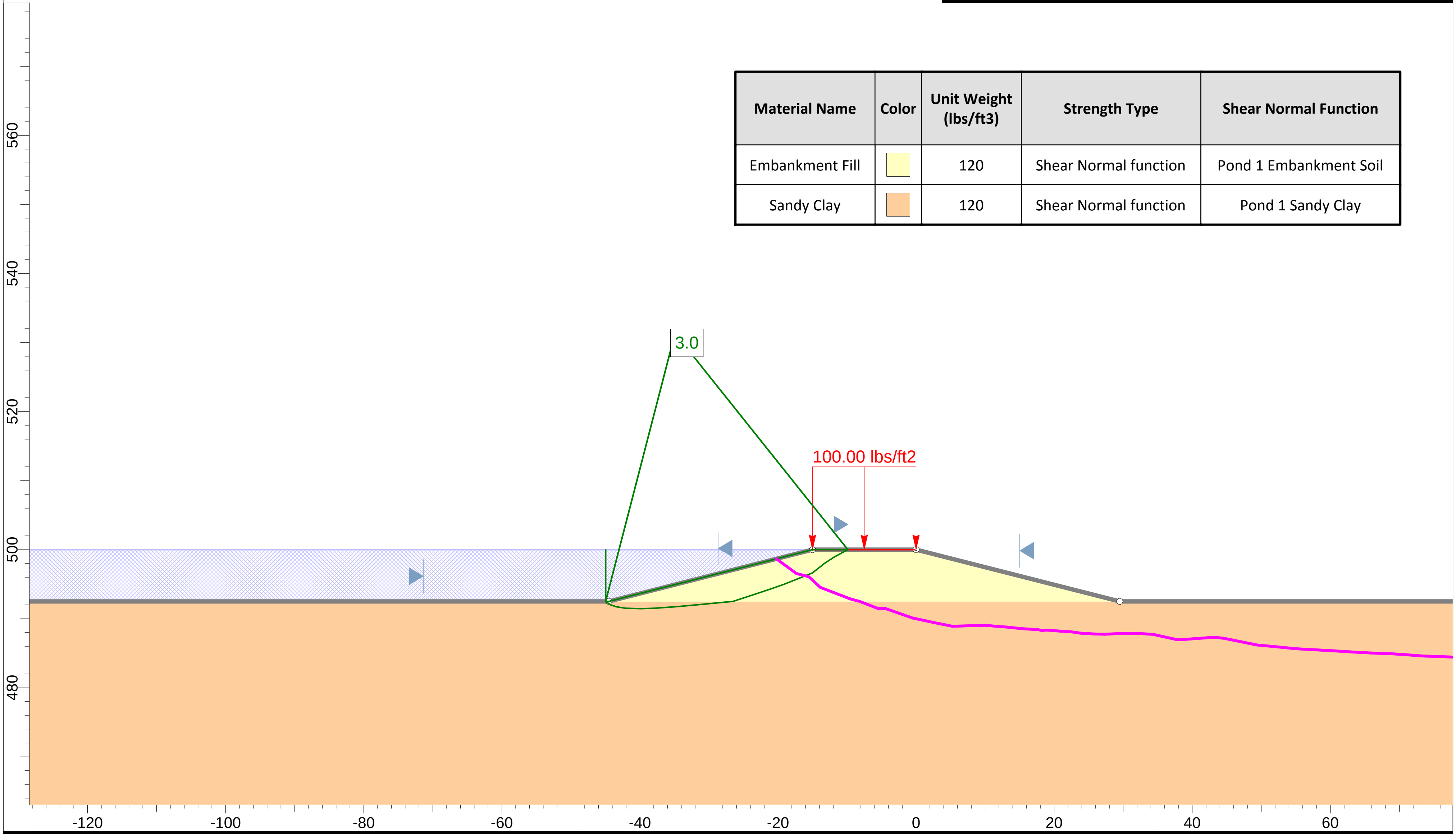
Profile "K" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-26a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



Profile "K" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

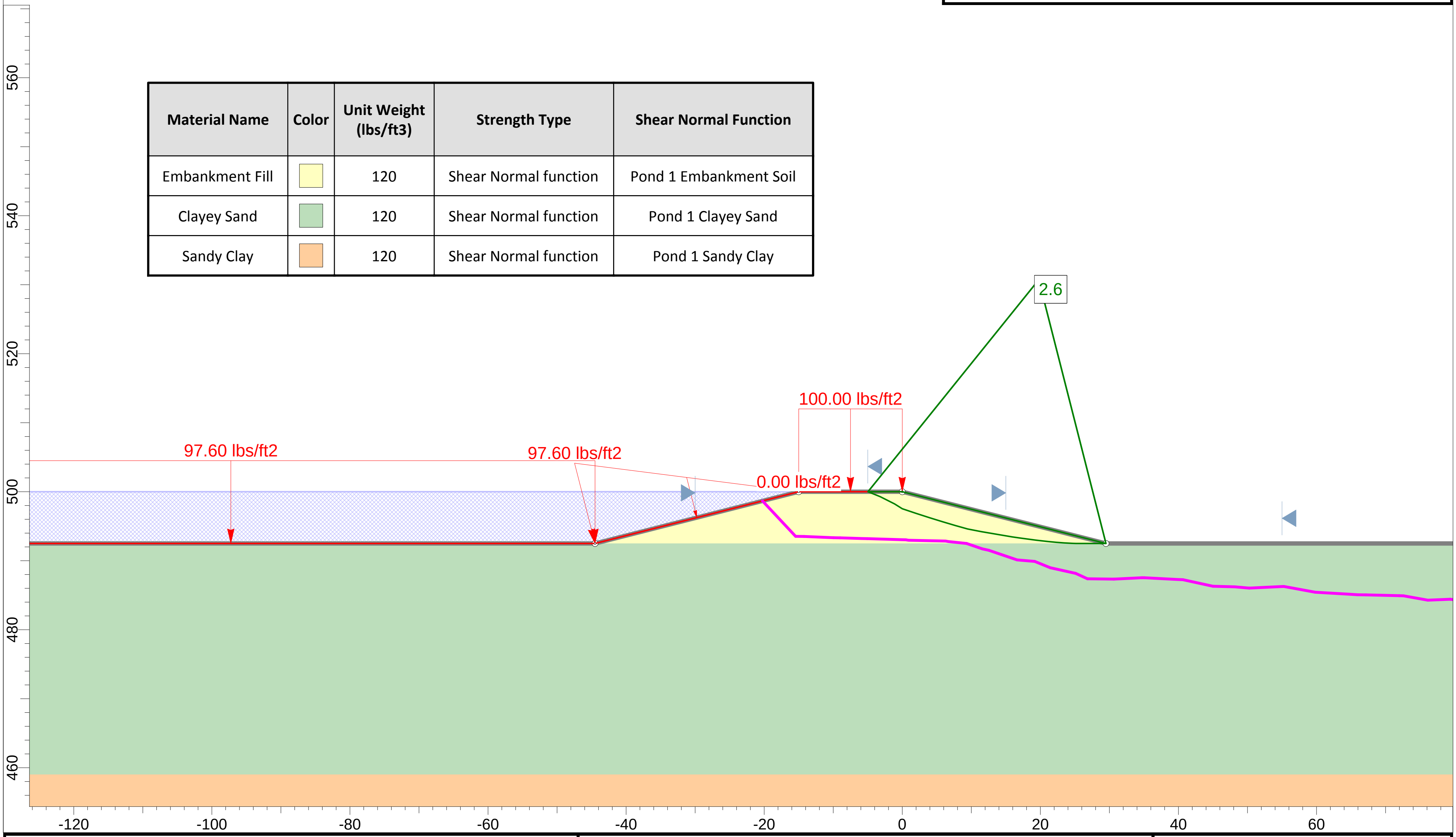
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-26b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



Profile "L" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

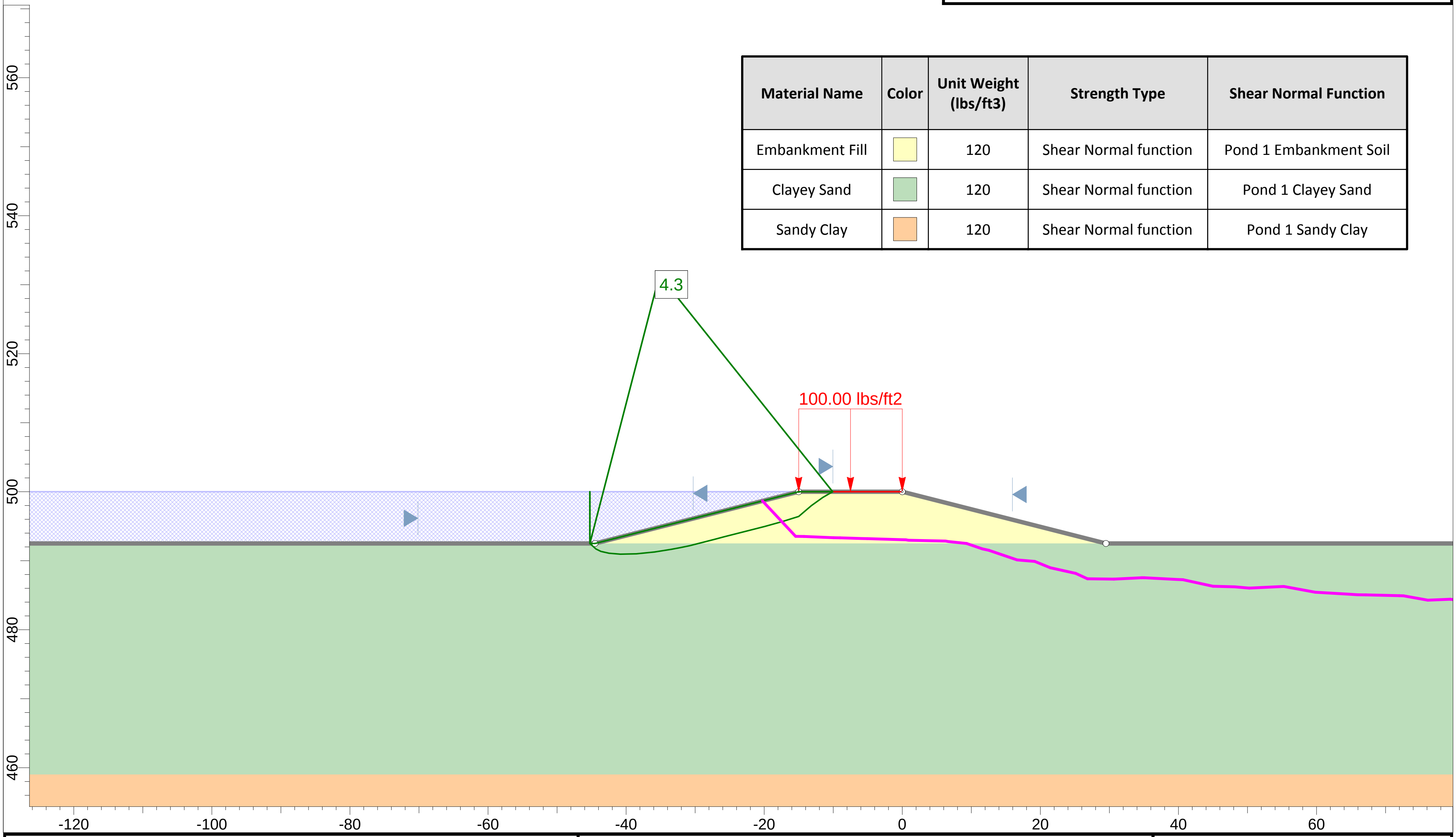
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-27a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



Profile "L" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

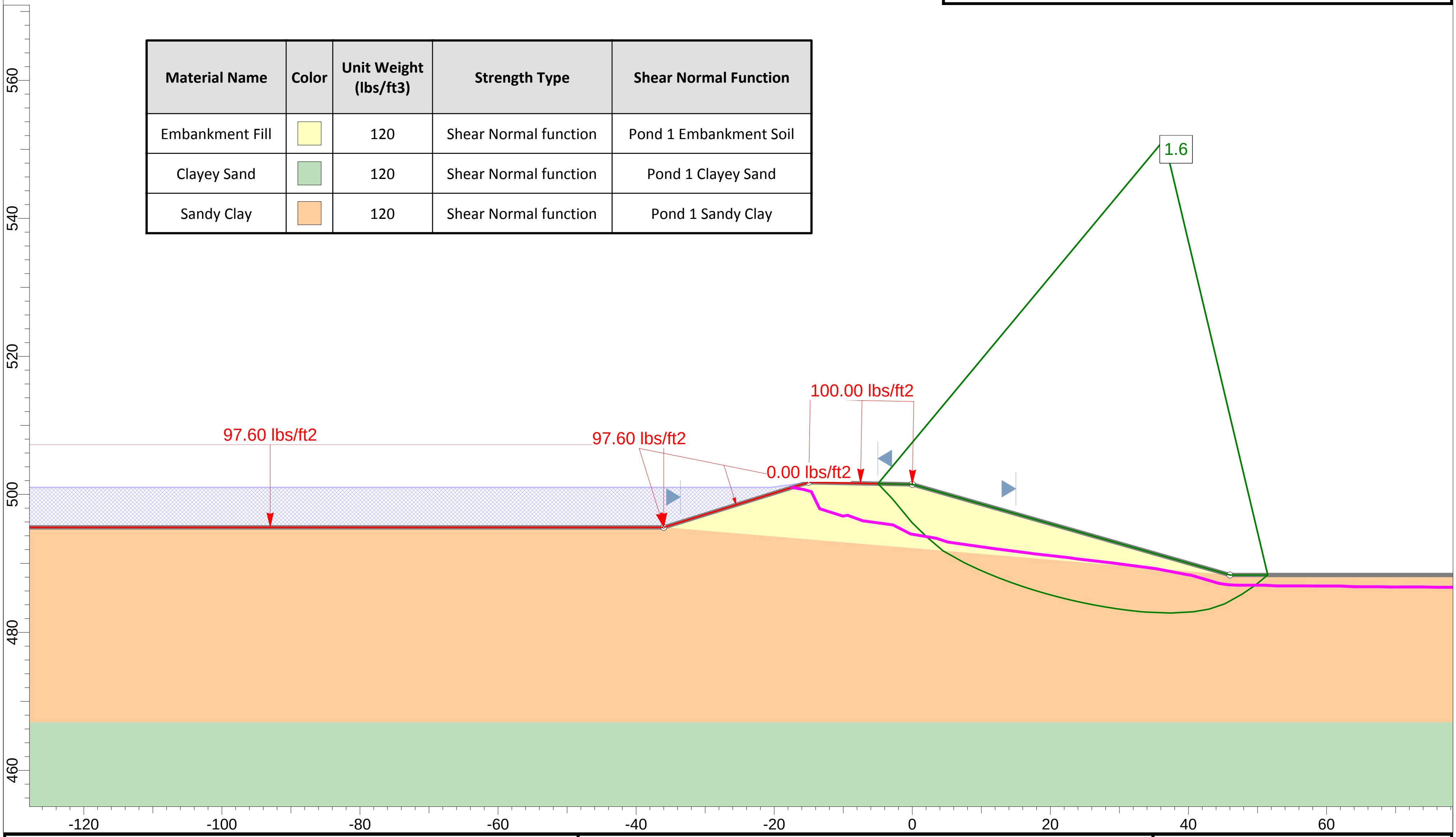
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-27b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



Profile "M" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

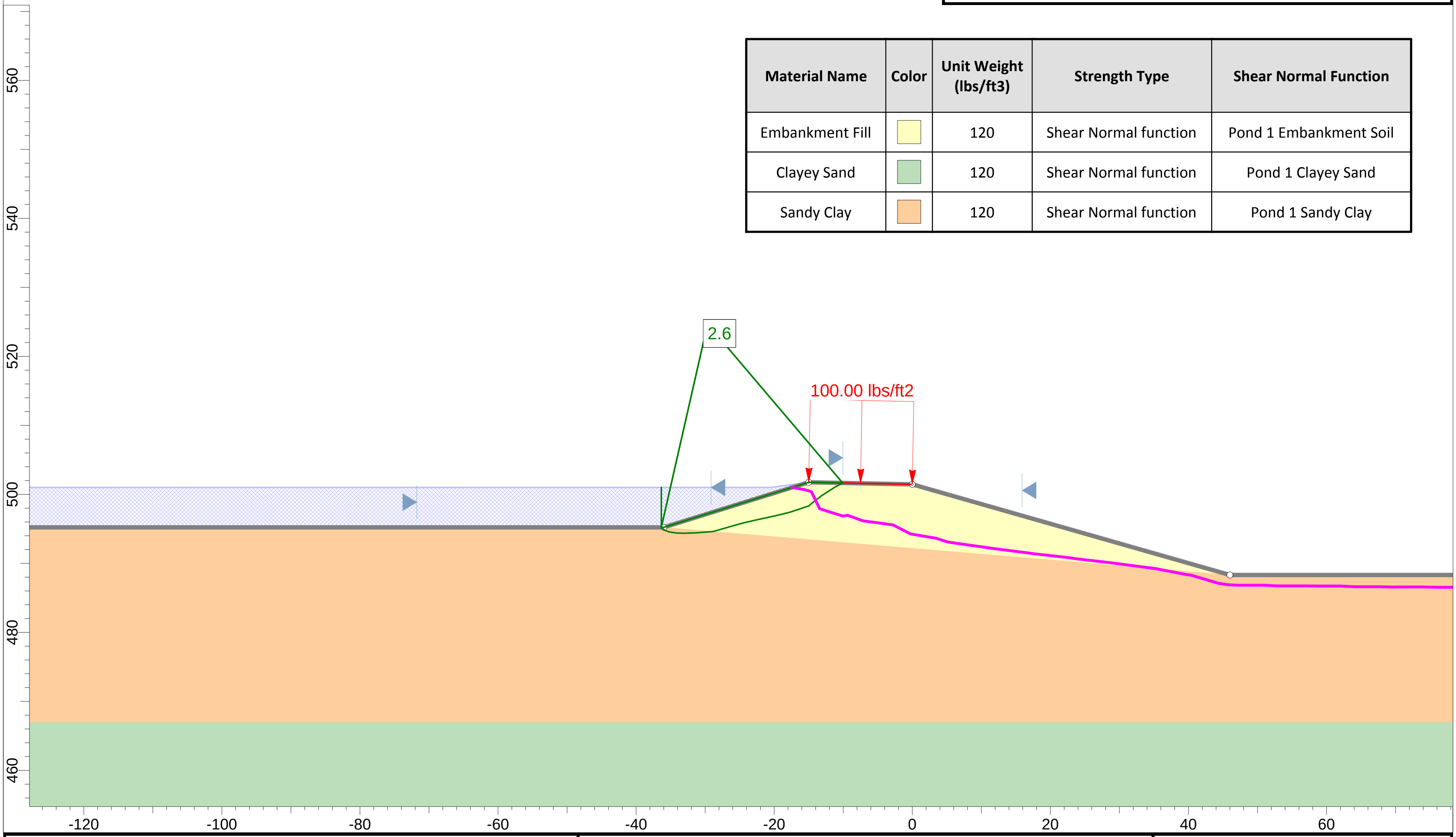
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-28a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 1 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 1 Clayey Sand
Sandy Clay	🟧	120	Shear Normal function	Pond 1 Sandy Clay



Profile "M" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

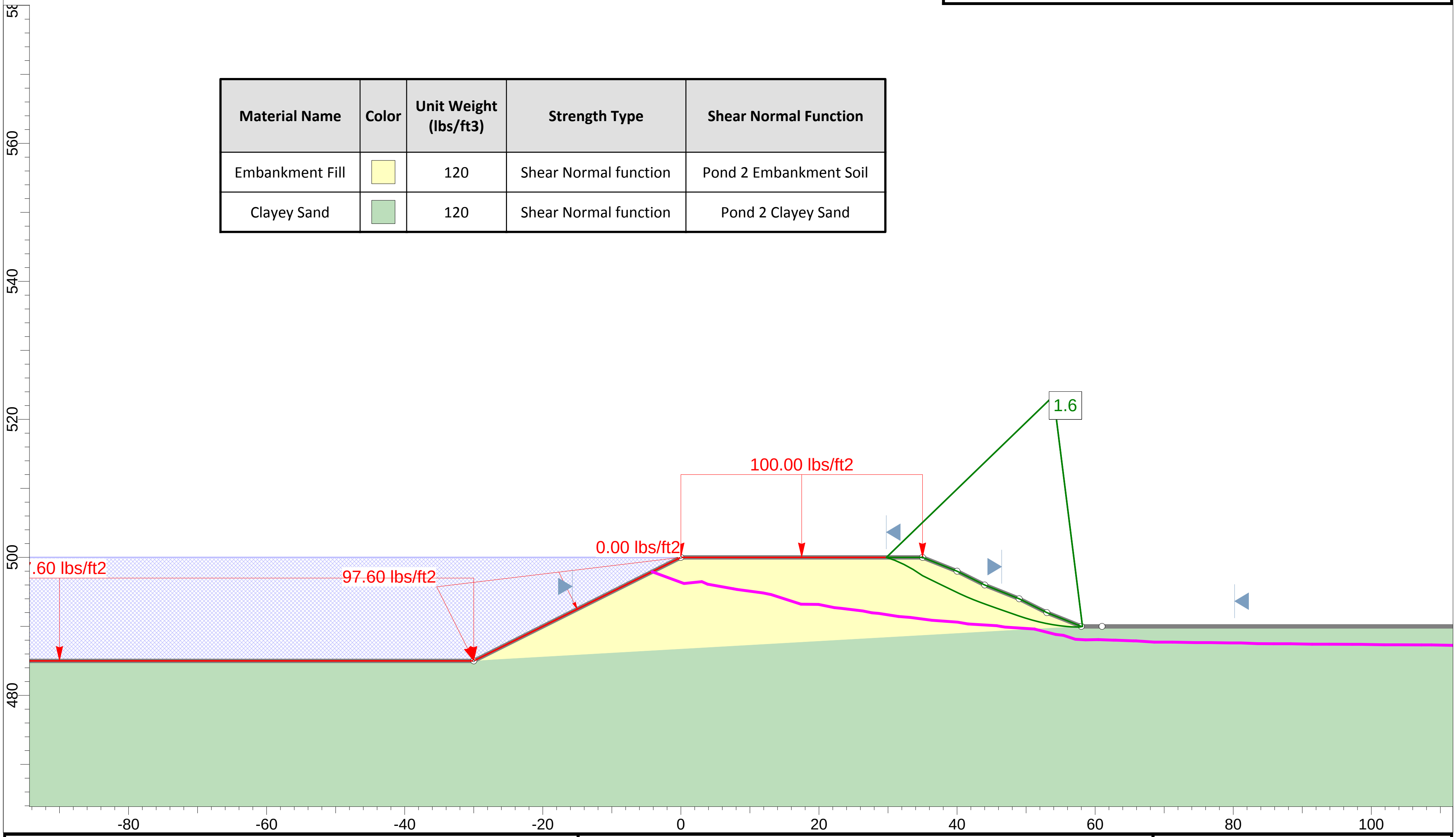
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-28b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand



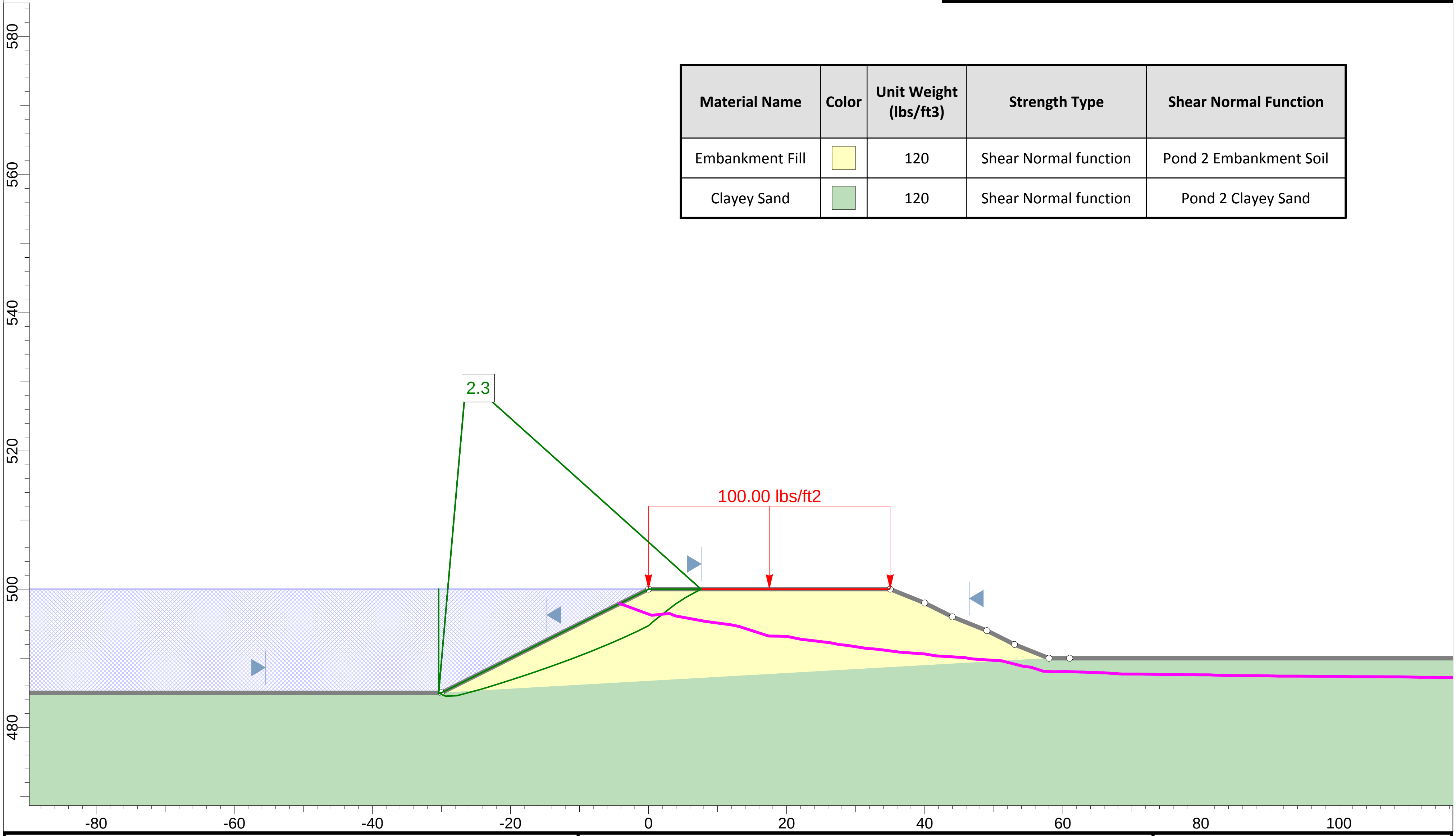
Profile "N" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-29a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Shear Normal Function
Embankment Fill	🟨	120	Shear Normal function	Pond 2 Embankment Soil
Clayey Sand	🟩	120	Shear Normal function	Pond 2 Clayey Sand



Profile "N" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure C-29b

RABA KISTNER CONSULTANTS

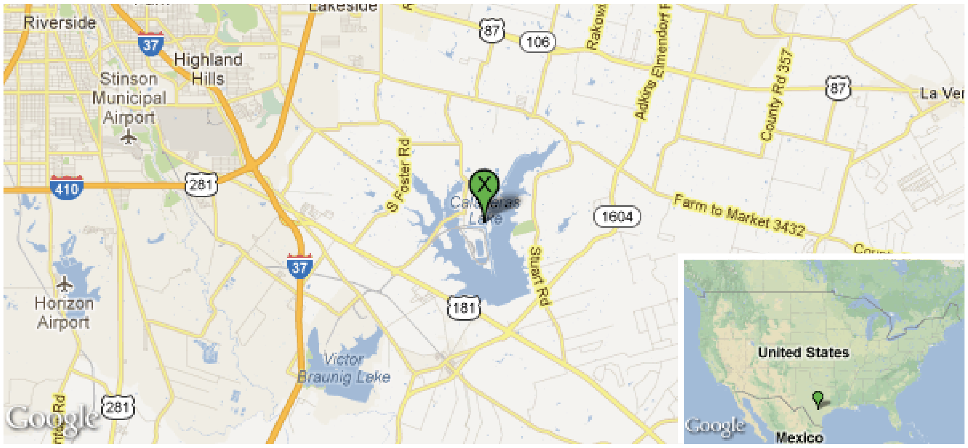
APPENDIX D

SEISMIC ANALYSES

USGS Design Maps Summary Report

User–Specified Input

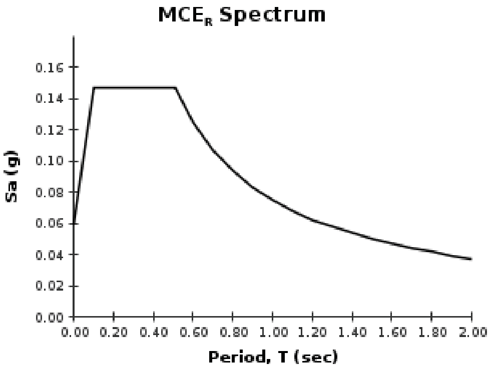
Building Code Reference Document	2009 NEHRP Recommended Seismic Provisions (which makes use of 2008 USGS hazard data)
Site Coordinates	29.30821°N, 98.3168°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

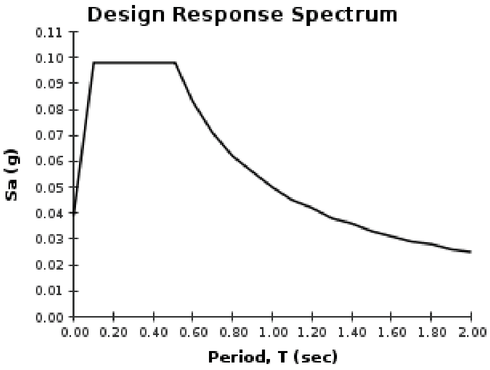


USGS–Provided Output

S_S = 0.092 g	S_{MS} = 0.147 g	S_{DS} = 0.098 g
S_1 = 0.031 g	S_{M1} = 0.075 g	S_{D1} = 0.050 g

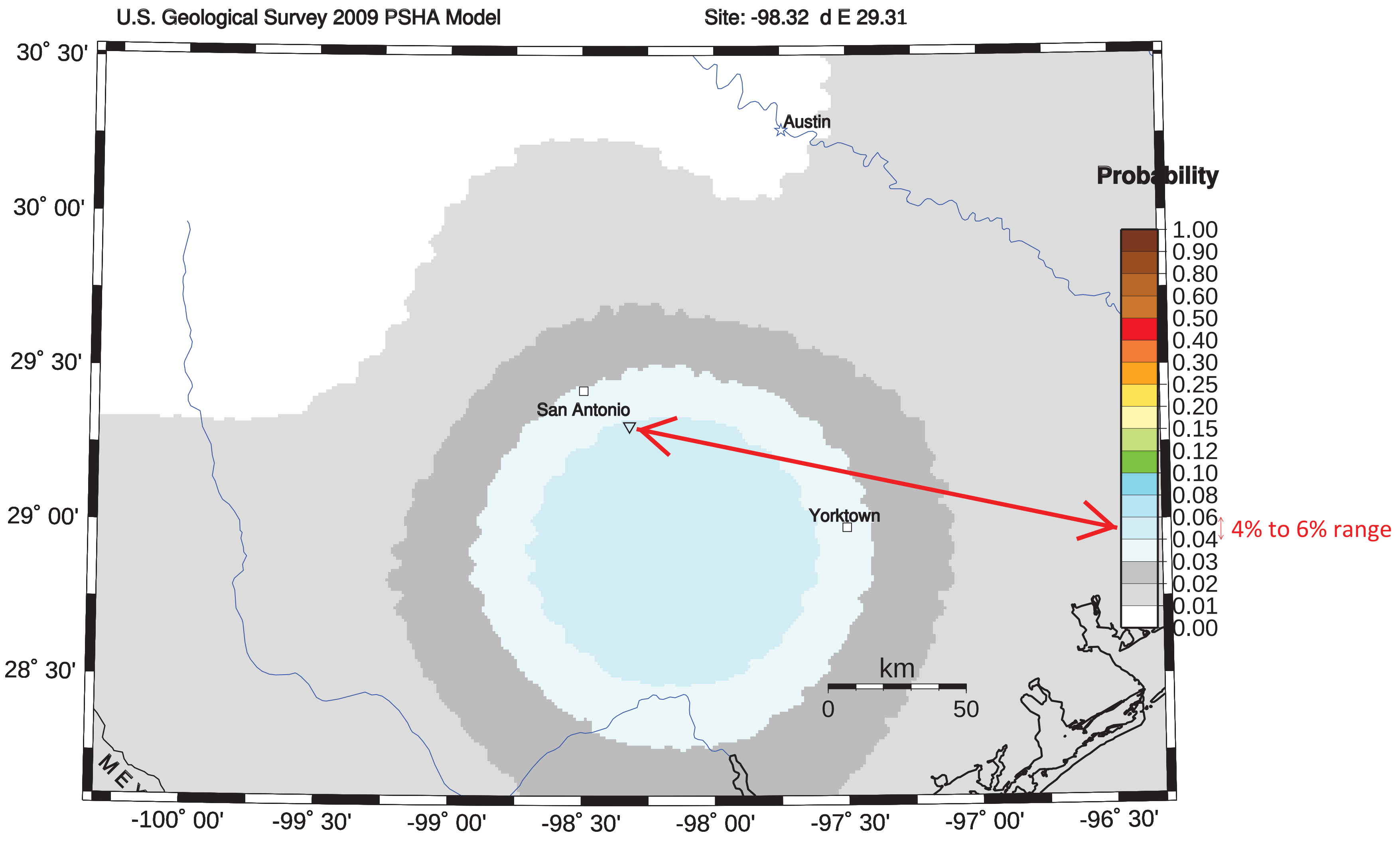
For information on how the S_S and S_1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please view the detailed report.


MCE_R Spectrum


Design Response Spectrum

For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

Probability of earthquake with M > 5.0 within 250 years & 50 km



GMT 2012 Nov 19 15:18:38 Earthquake probabilities from USGS OFR 08-1128 PSHA. 50 km maximum horizontal distance. Site of interest: triangle. Epicenters mb>5 black circles; rivers blue.

Design Maps Detailed Report

2009 NEHRP Recommended Seismic Provisions (29.30821°N, 98.3168°W)

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 2009 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

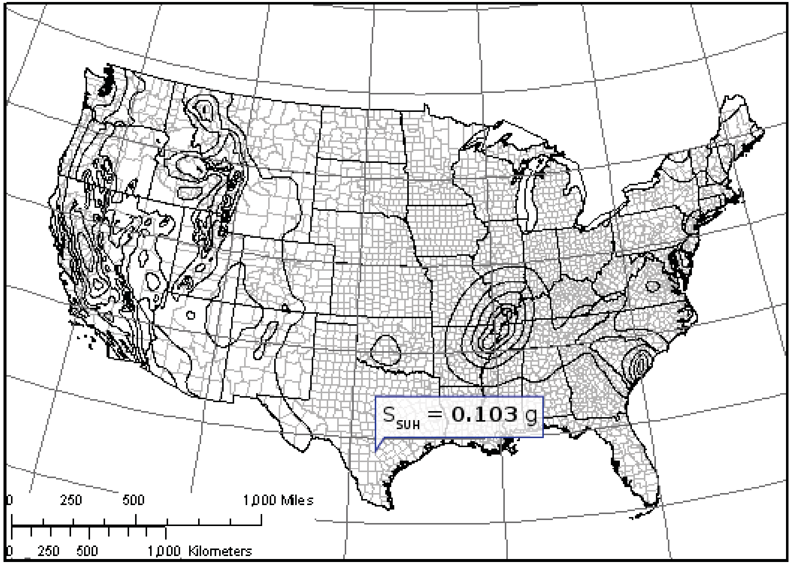


Figure 22–2: Uniform–Hazard (2% in 50–Year) Ground Motions of 1.0-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B

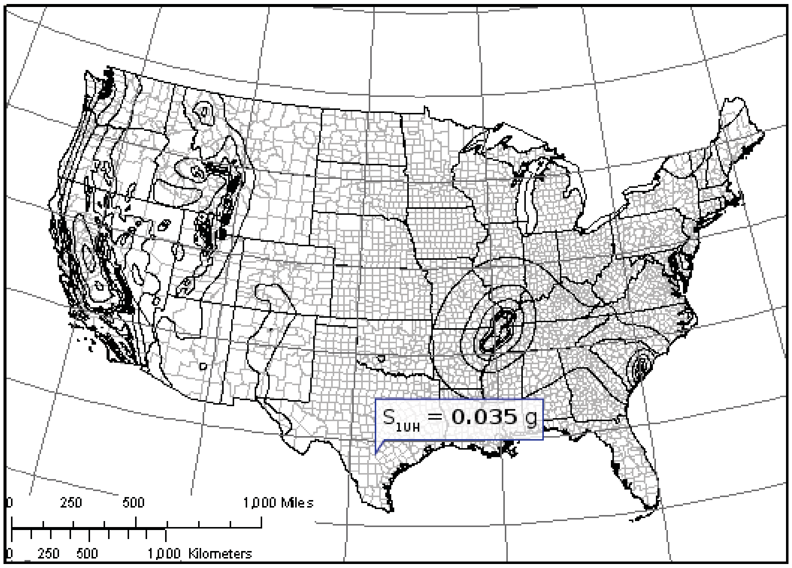

S$_{1UH}$ = 0.035 g
0 250 500 1,000 Miles
0 250 500 1,000 Kilometers

Figure 22–3: Risk Coefficient at 0.2-Second Spectral Response Period

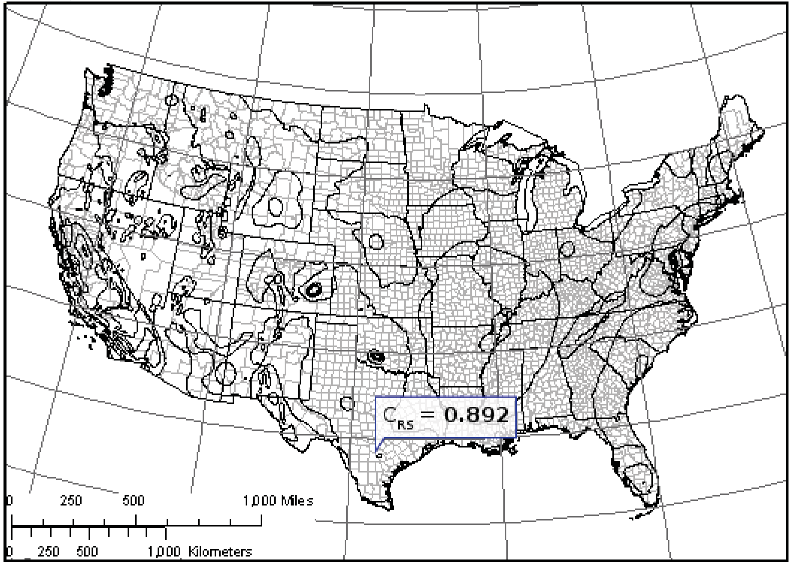


Figure 22–4: Risk Coefficient at 1.0-Second Spectral Response Period

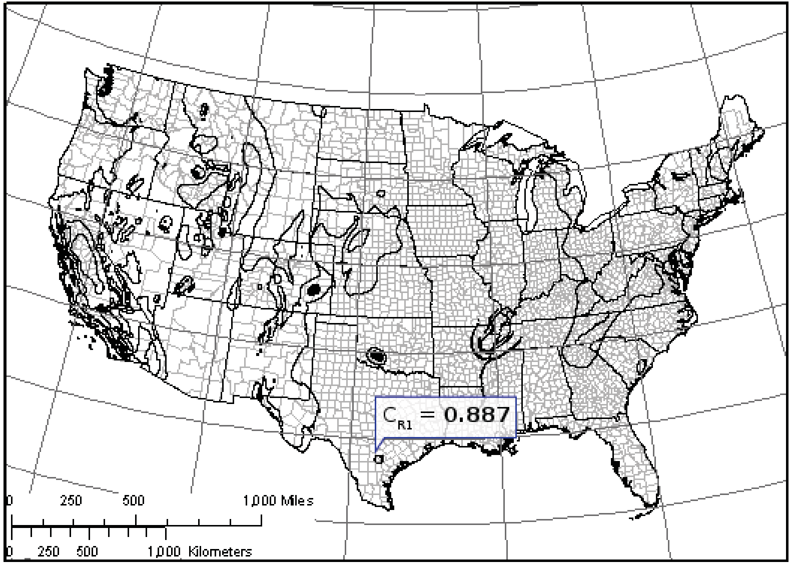


Figure 22–5: Deterministic Ground Motions of 0.2-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B

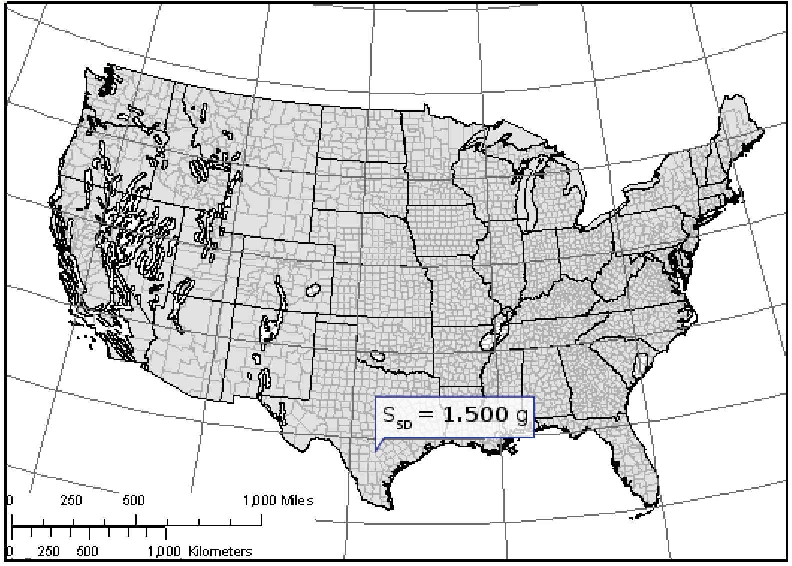
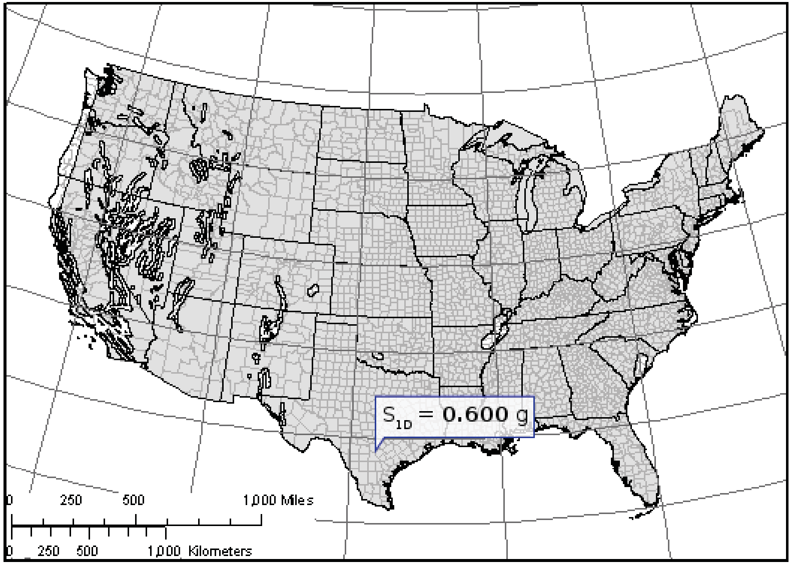


Figure 22–6: Deterministic Ground Motions of 1.0-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B



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	$\overline{v}_s$	$\overline{N}$ or $\overline{N}_{ch}$	$\overline{s}_u$
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: ● Plasticity index *PI* > 20, ● Moisture content *w* ≥ 40%, and ● Undrained shear strength $\overline{s}_u$ < 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 x 0.103 = 0.092 g

Equation (11.4–2): S_{SD} = 1.500 g

S_S ≡ "Lesser of values from Equations (11.4–1) and (11.4–2)" = 0.092 g

Equation (11.4–3): $C_{R1}S_{1UH}$ = 0.887 x 0.035 = 0.031 g

Equation (11.4–4): S_{1D} = 0.600 g

S_1 ≡ "Lesser of values from Equations (11.4–3) and (11.4–4)" = 0.031 g

Table 11.4–1: Site Coefficient F_a

Site Class	Spectral Response Acceleration Parameter at Short Period				
	$S_S \leq 0.25$	$S_S = 0.5$	$S_S = 0.75$	$S_S = 1$	$S_S \geq 1.25$
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 = 0.092 g, F_a = 1.600

Table 11.4–2: Site Coefficient F_v

Site Class	Spectral Response Acceleration Parameter at 1–Second Period				
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \geq 0.5$
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): $S_{MS} = F_a S_S = 1.600 \times 0.092 = 0.147$ g

Equation (11.4–6): $S_{M1} = F_v S_1 = 2.400 \times 0.031 = 0.075$ g

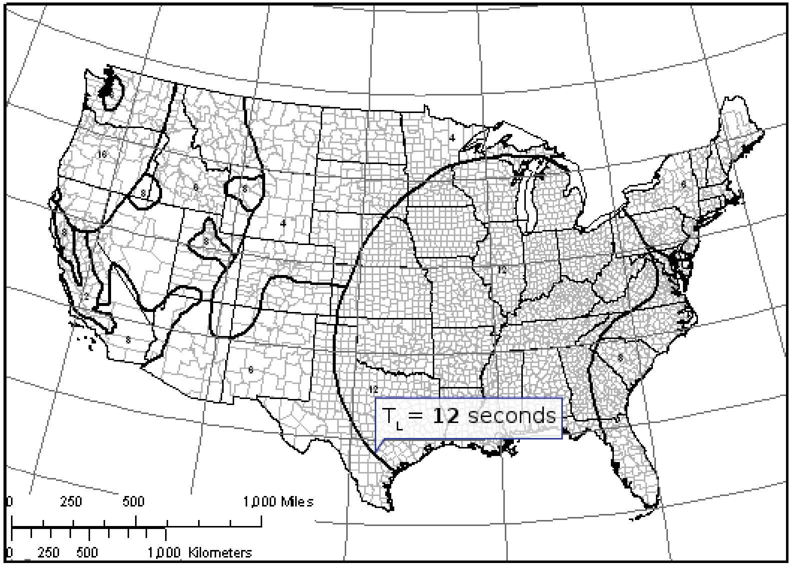
Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4–7): $S_{DS} = ⅔\, S_{MS} = ⅔ \times 0.147 = 0.098$ g

Equation (11.4–8): $S_{D1} = ⅔\, S_{M1} = ⅔ \times 0.075 = 0.050$ g

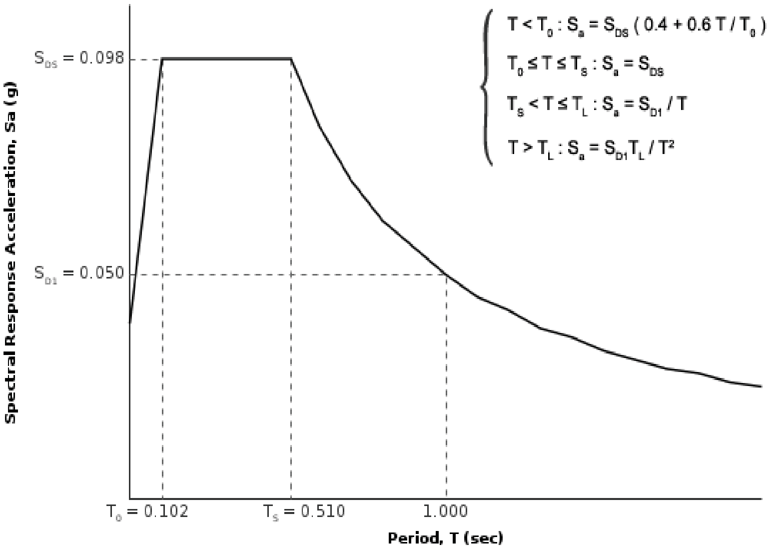
Section 11.4.5 — Design Response Spectrum

Figure 22–7: Long–period Transition Period, T_L (s)



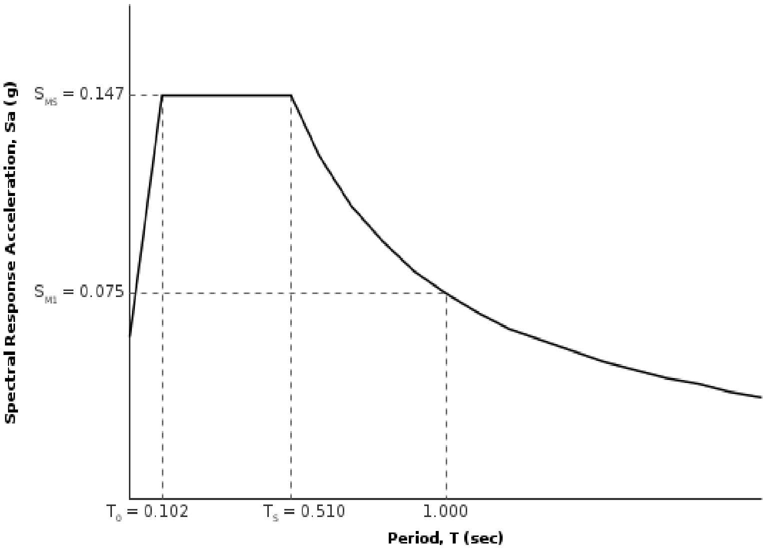
T_L = **12** seconds

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 ≤ 0.1	PGA = 0.2	PGA = 0.3	PGA = 0.4	PGA ≥ 0.5
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): $PGA_M = F_{PGA}PGA = 1.600 \times 0.047 = 0.075$ g

STRUCTURAL COMPONENTS AND SYSTEMS

For the Seismic Retrofit of Tilt-Up Buildings

Home **Mercalli XII** **Products** **Information** **Photos** **Contact** **TERMS OF USE**

Information ▸ Seismic Intensity Scales vs Peak Ground Acceleration

Seismic Intensity Scales vs Peak Ground Acceleration

Modified Mercalli Scale and PGA

MMI	PGA (g)
IV	0.03 and below
V	0.03 - 0.08
VI	0.08 - 0.15
VII	0.15 - 0.25
VIII	0.25 - 0.45
IX	0.45 - 0.60
X	0.60 - 0.80
XI	0.80 - 0.90
XII	0.90 and above

The above table shows the approximate relationship between Modified Mercalli Intensity and Peak Ground Acceleration (PGA).

Richter Magnitude, PGA, and Duration

Richter Magnitude	PGA (g)	Duration (seconds)
5.0	0.09	2
5.5	0.15	6
6.0	0.22	12

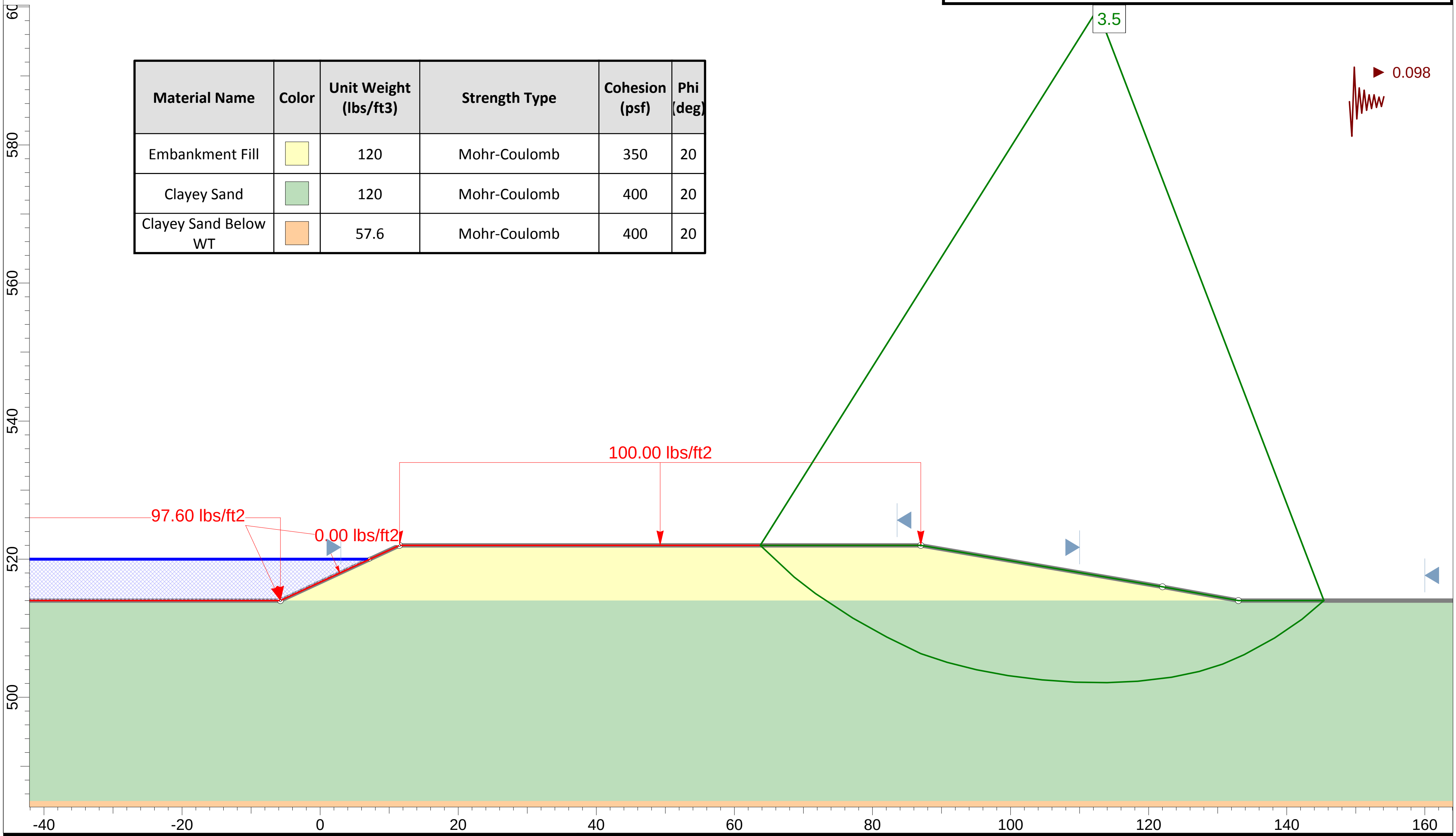
6.5	0.29	18
7.0	0.37	24
7.5	0.45	30
8.0	0.50	34
8.5	0.50	37

The above table shows the approximate relationship between Richter Magnitude, Peak Ground Acceleration (PGA), and duration of strong-phase shaking near the epicenter of earthquakes located in California.

< Prev Next >

Home | About Mercalli XII | Contact | Terms of Use

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

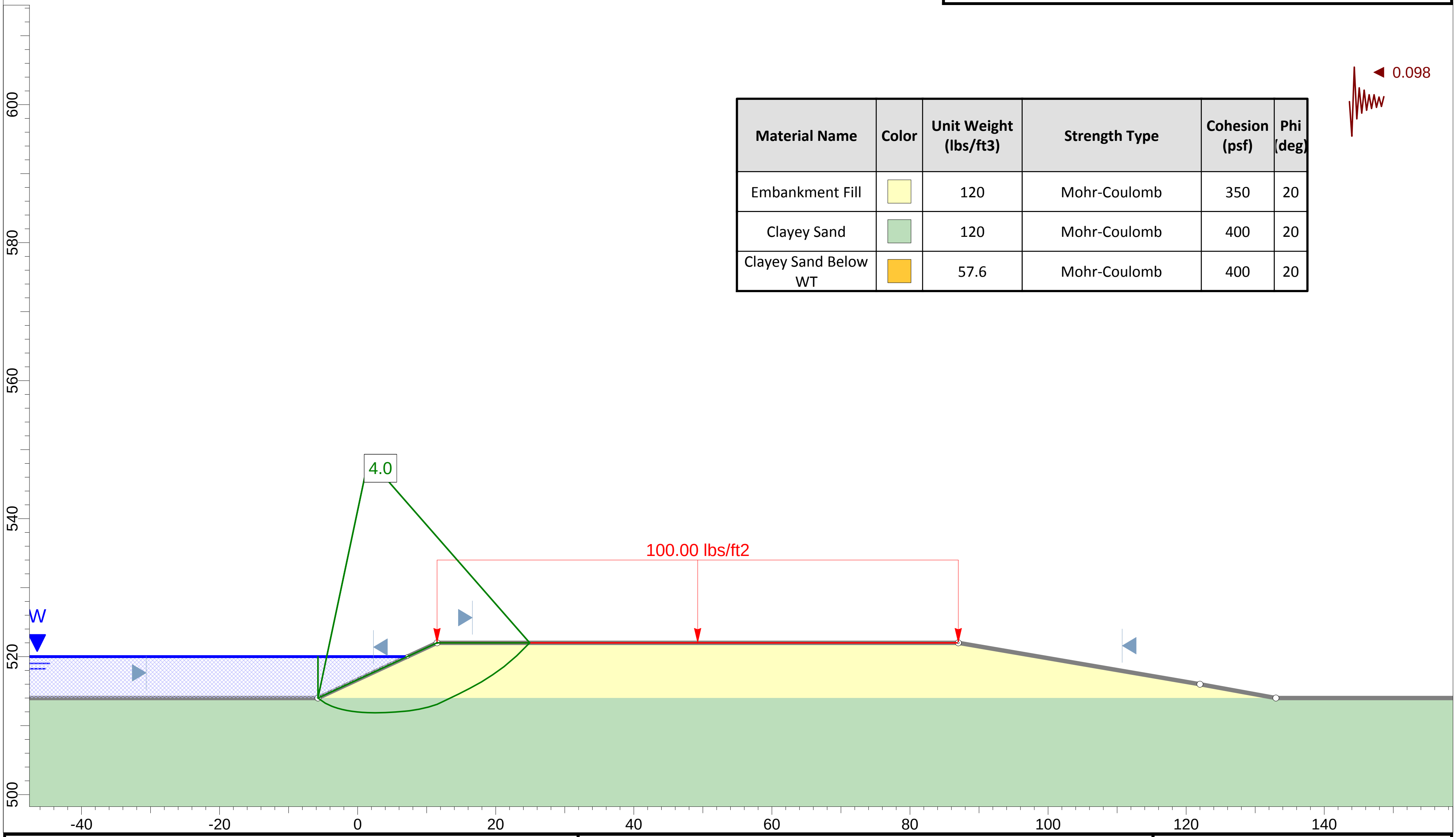
Profile "A" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-14a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

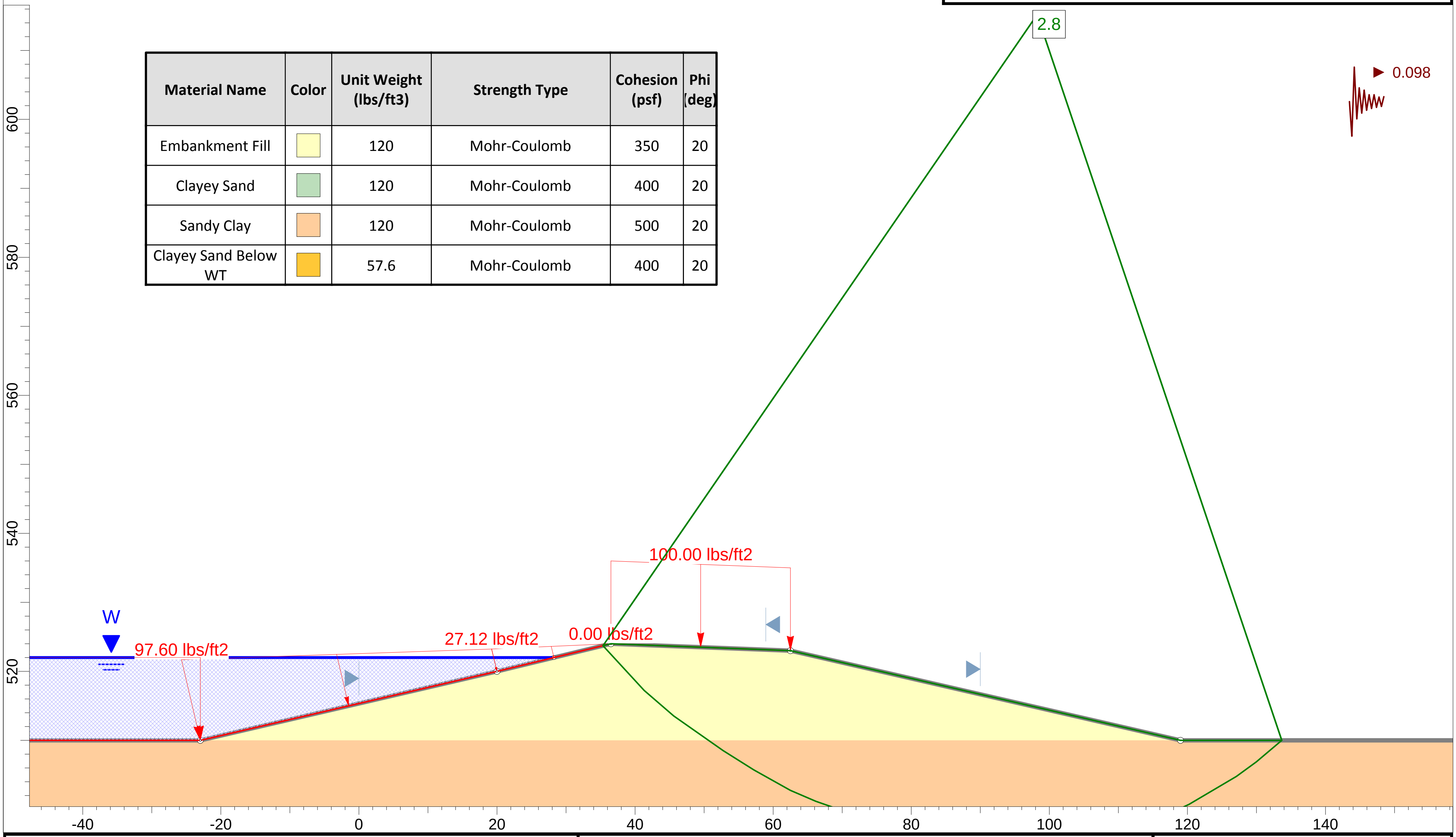
Profile "A" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-14b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

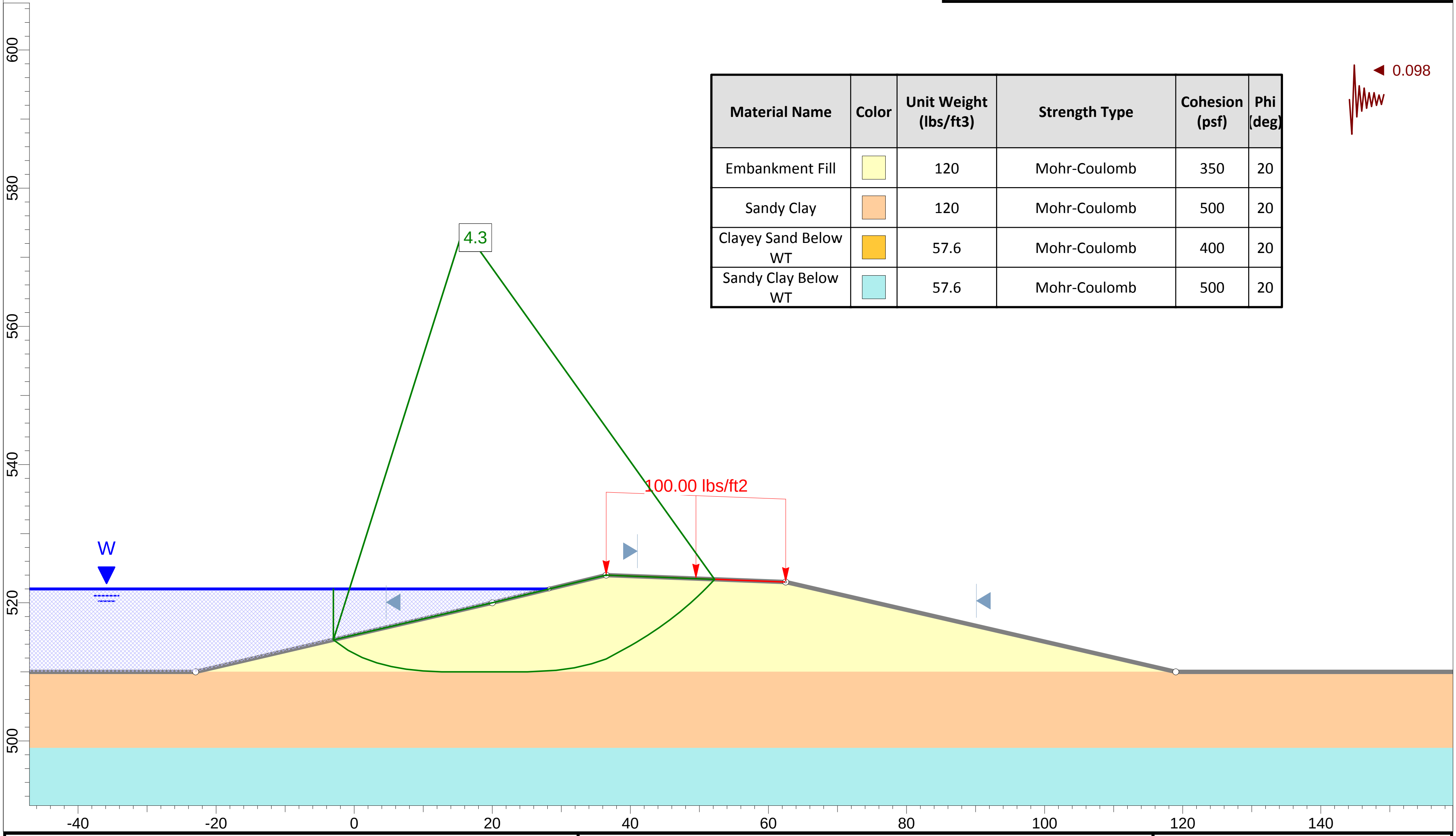
Profile "B" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-15a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "B" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

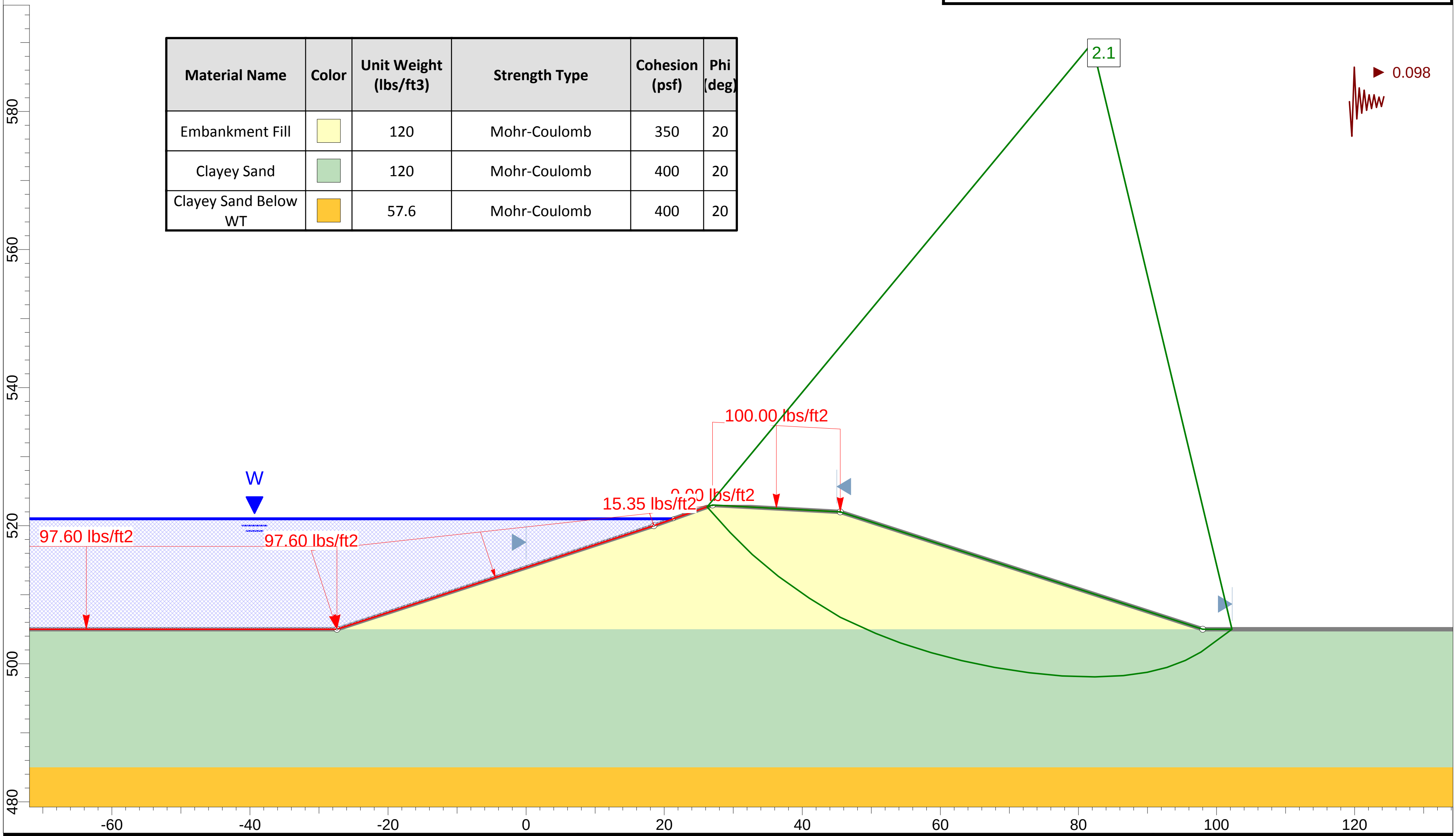
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-15b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



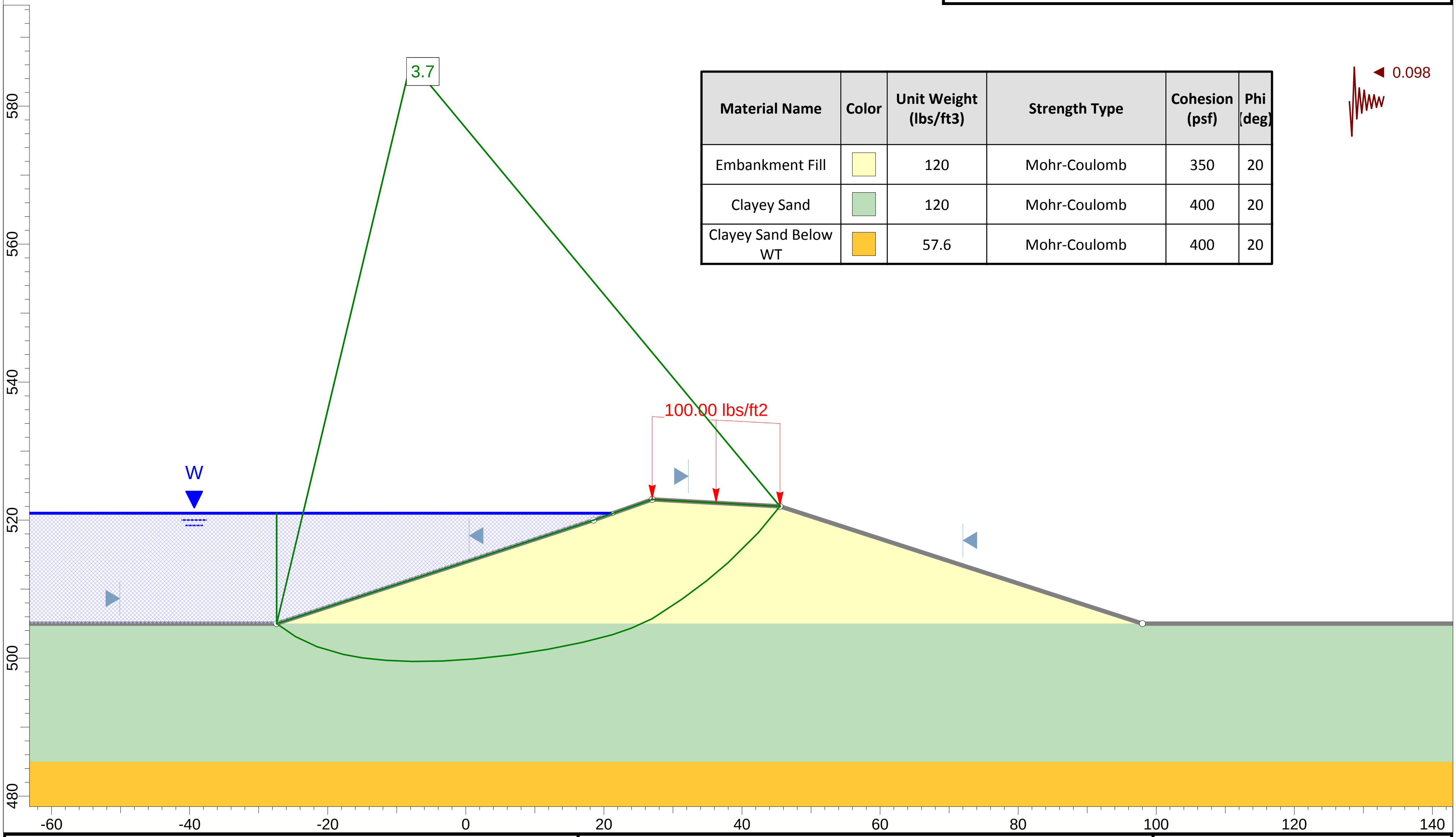
Profile "C" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-16a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

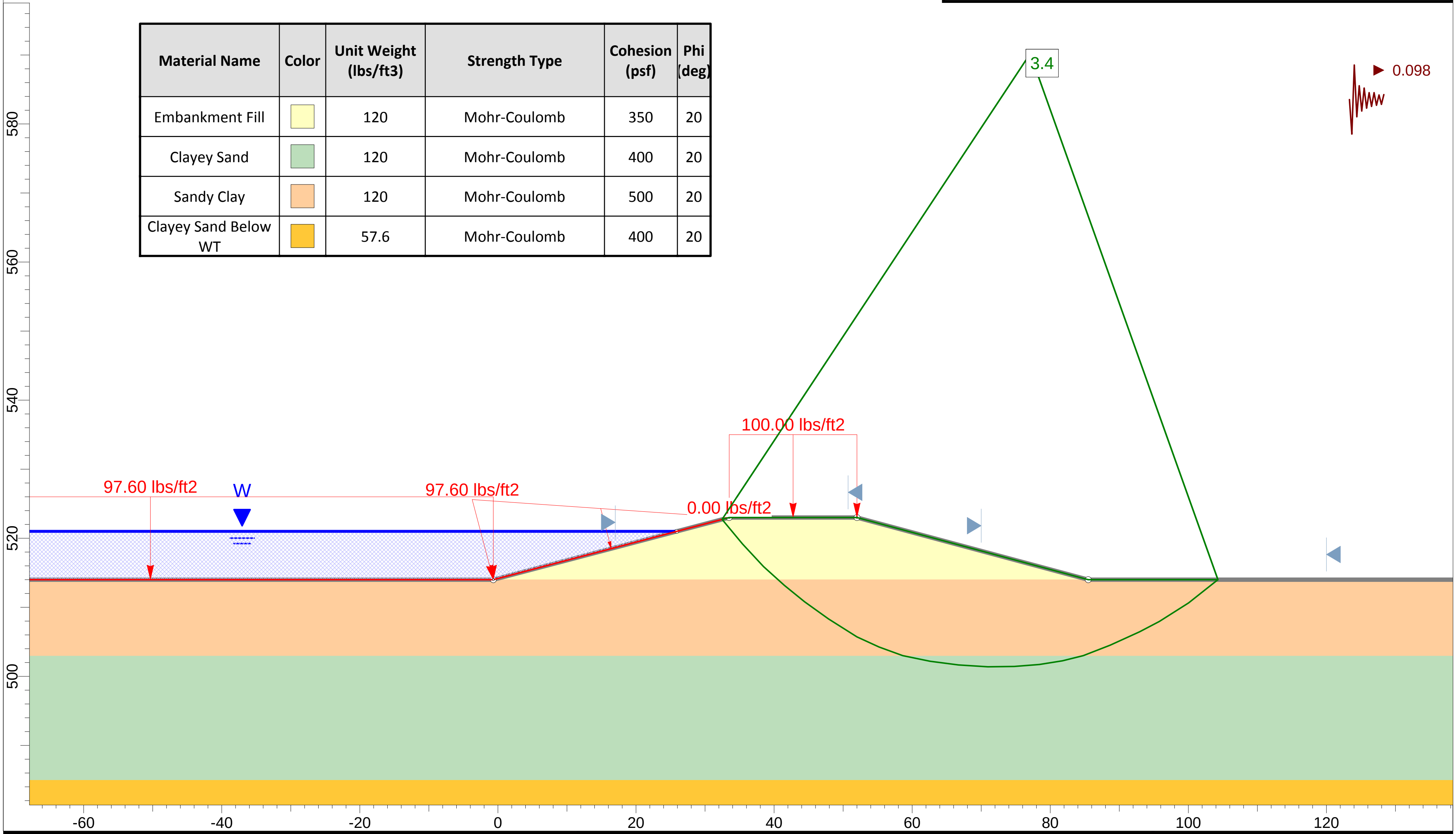
Profile "C" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-16b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

Profile "D" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

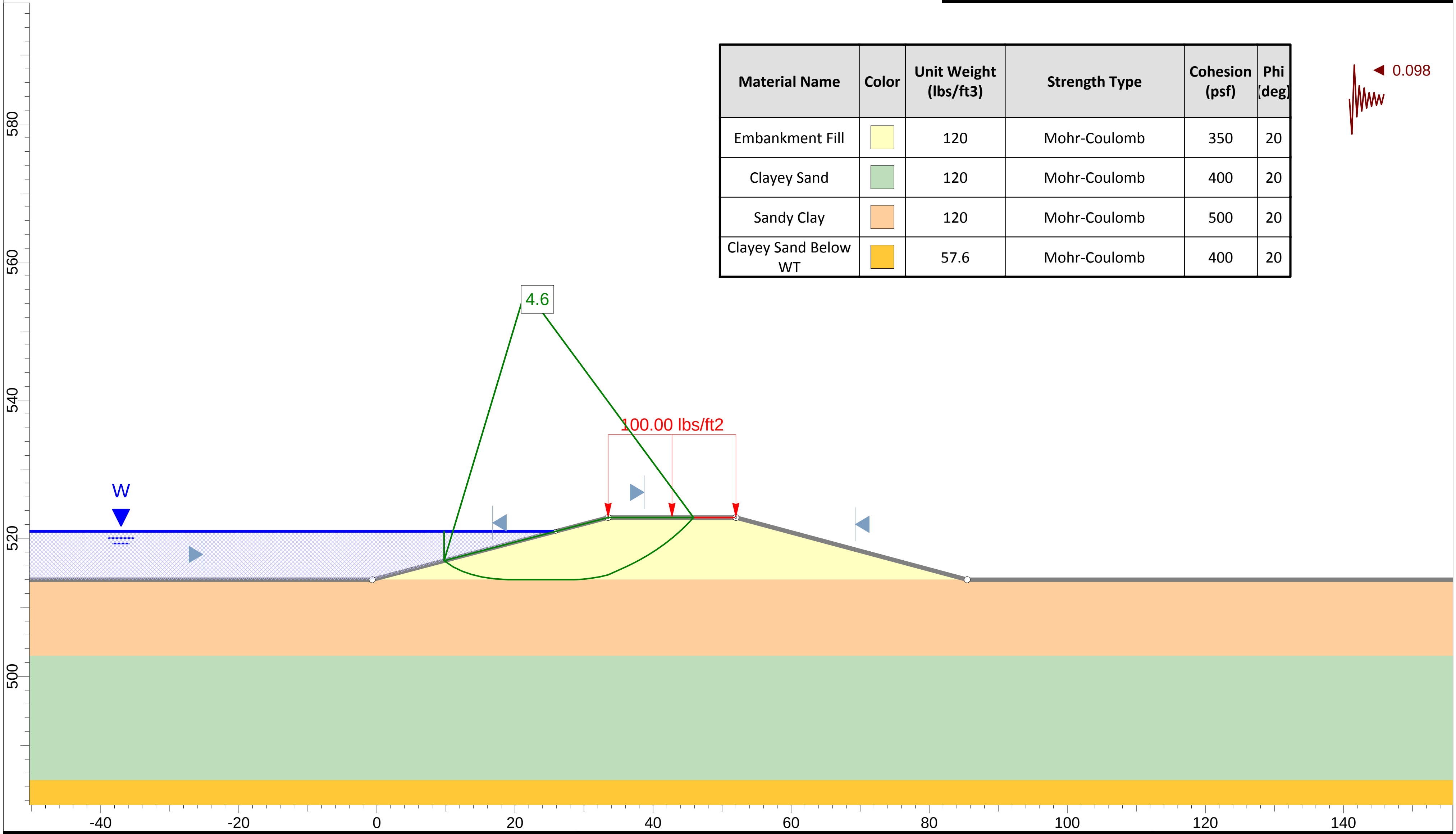
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-17a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20



Profile "D" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

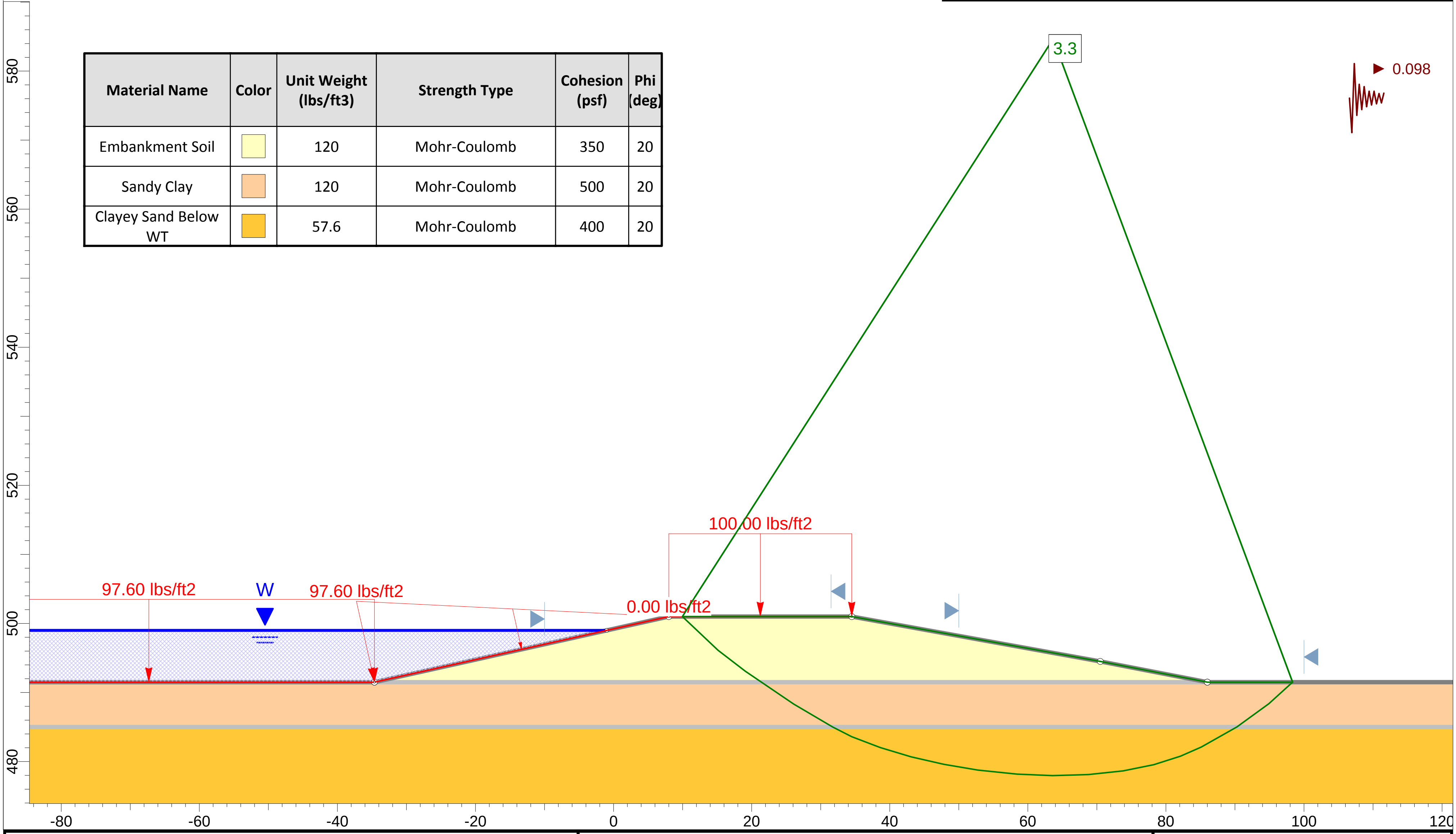
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-17b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Soil	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



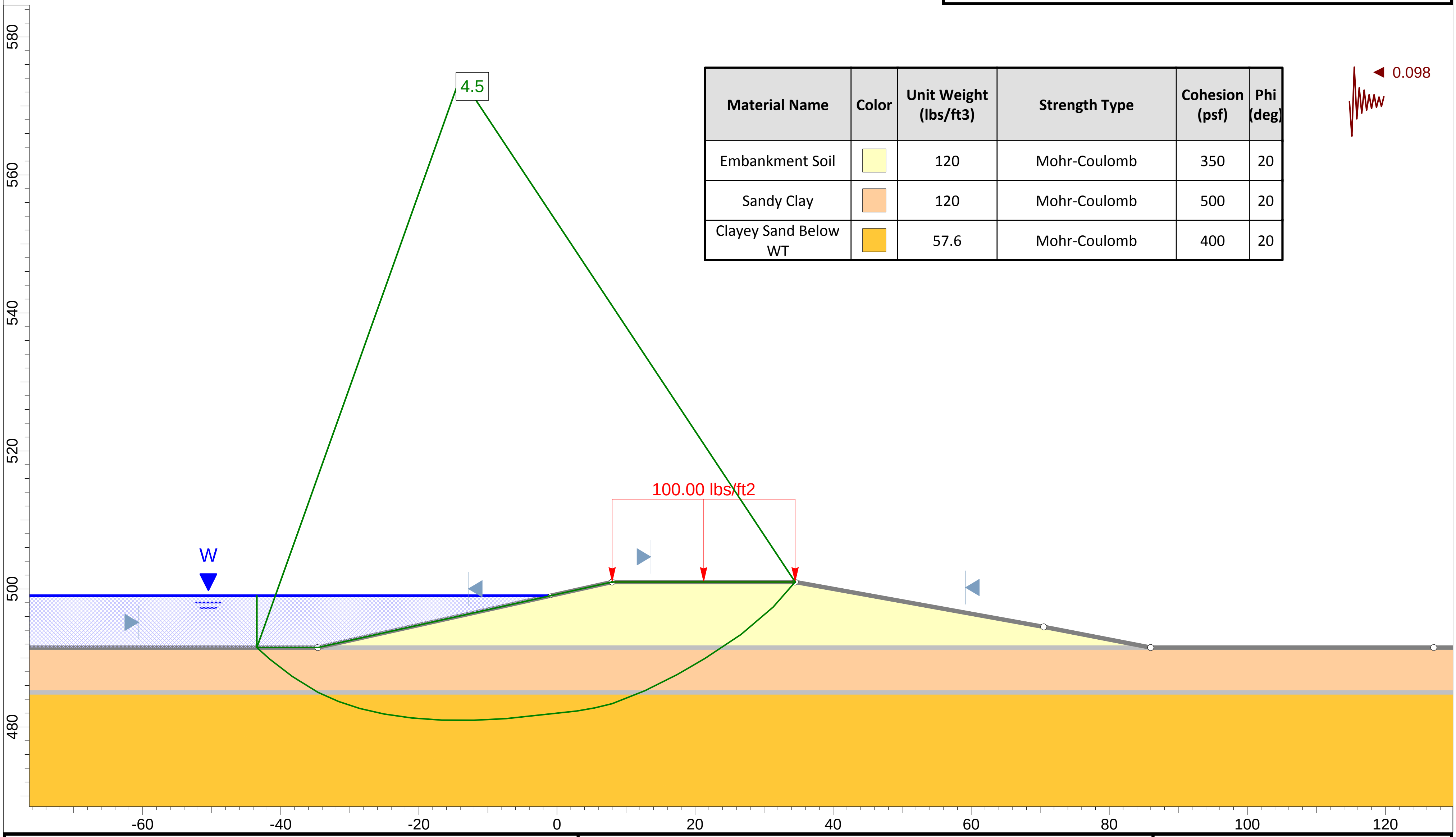
Profile "E" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-18a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Soil	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

Profile "E" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

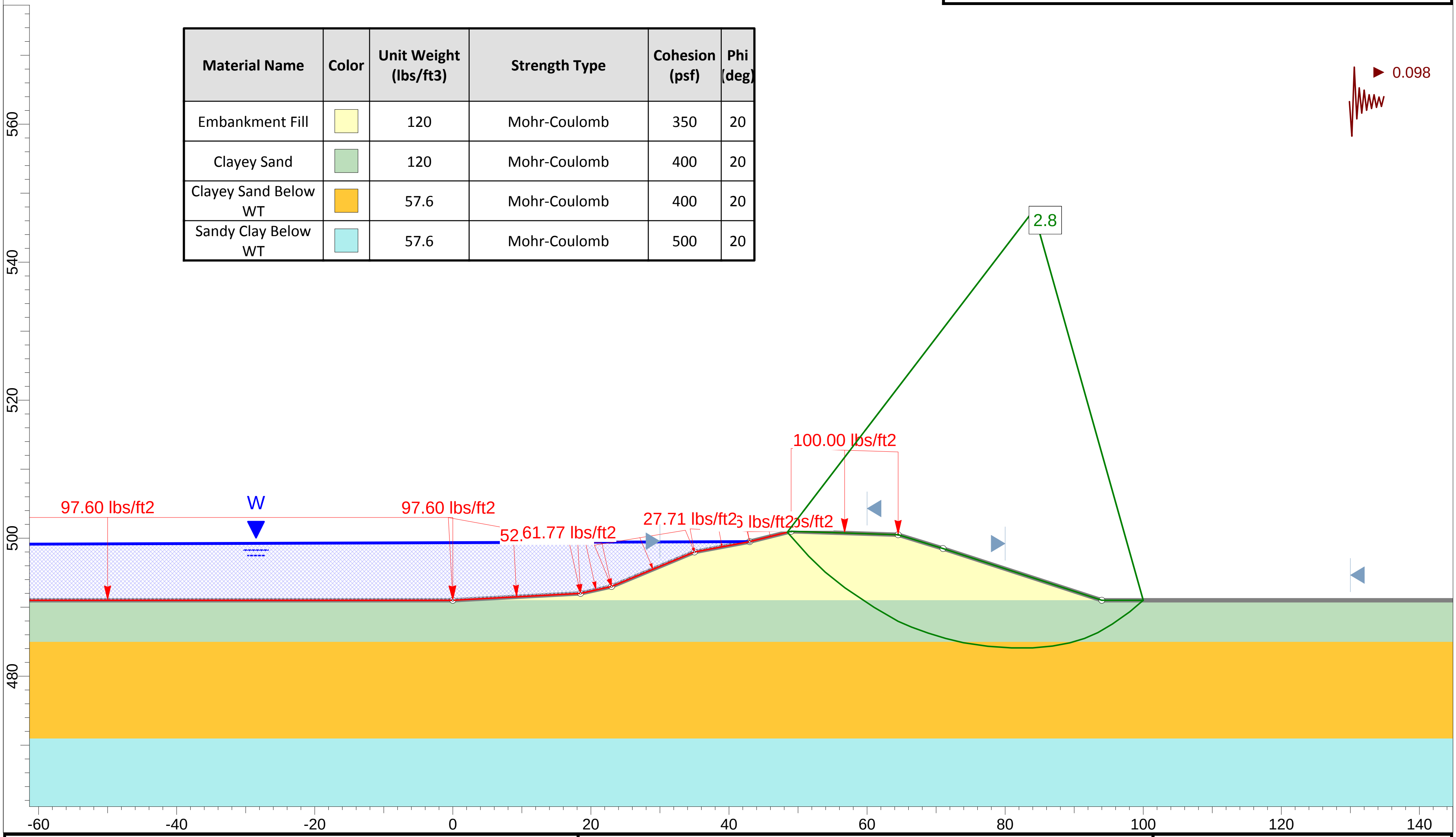
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-18b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



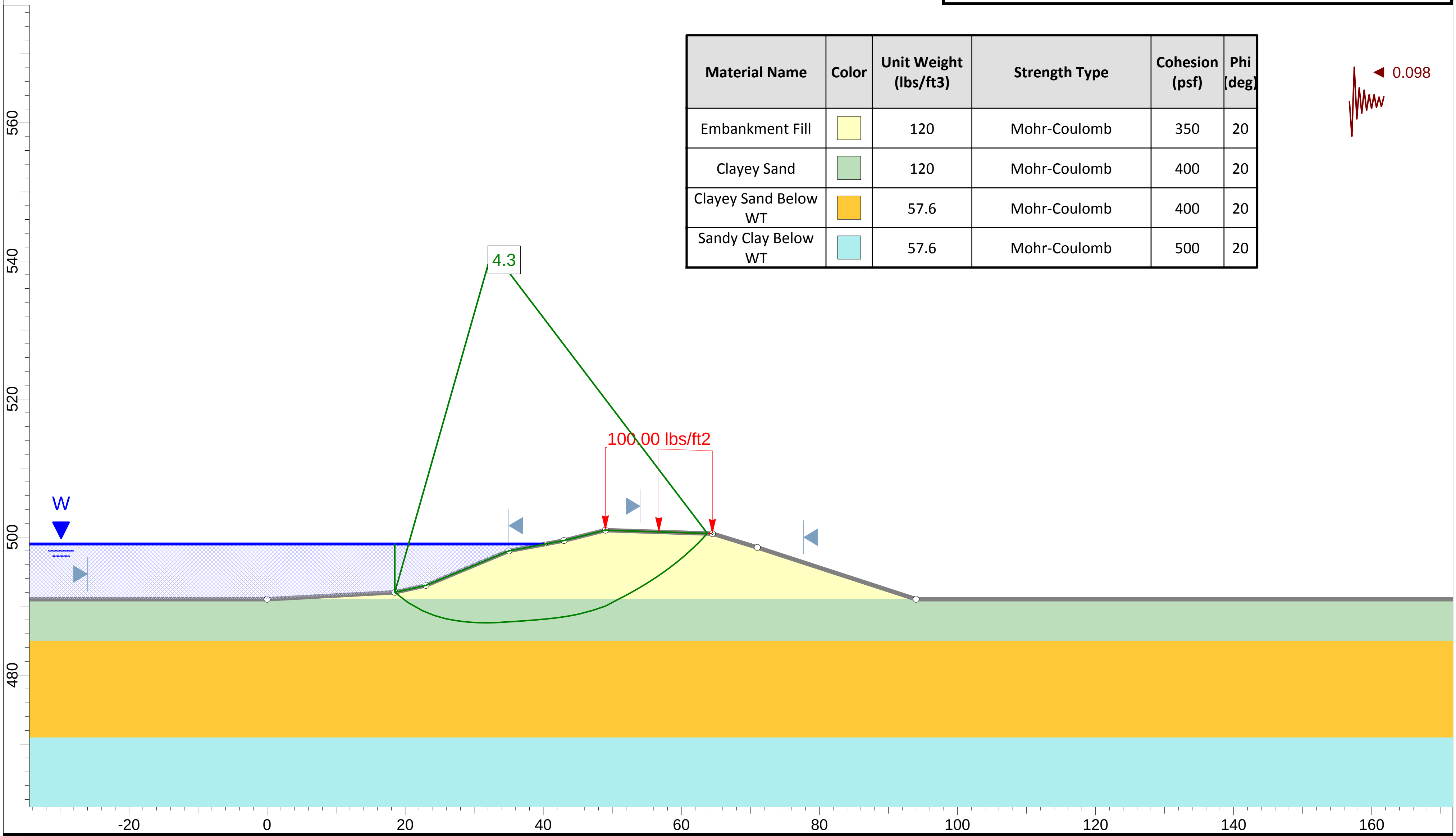
Profile "F" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-19a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



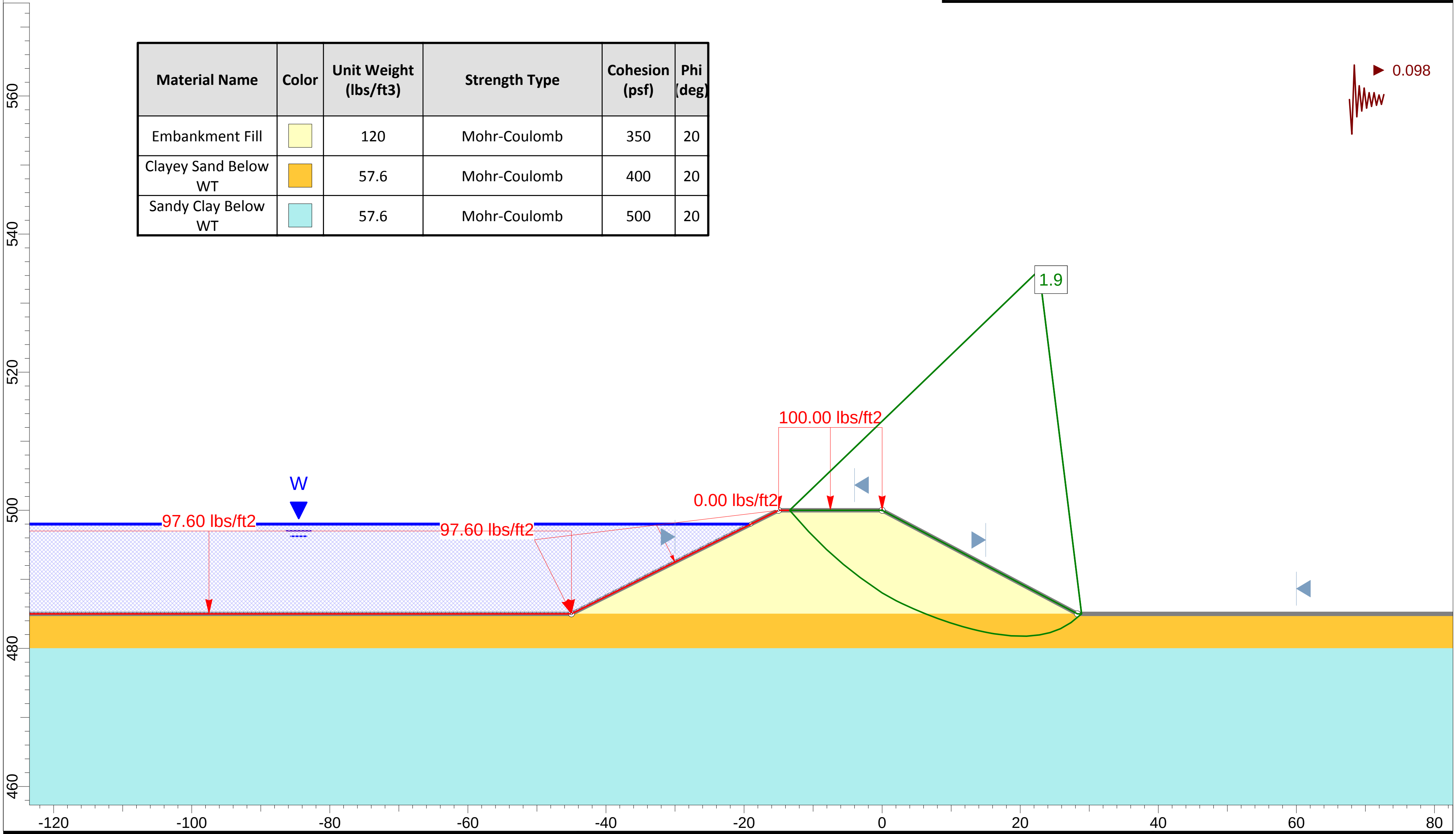
Profile "F" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-19b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

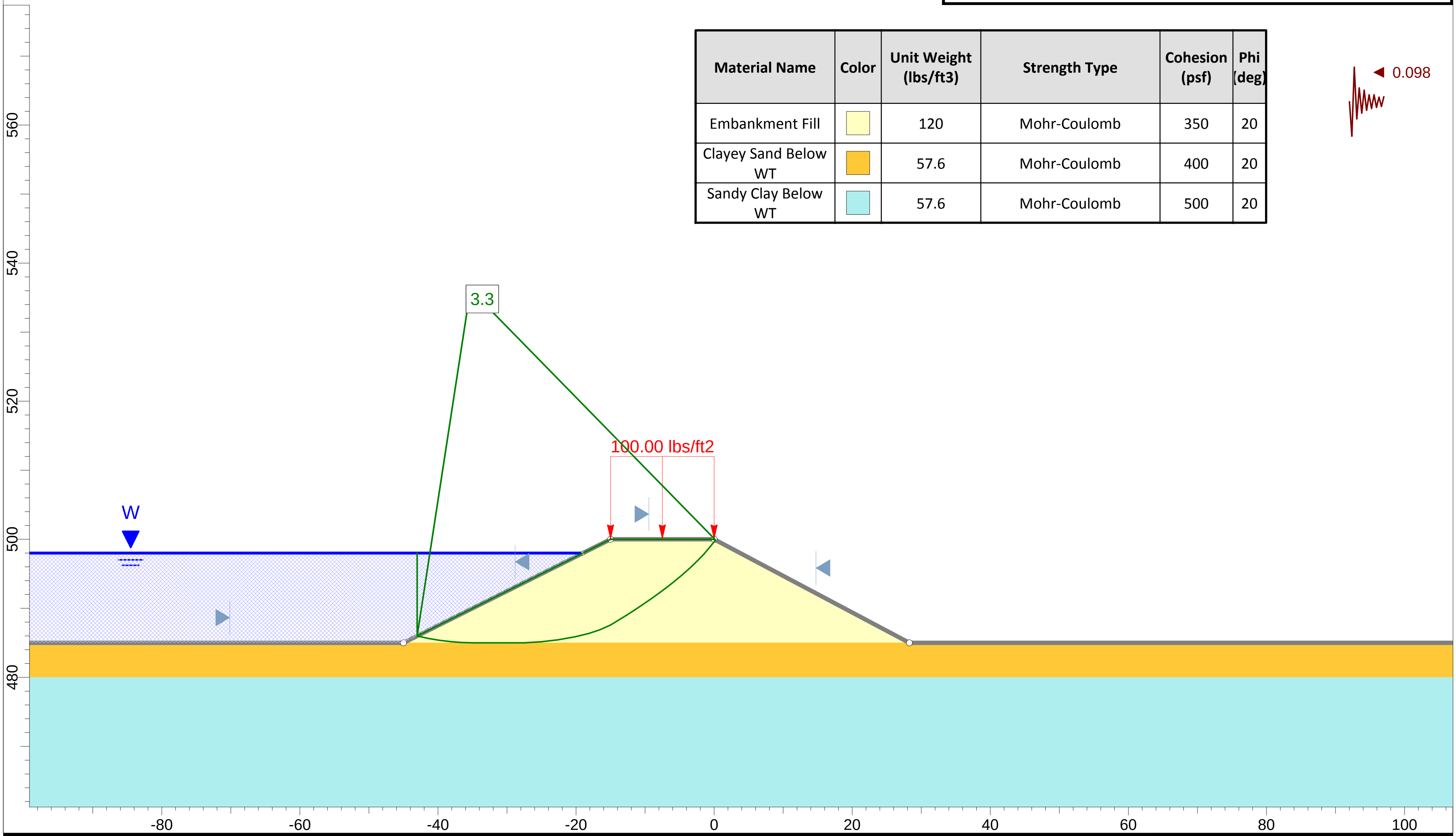
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-20a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



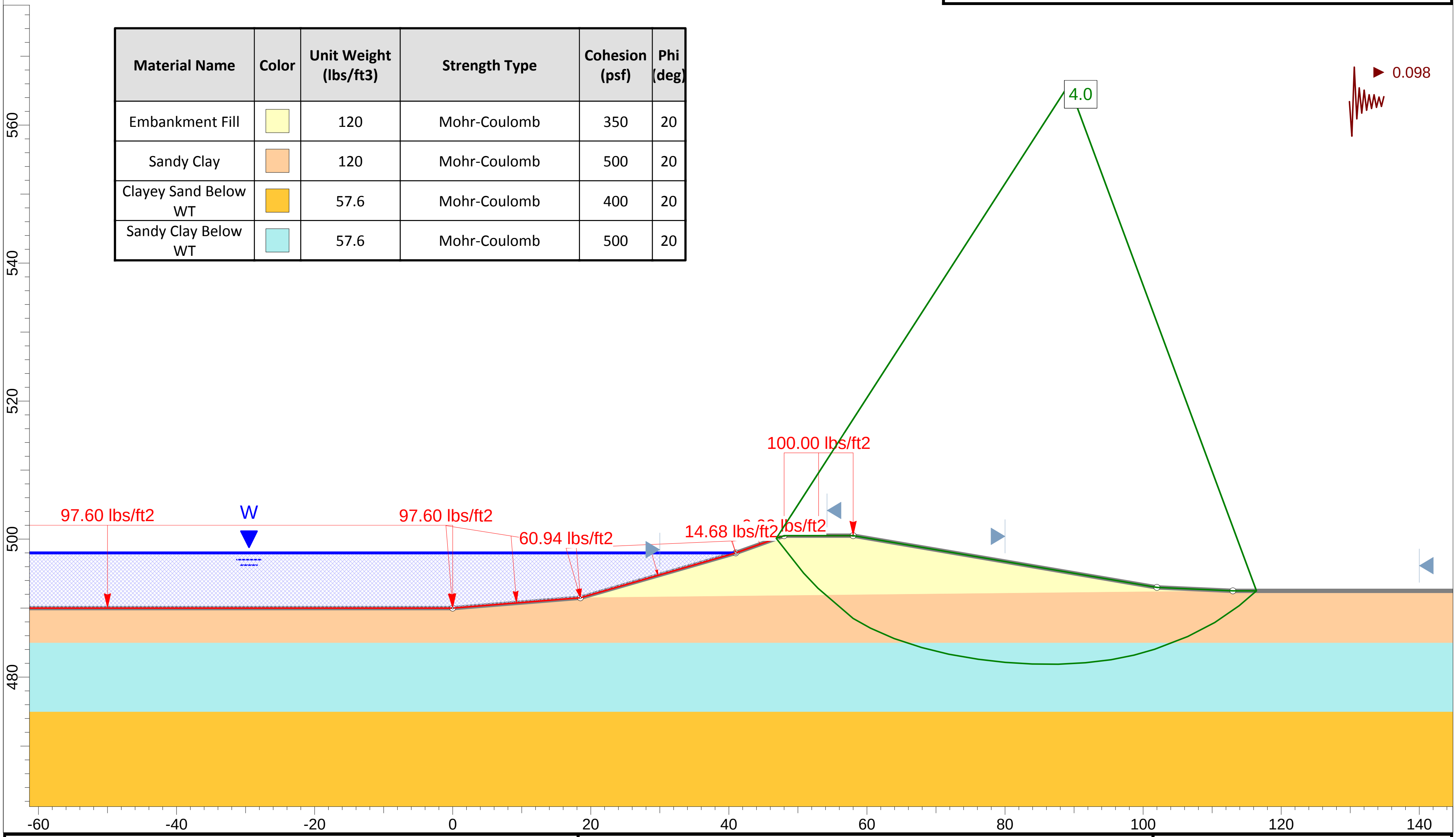
Profile "G" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-20b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "H" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

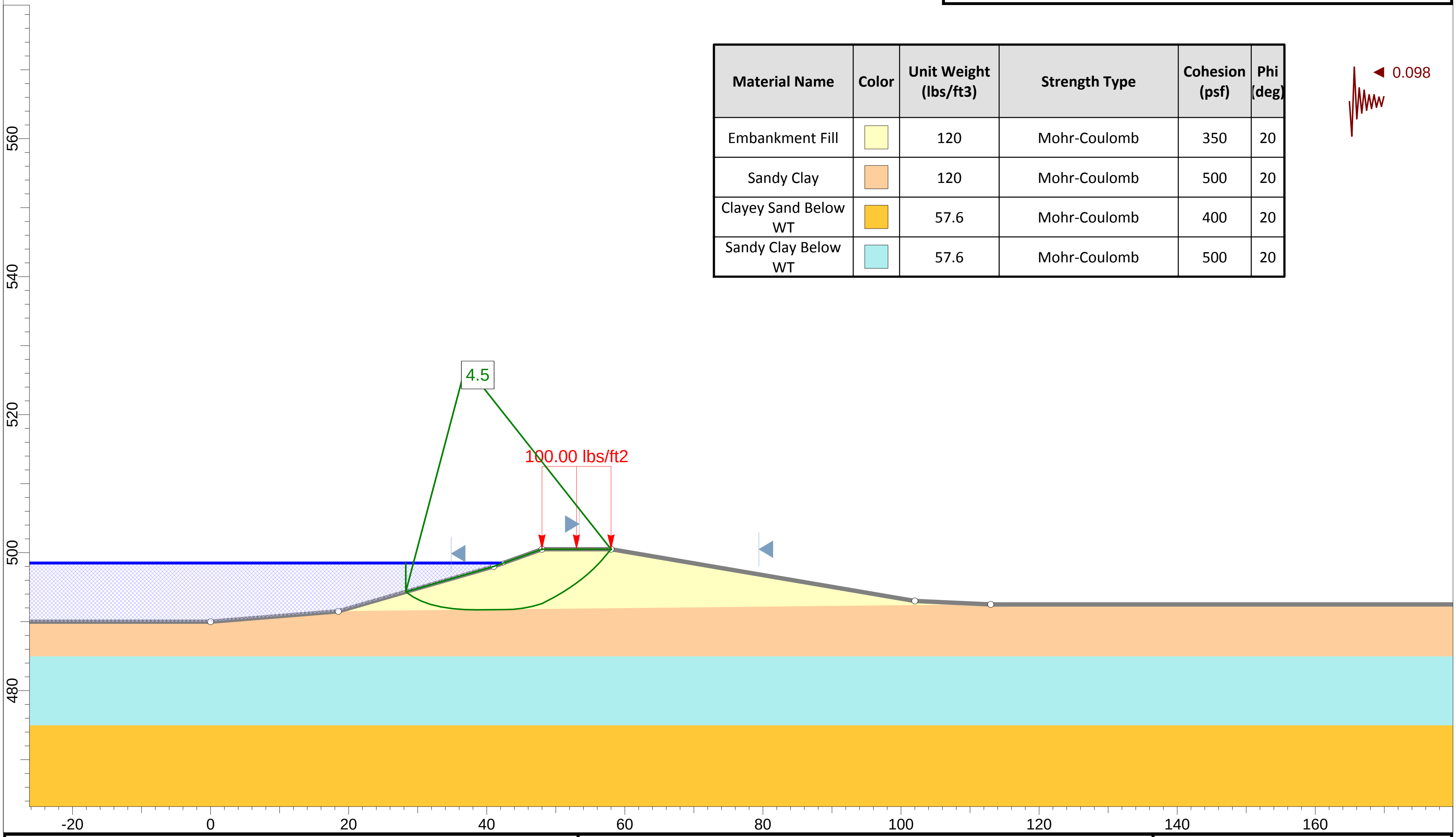
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-21a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "H" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

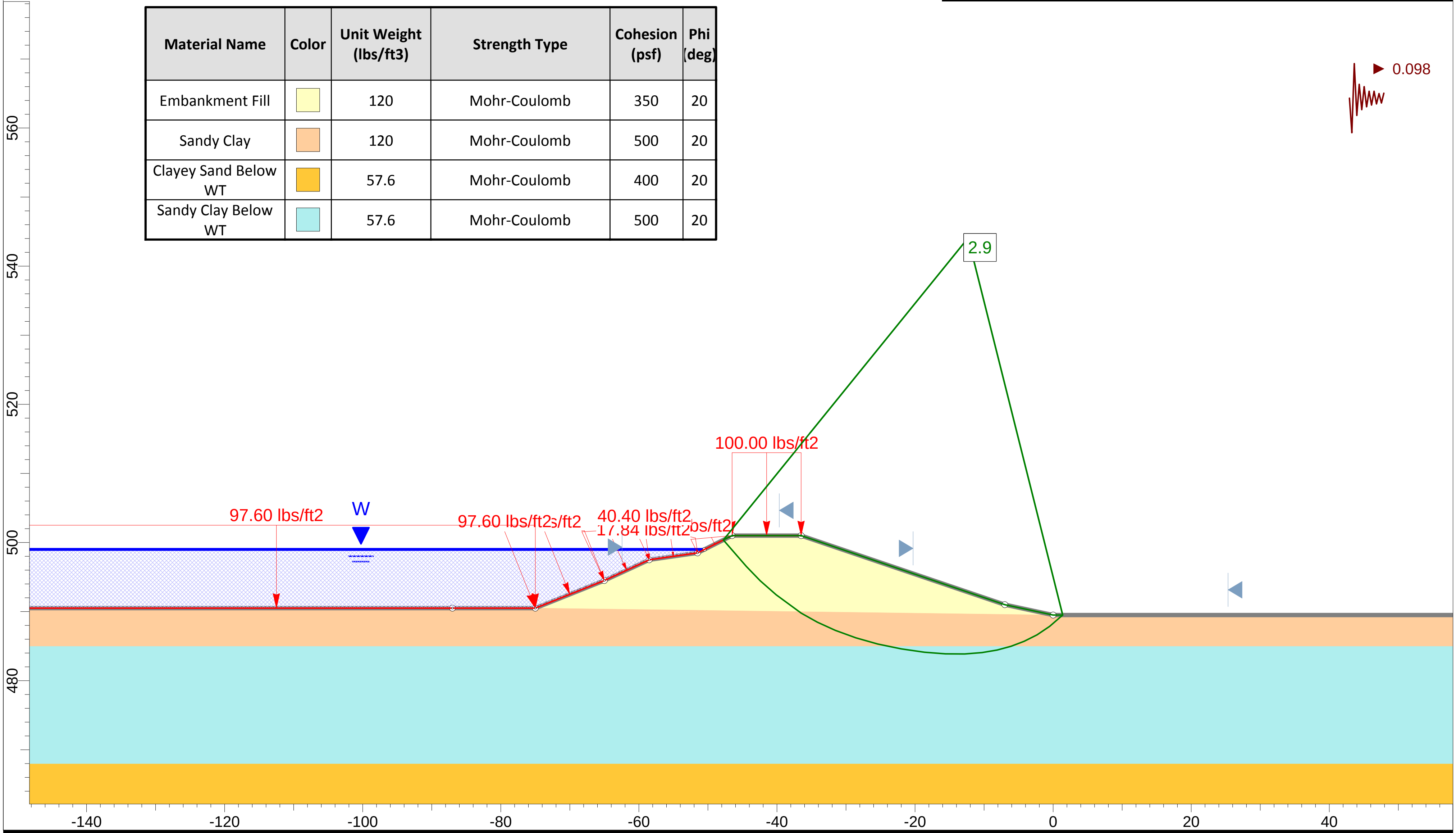
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-21b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



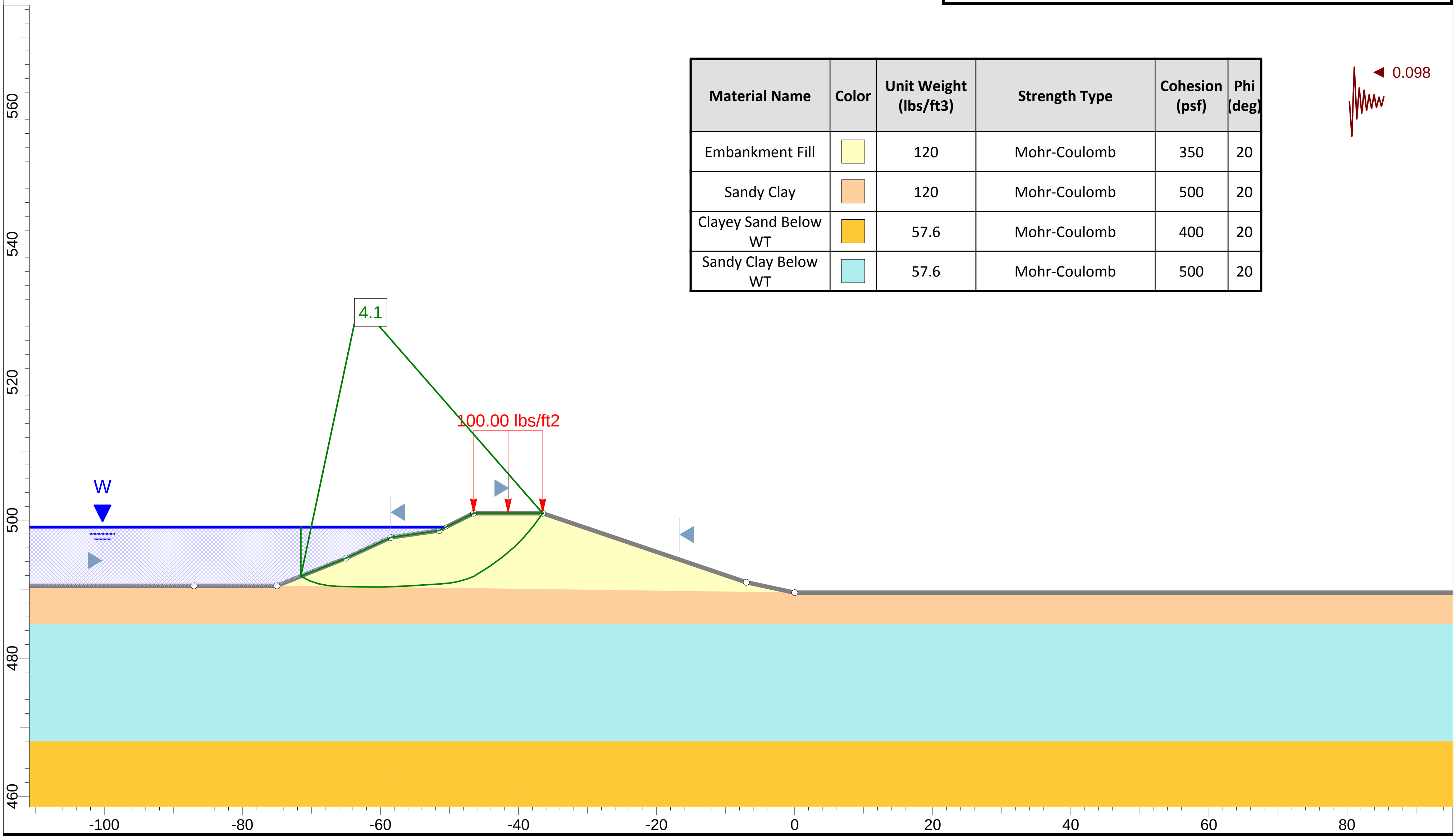
Profile "I" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-22a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "I" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

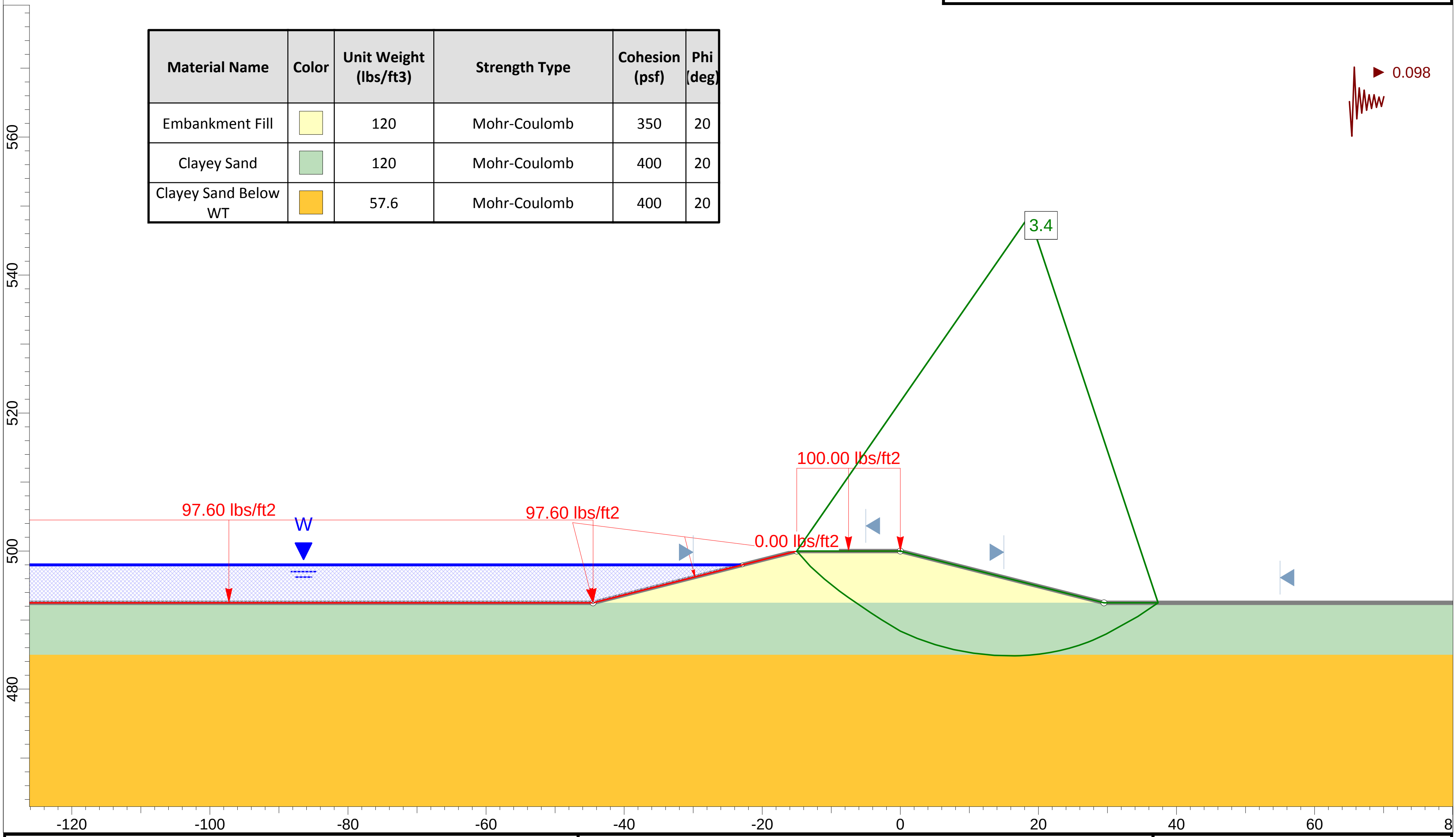
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-22b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



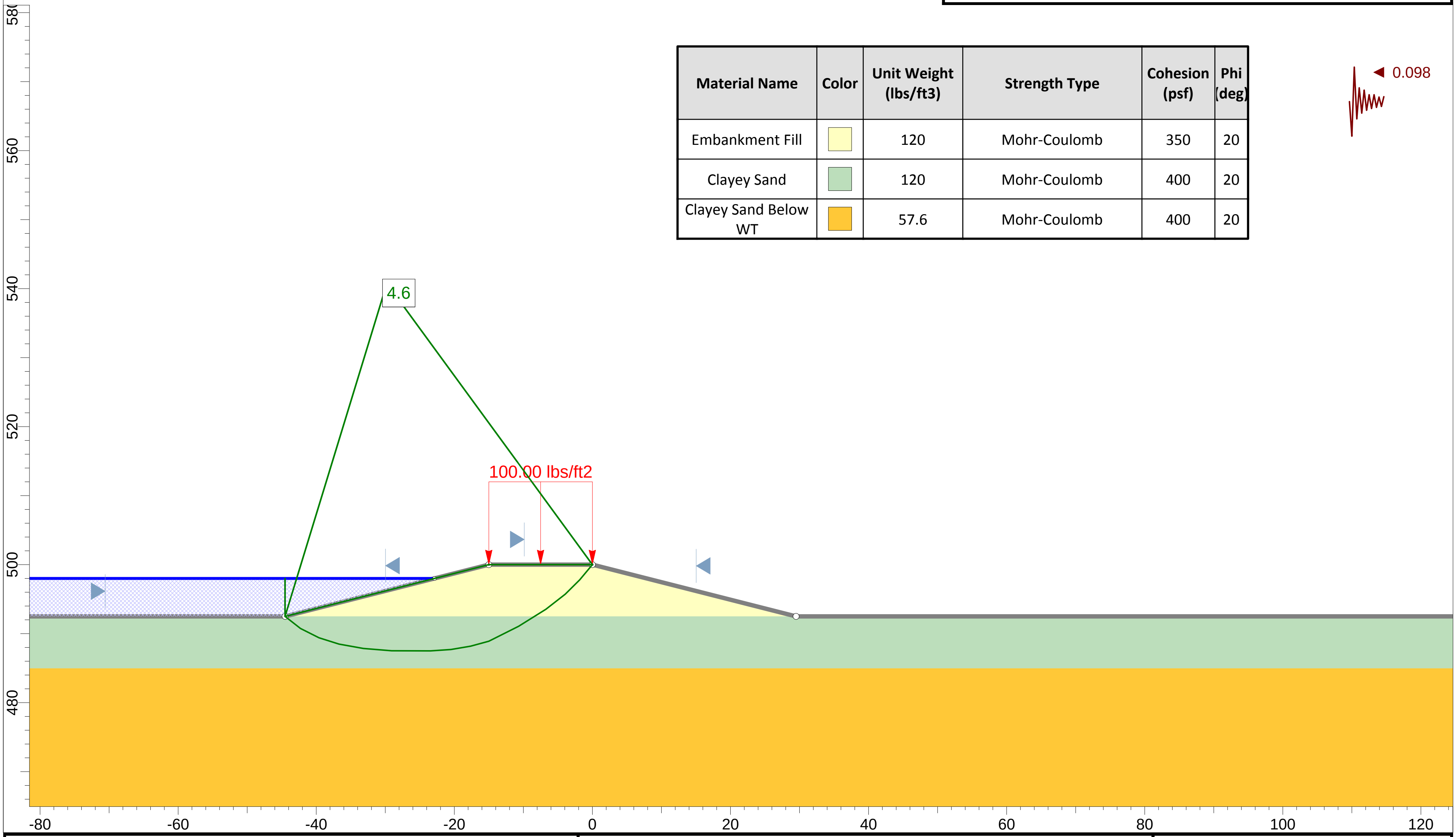
Profile "J" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-23a

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



Profile "J" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

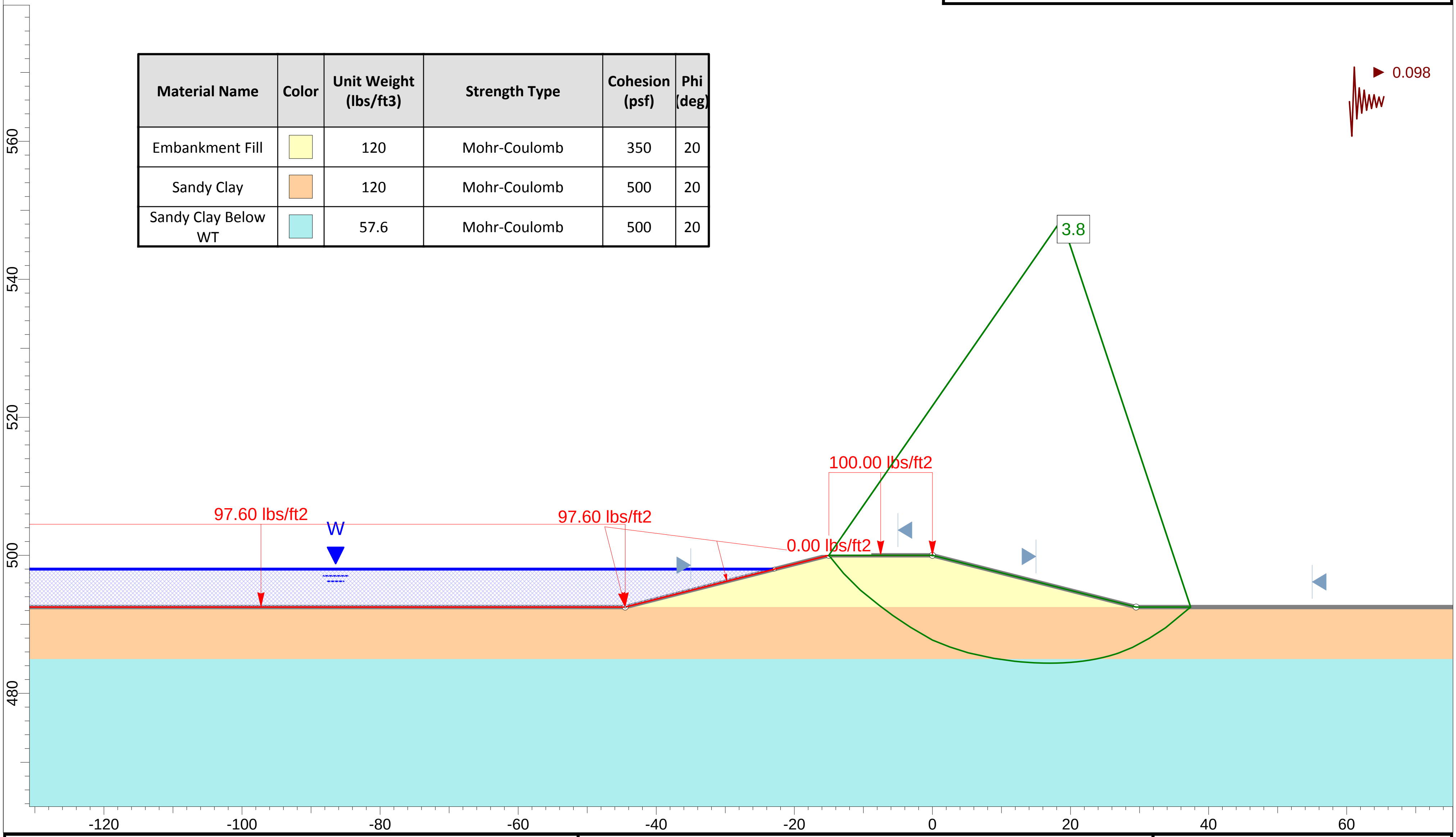
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-23b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



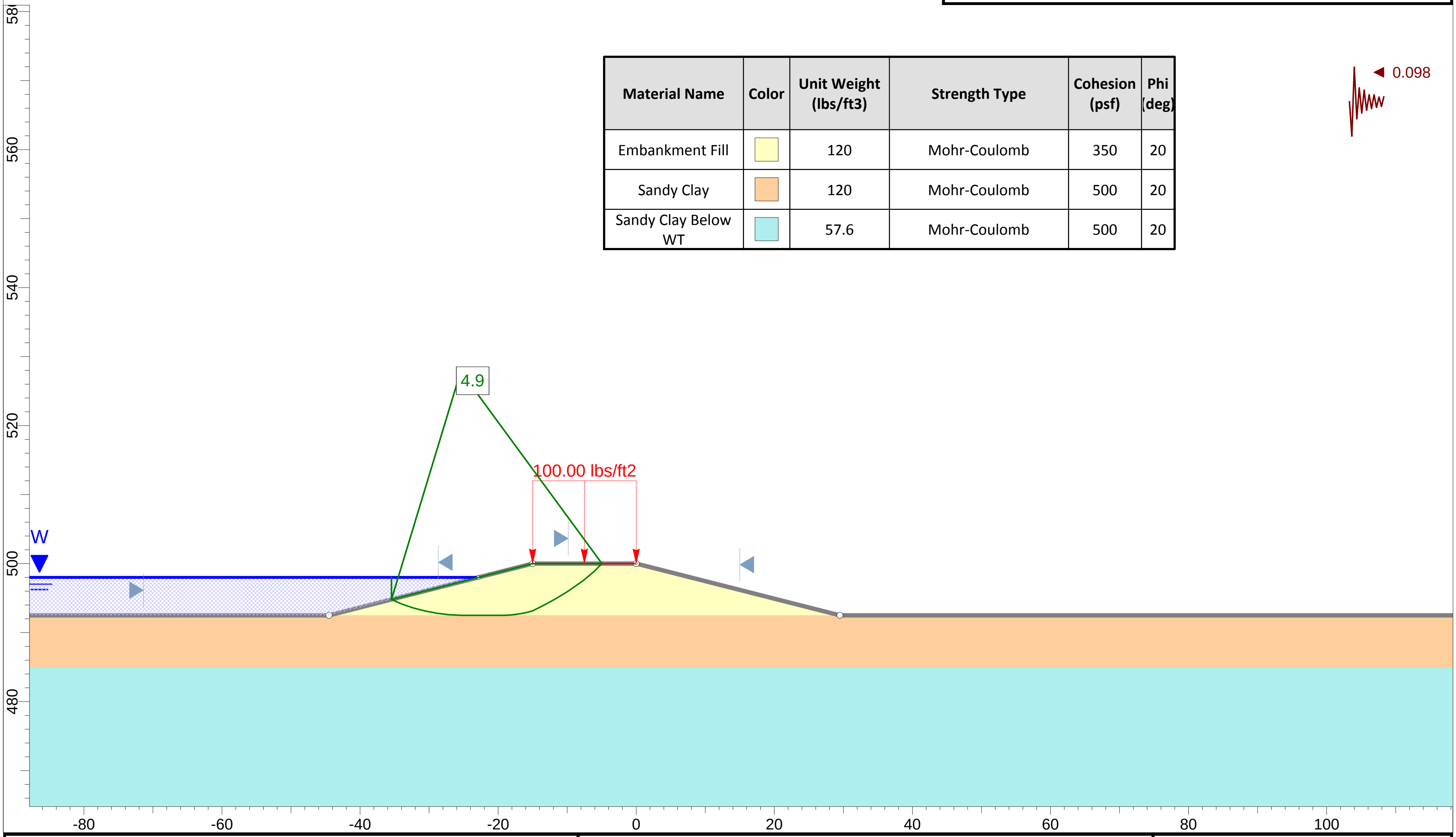
Profile "K" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-24a

RABA KISTNER CONSULTANTS

Global Stability Analysis



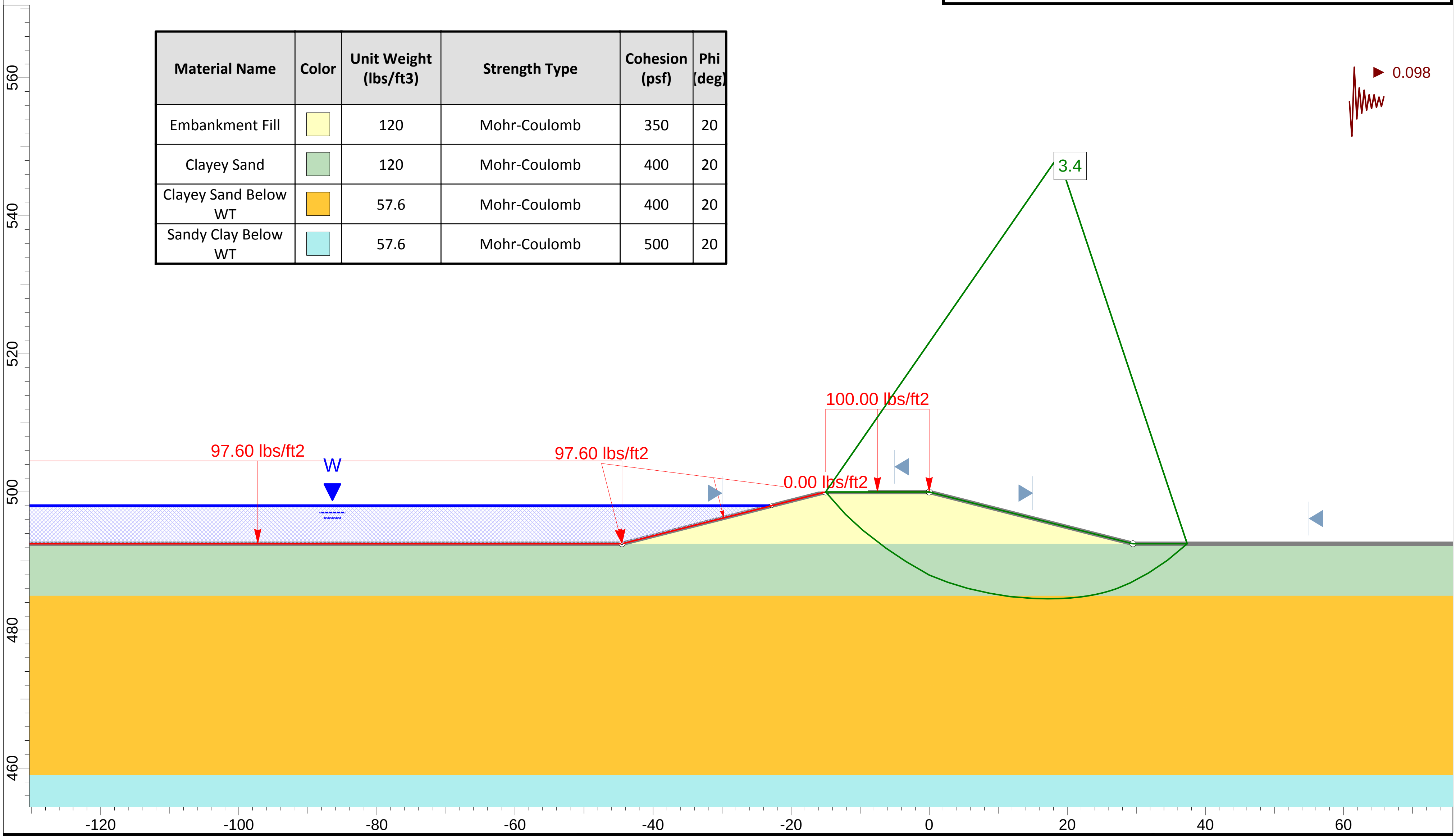
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "K" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-24b

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

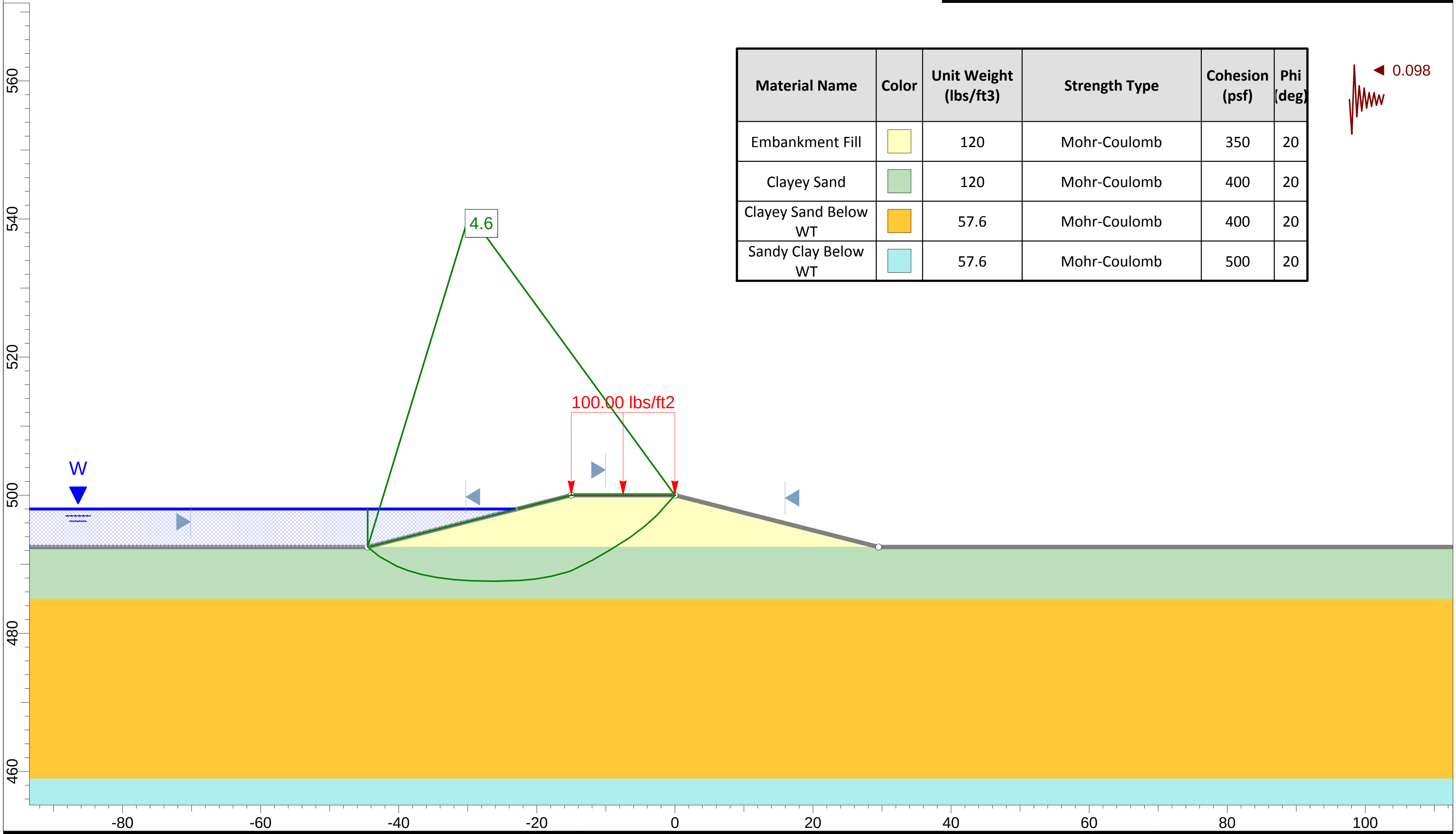
Profile "L" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-25a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

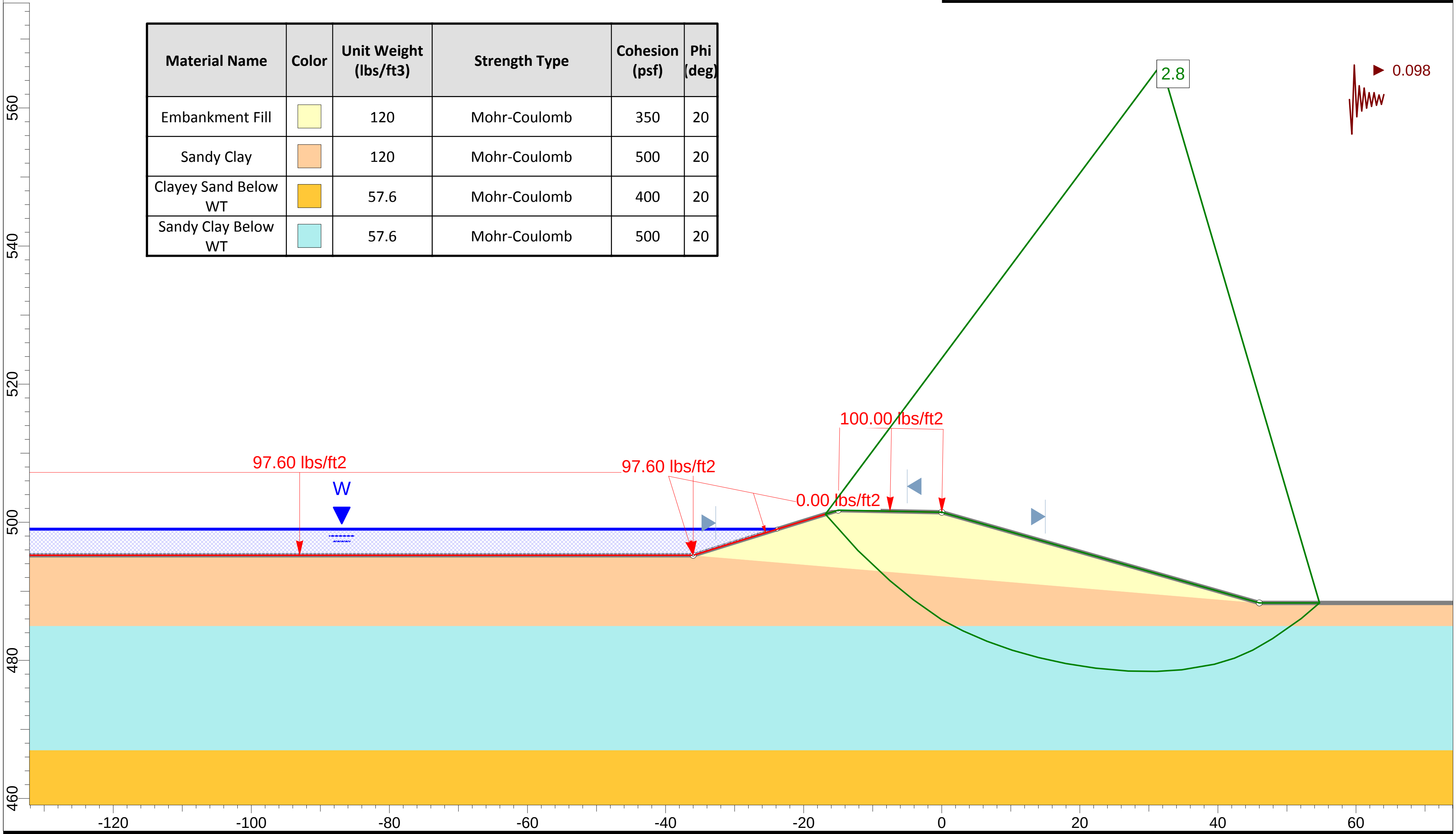
Profile "L" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-25b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

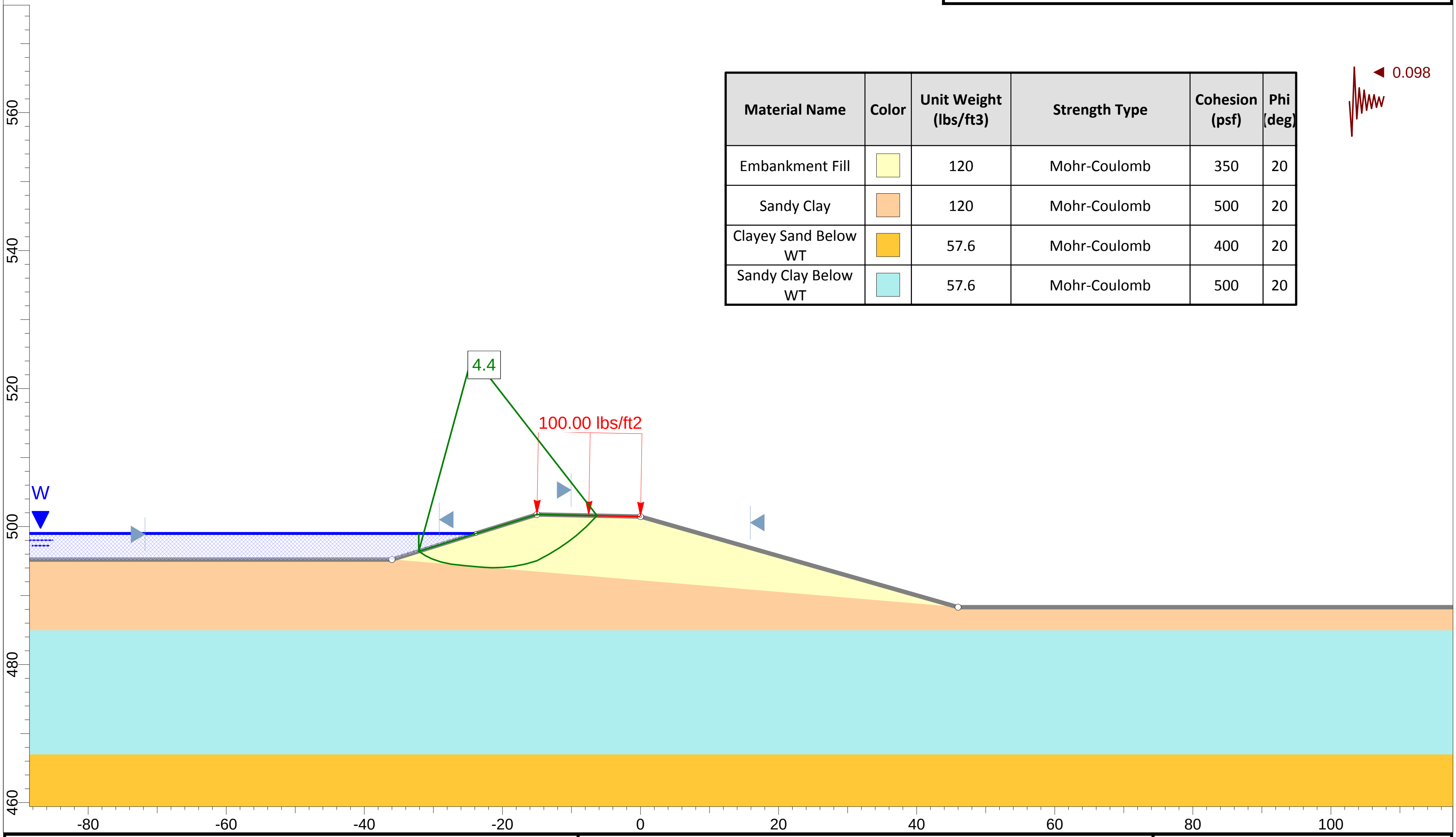
Profile "M" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-26a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟡	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "M" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

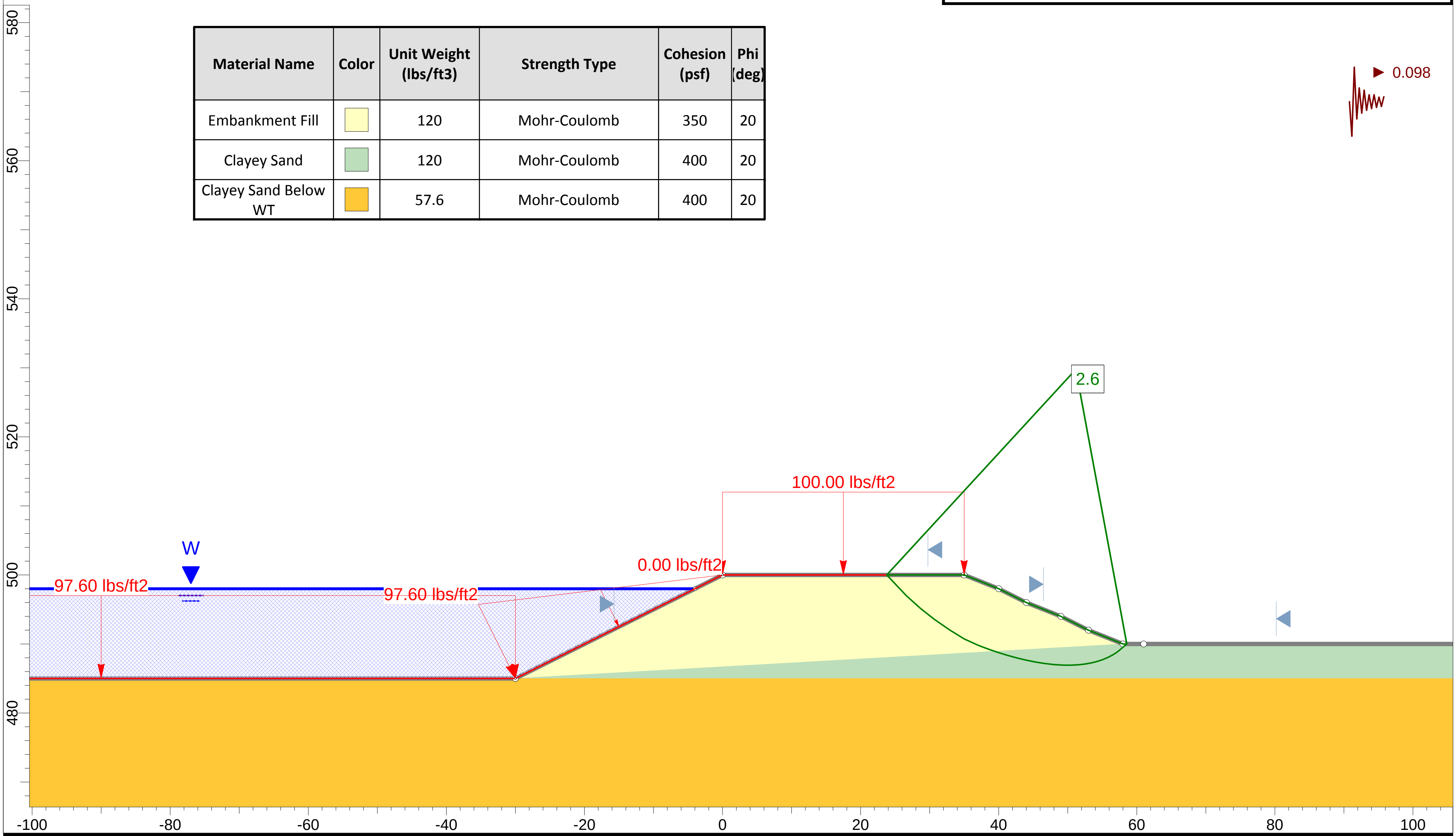
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-26b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



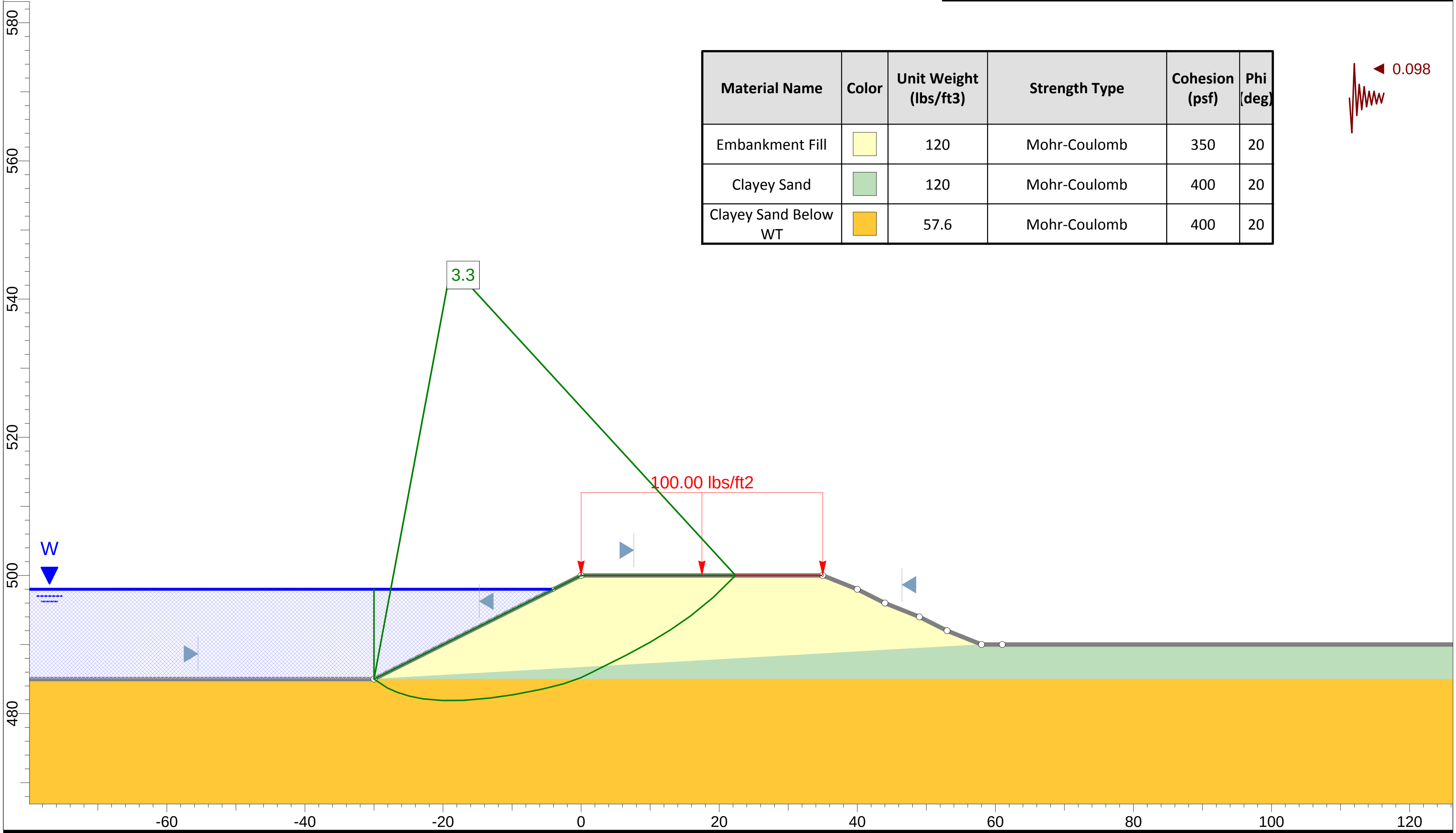
Profile "N" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-27a

RABA KISTNER CONSULTANTS

Global Stability Analysis



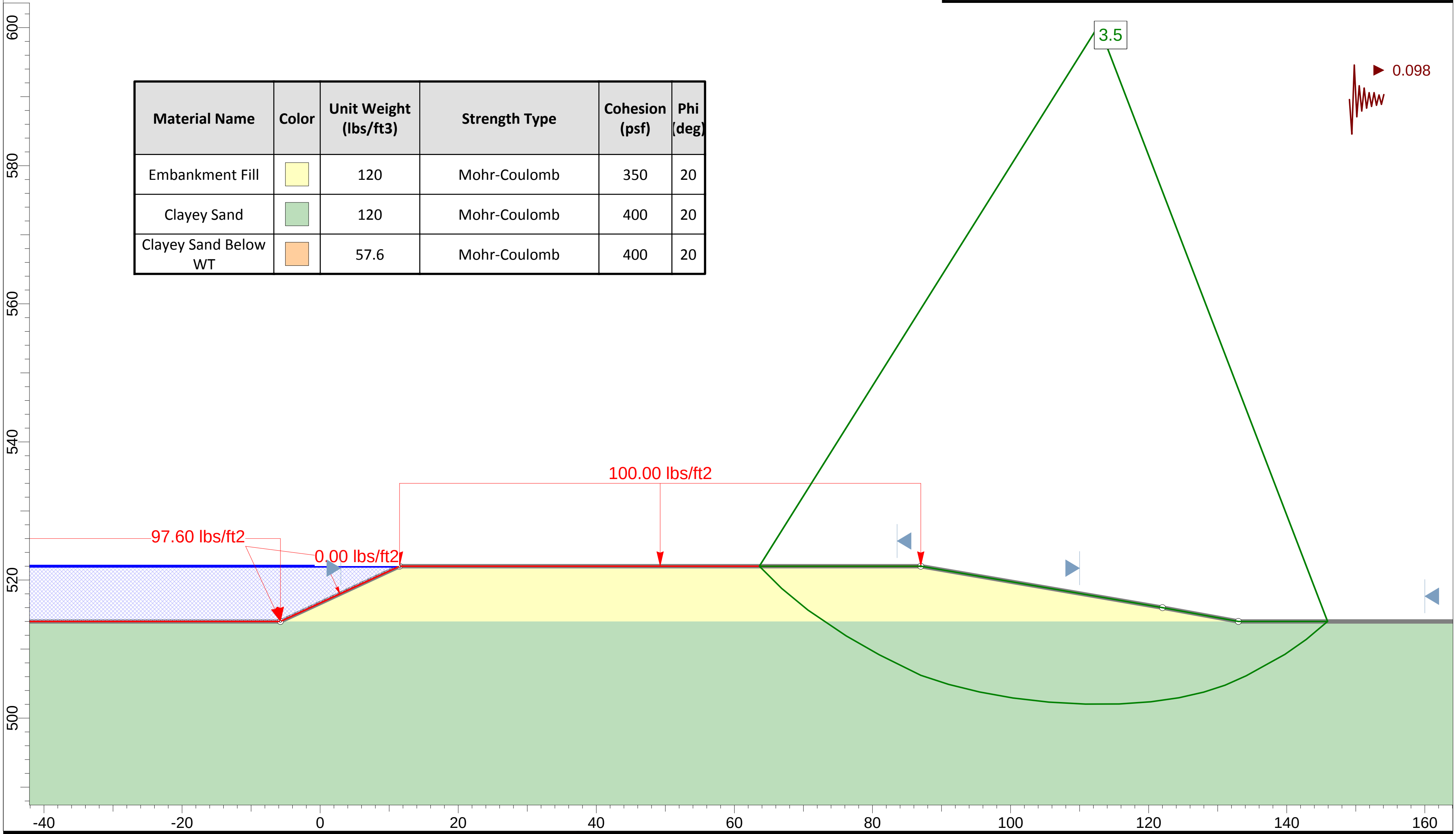
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "N" - Steady State
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-27b

Global Stability Analysis



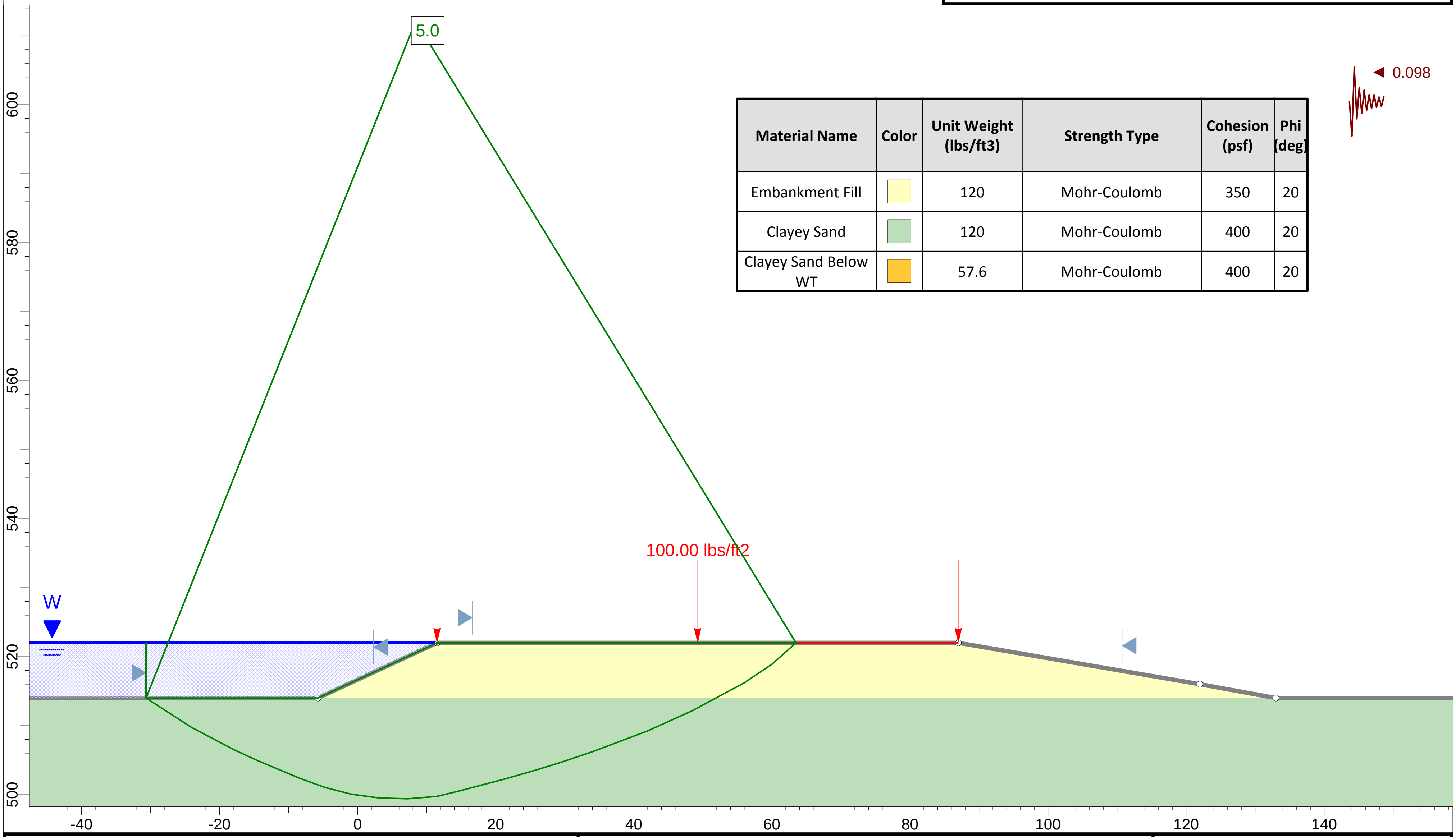
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "A" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-28a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

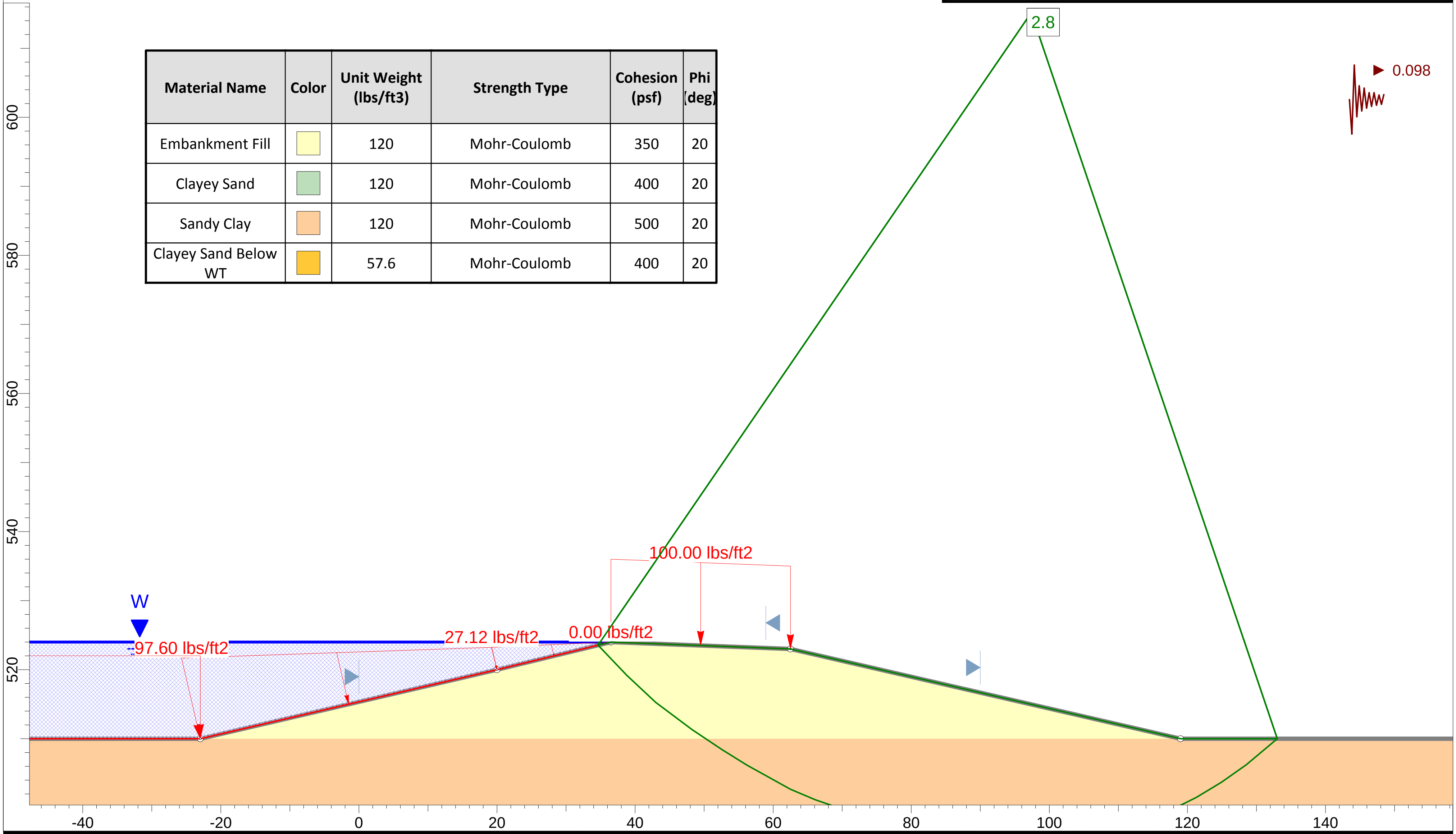
Profile "A" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-28b

RABA KISTNER CONSULTANTS

Global Stability Analysis



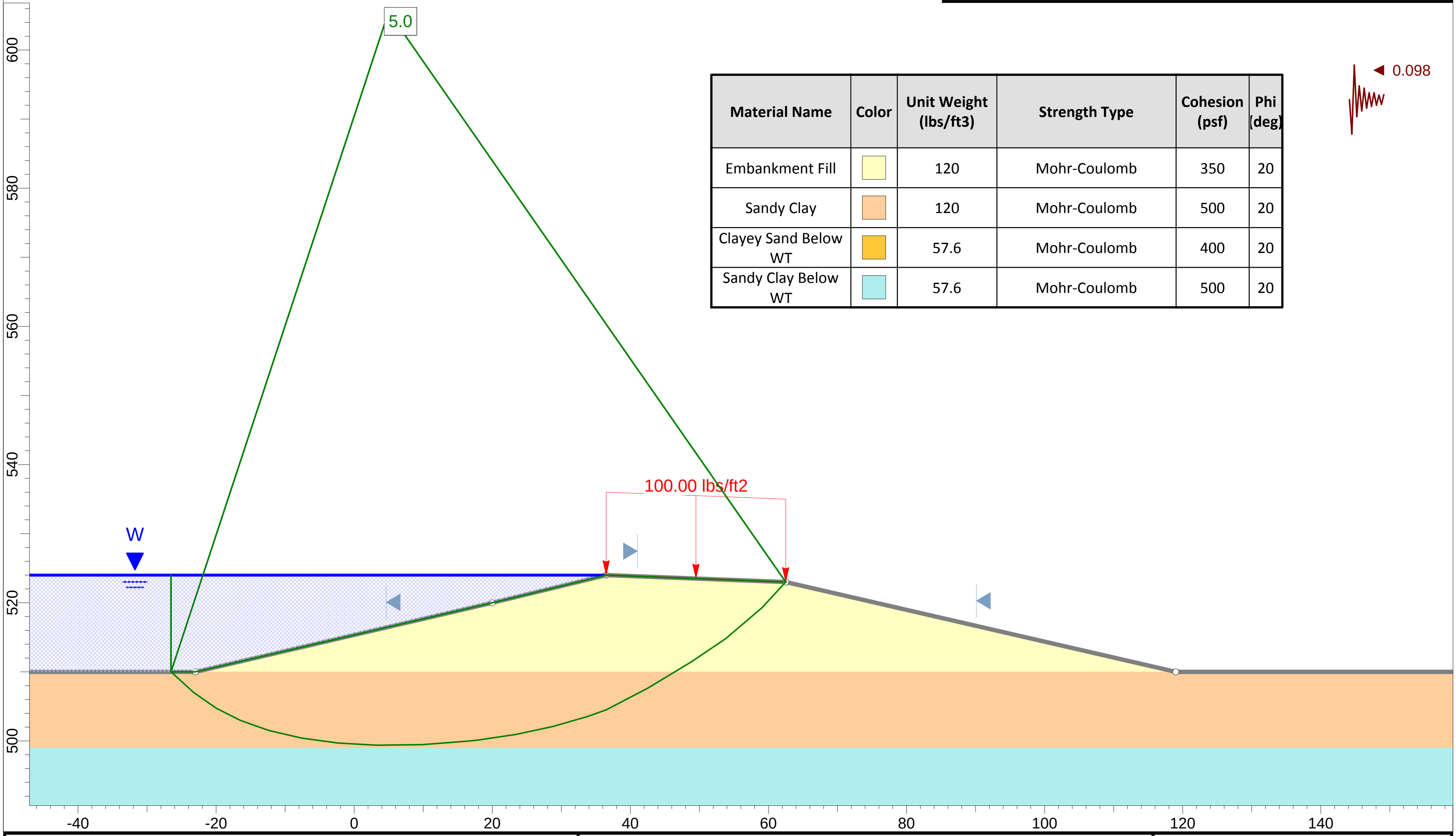
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

Profile "B" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-29a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "B" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

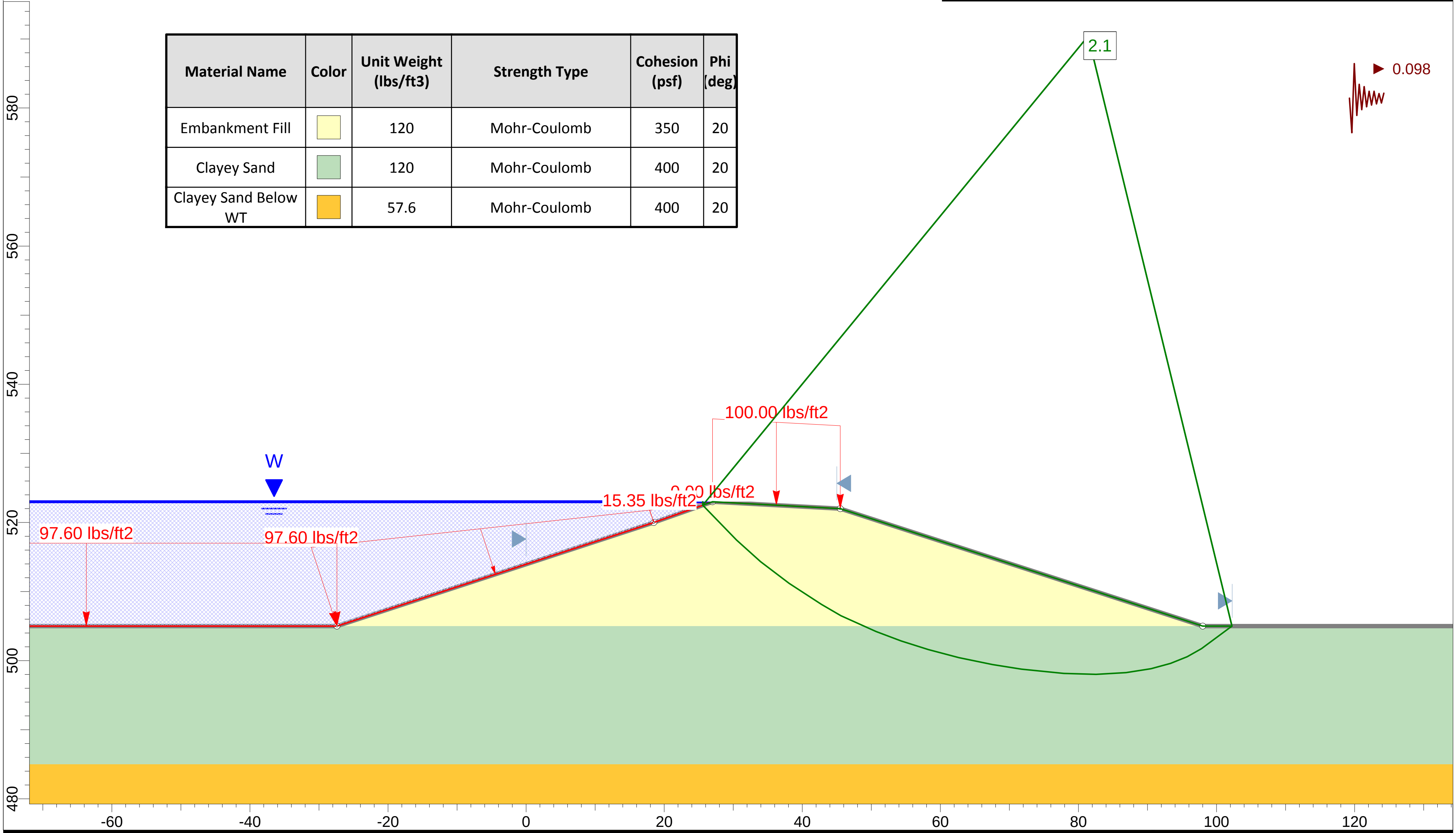
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-29b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



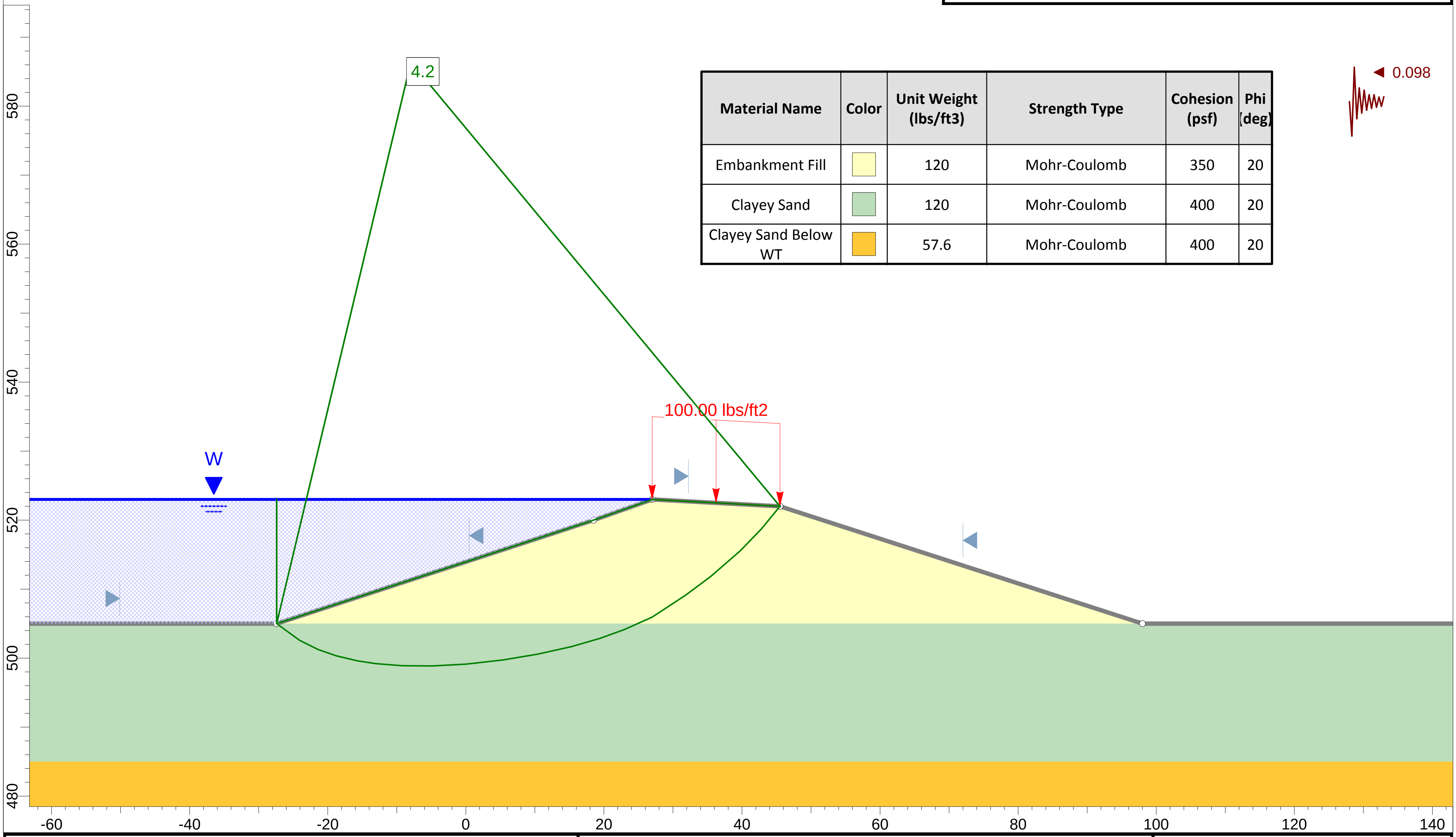
Profile "C" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-30a

RABA KISTNER CONSULTANTS

Global Stability Analysis



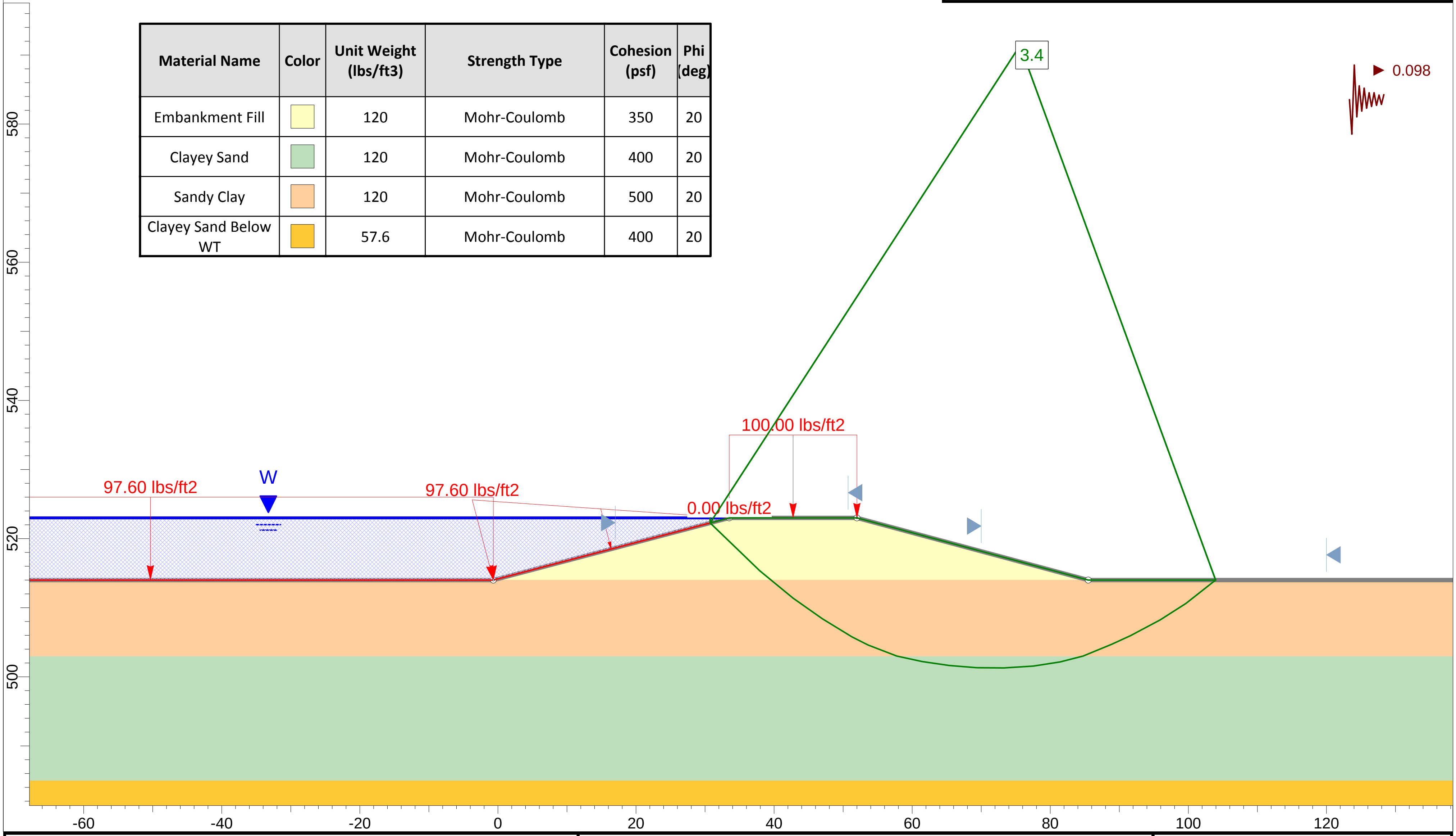
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "C" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-30b

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

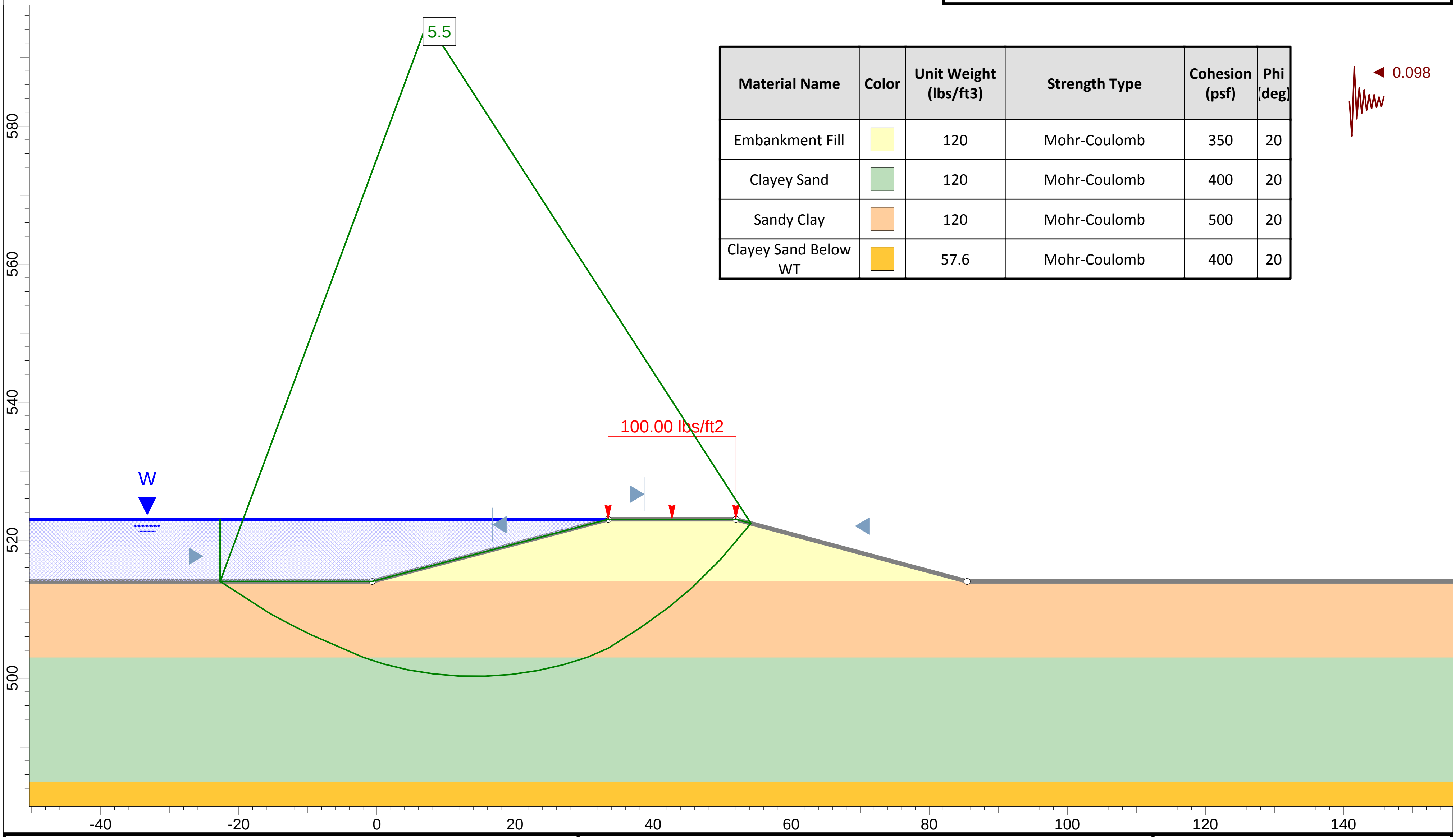
Profile "D" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-31a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20

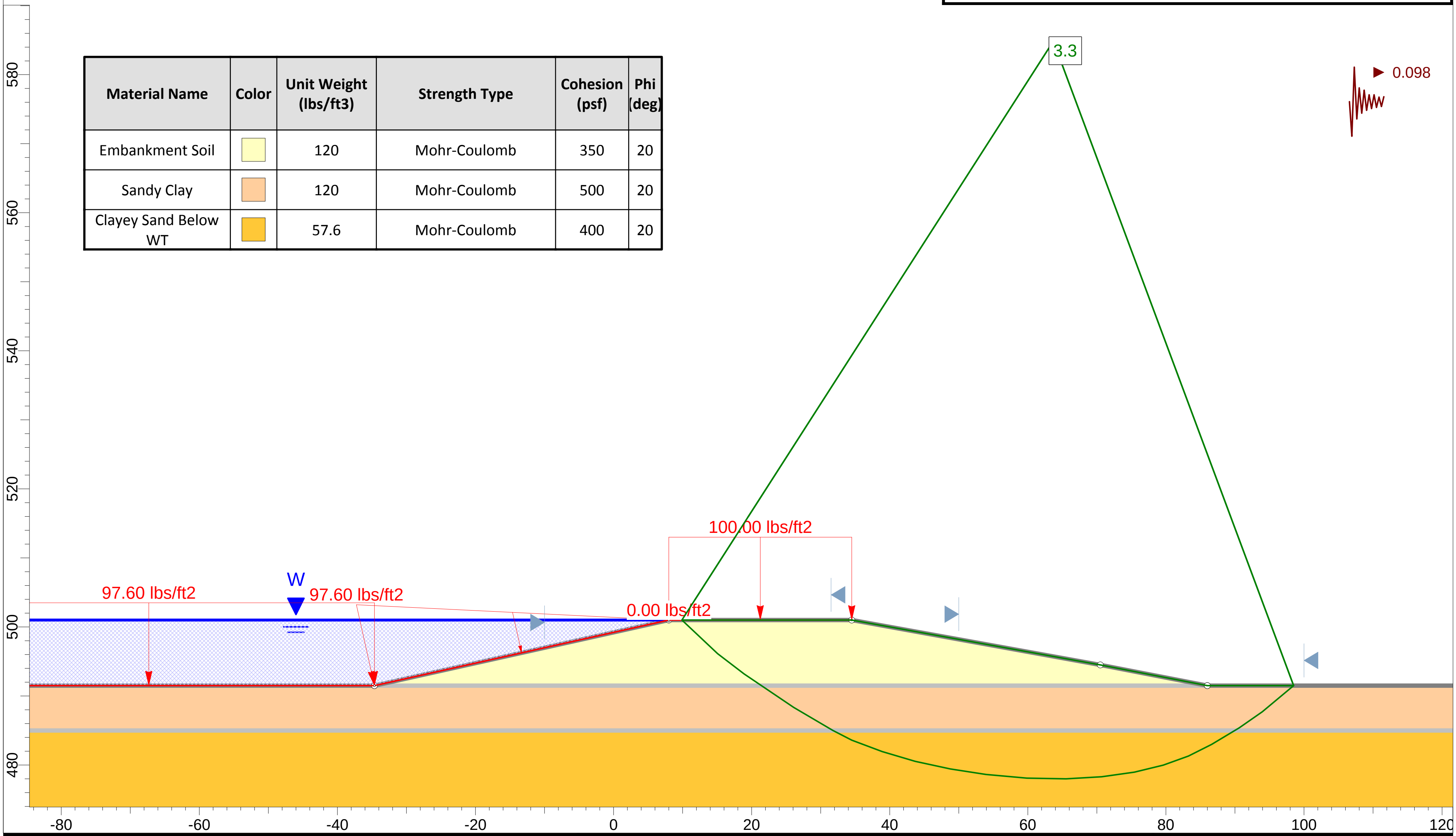
Profile "D" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-31b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Soil	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



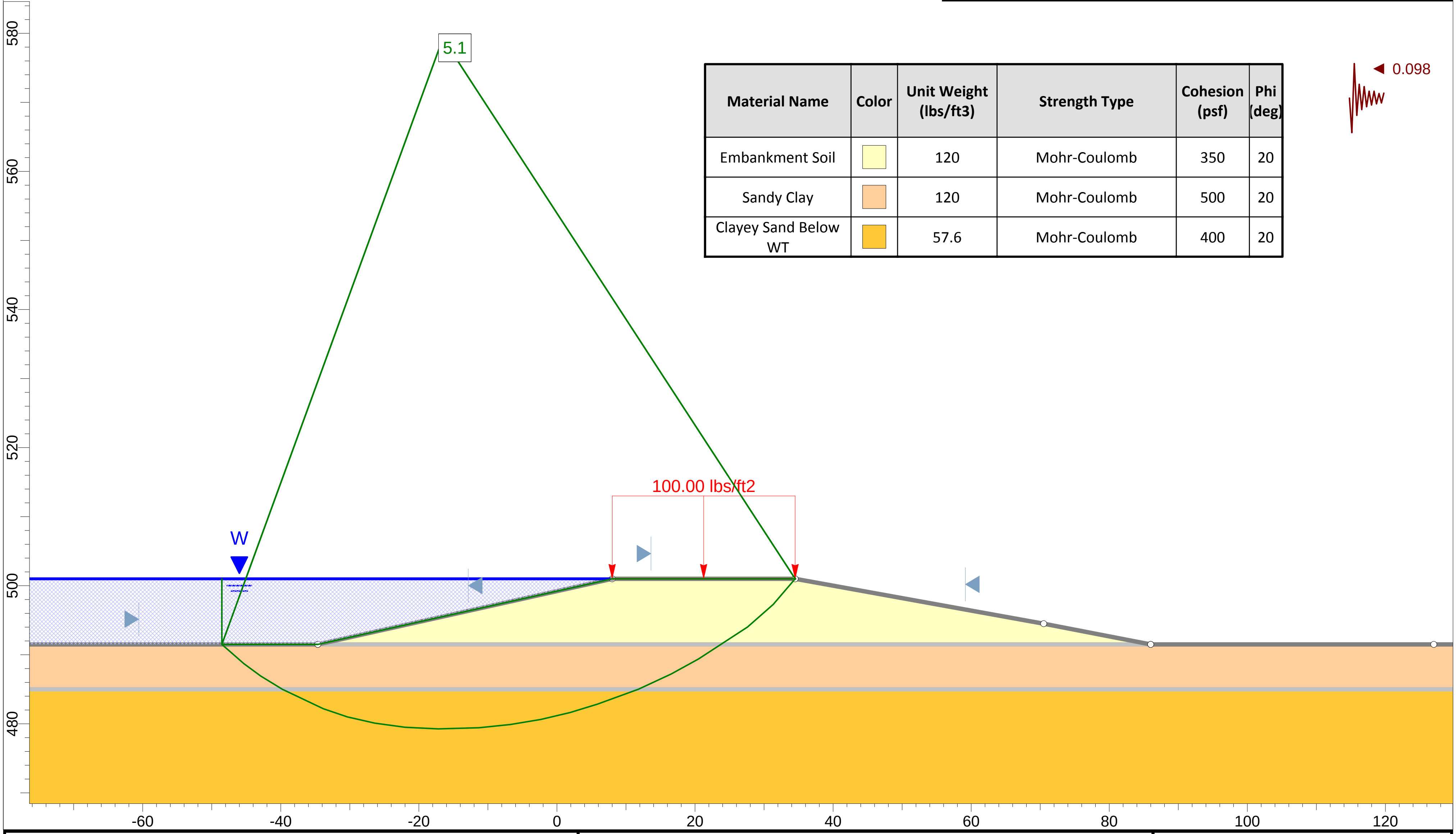
Profile "E" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-32a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Soil	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "E" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

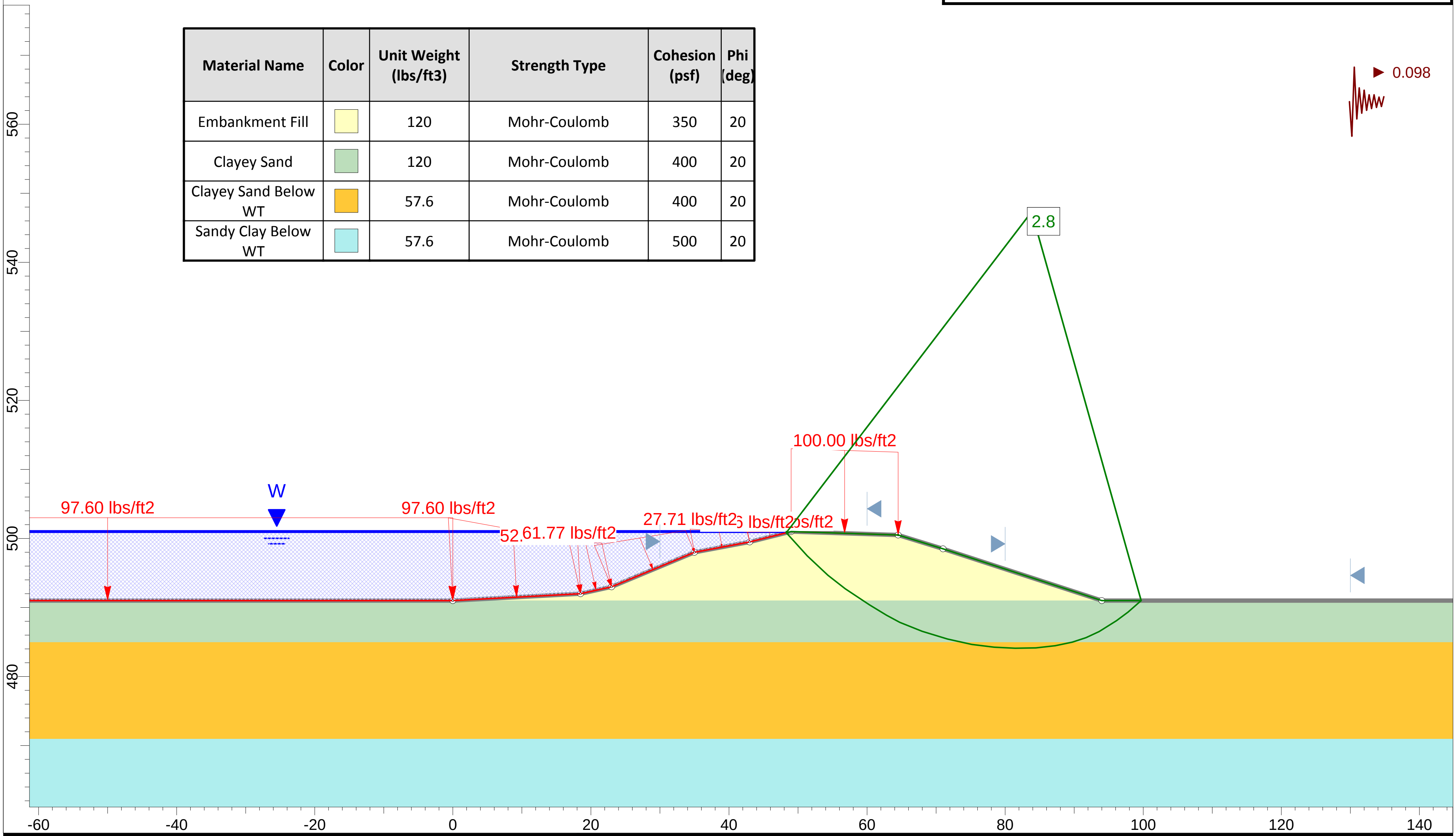
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-32b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

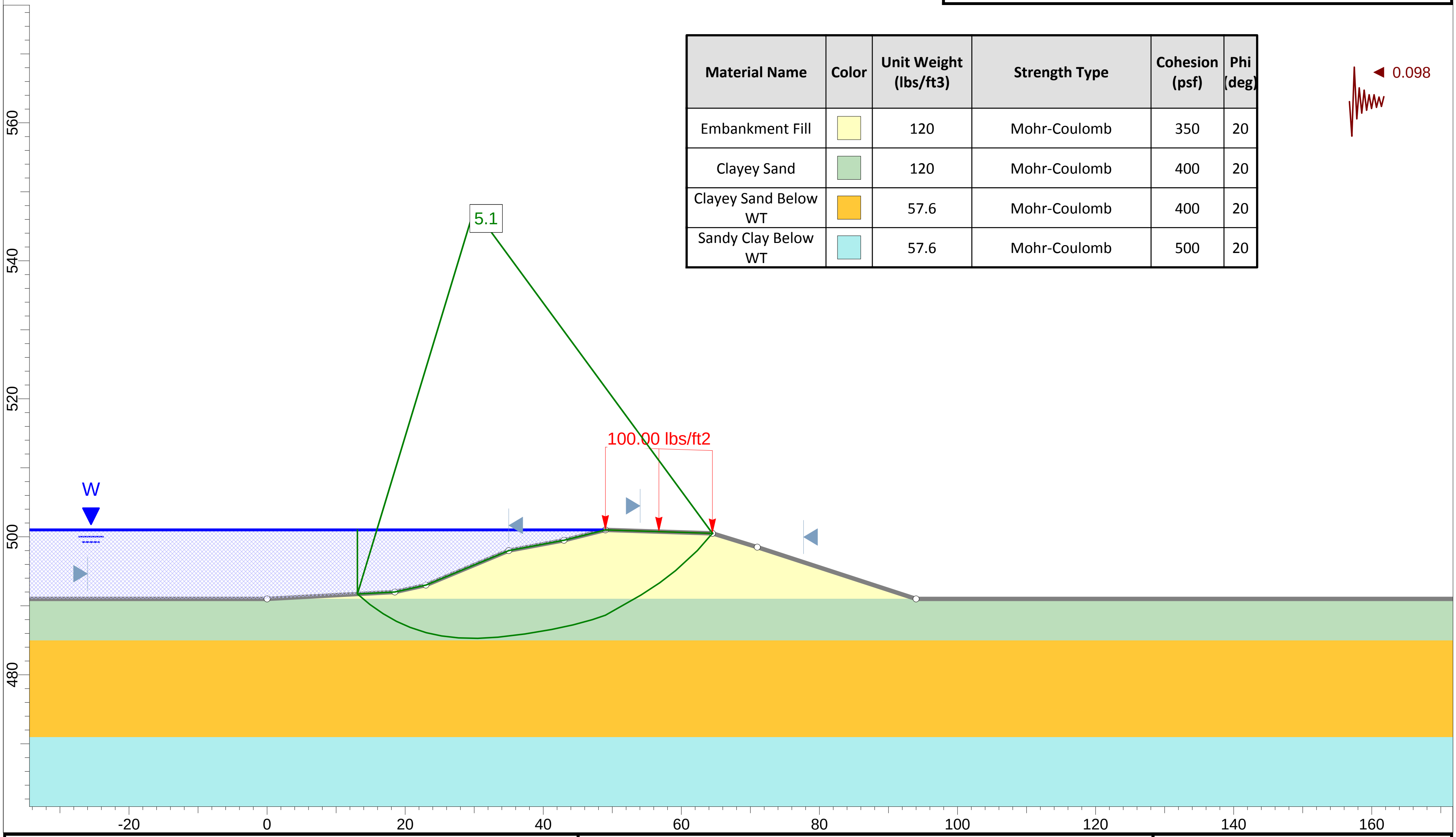


Profile "F" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-33a

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

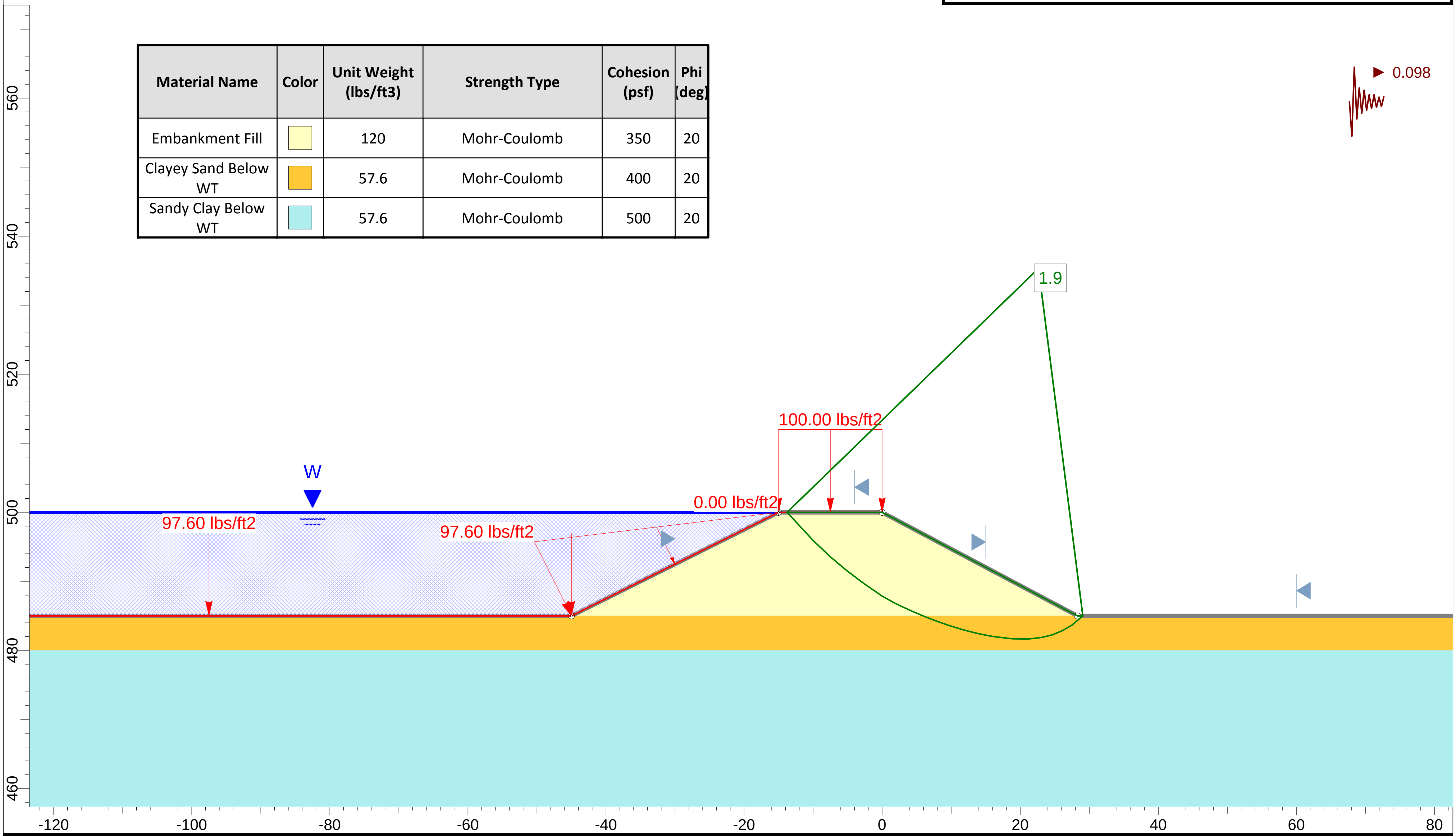
Profile "F" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-33b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

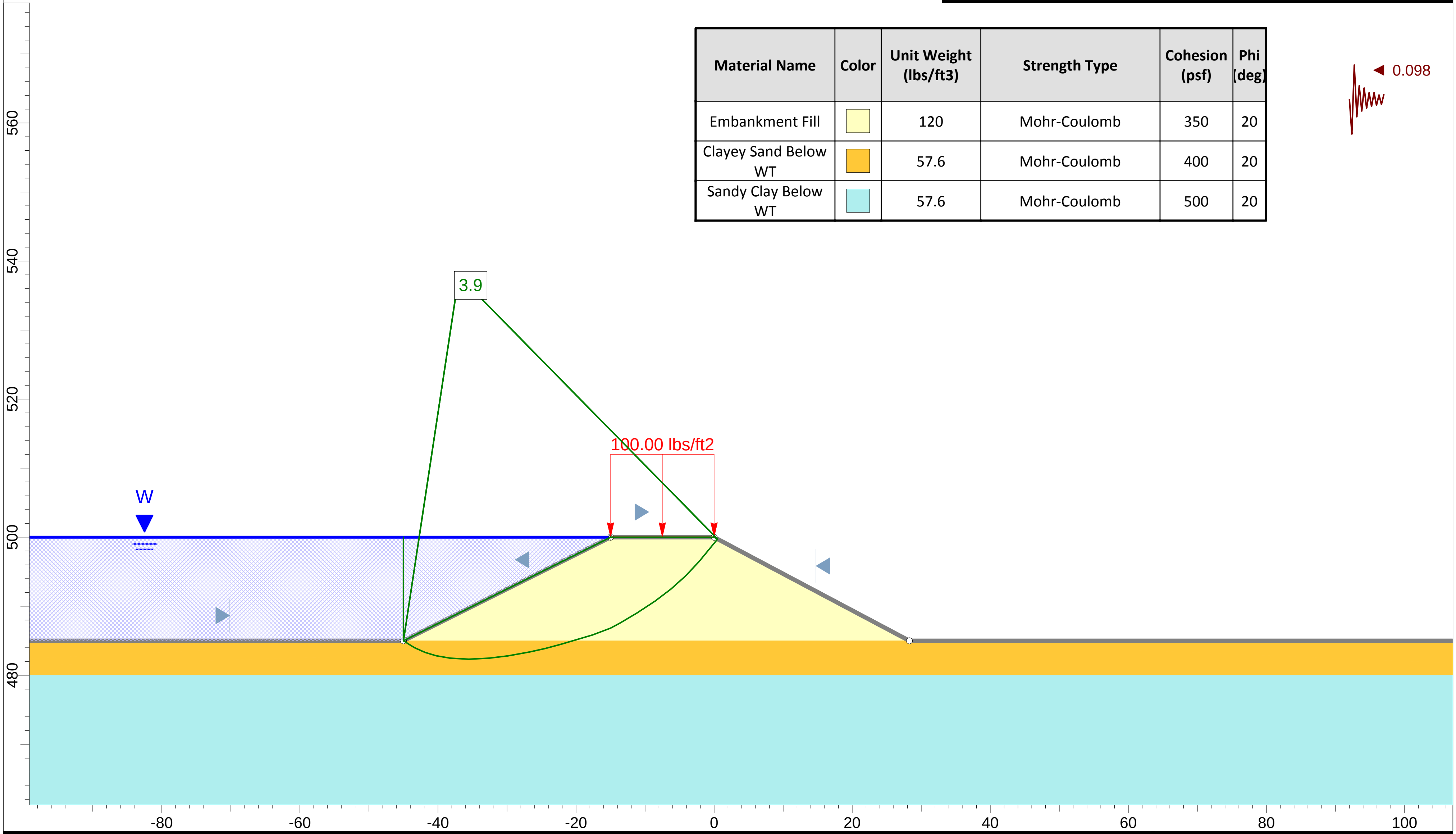
Profile "G" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-34a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

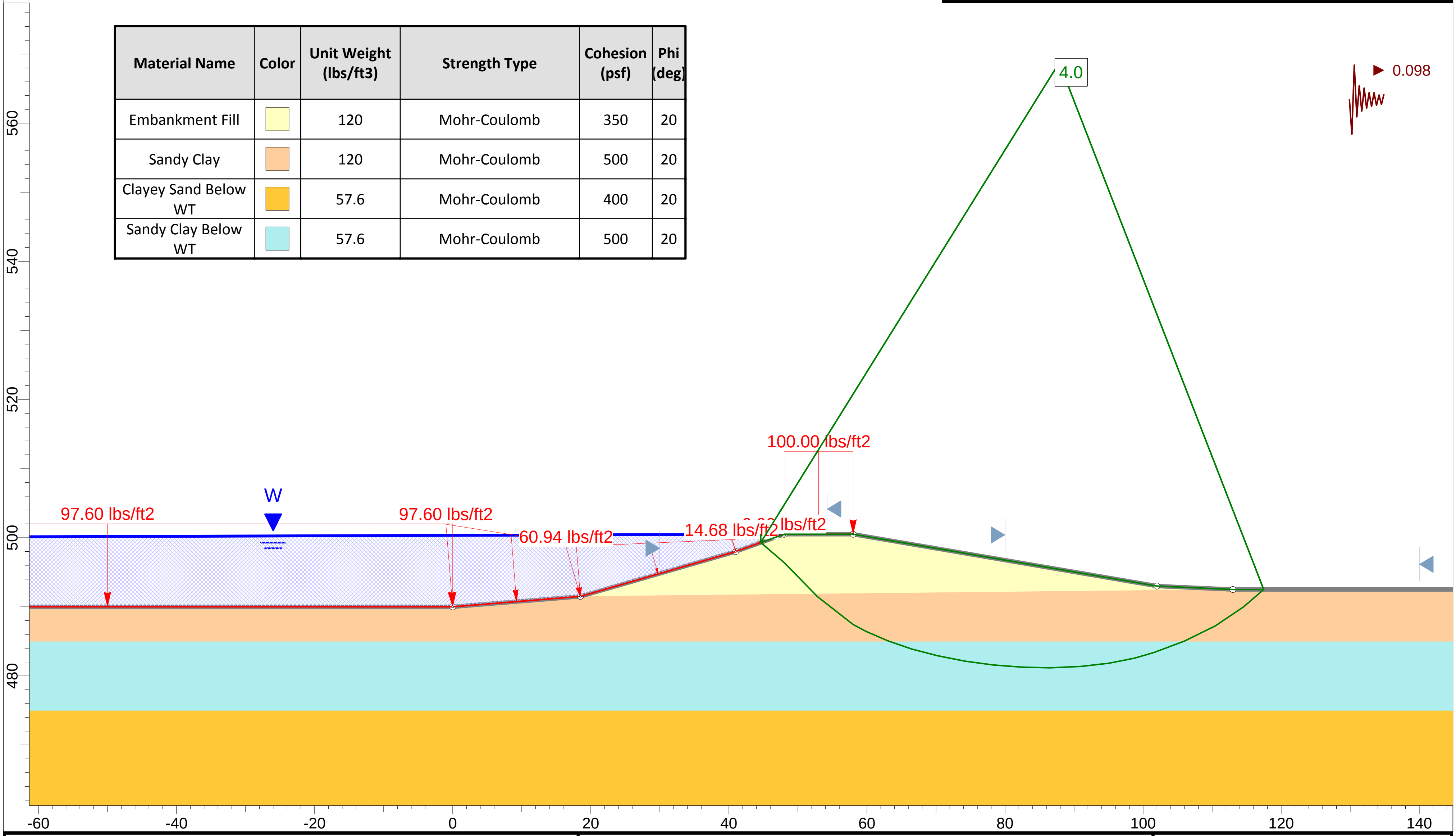
Profile "G" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-34b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "H" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

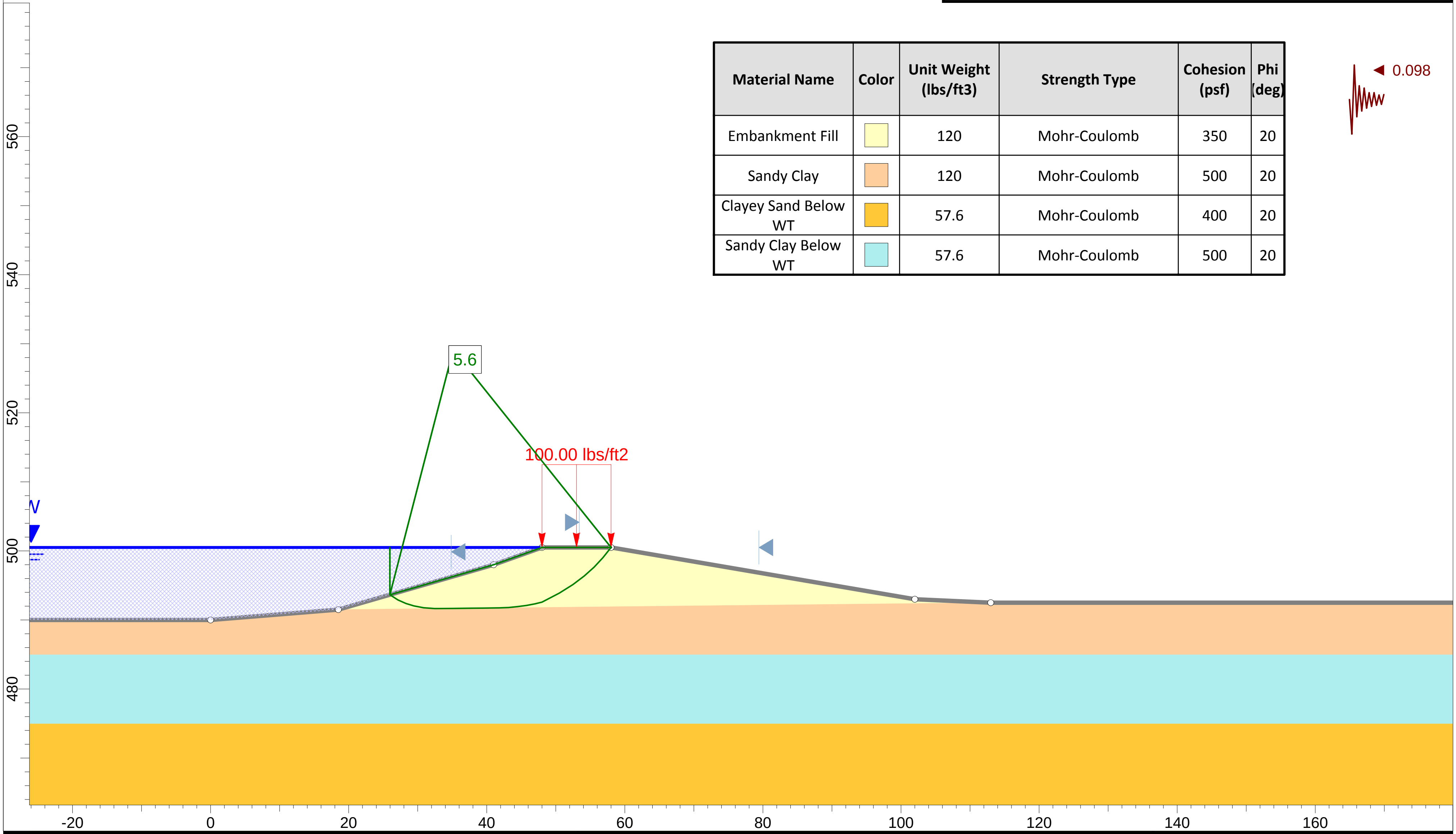
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-35a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



Profile "H" - Maximum Pool
Ash Pond Berms - Calaveras Lake Power Plant

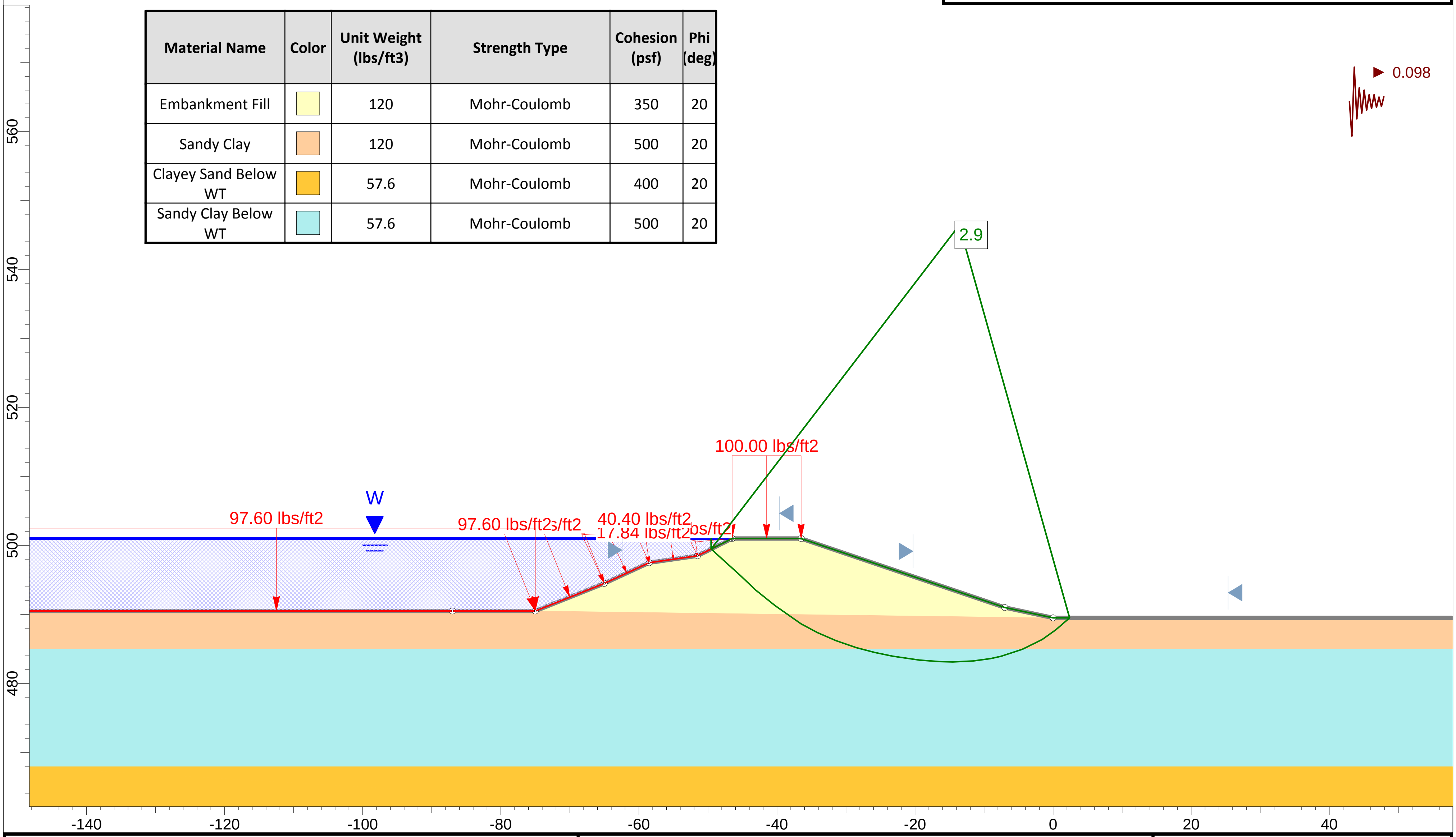
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-35b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



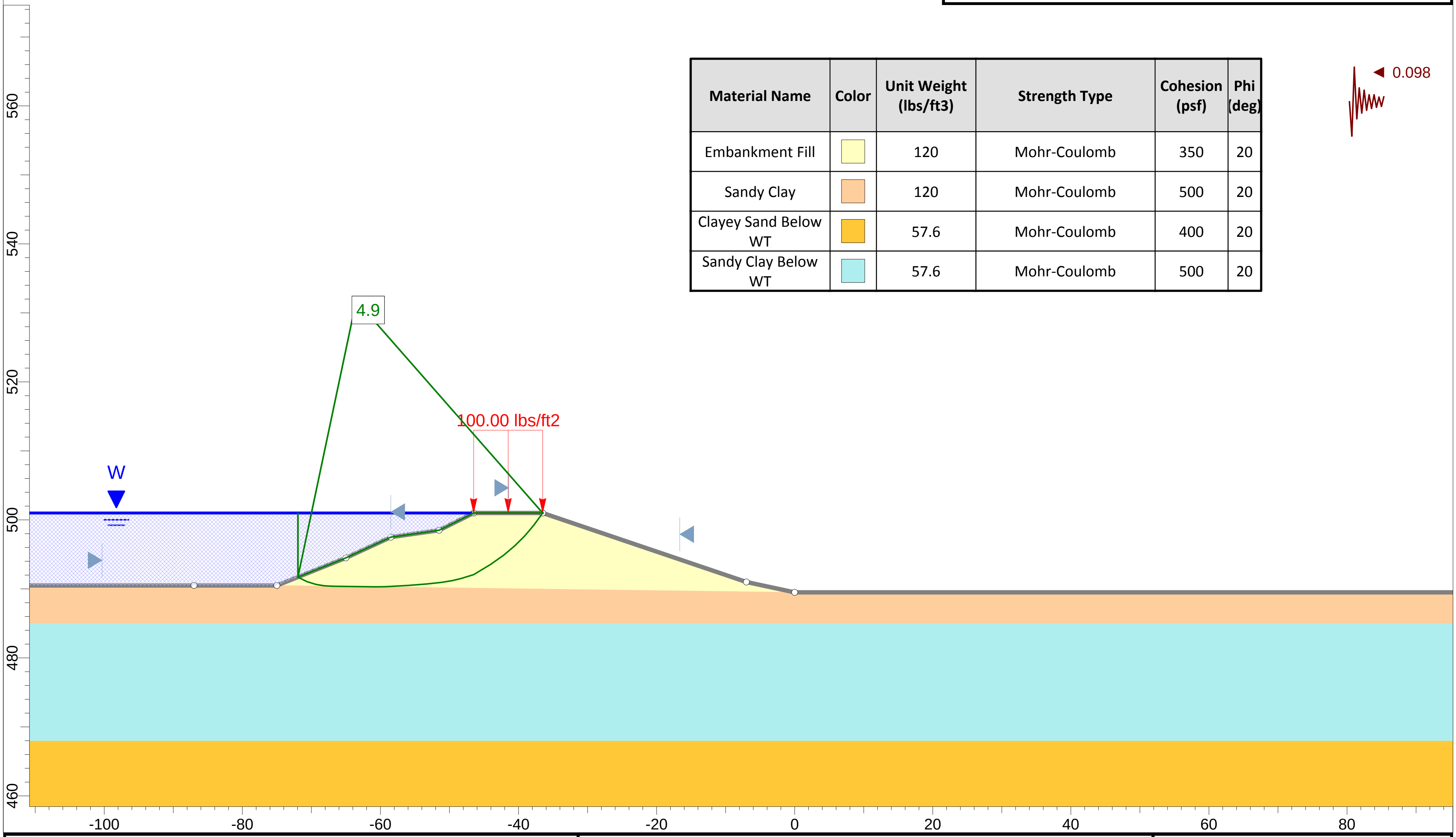
Profile "I" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-36a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

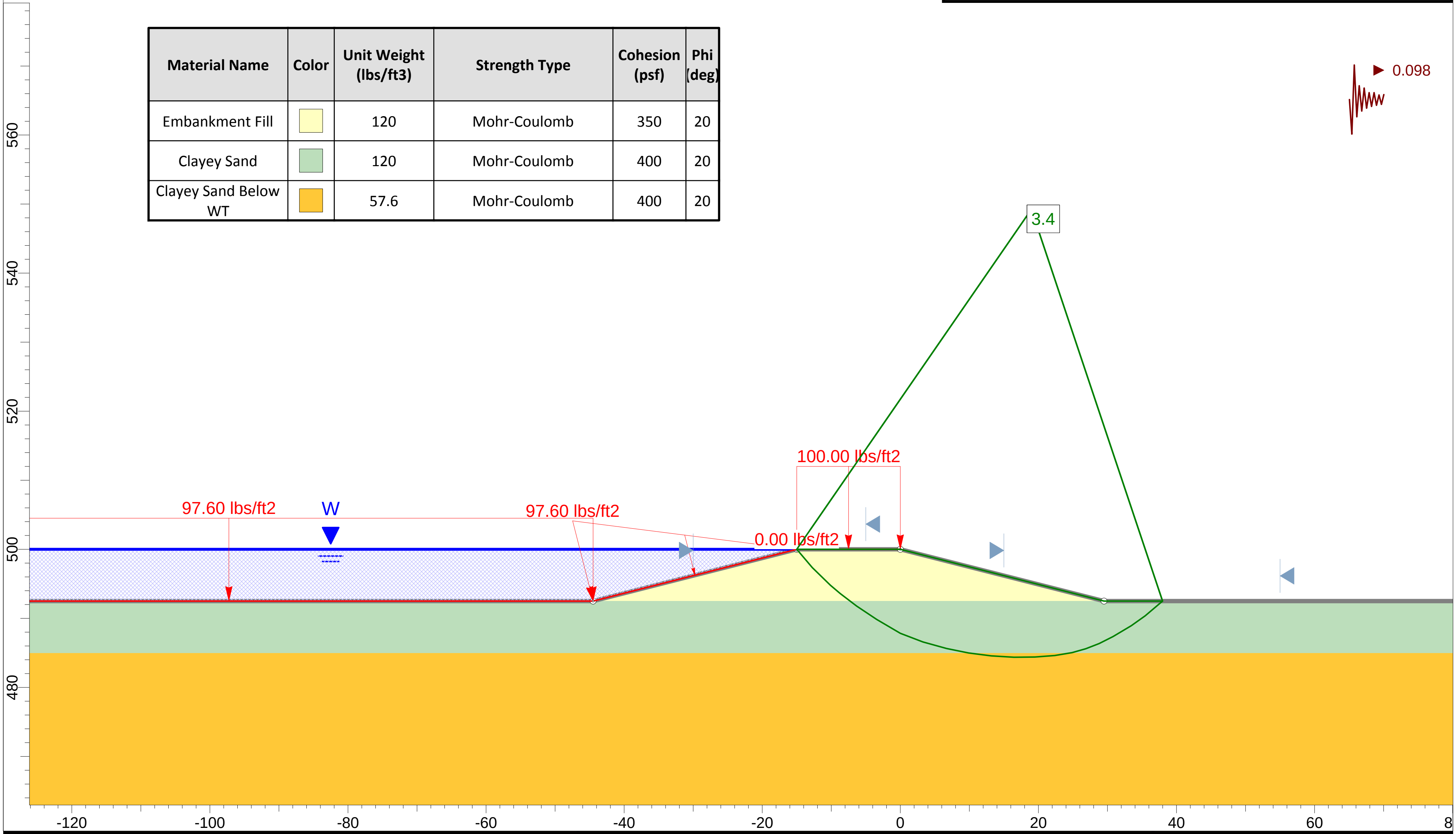
Profile "I" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-36b

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



Profile "J" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

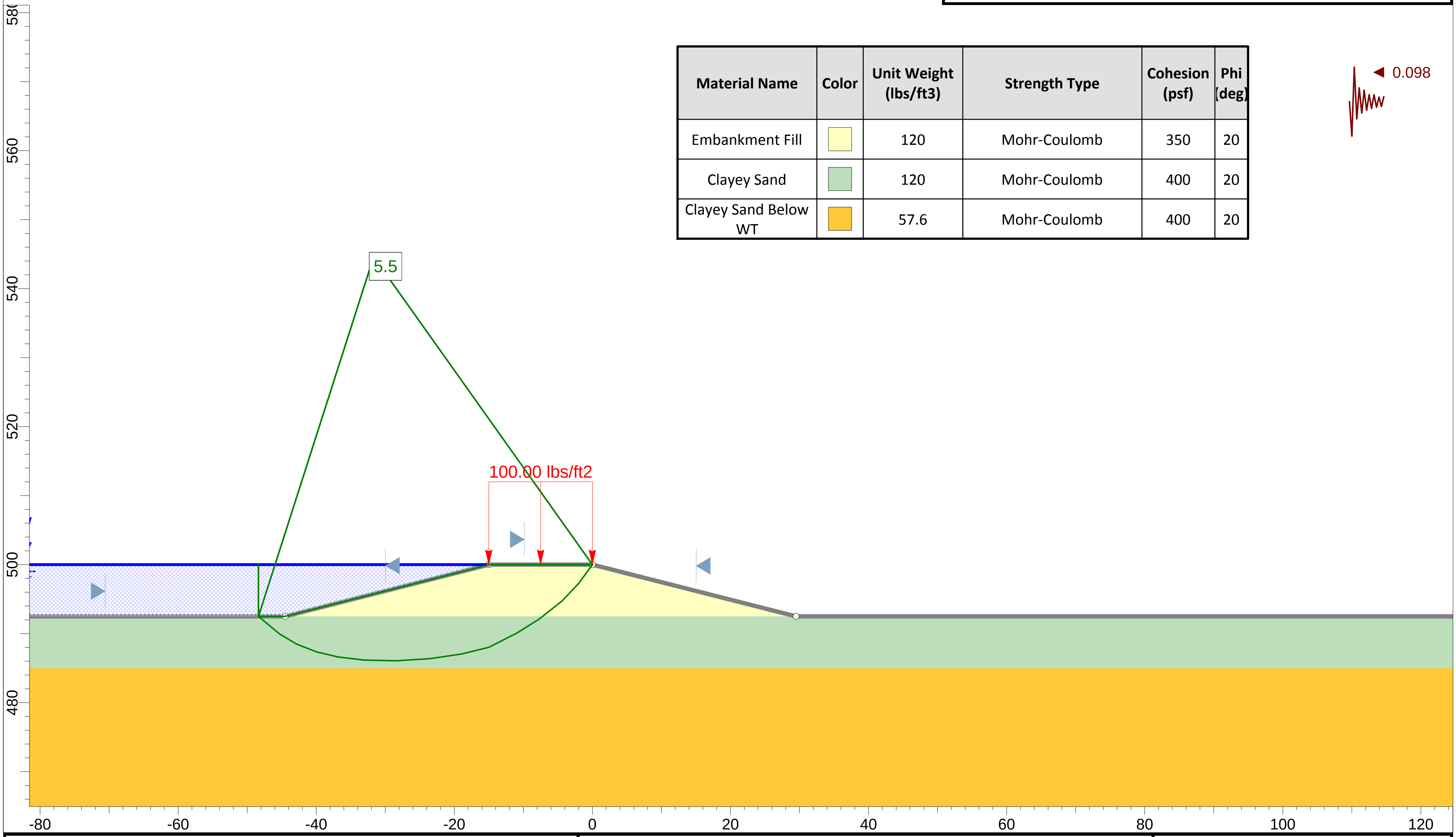
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-37a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



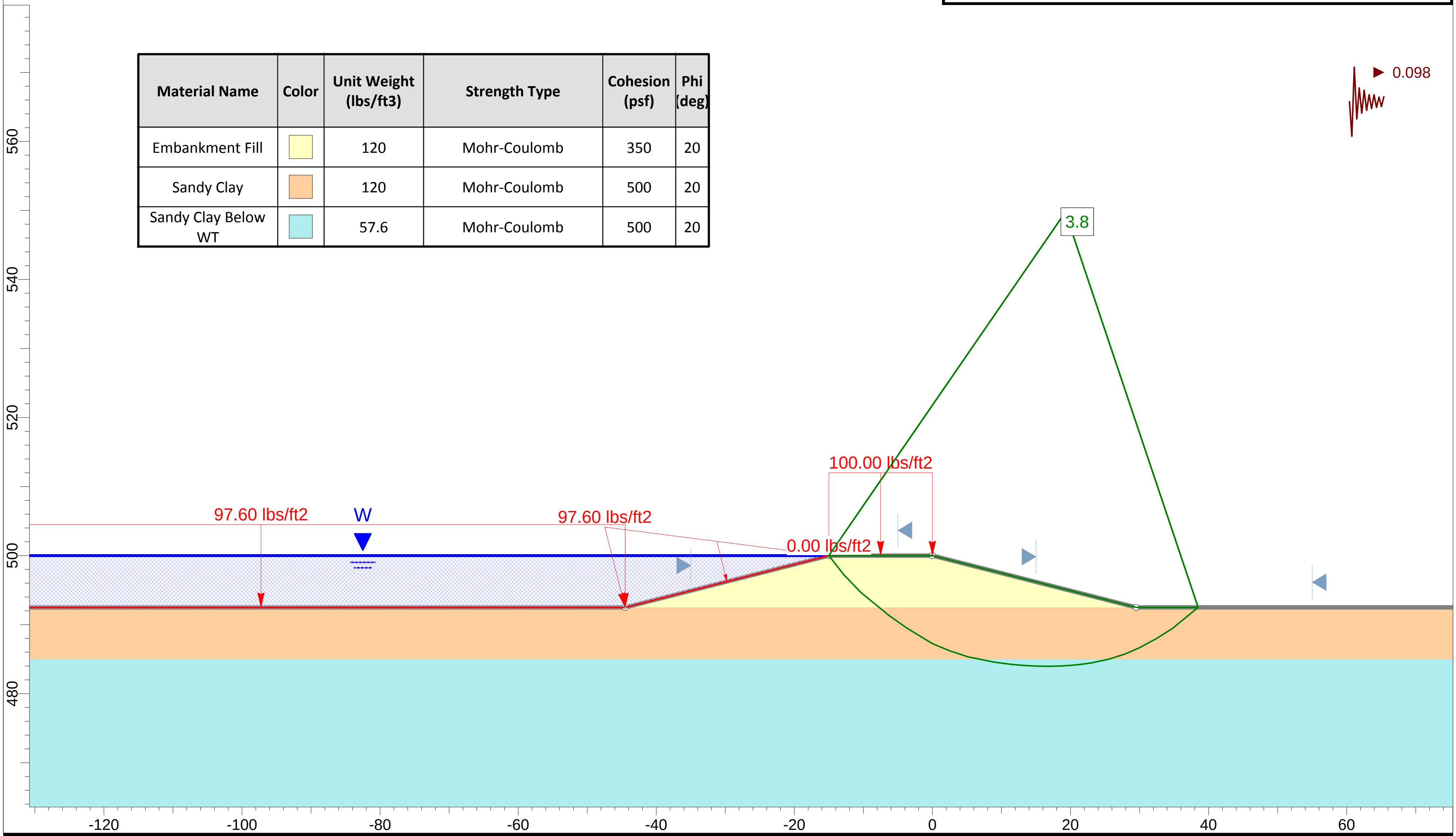
Profile "J" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-37b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

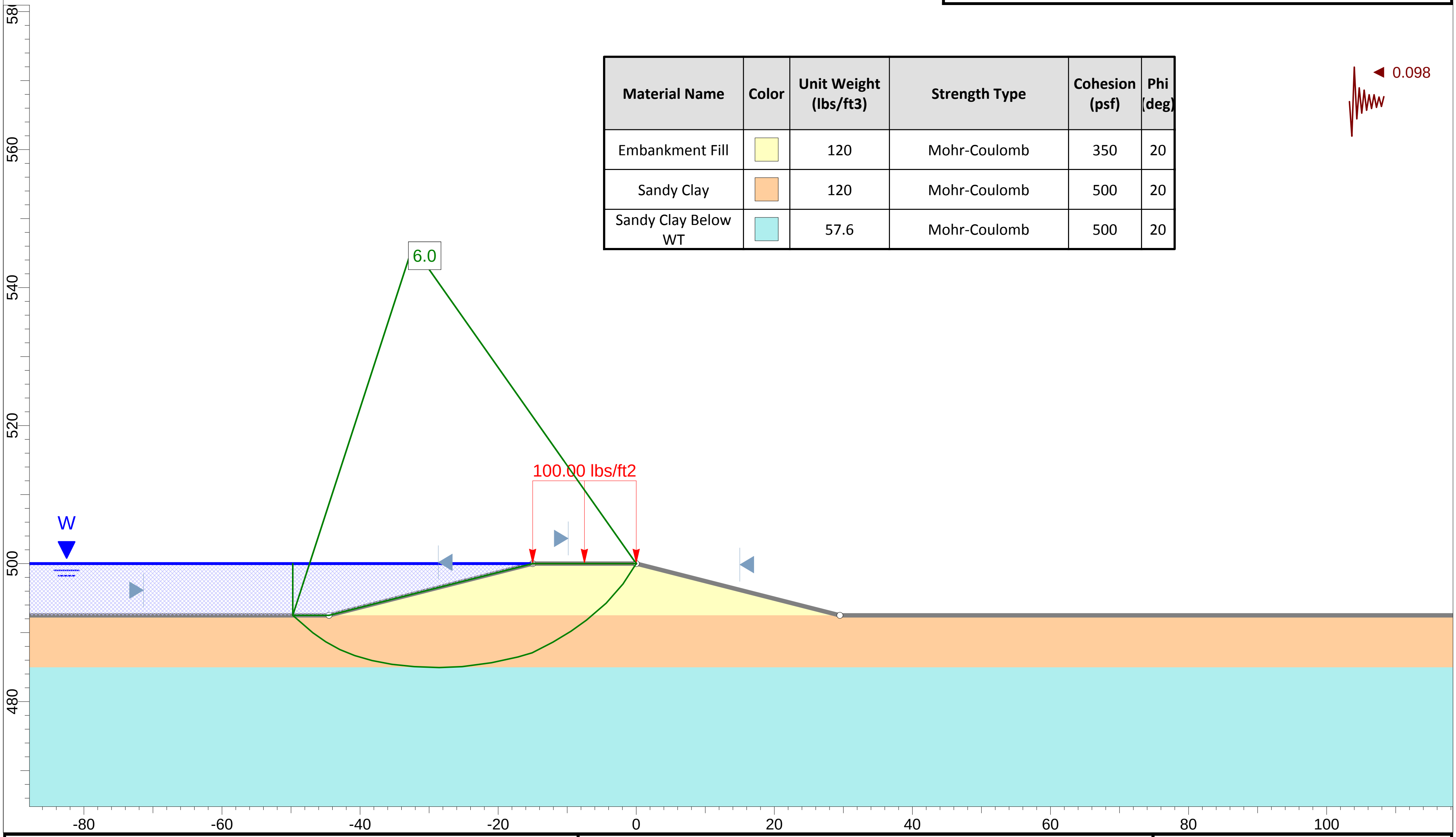
Profile "K" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-38a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "K" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

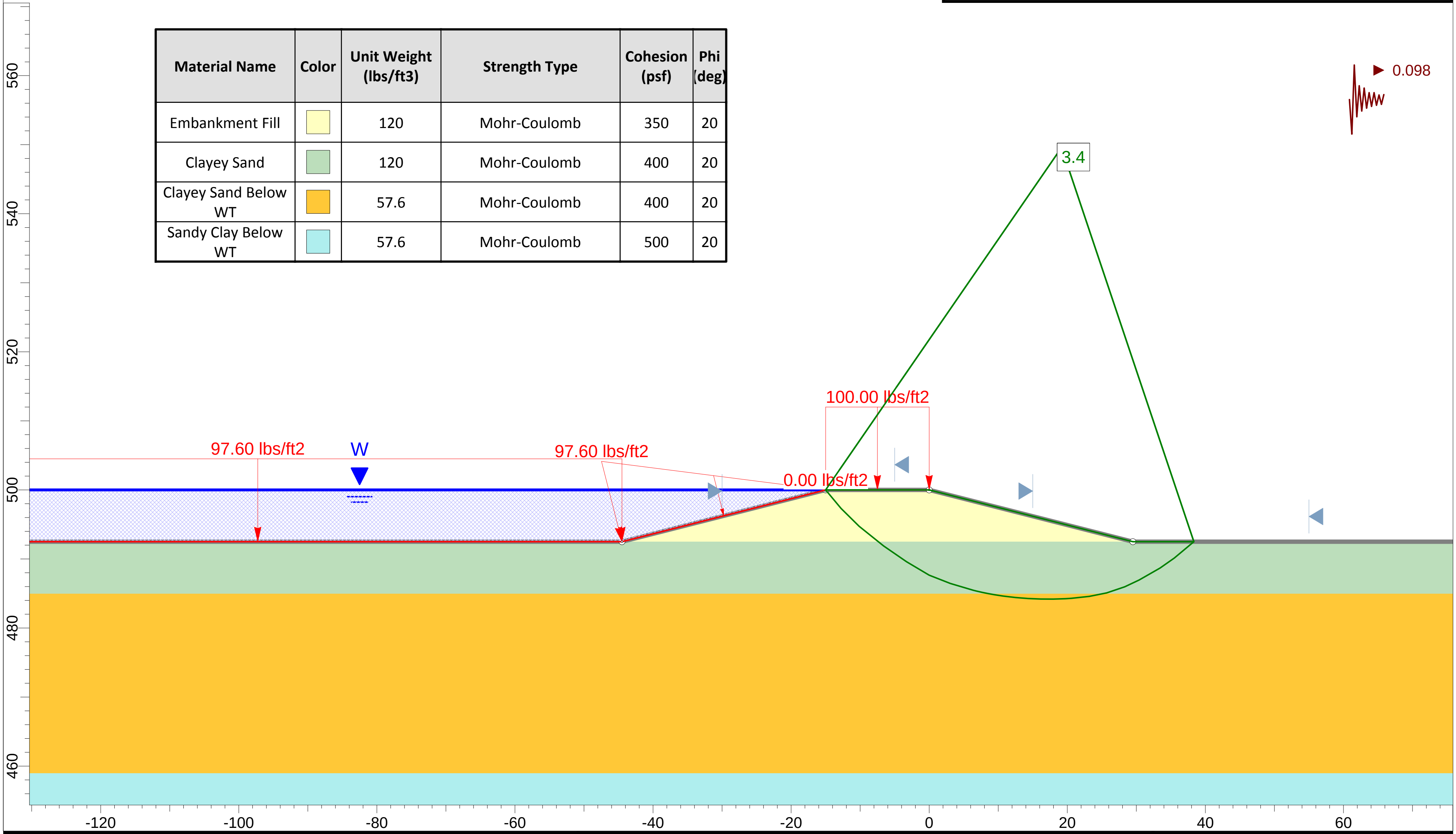
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-38b

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20



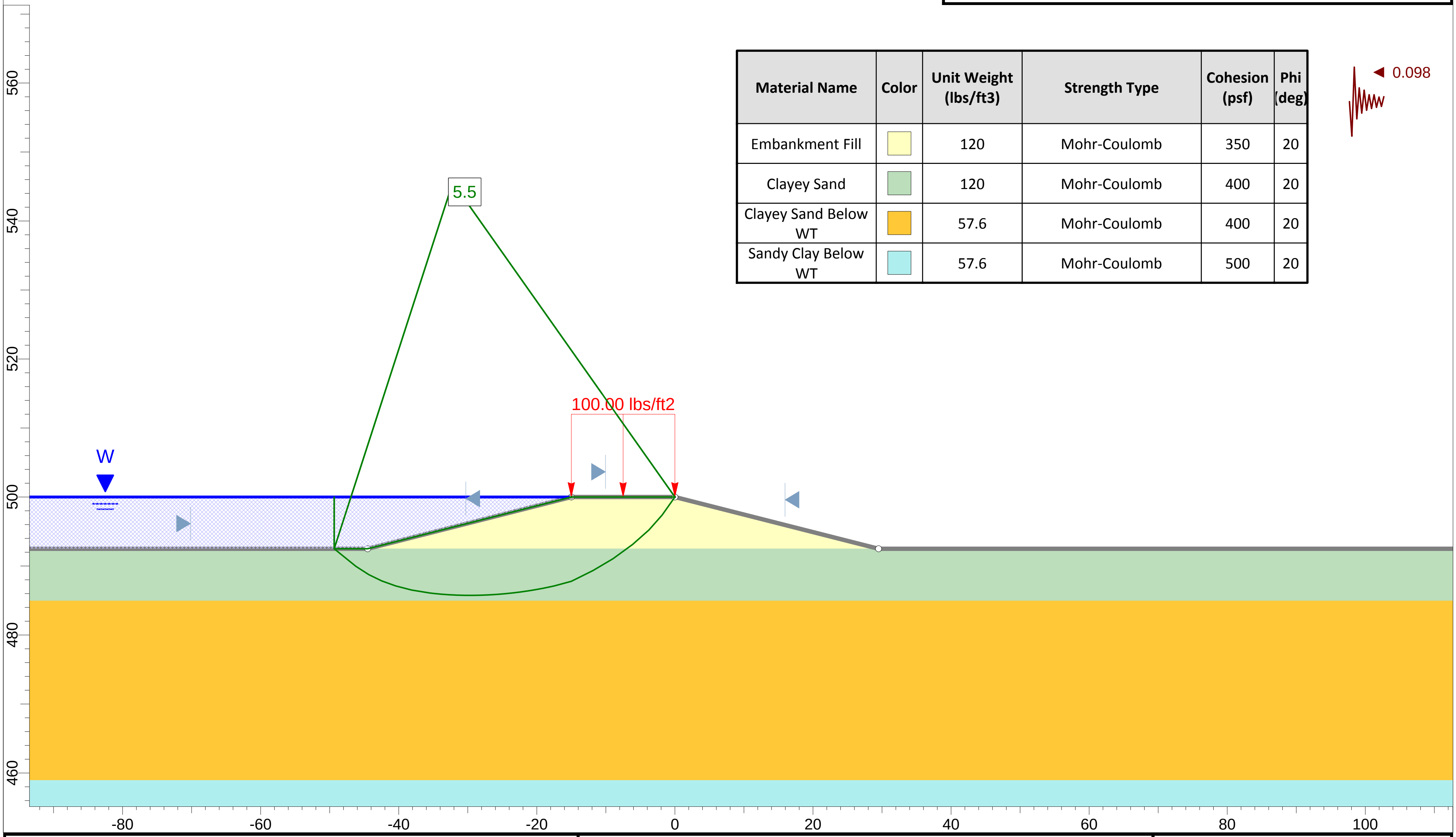
Profile "L" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-39a

RABA KISTNER CONSULTANTS

Global Stability Analysis



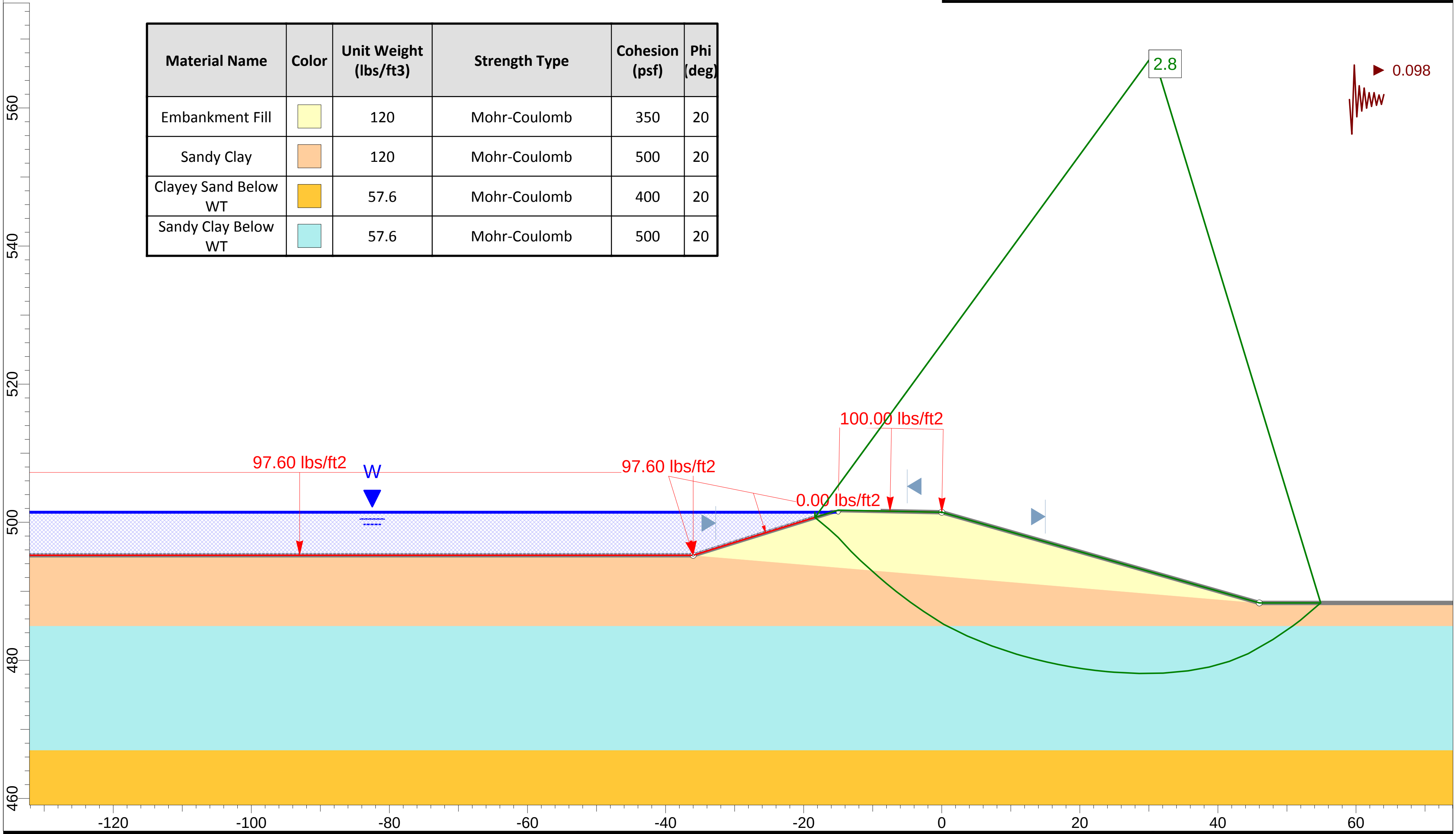
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

Profile "L" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-39b

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟨	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

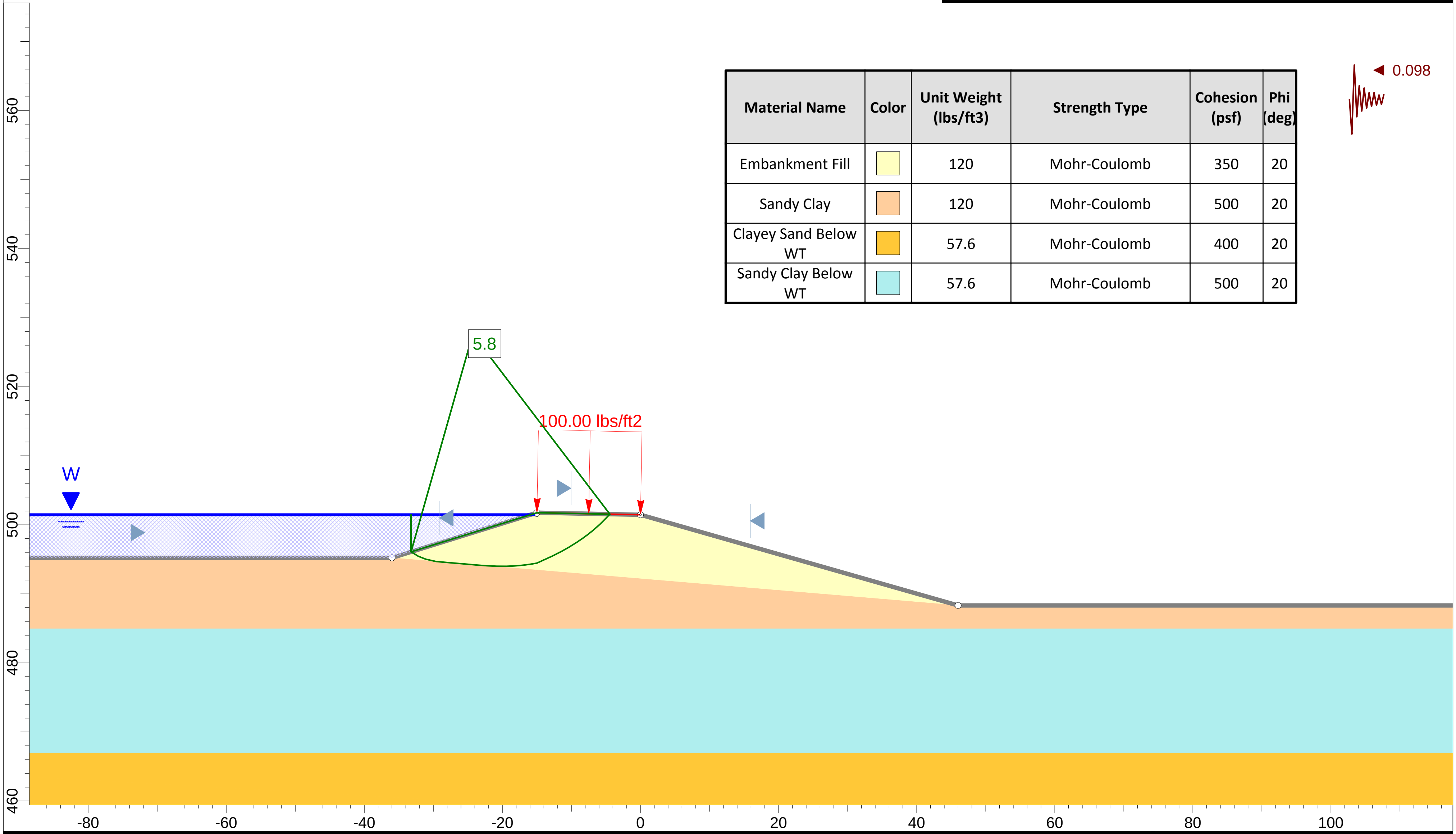
Profile "M" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-40a

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Sandy Clay	🟧	120	Mohr-Coulomb	500	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20
Sandy Clay Below WT	🟦	57.6	Mohr-Coulomb	500	20

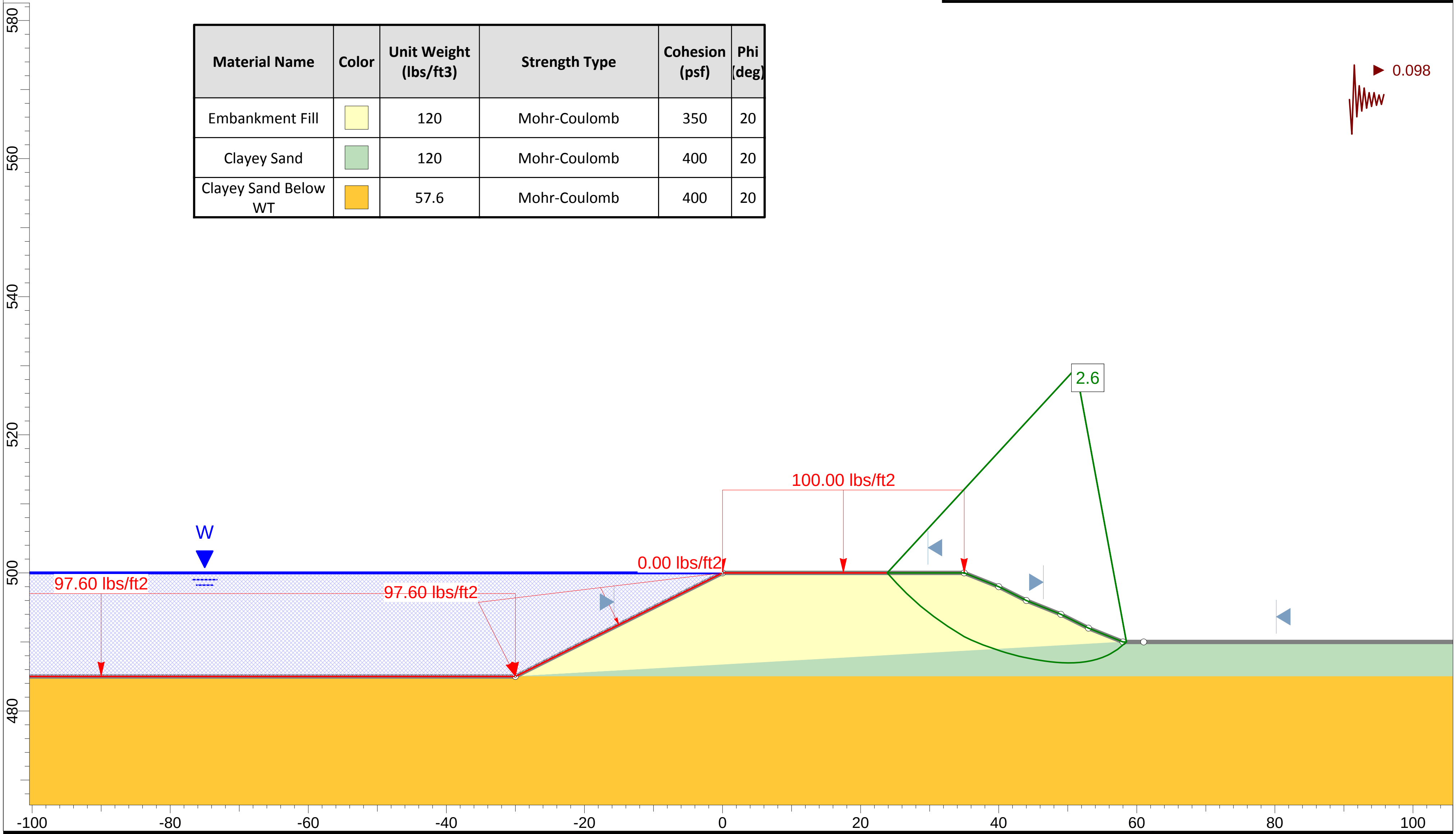
Profile "M" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-40b

RABA KISTNER CONSULTANTS

Global Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20

Profile "N" - Maximum Pool
Ash Pond Berms - Spruce/Deely Generation Units

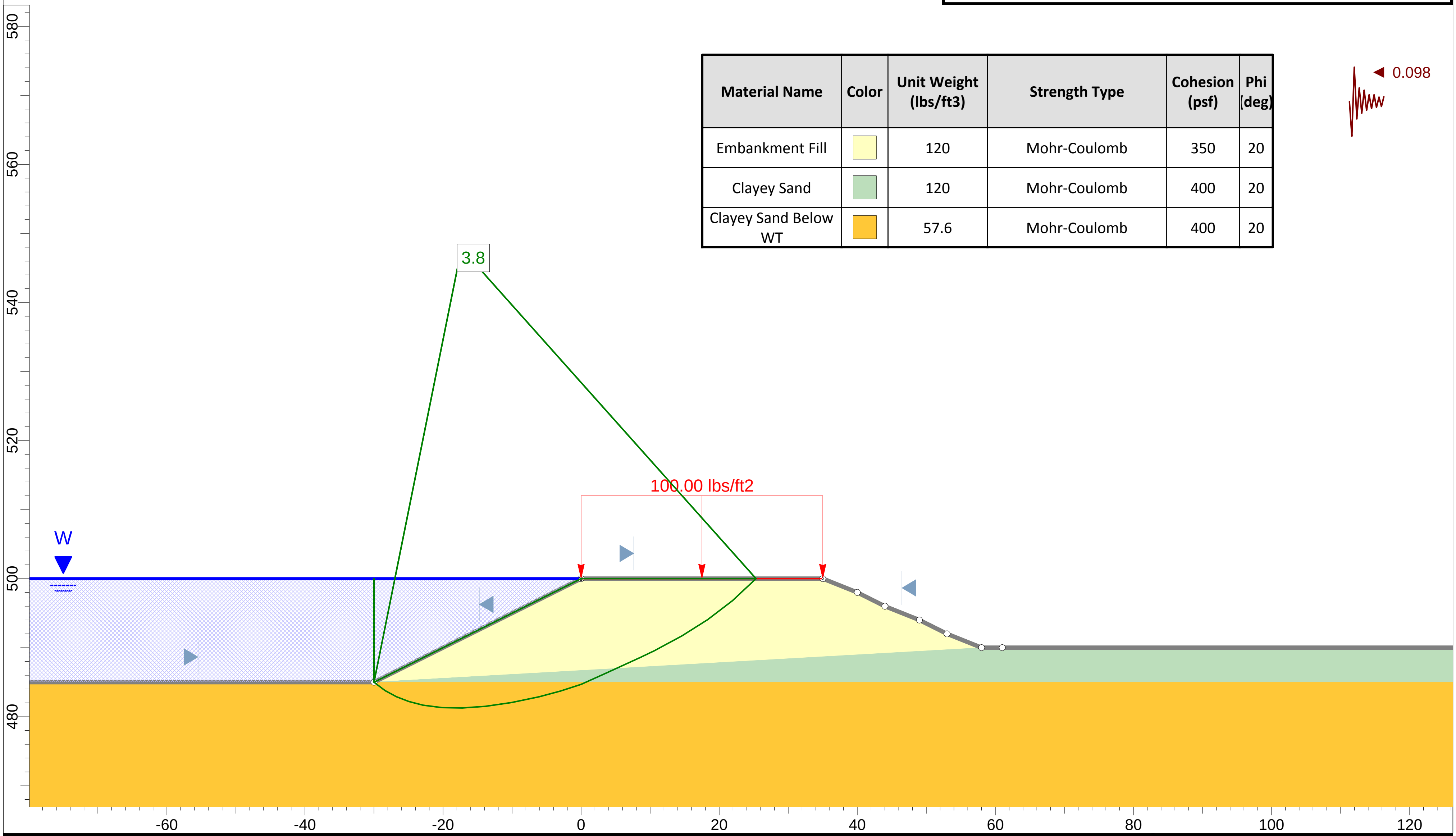
Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-41a

RABA KISTNER CONSULTANTS

Global Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill	🟨	120	Mohr-Coulomb	350	20
Clayey Sand	🟩	120	Mohr-Coulomb	400	20
Clayey Sand Below WT	🟧	57.6	Mohr-Coulomb	400	20



Profile "N" - Maximum Pool
Ash Pond Berms - Calaveras Lake Power Plant

Raba Kistner Consultants, Inc.
ASA12-098-00

Figure D-41b

RABA KISTNER CONSULTANTS

Appendix B

USEPA Checklists

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: JK Spruce/JT Deely Power Plants
Date: August 28, 2012
Unit Name: Evaporation Pond
Operator's Name: CPS Energy
Unit I.D.:
Hazard Potential Classification: High Significant [✓ Low]
Inspector's Name: Jamal Daas/Bevin Barringer

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	none		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	N/A		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	DNA		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	DNA		Is water entering inlet, but not exiting outlet?	DNA	
5. Lowest dam crest elevation (operator records)?	N/A		Is water exiting outlet, but not entering inlet?	DNA	
6. If instrumentation is present, are readings recorded (operator records)?	DNA		Is water exiting outlet flowing clear?	DNA	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?	DNA	
9. Trees growing on embankment? (If so, indicate largest diameter below)	X		At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	DNA		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?	DNA		Around the outside of the decant pipe?	DNA	
15. Are spillway or ditch linings deteriorated?	DNA		22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	DNA		23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

1. No formal inspections are performed.

2.,5.,8. No construction drawings or design information was provided for this this pond. The evaporation pond was constructed on top of a capped fly ash storage pond, based on information provided by CPS. The evaporation pond has no inlets or outlets. All material is brought in by truck for dewatering.

3.,4.,12.,14.,15.,16.,20.,21. There are no inlets or outlets.

9. Largest tree diamter is approximately 6 inches in diameter.

EPA FORM -XXXX toe.

N/A=not available
DNA=does not apply

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # WQ0001514000 INSPECTOR Jamal Daas/Bevin Barringer

Date August 28, 2012

Impoundment Name Evaporation Pond

Impoundment Company CPS Energy

EPA Region 6

State Agency (Field Office) Addresss Texas Commission on Environmental Quality
12110 Park 35 Circle, Austin, TX 78753

Name of Impoundment Evaporation Pond

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New x Update ____

	Yes	No
Is impoundment currently under construction?		x
Is water or ccw currently being pumped into the impoundment?		x

IMPOUNDMENT FUNCTION: Used to dewater scrubber waste.

Nearest Downstream Town : Name Elmendorf, TX

Distance from the impoundment 4.5 miles

Impoundment Location:

Longitude	98	Degrees	18	Minutes	53	Seconds
Latitude	29	Degrees	19	Minutes	27	Seconds

State TX County Bexar

Does a state agency regulate this impoundment? YES x NO ____

If So Which State Agency? Texas Commission on Environmental Quality

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

__X___ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

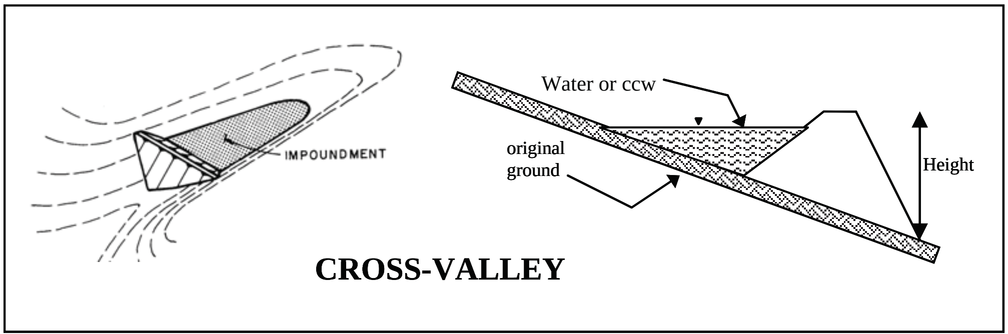
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

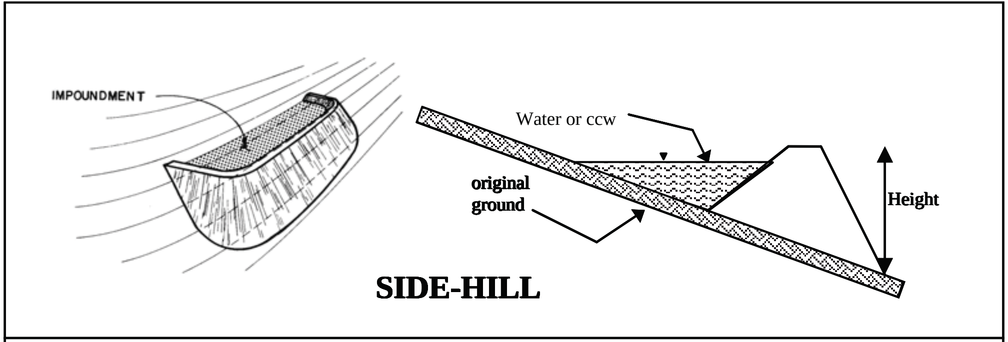
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

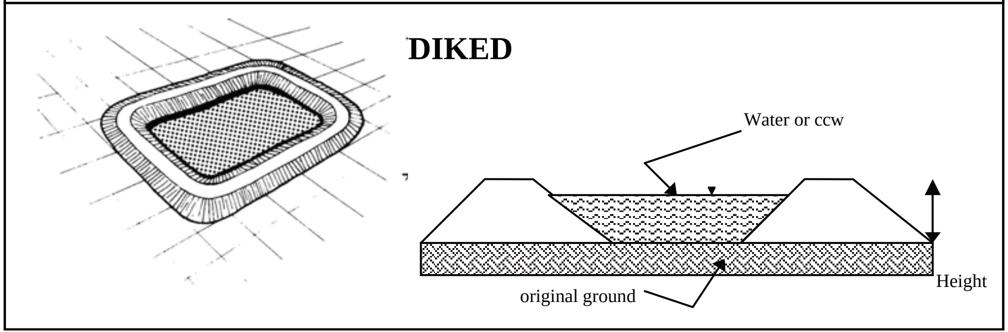
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

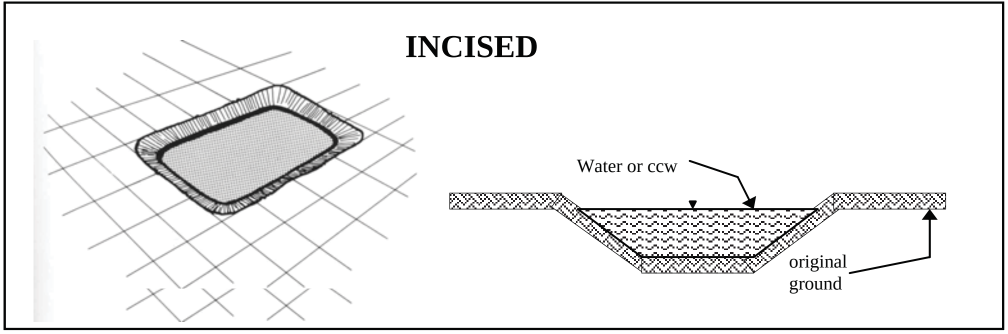
Failure or misoperation of the impoundment would likely result in damage to CPS property. Liquids would flow into Calaveras Lake which was constructed by and is owned by CPS Energy.

CONFIGURATION:


CROSS-VALLEY


SIDE-HILL


DIKED


INCISED

_____ Cross-Valley
_____ Side-Hill
__x__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height 15* feet   Embankment Material unknown
Pool Area 4.5 acres   Liner PVC
Current Freeboard 2* feet   Liner Permeability unknown

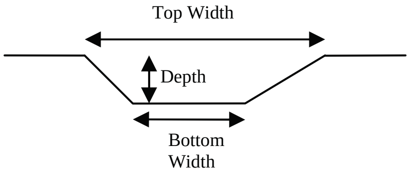
*Because information was not provided on this pond, embankment height and current freeboard were estimated during the assessment.

TYPE OF OUTLET (Mark all that apply)

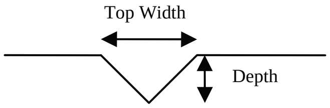
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width

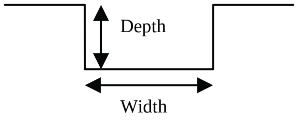
TRAPEZOIDAL



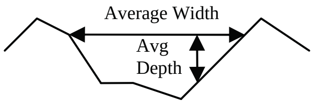
TRIANGULAR



RECTANGULAR

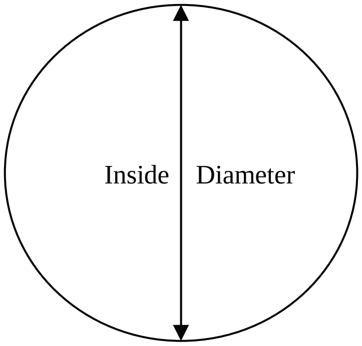


IRREGULAR



_____ **Outlet**

_____ inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ______________________

Is water flowing through the outlet? YES _______ NO _______

__x___ **No Outlet**

_____ **Other Type of Outlet** (specify) ________________________________

The Impoundment was Designed By unknown

Has there ever been a failure at this site? YES ___________ NO ____x_______

If So When? ______________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES ________ NO ___x____

If So When? ______________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________NO ___x____

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

The Evaporation Pond embankments were constructed on top of an area that had previously been used as a fly ash landfill and as a fly ash impoundment. Boring logs for subsurface investigations performed at the Evaporation Pond in 2012 by Raba Kistner Consultants, Inc., did not encounter CCW or other unsuitable materials per project boring logs.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The assessor did not meet with, or have documentation from, the design Engineer of Record concerning foundation preparation.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

There was no indication of prior releases, failures or patchwork on the embankments.

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: JK Spruce Power Plant

Date: August 27, 2012

Unit Name: SRH Pond

Operator's Name: CPS Energy

Unit I.D.:

Hazard Potential Classification: High [✓ Significant] Low

Inspector's Name: Jamal Daas/Bevin Barringer

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	none		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	495.0		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	492.5		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	499.5		Is water entering inlet, but not exiting outlet?	X	
5. Lowest dam crest elevation (operator records)?	500.0		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	DNA		Is water exiting outlet flowing clear?	DNA	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?	DNA	
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		X	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	see	note	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

1. No formal inspections are performed.

2. No plant water level measurements were provided. Pool level estimated during assessment.

12. No trashracks were observed.

16. Outlet pipes were submerged during assessment.

23. Fly Ash Pond - South is located at the east embankment exterior slope. A concrete lined drainage ditch is located at the south embankment exterior toe. The #1 Stormwater Runoff Pond is located at the north embankment exterior toe.

N/A=not available
DNA=does not apply

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # WQ0001514000 INSPECTOR Jamal Daas/Bevin Barringer
Date August 27, 2012

Impoundment Name SRH Pond
Impoundment Company CPS Energy
EPA Region 6
State Agency (Field Office) Addresss Texas Commission on Environmental Quality
12110 Park 35 Circle, Austin, TX 78753
Name of Impoundment SRH Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New x Update _________

	Yes	No
Is impoundment currently under construction?		x
Is water or ccw currently being pumped into the impoundment?	x	

IMPOUNDMENT FUNCTION: Stores stormwater from material storage, low volume waste, quench water, flue gas desulphurization scrubber sludge, and metal cleaning waste.

Nearest Downstream Town : Name Elmendorf, TX
Distance from the impoundment 3.5 miles
Impoundment Location:
Longitude 98 Degrees 19 Minutes 5 Seconds
Latitude 29 Degrees 18 Minutes 28 Seconds
State TX County Bexar

Does a state agency regulate this impoundment? YES x NO ______

If So Which State Agency? Texas Commission on Environmental Quality

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

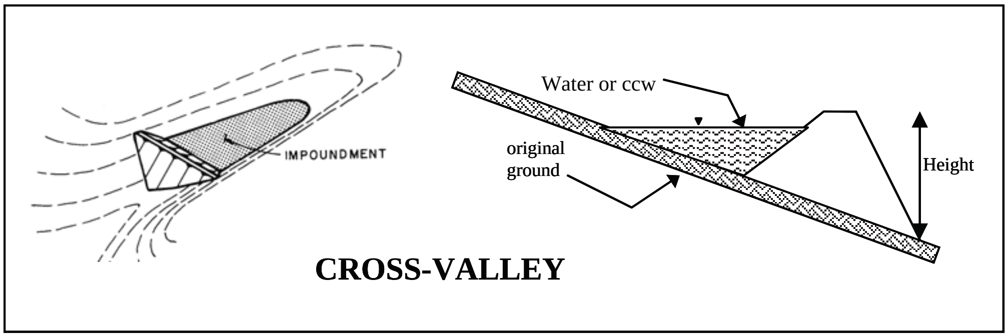
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

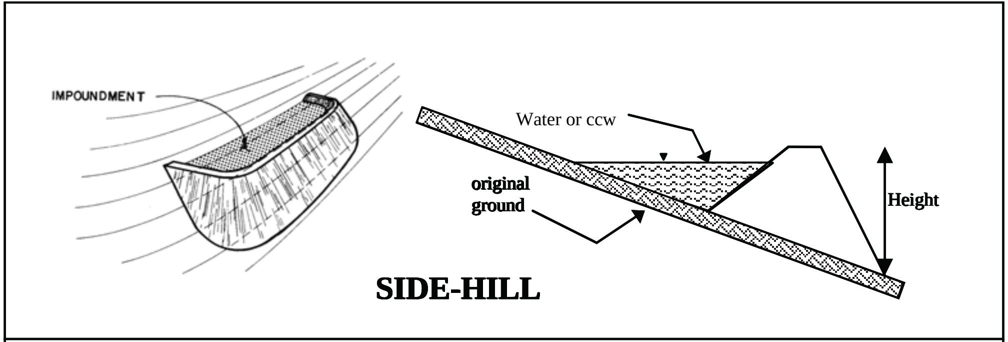
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure or misoperation of the impoundment could result in fluid flowing toward the plant facility located approximately 100 feet west of the SRH Pond which could result in economic loss and disruption of lifeline facilities.

CONFIGURATION:

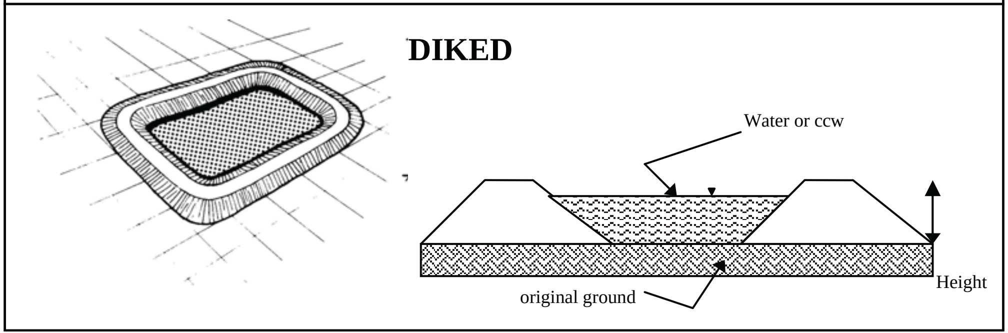


CROSS-VALLEY

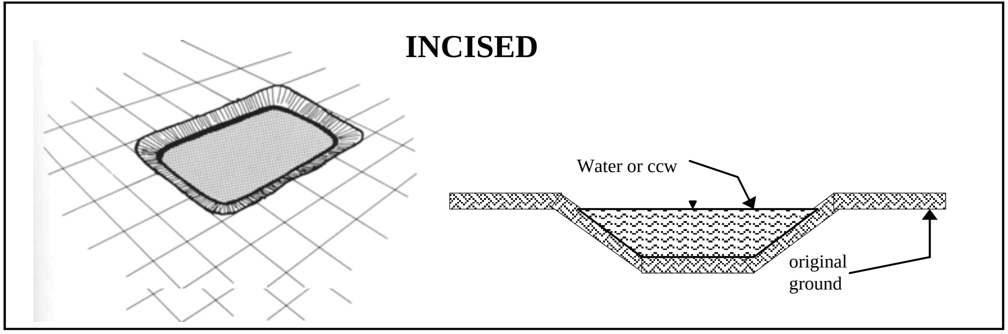


SIDE-HILL

DIKED



INCISED



_____ Cross-Valley
_____ Side-Hill
_x__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

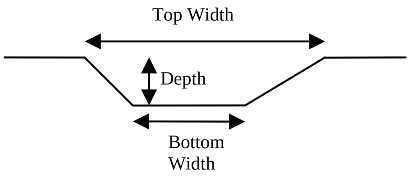
Embankment Height 8 feet Embankment Material Clay
Pool Area 3.5 acres Liner 30 mil HDPE liner
Current Freeboard 5 feet Liner Permeability N/A

TYPE OF OUTLET (Mark all that apply)

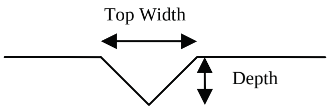
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width

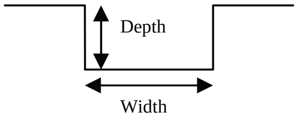
TRAPEZOIDAL



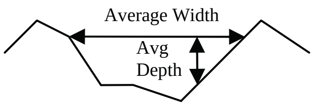
TRIANGULAR



RECTANGULAR

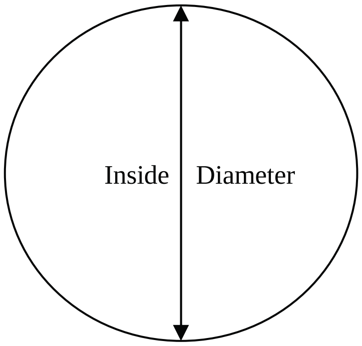


IRREGULAR



_x__ **Outlet**

_18"_ inside diameter



Material
_____ corrugated metal
_X__ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ______________________

Is water flowing through the outlet? YES _______ NO __X__

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) ___________________________________

The Impoundment was Designed By Utility Engineering Corporation
____

Has there ever been a failure at this site? YES ___________ NO ____x_______

If So When? ______________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES ________ NO __x____

If So When? ______________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________NO ___x____

If so, which method (e.g., piezometers, gw pumping,...)? ______________________

If so Please Describe : ____

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

It does not appear the SRH Pond was constructed over wet ash, slag or other unsuitable material. The SRH Pond was constructed in 1992. No historical subsurface soil information in the vicinity of the SRH Pond was provided. Borings performed in 2012 by RKCI indicate that the embankments consist of sandy clay and clayey sand fill material, and underlying native material consists of sandy clay and clayey sand with isolated tan and gray clay seams.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

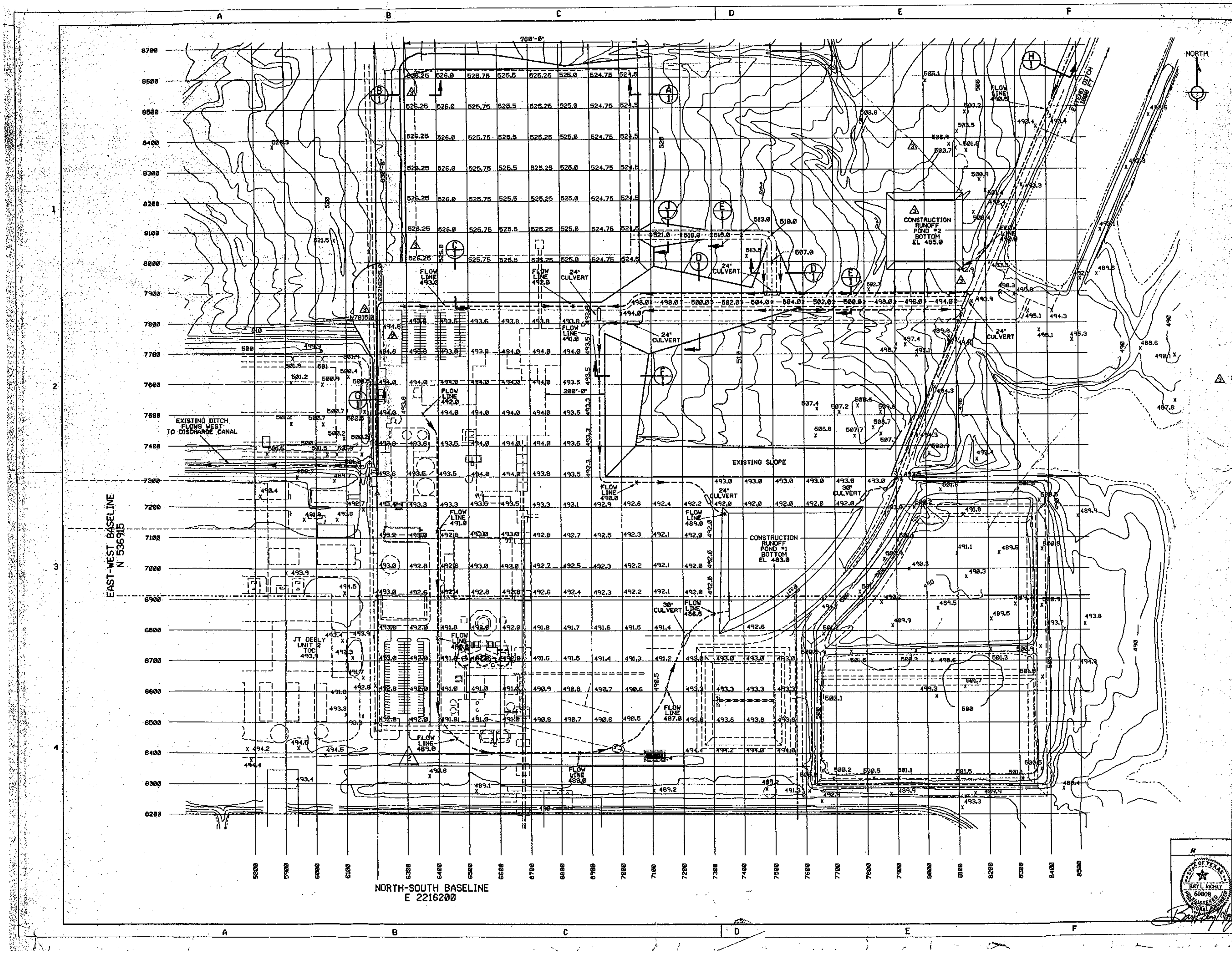
The assessor did not meet with, or have documentation from, the design Engineer of Record concerning foundation preparation.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

There was no indication of prior releases, failures or patchwork on the embankments.

Appendix C

Documentation from CPS



AS CONSTRUCTED

GENERAL NOTES

1. PLANT ELEVATION 100 FT = 494 FT (MSL)
2. ALL SITE FILL SHALL BE CONTROLLED COMPACTED FILL.
3. —▶— INDICATES A DITCH AND DIRECTION OF FLOW
4. DITCHES SHALL BE CONSTRUCTED ON A UNIFORM SLOPE BETWEEN FLOW LINE ELEVATIONS INDICATED. CONTRACTOR SHALL INSURE THAT ALL DITCHES DRAIN TOWARD CONSTRUCTION RUNOFF PONDS.
5. CONTRACTOR SHALL INSURE THAT DURING THE COURSE OF CONSTRUCTION ALL STORMWATER RUNOFF FROM AREAS WITH DISTURBED SOIL, TEMPORARY FACILITIES, LAYDOWN AND CONSTRUCTION SHALL DRAIN INTO ONE OF THE TWO CONSTRUCTION RUNOFF PONDS.
6. GRADES GIVEN ARE TOP OF FINISHED CONSTRUCTION SUBGRADE.
7. TOP OF SLAB ELEVATIONS FOR MAJOR STRUCTURES OF UNIT #1 SHALL BE:

OFFICE BUILDING	495'-0" = 101'-0"
TURBINE BUILDING	495'-0" = 101'-0"
MAINTENANCE BUILDING	495'-0" = 101'-0"
BOILER BUILDING	495'-0" = 101'-0"
BAGHOUSE	494'-0" = 100'-0"
SCRUBBER	493'-0" = 99'-0"
AQCS BUILDING	492'-0" = 98'-0"

8. CULVERTS SHALL BE REINFORCED CONCRETE PIPE, CLASS III DESIGN
9. SOILS EXCAVATED FROM THIS AREA MAY BE USED AS FILL OR STOCKPILED FOR USE AS FILL IF IT IS FREE OF LARGE ROCKS, ORGANIC MATERIALS OR DEBRIS
10. △3 TOP OF CONCRETE SLAB FOR JKS CONSTRUCTION OFFICES TO BE AT ELEV 496'-0"

REFERENCE DRAWINGS

1. SECTIONS AND DETAILS D-CL05-006-S006
2. CONSTRUCTION RUNOFF PONDS D-CL06-155-3001

RECEIVED
APR 04 1994
POWER [illegible]

NO	REVISIONS	DATE	BY	CHK	DSGN	APPR
3	MOVED POND/ADD COORD/REV AS NOTED	032989	[illegible]	[illegible]	[illegible]	[illegible]
2	ADDED NOTE 10 REV AT 0 2&4	081088	JKB	JKB	BER	DN
1	REVISED TO REFLECT CONSTRUCTION POND	052388	CEJ	JKB	BER	DH
0	ISSUE FOR CONSTRUCTION	050988	JKB	DLR	BER	DH

THIS DRAWING IS THE PROPERTY OF UTILITY ENGINEERING CORPORATION, AMARILLO, TEXAS AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS OR APPARATUS EXCEPT WHERE PROVIDED FOR BY AGREEMENT WITH SAID COMPANY

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
B.A. BACHT COMPANY

SITE PREPARATION
CONSTRUCTION GRADES

BARY L. RICHEY
60808

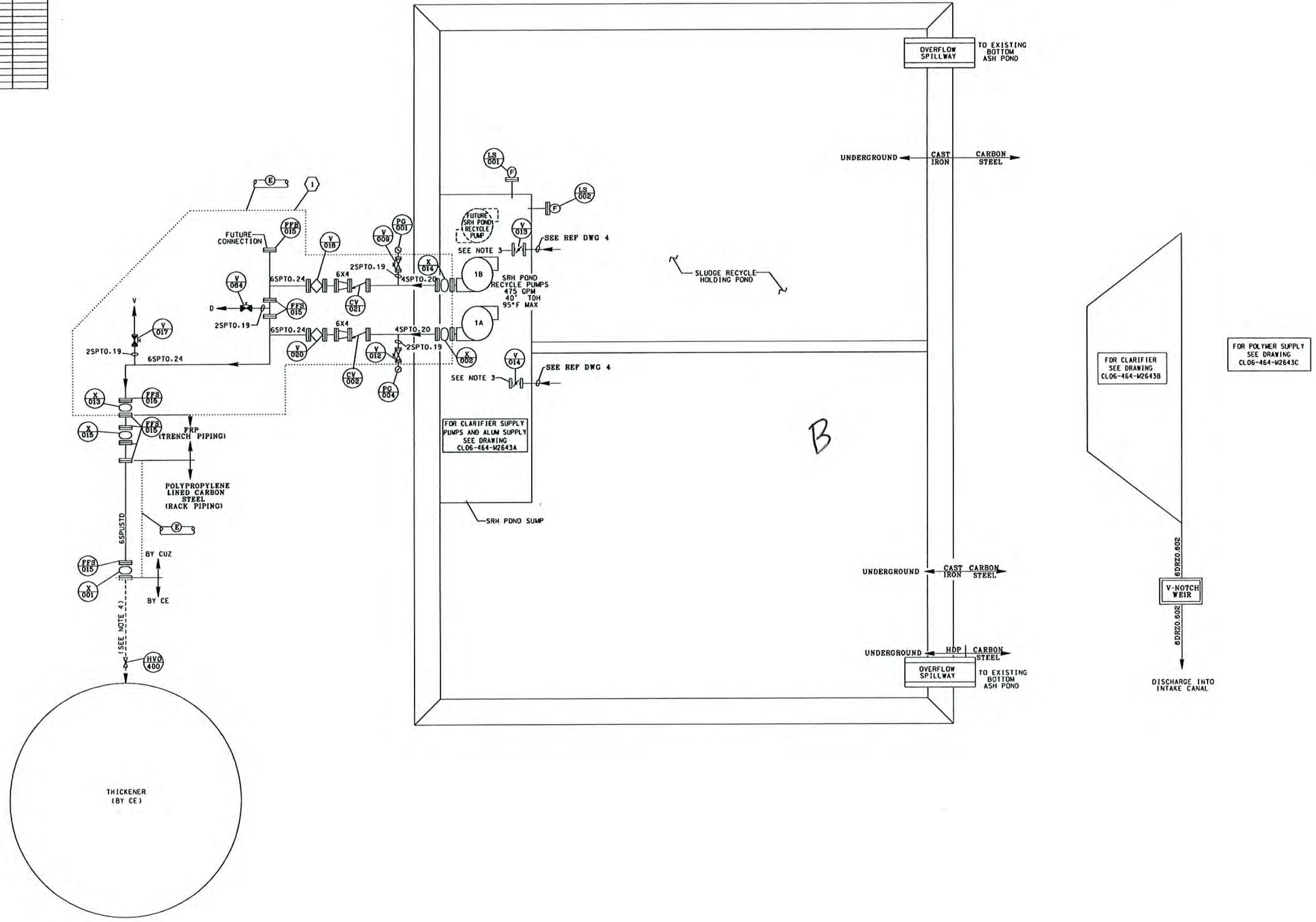
DRAWN SL 5-11-88 | DESIGNED DN 5-27-88 | CHECKED DLR | CONTROLS | ELECTRICAL | MECHANICAL | STRUCTURAL
APPR HATCHELL 5-22-88
UECO DRAWING NO. D-CL05-006-S005 | 3 | B

G 613

APR 19 1989

DEVICE TAG NUMBER	SYS TEM	FUNCTION
LS -001	SCS	HLA
LS -002	HWL	LC
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		
-		

△1



FLANGE DATA:

FXX / XXX

- FLANGE
- R OR F - RAISED FACE OR FLAT FACE
- TYPE OF FLANGE
  - W - WELD NECK
  - B - BLIND
  - S - SOCKET WELD
  - T - THREADED
  - L - LAP JOINT
  - O - SLIP ON
  - R - ORIFICE
- PRESSURE RATING
  - 012 - 125#
  - 015 - 150#
  - 030 - 300#
  - 040 - 400#
  - 060 - 600#
  - 090 - 900#
  - 150 - 1500#
  - 250 - 2500#

GENERAL NOTES

1. ALL FRP FLANGES SHALL MEET THE STANDARDS FOR ANSI B16.5 150 LB.
2. ALL PIPING WITH MATERIAL DESIGNATION "Z" SHALL BE HIGH MOLECULAR WEIGHT, HIGH-DENSITY PE3408 POLYETHYLENE. ALL PIPES SHALL HAVE A MINIMUM WALL THICKNESS EQUIVALENT TO SDR 13.5. JOINTS SHALL BE BY THE BUTT FUSION TECHNIQUE. THE VENDOR SHALL PROVIDE 40 FOOT MINIMUM LENGTHS.
3. PROVIDE PVC FABRICATED FLANGE FOR BOLTING SURFACE. CUT 2" THICK PVC PLATE TO MATCH STANDARD B16.5 18"~ FLANGE WITH 25" OD, 17.25" ID WITH 16-1.125" ~ BOLT HOLES ON 22.75" DIAMETER BOLT CIRCLE.
4. THE DASHED LINE REPRESENTS A 6" ~ POLYPROPYLENE LINE PIPE THAT IS PROVIDED BY CE ON REF DWG 5.
5. PIPE DESIGNATION "U" IS POLYPROPYLENE LINED CARBON STEEL. THE PIPING SHALL MEET ALL REQUIREMENTS SPECIFIED IN SUBSECTION 66.2000M, (D) OF THE CONTRACT. FLANGES SHOWN ON THE LINED PIPE SHALL NOT BE TAGGED SINCE ALL JOINTS ARE PROVIDED WITH FLANGES.
6. CAST IRON FLANGED COUPLING ADAPTER-ROCKWELL INTERNATIONAL:SPECIAL ORDER 912-065006-000. PROVIDE WITH O-RING GASKET FOR FLANGED END & NON-CORROSIVE ANCHOR STUDS. STUD LENGTHS SHALL INCLUDE THE WIDTH OF THE HDP FLANGE ADAPTER END (0.8").

REFERENCE DRAWINGS

1. SRH POND SUMP PIPING
   PLAN AND SECTIONS
   D-CL05-464-M100
2. SRH CLARIFIER SUPPLY & POND RECYCLE PUMPS
   464-B001 (MFR)
3. P&ID - DATA BASE
   A-CL05-464-M001 VALV
   A-CL05-464-M001 INST
   A-CL05-464-M001 PIPE
4. SLUDGE HANDLING SYSTEM
   SRH POND SUMP-PLAN, SECT & DETAILS
   D-CL05-464-S002
5. MISC PIPING-THICKNER AREA
   281-1014 (MFR)

NO	REVISIONS	DATE	BY	CHK	DSNR	APPR
5	CPS JKS2 CHANGES	090910	RWR	LSL		
4	CPS DRAWING REVISION	040609	RWR	WA		
3	CPS FIELD REVISIONS/ADDED TNK & PMP	4-19-05	RWR	JG		
2	ADDED LEVEL SWITCH @ A-1 AS NOTED & INSUL AROUND VALVE 019 @ D-3 & VALVE 065 & PIPING @ A-2,3	121092	MHS			
1	ADDED INSTR USAGE INFO	121091	JJB	JB	SGB	SC
0	ISSUED FOR CONSTRUCTION	082991				SHB

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
H.B.ZACHRY COMPANY

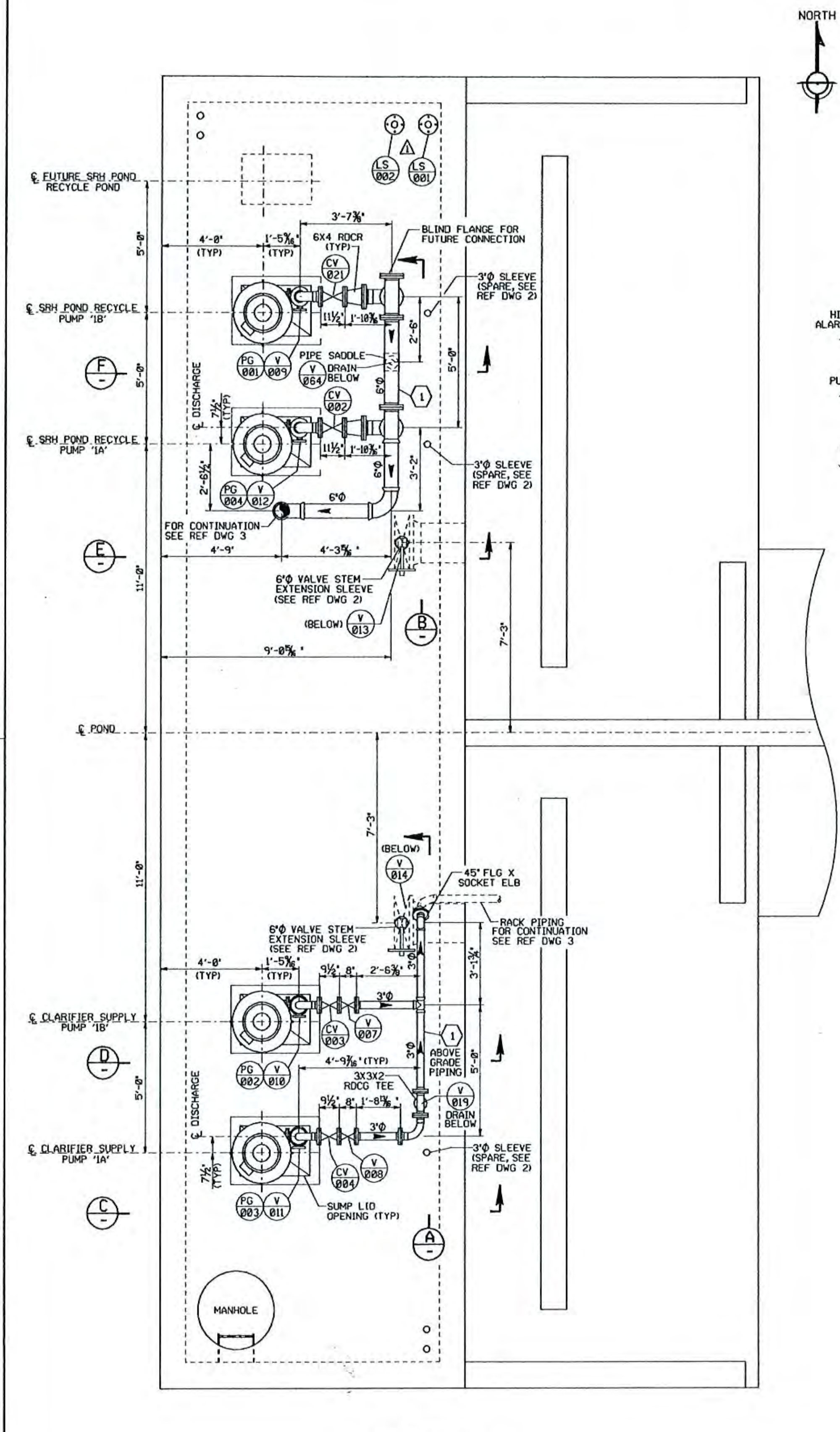
SLUDGE RECYCLE SYSTEM
PROCESS & INSTRUMENTATION DIAGRAM

DWN	DSGND	CHKD	CONTROLS	ELECTRICAL	MECHANICAL	STRUCTURAL
D COX 082991	SGB	K.BROWN				

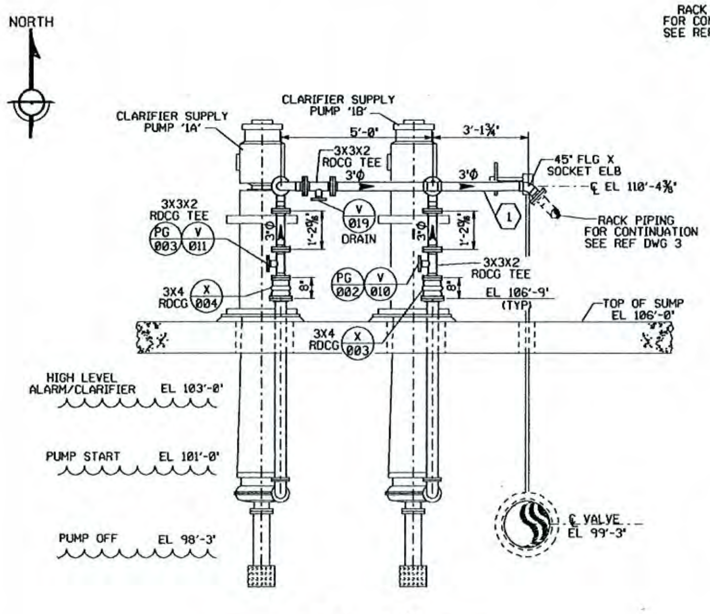
APPR	CADD DRAWING NO.	SHEET	REV
SHB	D-CL05-464-M001		5
APPR			

`$$USERNAME$$`

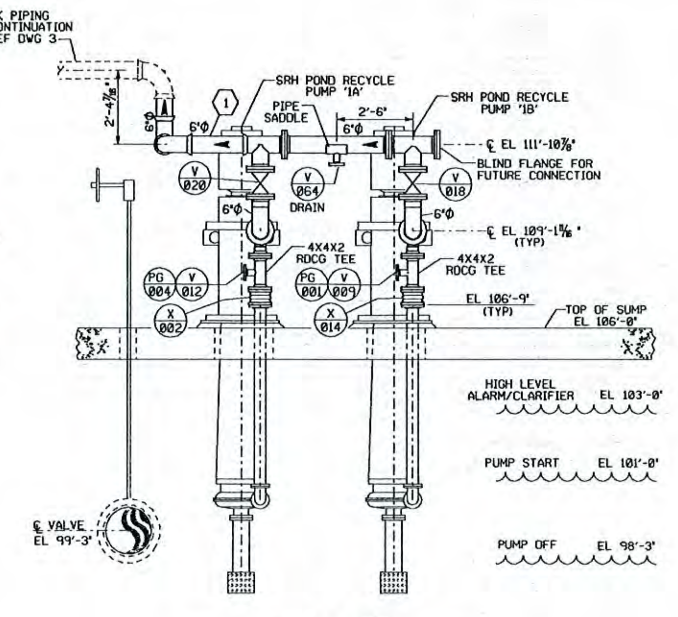
54-3



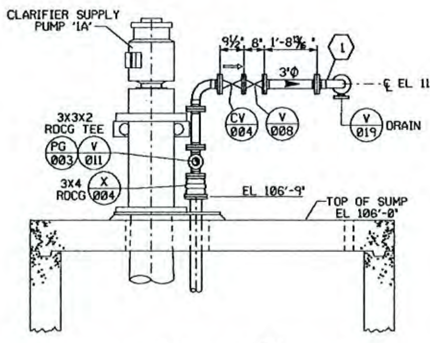
PLAN VIEW



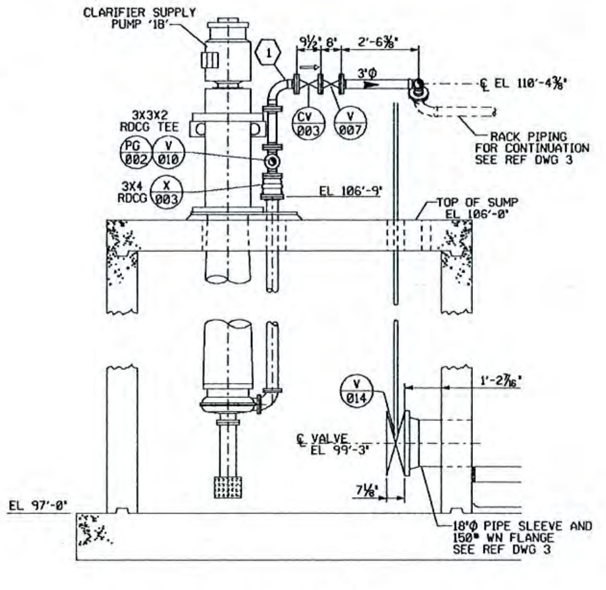
SECTION Ⓐ



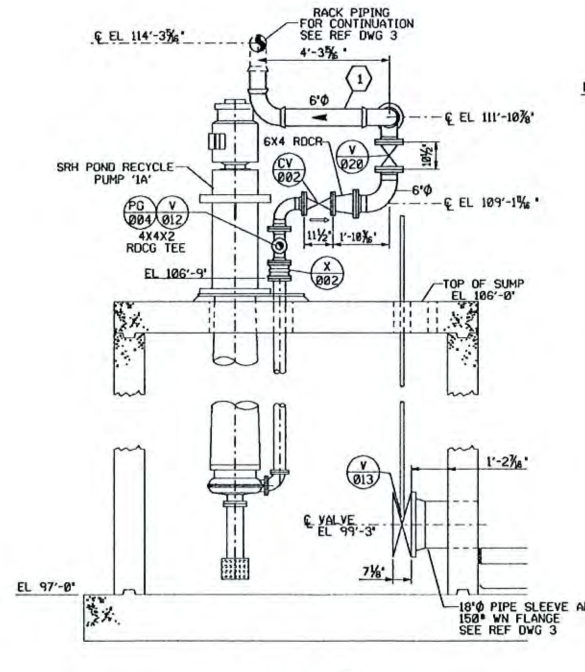
SECTION Ⓑ



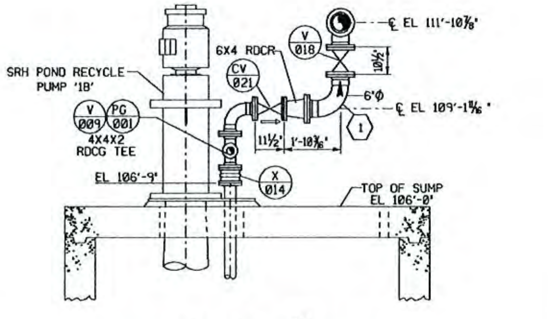
SECTION Ⓒ



SECTION Ⓓ



SECTION Ⓔ



SECTION Ⓕ

GENERAL NOTES

1. ALL PIPING SHALL BE FIBERGLASS REINFORCED PLASTIC.

REFERENCE DRAWINGS

1. SLUDGE HANDLING SYSTEM - SRH POND PLAN D-CL05-464-S001
2. SLUDGE HANDLING SYSTEM-SRH POND SUMP PLAN D-CL05-464-S002
3. SLUDGE HANDLING SYSTEM-SRH POND PIPE RACK PIPING PLAN D-CL05-051-L981 SH 2
4. SLUDGE HANDLING SYSTEM-SLUDGE RECYCLE SYSTEM P&ID D-CL05-464-M001
5. SRH CLARIFIER SUPPLY & POND RECYCLE PUMPS 464-B001 (MFR)

RECEIVED
APR 0 1994
POWER ENGINEERING

AS CONSTRUCTED

NO	REVISIONS	DATE	BY	CHK	DSNR	APPR
1	REVISED PLAN @ A-1 PER FM 92-143	030592				
0	ISSUED FOR CONSTRUCTION					

THIS DRAWING IS THE PROPERTY OF UTILITY ENGINEERING CORPORATION AMARILLO, TEXAS AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS OR APPARATUS EXCEPT WHERE PROVIDED FOR BY AGREEMENT WITH SAID COMPANY

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
H. B. ZACHRY COMPANY

SLUDGE HANDLING SYSTEM - SRH POND
SUMP PIPING PLAN AND SECTIONS

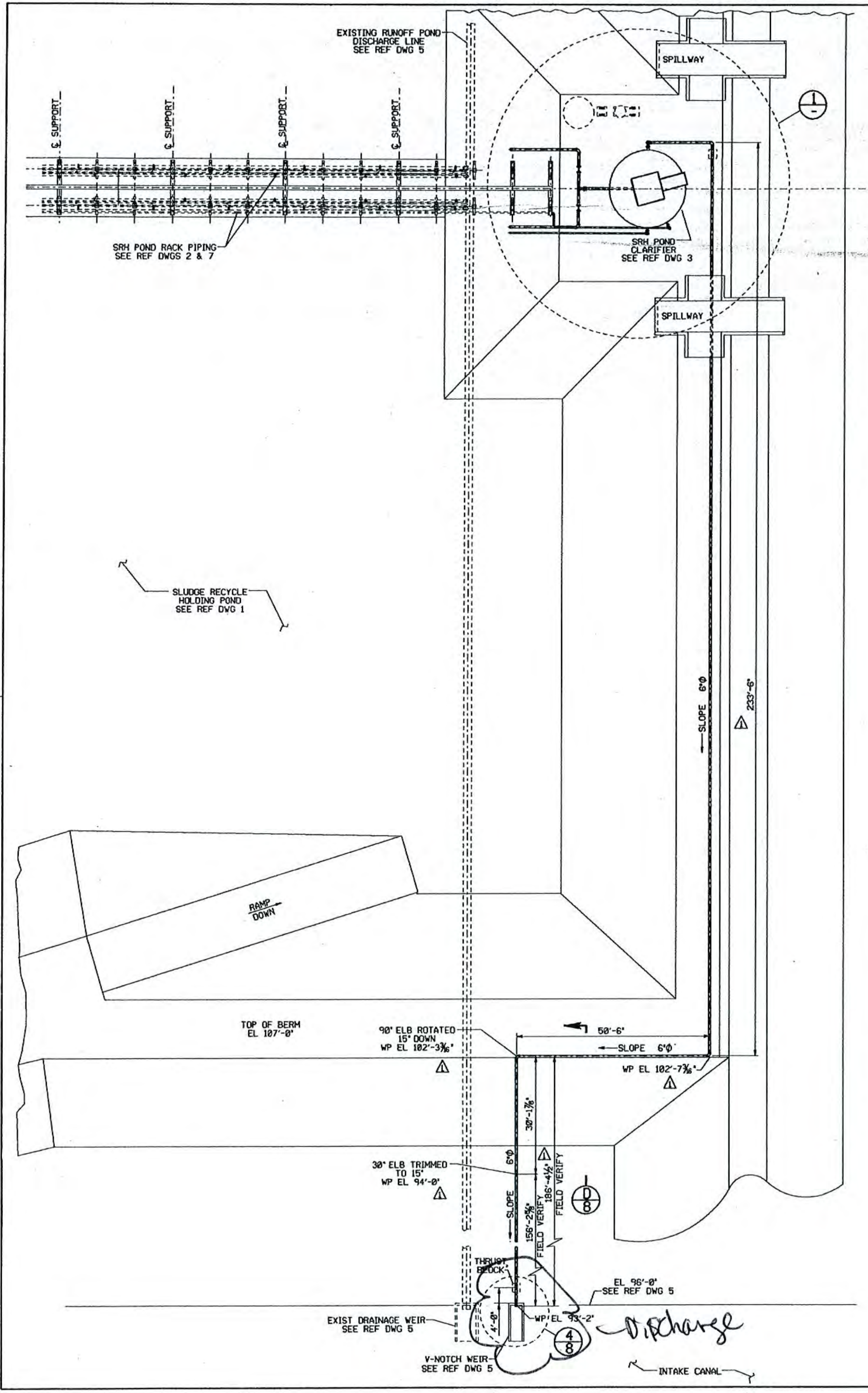
RANDALL W. ALLISON
69319
5-6-92

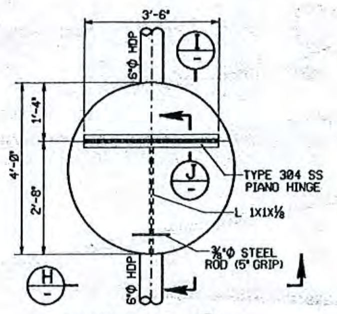
DWN	DSGND	CHKD	CONTROLS	ELECTRICAL	MECHANICAL	STRUCTURAL
D COX	SHB	JKB	KD	—	RWA	—

APPR	CADD DRAWING NO.	SHEET	REV
S CROSS	D-CL05-464-M100		1

MAR 10 1992

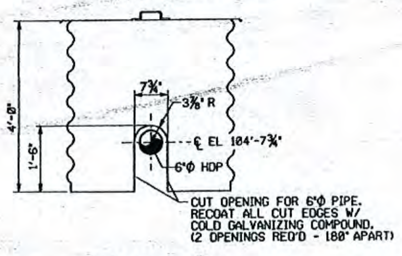
wauer
05-MAR-1992 09:43
/usr/p/jkal/464m100.dgn





DETAIL ②

SEE THIS SHEET (2 REQ'D)



SECTION Ⓗ

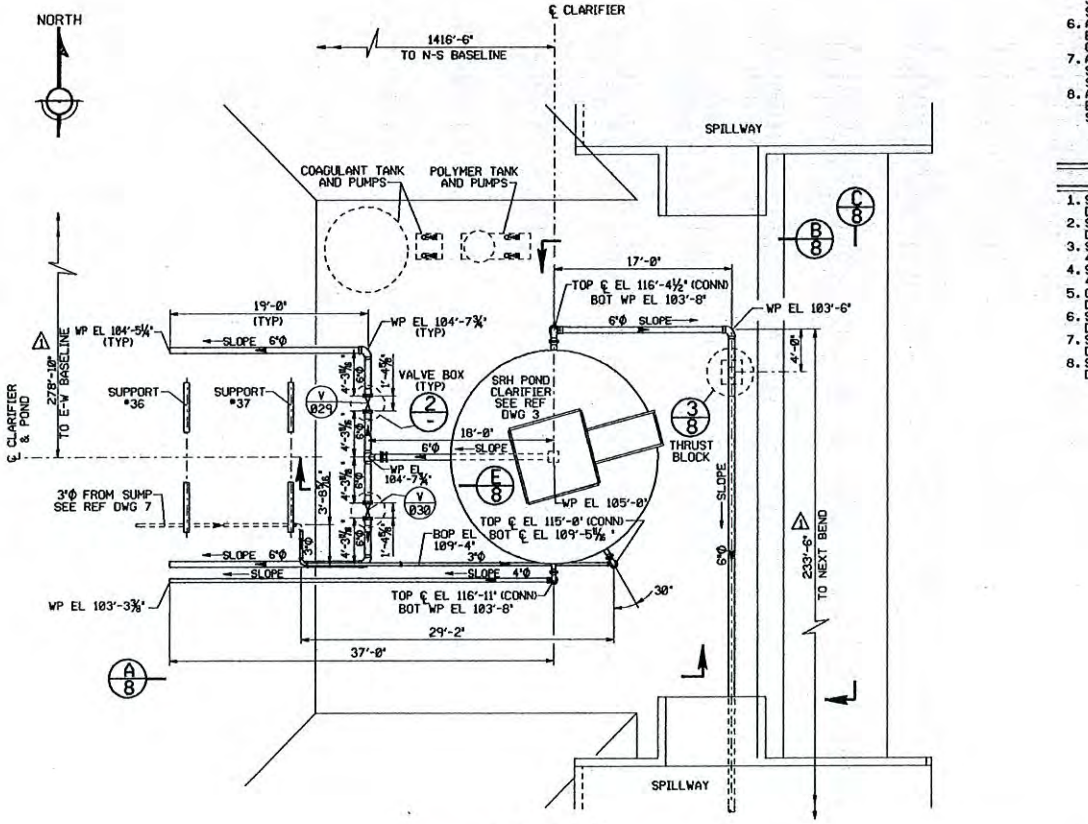
SEE THIS SHEET

GENERAL NOTES

1. ALL UNDERGROUND DRAINAGE PIPE SHALL BE BURIED IN ACCORDANCE TO SPECIFICATION 851-013.
2. ALL UNDERGROUND HIGH-DENSITY PE3408 POLYETHELENE PIPE SHALL BE INSTALLED WITHIN THE ALLOWABLE TEMPERATURE RANGE OF 35°F TO 100°F.
3. THE MINIMAL BURIAL DEPTH FOR THE 6"Ø SDR 11 CLARIFIER OVERFLOW PIPE SHALL BE 3'-0". THE MAXIMUM BURIAL DEPTH FOR THE OVERFLOW PIPE SHALL BE APPROXIMATELY 5'-0", UNLESS APPROVED OTHERWISE BY DESIGN ENGINEER.
4. THE TRENCH BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 90% OF MAXIMUM DENSITY. BACKFILL FOR TRENCHES TRAVERSING SUB-GRADES OF ROADS, RAILROADS, PARKING AREAS, UNDERGROUND PIPING, UNDERGROUND ELECTRICAL DUCTS AND CONDUIT, AND OTHER FACILITIES SUBJECT TO DAMAGE BY SETTLEMENT SHALL BE COMPACTED TO NOT LESS THAN 95% OF MAXIMUM DENSITY.
5. ALL HDP PIPE SHALL BE HANDLED, STORED, JOINED, AND INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
6. ALL UNDERGROUND ANCHOR CLAMPS AND BOLTING SHALL BE FABRICATED OF NON-CORROSIVE MATERIALS.
7. ALL ABOVE-GROUND CARBON STEEL PIPING SHALL BE ASTM A106 GR B, STD WEIGHT, SEAMLESS.
8. ALL FIBERGLASS PIPING SHALL BE MANUFACTURED BY ABCO AND SHALL CONFORM TO THE CONTRACT SPECIFICATION 66.2000M (D).

REFERENCE DRAWINGS

1. SLUDGE HANDLING SYSTEM-SRH POND LAYOUT D-CL05-464-S001
2. SRH POND PIPING GENERAL LAYOUT D-CL05-051-L981 SH 1
3. SRH POND CLARIFIER LAYOUT - PLAN VIEW 464-A002 (MFR)
4. SRH POND CLARIFIER ELEVATION 464-A003 (MFR)
5. CONSTRUCTION RUNOFF PONDS PLAN VIEW D-CL05-155-S001
6. SLUDGE RECYCLE SYSTEM - P & ID D-CL05-464-M001
7. SRH POND SUMP PIPING PLAN & SECTIONS D-CL05-464-M100
8. SRH POND CLARIFIER PIPING SECTIONS D-CL05-464-M102

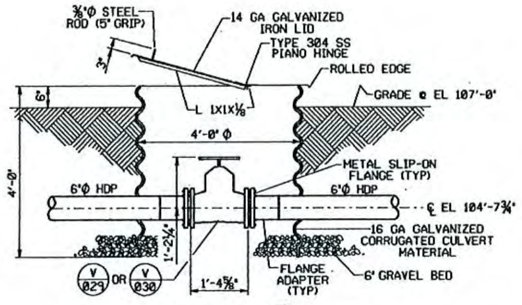


DETAIL ①

SEE THIS SHEET

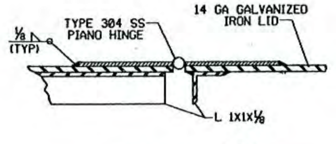
RECEIVED
APR 0 4 1994
POWER ENGINEERING

AS CONSTRUCTED



SECTION Ⓘ

SEE THIS SHEET



SECTION Ⓙ

SEE THIS SHEET

NO	REVISIONS	DATE	BY	CHK	DSNR	APPR
1	REV PP ON PLAN, DET I	013092	JPR	CJ		SC
0	ISSUED FOR CONSTRUCTION					SC

THIS DRAWING IS THE PROPERTY OF UTILITY ENGINEERING CORPORATION AMARILLO, TEXAS AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS OR APPARATUS EXCEPT WHERE PROVIDED FOR BY AGREEMENT WITH SAID COMPANY

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
H.B.ZACHRY COMPANY

SLUDGE HANDLING SYSTEM
SRH POND CLARIFIER PIPING PLAN

DWN	DSGND	CHKD	CONTROLS	ELECTRICAL	MECHANICAL	STRUCTURAL
D.COX	S.BRADY	K.BROWN	—	—	Rev	—

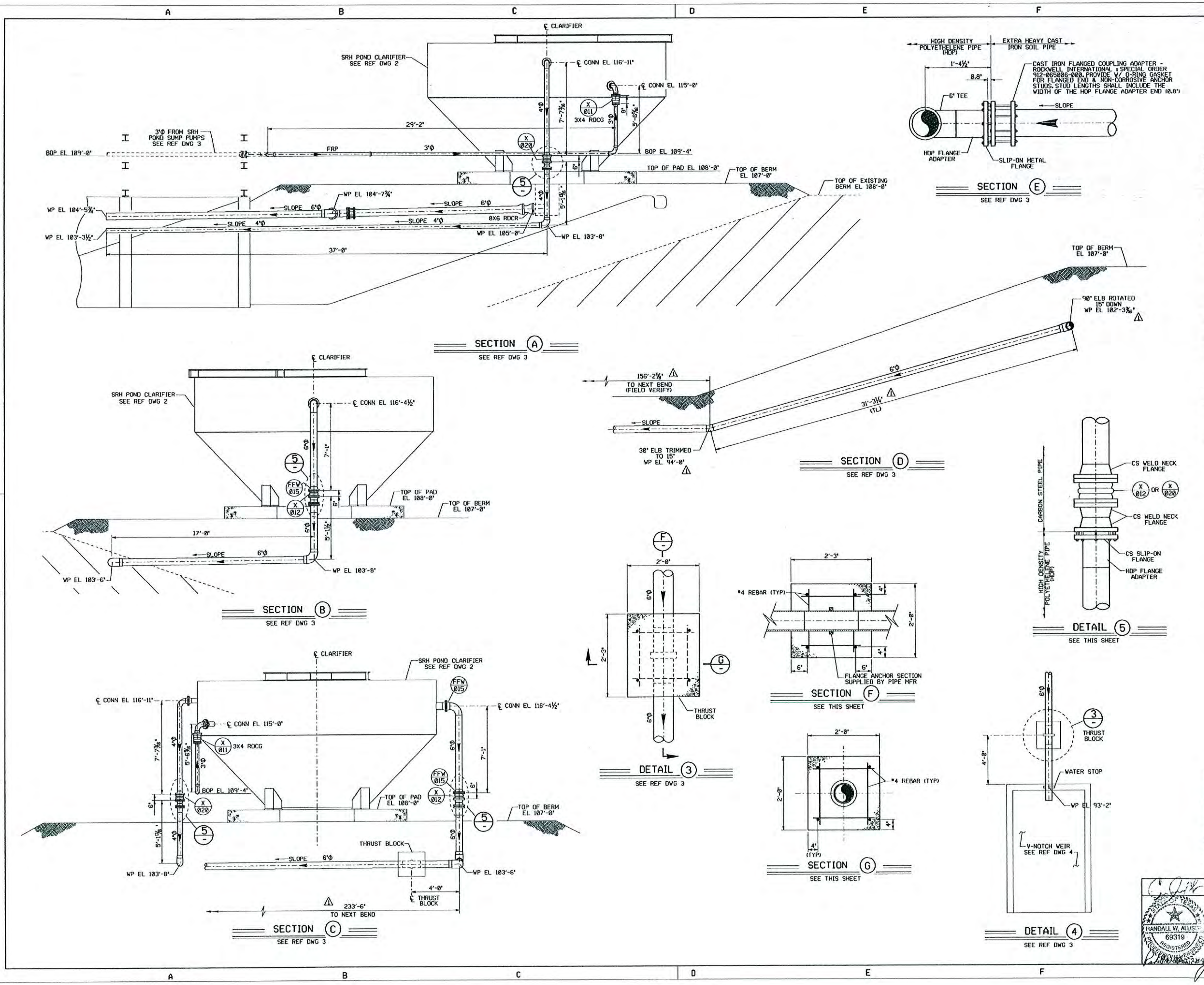
APPD L.CROSS

CADD DRAWING NO. D-CL05-464-M101 — SHEET — REV 1

RANDALL W. ALLISON
69319
2-18-92

MAR 0 5 1992

BROWN
28-FEB-1992 14:56



GENERAL NOTES

1. ALL UNDERGROUND DRAINAGE PIPE SHALL BE BURIED IN ACCORDANCE TO SPECIFICATION 851-013.
2. ALL UNDERGROUND HIGH-DENSITY PE3408 POLYETHELENE PIPE SHALL BE INSTALLED WITHIN THE ALLOWABLE TEMPERATURE RANGE OF 35°F TO 100°F.
3. THE MINIMAL BURIAL DEPTH FOR THE 6"Φ SDR 11 CLARIFIER OVERFLOW PIPE SHALL BE 3'-0". THE MAXIMUM BURIAL DEPTH FOR THE OVERFLOW PIPE SHALL BE APPROXIMATELY 5'-0", UNLESS APPROVED OTHERWISE BY DESIGN ENGINEER.
4. THE TRENCH BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 90% OF MAXIMUM DENSITY. BACKFILL FOR TRENCHES TRAVERSING SUB-GRADES OF ROADS, RAILROADS, PARKING AREAS, UNDERGROUND PIPING, UNDERGROUND ELECTRICAL DUCTS AND CONDUIT, AND OTHER FACILITIES SUBJECT TO DAMAGE BY SETTLEMENT SHALL BE COMPACTED TO NOT LESS THAN 95% OF MAXIMUM DENSITY.
5. ALL HDP PIPE SHALL BE HANDLED, STORED, JOINED, AND INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
6. ALL UNDERGROUND ANCHOR CLAMPS AND BOLTING SHALL BE FABRICATED OF NON-CORROSIVE MATERIALS.
7. ALL ABOVE-GROUND CARBON STEEL PIPING SHALL BE ASTM A106 GR B, STD WEIGHT, SEAMLESS.
8. ALL FIBERGLASS PIPING SHALL BE MANUFACTURED BY ABCO AND SHALL CONFORM TO THE CONTRACT SPECIFICATION 66.2000M (D).

REFERENCE DRAWINGS

1. SLUDGE HANDLING SYSTEM-SRH POND LAYOUT D-CL05-464-S001
2. SRH POND CLARIFIER ELEVATION 464-A003 (MFR)
3. SRH POND CLARIFIER PIPING PLAN D-CL05-464-M101
4. CONSTRUCTION RUNOFF PONDS D-CL05-155-S001

RECEIVED
APR 0 4 1994
POWER ENGINEERING

AS CONSTRUCTED

NO	REVISIONS	DATE	BY	CHK	DSNR	APPR
1	REV PIPING @ SECTION C & D AS NOTED	013092	VR	AJ	RA	SC
0	ISSUED FOR CONSTRUCTION					SC

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
H.B. ZACHRY COMPANY

SLUDGE HANDLING SYSTEM
SRH POND CLARIFIER PIPING SECTIONS

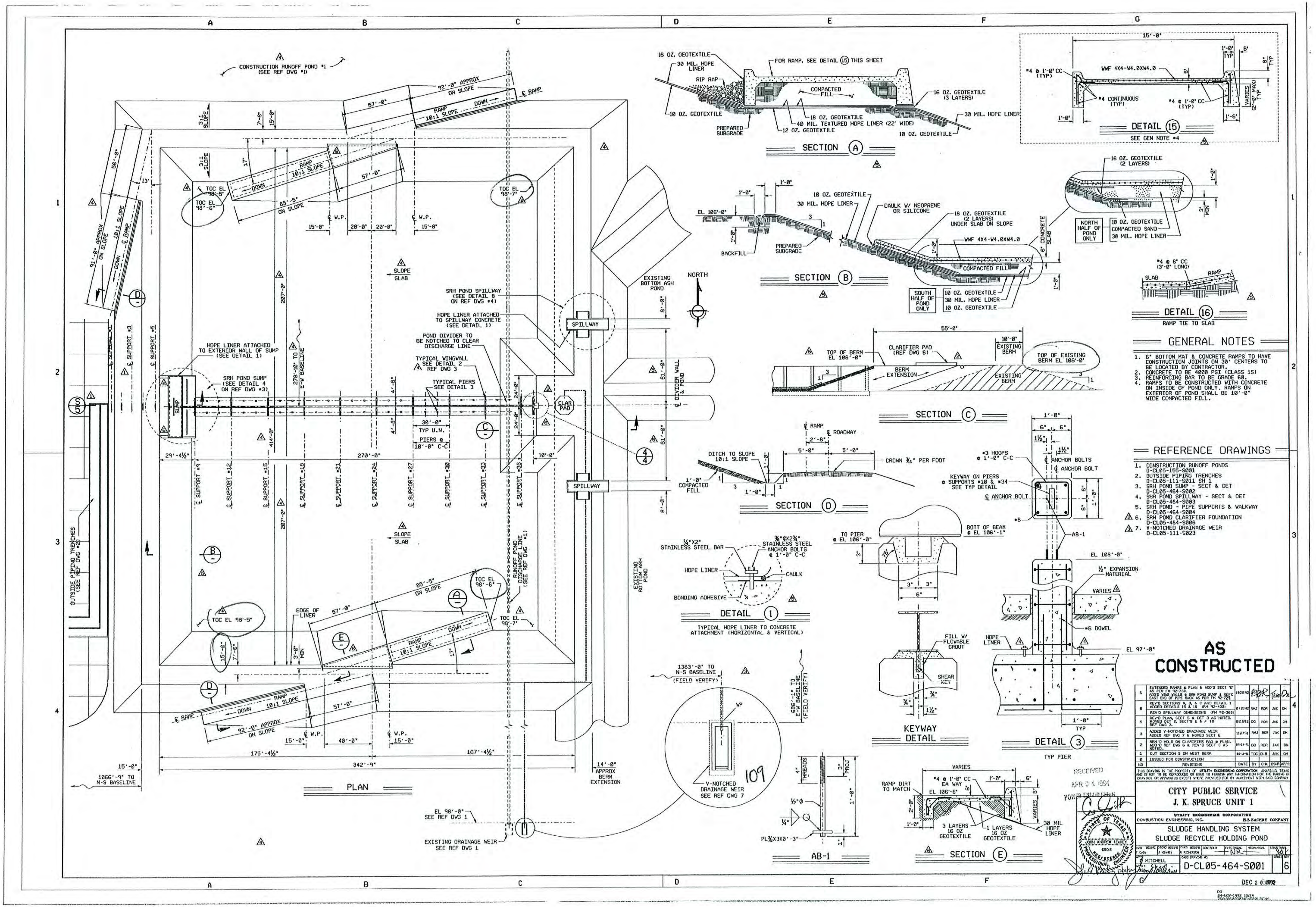
DWN	DSGND	CHKD	CONTROLS	ELECTRICAL	MECHANICAL	STRUCTURAL
D.COX	S.BRADY	K.BROWN	—	—	RWA	—

APPR S.CROSS
CADD DRAWING NO. D-CL05-464-M102
SHEET
REV 1

RANDALL W. ALLISON
69319
2-28-92

MAR 0 5 1992

BROWN
28-FEB-1992 14:53



AS CONSTRUCTED

GENERAL NOTES

1. 6" BOTTOM MAT & CONCRETE RAMPS TO HAVE CONSTRUCTION JOINTS ON 30' CENTERS TO BE LOCATED BY CONTRACTOR.
2. CONCRETE TO BE 4000 PSI (CLASS 1S)
3. REINFORCING BAR TO BE GRADE 60.
4. RAMPS TO BE CONSTRUCTED WITH CONCRETE ON INSIDE OF POND ONLY. RAMPS ON EXTERIOR OF POND SHALL BE 10'-0" WIDE COMPACTED FILL.

REFERENCE DRAWINGS

1. CONSTRUCTION RUNOFF PONDS D-CL05-155-S001
2. OUTSIDE PIPING TRENCHES D-CL05-111-S011 SH 1
3. SRH POND SUMP - SECT & DET D-CL05-464-S002
4. SHR POND SPILLWAY - SECT & DET D-CL05-464-S003
5. SRH POND - PIPE SUPPORTS & WALKWAY D-CL05-464-S004
6. SRH POND CLARIFIER FOUNDATION D-CL05-464-S006
7. V-NOTCHED DRAINAGE WEIR D-CL05-111-S023

NO	REVISIONS	DATE	BY	CHK	DSNR	APPR
6	EXTENDED RAMPS @ PLAN & ADD'D SECT "E" AS PER FM 92-730. ADD'D WING WALLS @ SRH POND SUMP & REV'D EAST END OF PIPE RACK AS PER FM 92-729	102092				
5	REV'D SECTIONS A, B, & C AND DETAIL 1 ADDED DETAILS 15 & 16 (FM 92-430) REV'D SPILLWAY DIMENSIONS (FM 92-368)	071592	RMJ	RDR	JAK	DH
4	REV'D PLAN, SECT B & DET 3 AS NOTED. MOVED DET 2, SECT'S E & F TO REF DWG 3.	011692	DO	RDR	JAK	DH
3	ADDED V-NOTCHED DRAINAGE WEIR ADDED REF DWG 7 & MOVED SECT E	110791	RMJ	RDR	JAK	DH
2	REM'D HOLD ON CLARIFIER PAD @ PLAN. ADD'D REF DWG 6 & REV'D SECT C AS NOTED.	09-24-91	DO	RDR	JAK	DH
1	CUT SECTION S ON WEST BERM	08-11-91	TDC	DLR	JAK	DH
0	ISSUED FOR CONSTRUCTION					

THIS DRAWING IS THE PROPERTY OF UTILITY ENGINEERING CORPORATION AMARILLO, TEXAS AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS OR APPARATUS EXCEPT WHERE PROVIDED FOR BY AGREEMENT WITH SAID COMPANY

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
H.B.ZACHRY COMPANY

SLUDGE HANDLING SYSTEM
SLUDGE RECYCLE HOLDING POND

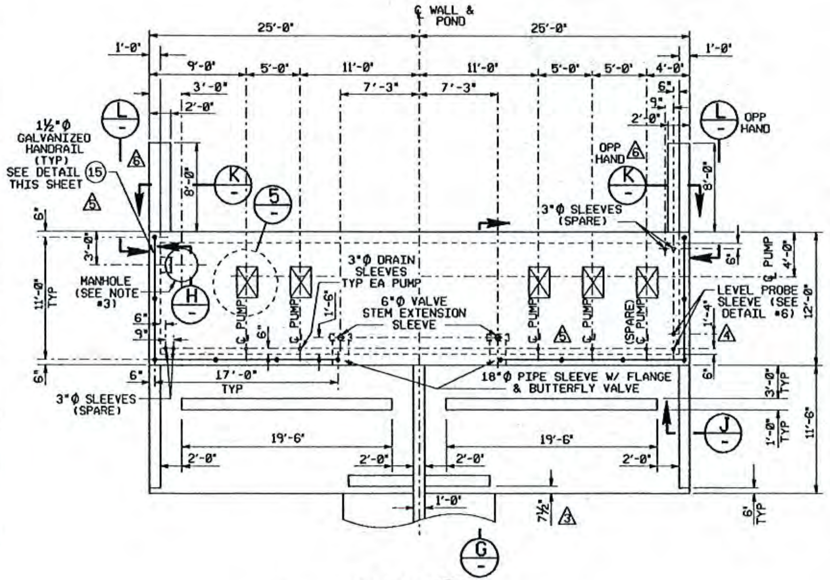
DWN 052091 T CAIN
DSGND 052091 J KEHEY
CHKD 052091 R RICHERSON
CONTROLS
ELECTRICAL NR
MECHANICAL
STRUCTURAL
APPR D MITCHELL
CADD DRAWING NO. D-CL05-464-S001
SHEET
REV 6

JOHN ANDREW KEAHEY
65018
12/21/92

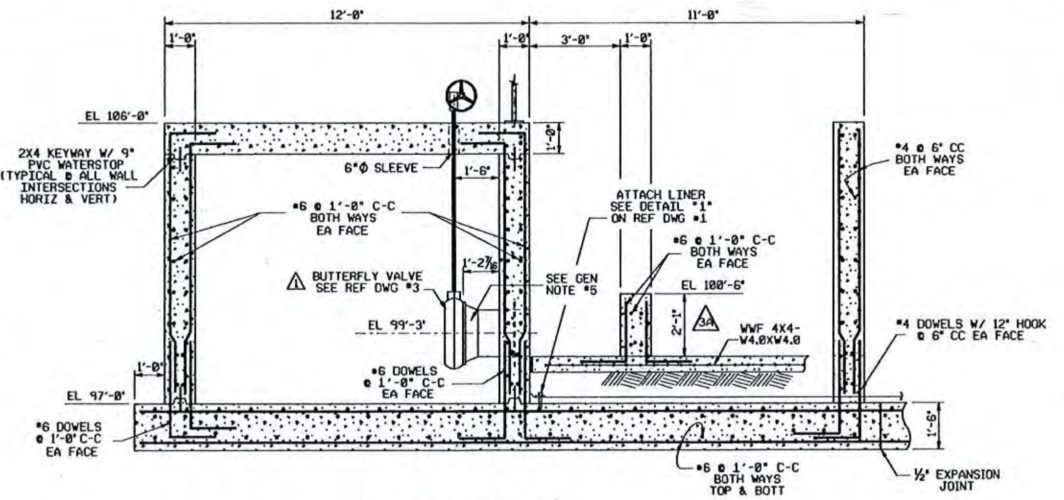
RECEIVED
APR 0 4 1994
POWER ENGINEERING

DEC 3 0 1992

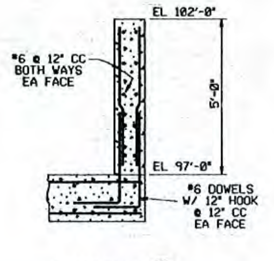
DO
04-NOV-1992 15:24



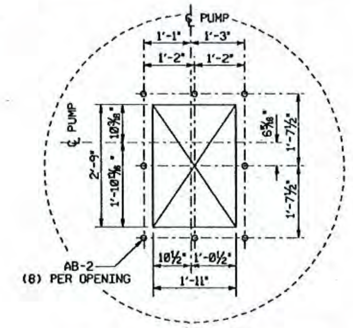
DETAIL 4



SECTION G

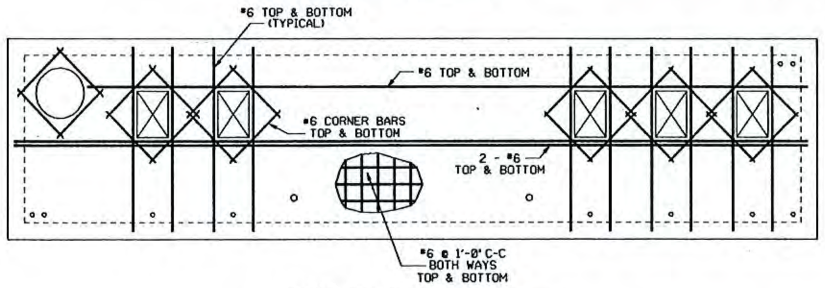


SECTION J

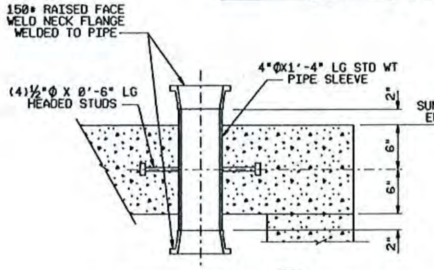


DETAIL 5

TYP PUMP OPENING (2" GROUT REQUIRED)

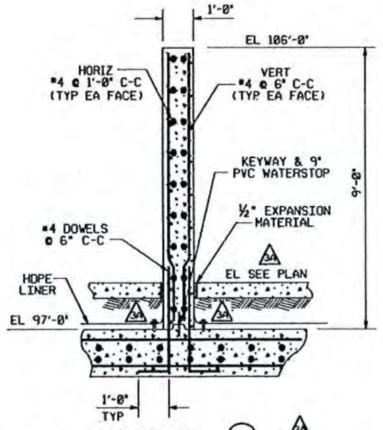


SUMP TOP REINFORCING

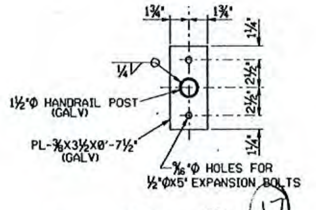


DETAIL 6

LEVEL PROBE SLEEVE

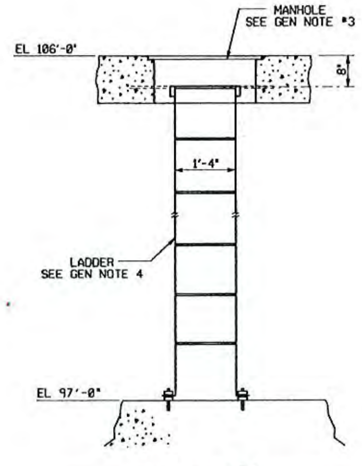


SECTION E

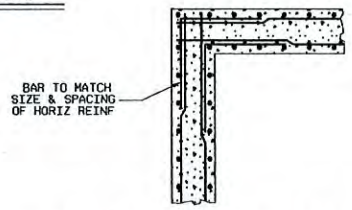


DETAIL 15

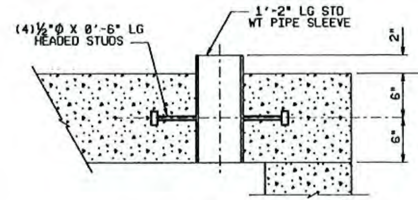
HANDRAIL POST BASE PLATE



SECTION H

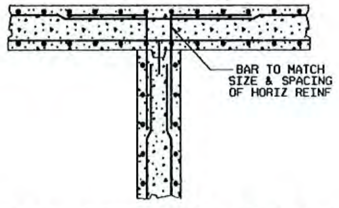


TYP WALL CORNER REBAR PLAN

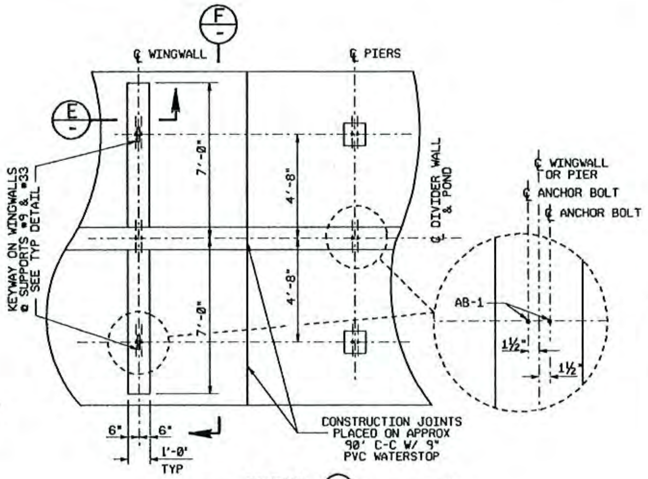


DETAIL 7

TYPICAL SLEEVE DETAIL (UNLESS NOTED)

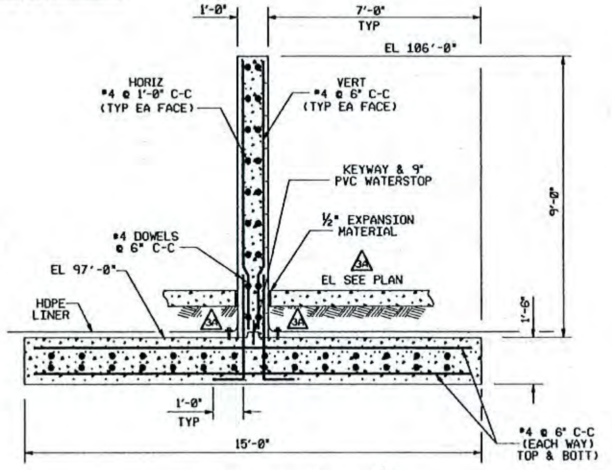


TYP WALL INTERSECTION REBAR PLAN

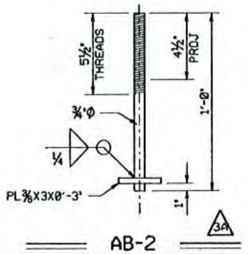


DETAIL 2

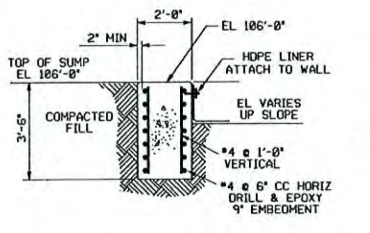
TYP ANCHOR BOLT LOCATIONS



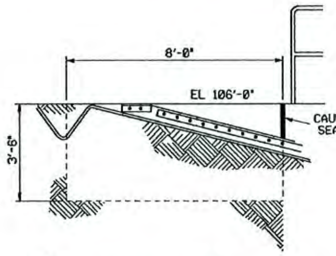
SECTION F



AB-2



SECTION K



SECTION L

GENERAL NOTES

1. CONCRETE TO BE 4000 PSI (CLASS 1S).
2. REINFORCING BAR TO BE GRADE 60.
3. MANHOLES SHALL BE McKINLEY S-38L.
4. LADDER SHALL BE McGRAW EDISON "DU5L SERIES" WITH "DU3L1" HOOKS OR APPROVED EQUAL.
5. PIPE TO BE 304 STAINLESS STEEL, SCH 40, 18"Φ W/ 3" WIDE STIFFNER RING. USE 18"Φ 150# FLAT-FACED SLIP ON FLANGE.
6. ALL REINFORCING TO HAVE 2" COVER (UN).
7. ¾" CHAMFER ON ALL EXPOSED CONCRETE EDGES.

REFERENCE DRAWINGS

1. SLUDGE RECYCLE HOLDING POND D-CL05-464-S001
2. SRH POND - PIPE SUPPORTS & WALKWAY D-CL05-464-S003
3. SRH POND - P & I D D-CL05-464-M001

AS CONSTRUCTED

NO	REVISIONS	DATE	BY	CHK	DSNR	APPR
6	REV'D DET "4" & ADD'D SECT'S K & L AS PER FM #92-729.	102092				
5	ADDED GALV HANDRAIL AT DETAIL 4 AND DETAIL 15 AS PER FM 92-430	071392	RMJ	DLR	JAK	DH
4	REV'D DETAIL 4 PER FM 92-143	052092	GPD	RDR	JAK	DH
3	REV'D DIM @ DET 4 AS PER FM 92-016.					
3A	MOVED DET'S 5, 7 & AB-2. ADDED DET 2, SECT'S E & F FROM REF DWG 1. REV'D SECT'S G, E & F AS NOTED.	011492	DD	RDR	JAK	DH
2	REVISED GENERAL NOTE 5	092391	RMJ	DLR	JAK	DH
1	REVISED TYP PUMP OPENING & ANCHOR BOLT LOCATION IN DETAIL 5, ADDED REF DWG #3.	071291	TDC	RDR	JAK	DH
0	ISSUED FOR CONSTRUCTION.					

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
H.B.ZACHRY COMPANY

SLUDGE HANDLING SYSTEM
SRH POND SUMP - PLAN, SECT & DET

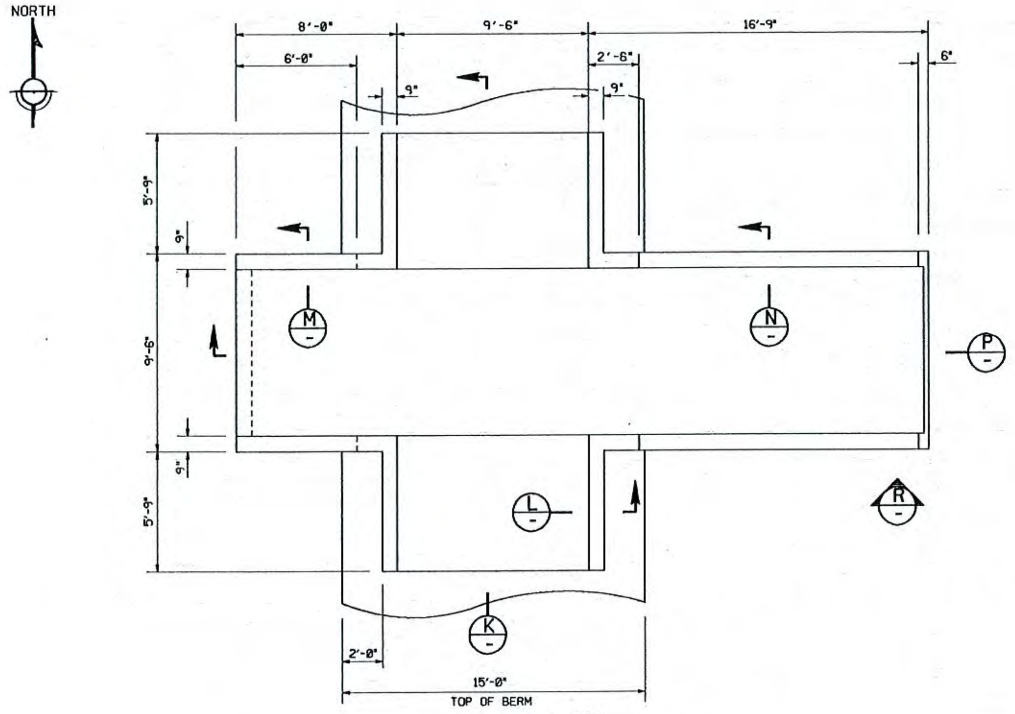
JOHN ANDREW KEAHEY
65018
12/2/92

DWN 052491	DSGND 052491	CHKD 052491	CONTROLS	ELECTRICAL	MECHANICAL	STRUCTURAL
T CAIN	J KEAHEY	B RODEN		NR		

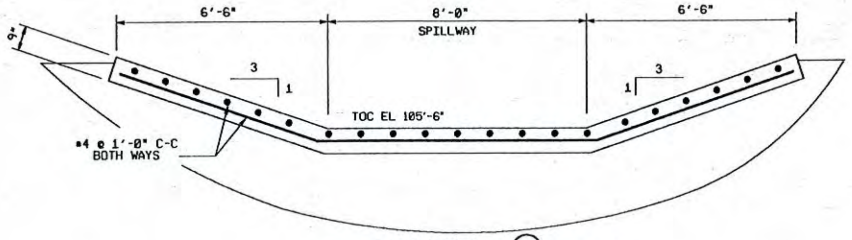
APPR	CADD DRAWING NO.	SHEET	REV
D MITCHELL 052891	D-CL05-464-S002		6

DEC 3 0 1992

DD
02-NOV-1992 11:10
[illegible]

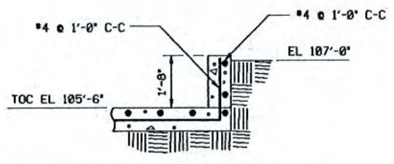


DETAIL ⑧

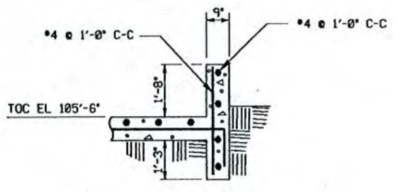


SECTION Ⓚ

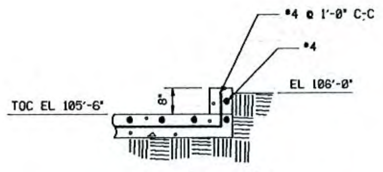
TYP FOR (2) SPILLWAYS



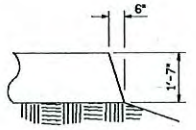
SECTION Ⓛ



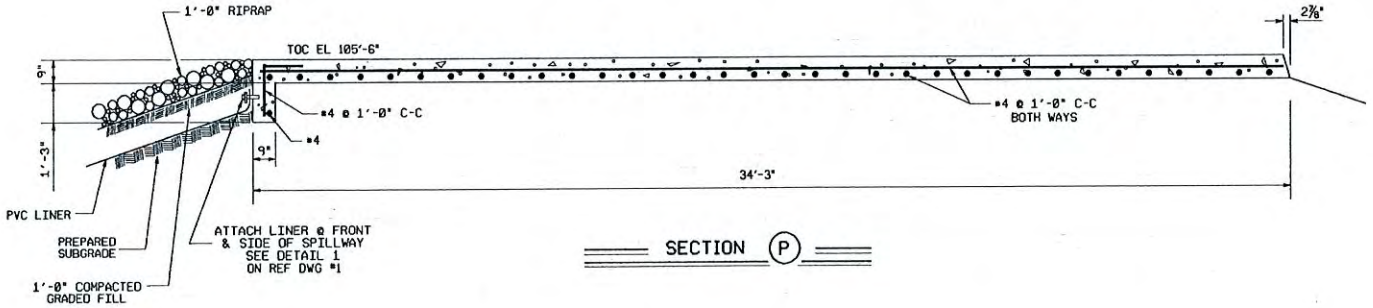
SECTION Ⓜ



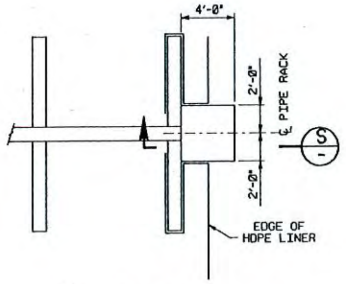
SECTION Ⓝ



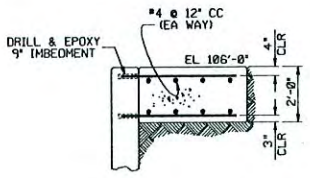
ELEVATION Ⓡ



SECTION Ⓟ



△1 DETAIL ④



△1 SECTION Ⓢ

GENERAL NOTES

1. CONCRETE TO BE 4000 PSI (CLASS 1S).
2. REINFORCING BAR TO BE GRADE 60.
3. ¾" CHAMFER ON ALL EXPOSED CONCRETE EDGES.

REFERENCE DRAWINGS

1. SLUDGE RECYCLE HOLDING POND D-CL05-464-S001
2. SRH POND SUMP - SECT & DET D-CL05-464-S002
3. SRH POND - PIPE SUPPORTS & WALKWAY D-CL05-464-S004

AS CONSTRUCTED

NO	REVISIONS	DATE	BY	CHK	DSNR	APPR
1	ADD'D DET "4" & SECT "S" AS PER FM #92-729.	10-20-92	JC	BP	[illegible]	[illegible]
0	ISSUED FOR CONSTRUCTION.	- -				

THIS DRAWING IS THE PROPERTY OF UTILITY ENGINEERING CORPORATION AMARILLO, TEXAS AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS OR APPARATUS EXCEPT WHERE PROVIDED FOR BY AGREEMENT WITH SAID COMPANY

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
H.B.ZACHRY COMPANY

SLUDGE HANDLING SYSTEM
SRH POND SPILLWAY - SECT & DET

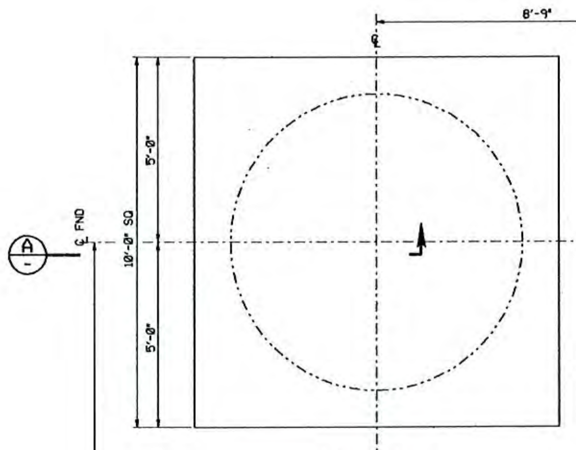
DWN 05-24-92 T CAIN
DSGND J KEAHEY
CHKD 05-24-92 D RODEN
CONTROLS —
ELECTRICAL NR
MECHANICAL —
STRUCTURAL
APPR B MITCHELL 05-28-92
CADD DRAWING NO. D-CL05-464-S003
SHEET
REV 1

JOHN ANDREW KEAHEY
65018
12/21/92

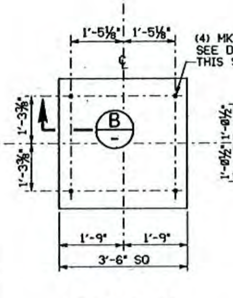
DEC 3 0 1992

RECEIVED
APR 0 4 1994
POWER ENGINEERING

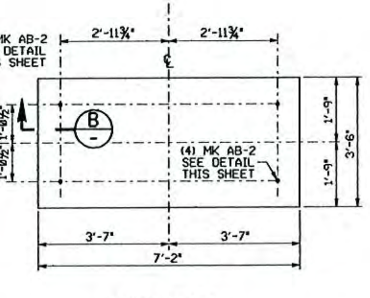
DO
04-NOV-1992 15:46
ZG0:[060030]464S003.DGN;1



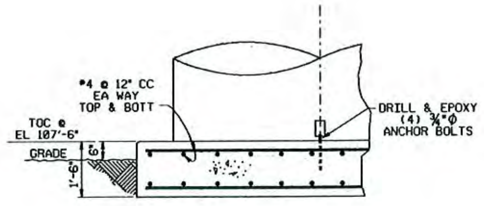
COAGULANT TANK FND



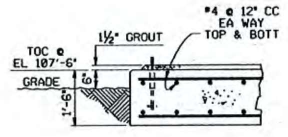
CLARIFIER ALUM FEED SYSTEM FND



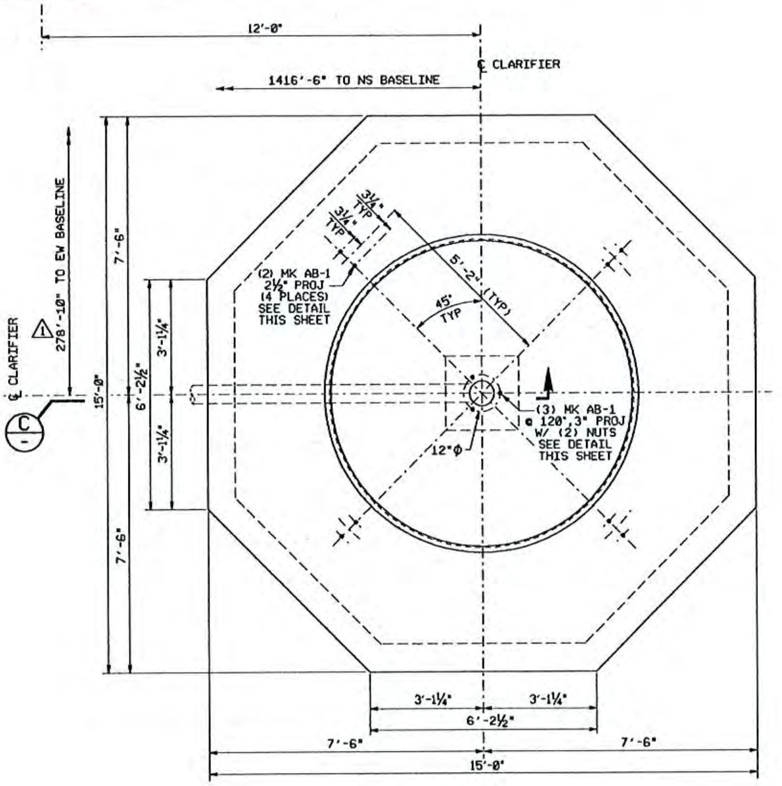
CLARIFIER POLYMER FEED SYSTEM FND



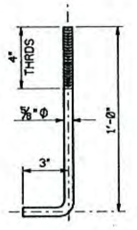
SECTION Ⓐ



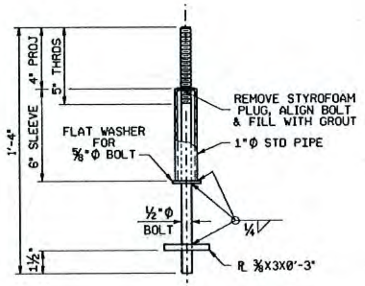
SECTION Ⓑ



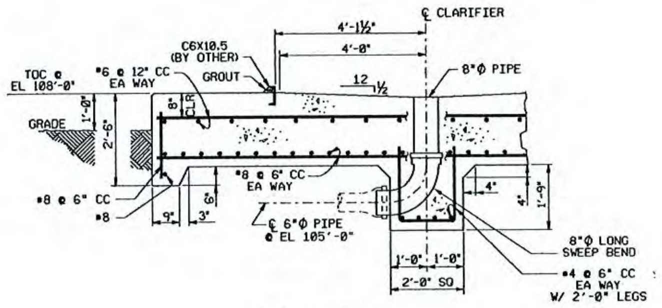
SRH POND CLARIFIER FND



MK AB-1



MK AB-2



SECTION Ⓒ

GENERAL NOTES

1. PROJECTING FLANGE OF EMBEDDED CHANNEL MUST BE LEVEL WITHIN ±1/16"
2. INSIDE RADIUS OF EMBEDDED CHANNEL MUST BE HELD WITHIN ±⅛"
3. CONCRETE TO BE 4000 PSI.
4. REBAR TO BE GRADE 60.
5. ¾" CHAMFER REQUIRED ON ALL EXPOSED EXTERIOR CORNERS.
6. ALL REINFORCING TO HAVE 3" COVER (UN).

REFERENCE DRAWINGS

1. S.R.H. POND CLARIFIER PIPING PLAN D-CL05-464-M101
2. SLUDGE RECYCLE HOLDING POND D-CL05-464-S001
3. COAGULANT TANK 289-T001
4. POLYMER FEED SYSTEM 464-A005 (MFR)

AS CONSTRUCTED

RECEIVED
APR 0 4 1994
POWER ENGINEERING

NO	REVISIONS	DATE	BY	CHK	DSNR	APPR
1	REV'D DIM @ "SRH POND CLARIFIER FND" AS NOTED.	11-17-92	DD	DLR	BLR	DM
0	ISSUED FOR CONSTRUCTION.	- -				

THIS DRAWING IS THE PROPERTY OF UTILITY ENGINEERING CORPORATION AMARILLO, TEXAS AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR THE MAKING OF DRAWINGS OR APPARATUS EXCEPT WHERE PROVIDED FOR BY AGREEMENT WITH SAID COMPANY

1-11-94

LARRY L. RICHEY
1/11/94

CITY PUBLIC SERVICE
J. K. SPRUCE UNIT 1

UTILITY ENGINEERING CORPORATION
COMBUSTION ENGINEERING, INC.
H.B.ZACHRY COMPANY

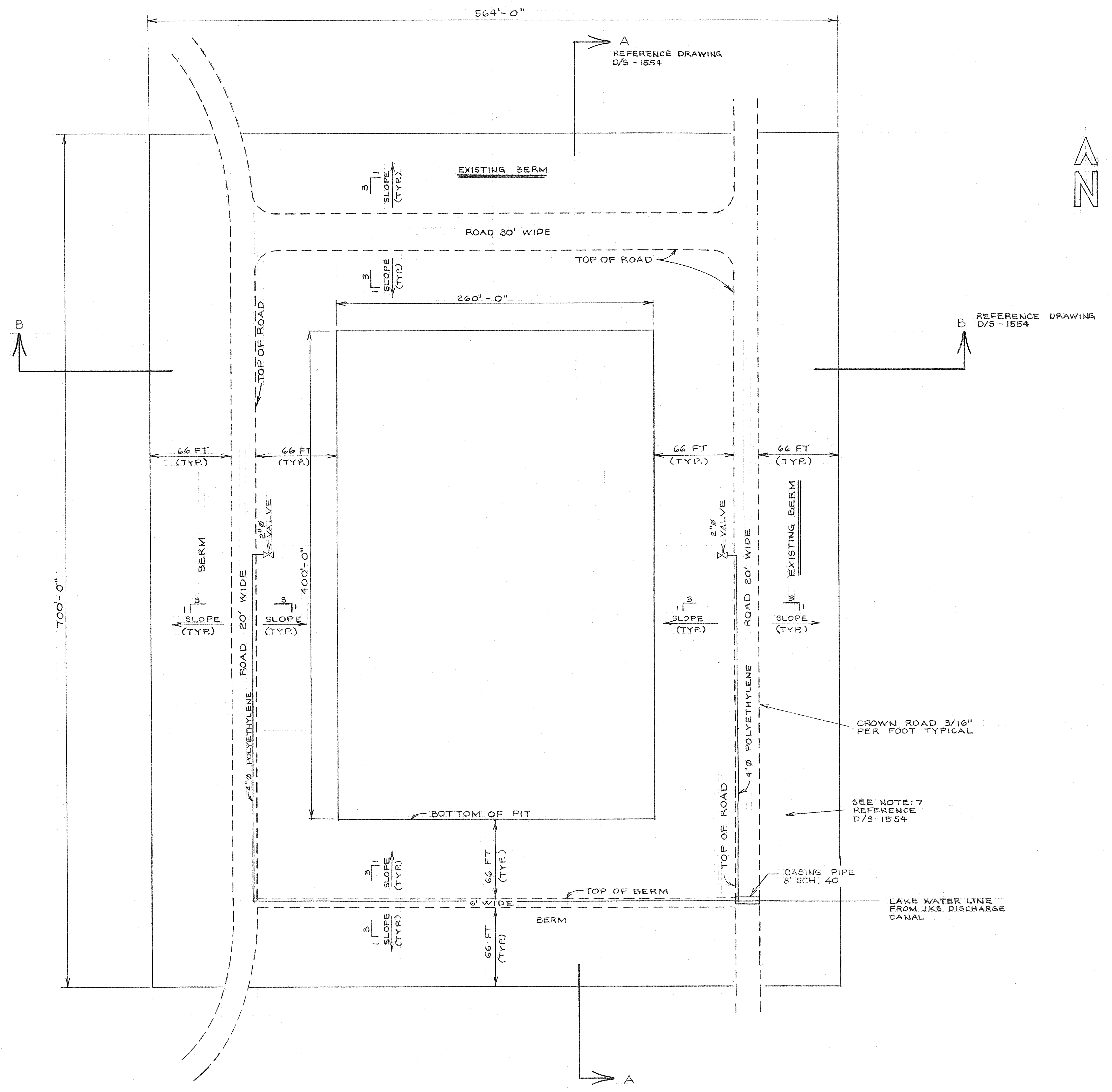
SLUDGE HANDLING SYSTEM
CLARIFIER FND, PLAN, SEC & DET

DWN	DSGND	CHKD	CONTROLS	ELECTRICAL	MECHANICAL	STRUCTURAL
P DD	J KEAHEY	R RICHERSON	RH	CLN	SHB	JAK

APPR D MITCHELL 10-30-91
APPR J WILLIAMS
CADD DRAWING NO. D-CL05-464-S006
SHEET
REV 1

JAN 1 0 1994

RICHERSON
03-JAN-1994 13:11
Z00:[060030]464S006.DGN;1



REFERENCE DRAWINGS
1, D-CL05-289-S002
2 D/S 1554

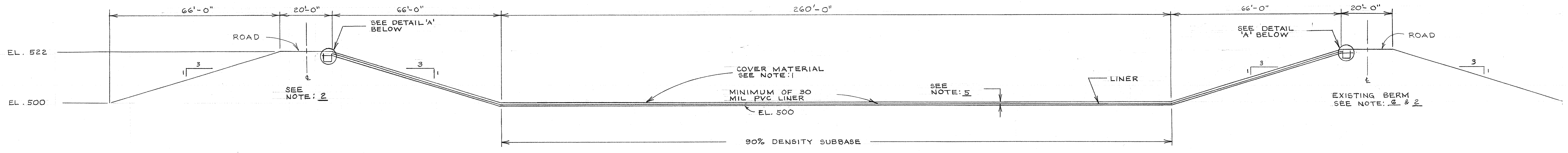
J.T. DEELY/J.K. SPRUCE
ASH DISPOSAL PIT # 4
PLAN VIEW

CITY PUBLIC SERVICE
SAN ANTONIO, TEXAS

DRAWN: FRANK TOBAR
DATE: 7/16/90
CHECKED: DTS
SCALE: 1" = 50'-0"
APPROVED: DTS
SHEET 1 OF 1

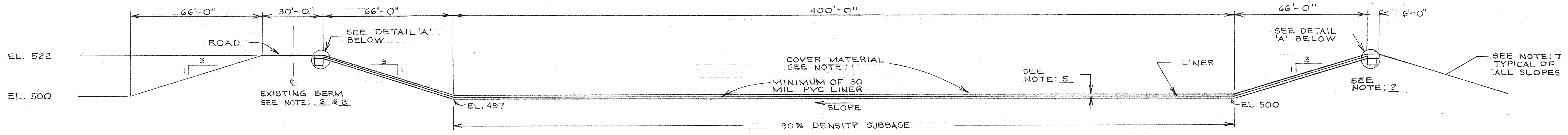
SYSTEM	I.D.	DRAWING NUMBER	CODE
		D/S - 1547	

No.	DATE	REVISION	BY	CK'D	APP
1	7-25-90	BID ISSUE	F.T.	DES	DTS



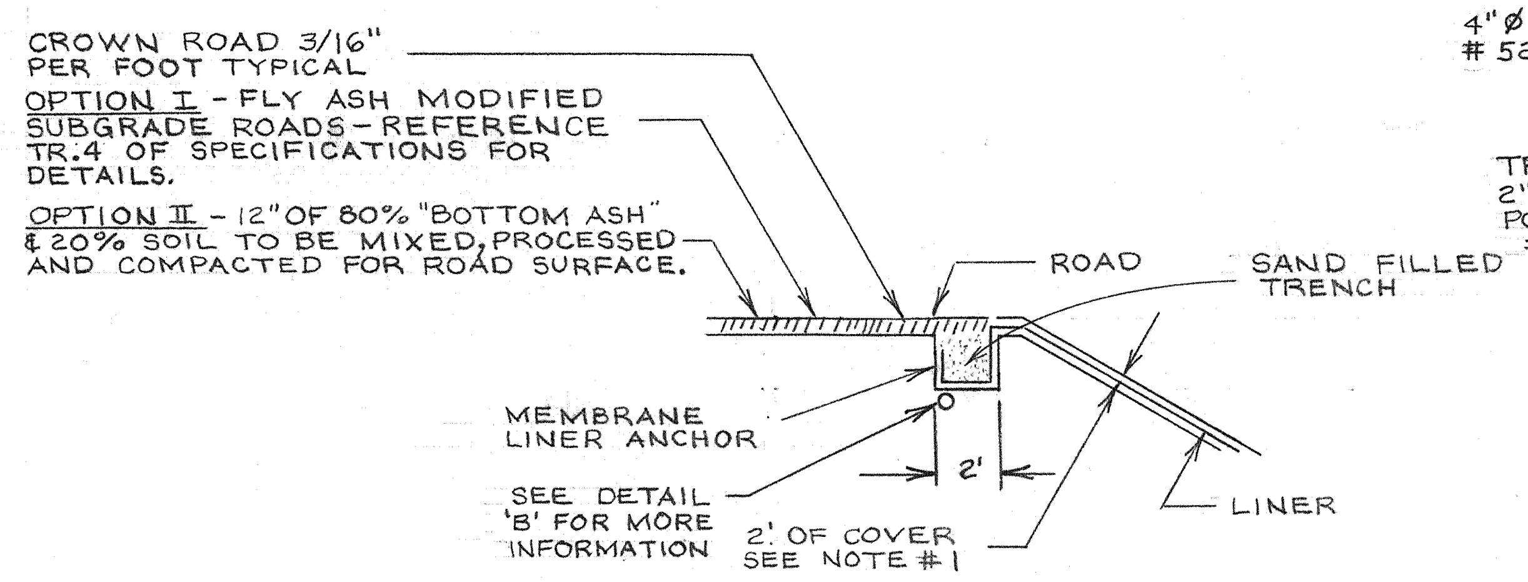
SECTION 'B-B'
—LOOKING NORTH—
SCALE: 1" = 20'-0"

REFERENCE DRAWINGS
1. D-CLO5-289-S002
2. D/S-1547

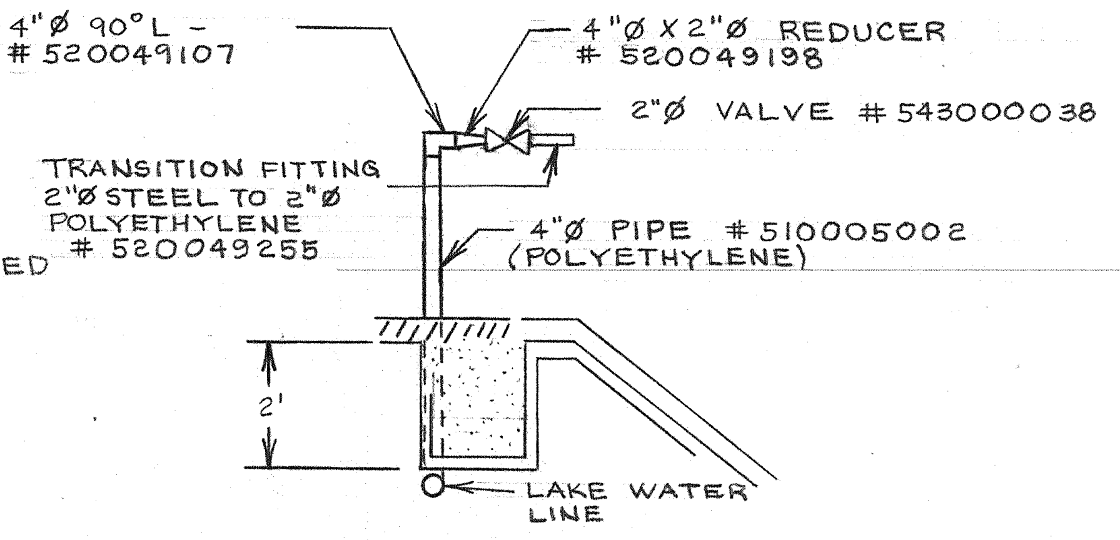


SECTION 'A-A'
—LOOKING EAST—
SCALE: 1" = 30'-0"

NOTE:
1) COVER MATERIAL SHALL BE COHESIVE SOILS FREE OF ALL ROCKS, ROOTS AND OTHER FOREIGN MATERIALS. THE COVER MATERIALS SHALL BE PLACED OVER THE LINER AS RECOMMENDED BY THE MANUFACTURER AND APPROVED BY CPS FIELD REPRESENTIVE.
2) SUBGRADE COMPACTED TO 90% DENSITY
3) ROCKS THAT ARE LESS THAN 6"X12" ARE ACCEPTABLE IN ALL BUT THE TOP TWO FEET OF THE BERM.
4) CONTRACTOR WILL BE REQUIRED TO WATER ALL EXTERNAL SLOPES FOR A PERIOD OF TWO MONTHS (DAILY) TO AID IN THE ESTABLISHMENT OF GRASS
5) REQUIREMENTS FOR SOIL COVER MATERIAL
  a) PVC - 1FT. OF THE TYPE OF SOIL STATED IN NOTE #1
  b) HDPE - 4 IN. OF THE TYPE OF SOIL STATED IN NOTE #1
6) MOST OF THIS BERM IS EXISTING. THE CONTRACTOR WILL BE REQUIRED TO COMPLETE THE INSIDE SLOPES AND TO BRING THE EXISTING ROAD UP TO ELEVATION 522.
7) MIRAMAT "2400" OR TENSAR "NS 3000" EROSION CONTROL AND REVEGETATION MAT SHALL BE INSTALLED ON EXTERNAL SLOPES, PER MANUFACTURE RECOMMENDATION. EROSION CONTROL MAT IS TO BE SUPPLIED AND INSTALLED BY CONTRACTOR. MAT IS TO BE COVER WITH A MINIMUM OF 1" OF TOP SOIL. ALL EXTERNAL SLOPES SHALL THEN BE SEEDED, FERTILIZED AND MULCHED BY CONTRACTOR PER SPECIFICATIONS.



DETAIL 'A'
(TYP.)



NOTE: ALL PHILLIPS DRISCO POLYETHYLENE PIPE AND ACCESSORIES WILL BE FURNISHED FROM CPS STOCK AND INSTALLED THE CONTRACTOR.

DETAIL 'B'
(TYP.)

No.	DATE	REVISION	BY	CK'D	APP
1	7-25-90	BID ISSUE	F.T.	DTS	DTS

J.T. DEELY / J.K. SPRUCE
ASH DISPOSAL PIT # 4
ELEVATION VIEWS

CITY PUBLIC SERVICE
SAN ANTONIO, TEXAS

DRAWN: FRANK TOBAR
DATE: 7/16/90
CHECKED: DTS
SCALE: SHOWN
APPROVED: DTS
SHEET 1 OF 1

SYSTEM	I.D.	DRAWING NUMBER	CODE
		D/S - 1554	

CITY PUBLIC SERVICE
SAN ANTONIO, TEXAS
CALAVERAS UNIT 5

TURNKEY CONTRACT DOCUMENTS

VOLUME 4

POWER PLANT EQUIPMENT AND MATERIAL REQUIREMENTS

BOOK 1

DIV 50 - UNIT DESIGN AND PERFORMANCE
DIV 60 - GENERAL
DIV 61 - STRUCTURAL

DEC 31 1987

UTILITY ENGINEERING CORPORATION
H. B. ZACHRY COMPANY
COMBUSTION ENGINEERING, INC.

Black & Veatch
Engineers-Architects

Section 50.0200 - SITE DESIGN CONDITIONS

1.0 GENERAL. The Calaveras Unit 5 site conditions to be used as design and performance criteria shall be as described herein. These site design conditions shall be used for the design and selection of any equipment or materials furnished unless otherwise stated.

2.0 METEOROLOGY. The climate in the vicinity of the Calaveras Lake site is characteristic of the plains of south Texas. The site ambient conditions are summarized as follows.

Elevation	494 ft msl
Design ambient temperature	110 F maximum 0 F minimum
Dry- and wet-bulb temperature and duration	
Recorded dry-bulb (December - February)	99 percent of time above 25 F 97.5 percent of time above 30 F
Recorded dry-bulb and mean coincident wet-bulb (June - September)	1 percent of time above 99 F/72 F 2.5 percent of time above 97 F/73 F 5 percent of time above 96 F/73 F
Mean daily range (summer)	19 F
Design wet-bulb	1 percent of time above 77 F 2.5 percent of time above 76 F 5 percent of time above 76 F
Mean annual precipitation	29 inches

3.0 NATURAL PHENOMENA DESIGN CRITERIA. The design criteria based on natural phenomena shall be as follows.

3.1 Rainfall. The rainfall design basis may vary for the different systems and system components. The Contractor shall identify each building, system component, and the associated rainfall design basis in the Project Outline. The Project Consultant will provide information to the Contractor regarding the Coal Yard Facilities for inclusion in the Project Outline.

Precipitation amounts to be used with each design basis are listed in Table 50.0200-1 included herein for various durations and return periods. The data were obtained from the Rainfall Frequency Atlas of the United States, May 1961.

3.2 Wind Speed. The design wind speed shall be 80 miles per hour based on ANSI Standard A58.1-1982 for a 50 year recurrence interval. This design wind speed shall be used to determine wind loads for all structures except the concrete chimney. The design wind speed for the concrete chimney design shall be in accordance with the requirements for the chimney included in Section 61.1001 of these contract documents.

3.3 Temperature. Systems and system component design criteria which require ambient temperature extremes shall use the range from 0 F to 110 F for dry-bulb temperatures. Equipment such as oil-filled power transformers shall be designed for a maximum daily average temperature of 100 F.

3.4 Relative Humidity. The average annual relative humidity is 67 percent.

3.5 Barometric Pressure. The average annual barometric pressure is 29.49 inches Hg abs based on a site elevation of 494 feet above mean sea level.

3.6 Frost Depth. The "mean air freezing index" at the Calaveras Lake site is 0 degree-days. The index is defined as the cumulative number of degree-days below 32 F computed on the basis of mean air temperature data.

The "design freezing index" is 50 degree-days. This index is defined as the cumulative number of degree-days with air temperature below 32 F for the coldest year in a 10 year cycle, or the average of the coldest 3 years in a 30 year cycle. (The above information was extracted from the Army Technical Manual TM5-818-2, Pavement Design for Frost Conditions, July 1965.)

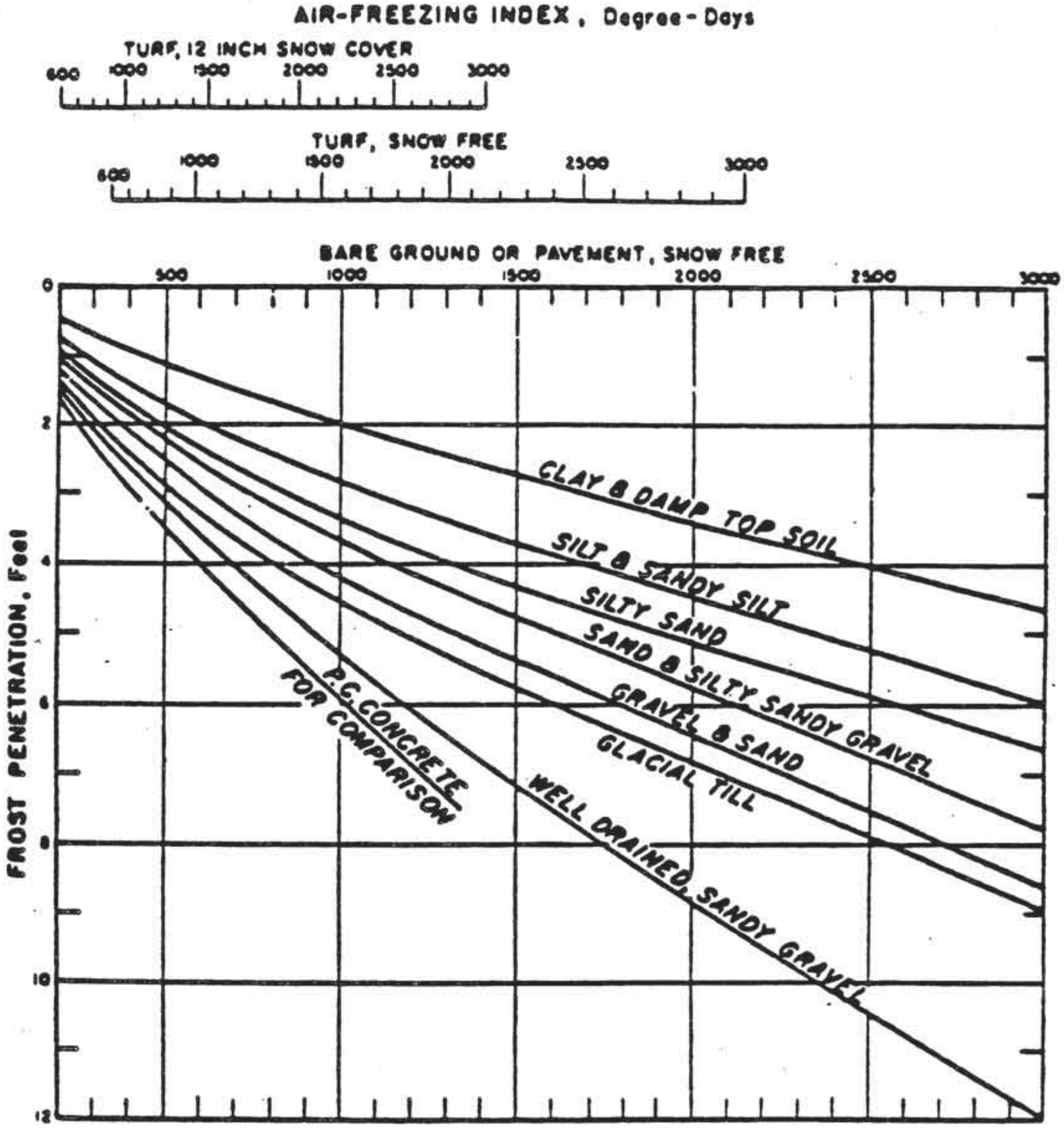
The relationship between air freezing index and frost penetration for various types of soils and surface cover is shown on Figure 50.0200-1 included herein, as extracted from the Army Technical Manual TM5-852-6, January 1966.

Frost protection for footings, pipes, and other frost susceptible structures shall be designed according to the above criteria; however, unless special localized conditions exist, 2 feet shall be used for frost penetration design.

Yard fire water mains shall be installed with top of pipe not less than 1 foot below the design frost penetration depth in accordance with National Fire Protection Association Standard 24.

TABLE 50.0200-1. PRECIPITATION AMOUNTS FOR SELECTED DURATIONS AND RETURN PERIODS EXPECTED IN THE CALAVERAS LAKE SITE AREA

	Return Period				
Duration hours	5 Year inches	10 Year inches	25 Year inches	50 Year inches	100 Year inches
1/2	1.95	2.32	2.68	3.02	3.35
1	2.44	2.92	3.38	3.80	4.25
2	3.03	3.58	4.21	4.69	5.29
3	3.33	3.97	4.63	5.25	5.86
6	4.00	4.77	5.67	6.29	7.13
12	4.75	5.63	6.68	7.64	8.54
24	5.41	6.60	7.75	8.80	9.92



Relationship between air-freezing index, surface cover, and frost penetration into homogeneous soils

FIGURE 50.0200-1

3.7 Seismicity. The Calaveras Lake site is located in Risk Zone 0, as determined from Figure 13 of ANSI Standard A58.1-1982.

3.8 Soil Resistivity. An onsite soil resistivity survey shall be performed by the Contractor. Information regarding soil resistivity is required for design of the station grounding system and to determine the requirements for cathodic protection of underground piping. The results of the survey shall be documented in the Project Outline to be provided by the Contractor as described in Volume 2.

3.9 Soil Borings. The Contractor shall be responsible for all soil borings and geotechnical analysis of soil borings. Any soil boring information provided by the Owner is for the Contractor's information only. Information regarding soil borings and their effect on design of the power plant systems shall be documented in the Project Outline to be provided by the Contractor as described in Volume 2.

4.0 DESIGN WATER QUALITY. The water supplies to the Calaveras Lake site are from the lake and from a city water main.

4.1 Lake Water. The design water quality to be used for all equipment, materials, and processes using untreated lake water shall be as follows.

Constituent	Design Value	Typical Range
Calcium, mg/l as $CaCO_3$	120	100 - 135
Magnesium, mg/l as $CaCO_3$	107	95 - 115
Sodium, mg/l as $CaCO_3$	182	85 - 230
Potassium, mg/l as $CaCO_3$	24	20 - 27
Alkalinity, mg/l as $CaCO_3$	156	140 - 180
Sulfate, mg/l as $CaCO_3$	111	95 - 120
Chloride, mg/l as $CaCO_3$	166	35 - 225
Silica, mg/l as SiO_2	0.3	0.1 - 0.5
Iron, mg/l as Fe	0.14	0.07 - 0.22
pH	8.8	7.3 - 9.1
Conductivity, mmho/cm	847	820 - 875

Lake water temperature for design and performance guarantees shall be 95 F.

4.2 City Water. The design water quality to be used for all equipment, materials, and processes using city water shall be as follows.

Constituent	Design Value	Typical Range
Calcium, mg/l as $CaCO_3$	187	175 - 195
Magnesium, mg/l as $CaCO_3$	59	55 - 65
Sodium, mg/l as $CaCO_3$	15	10 - 20
Alkalinity, mg/l as $CaCO_3$	213	200 - 225
Sulfate, mg/l as $CaCO_3$	26	23 - 30
Chloride, mg/l as $CaCO_3$	21	18 - 23
Nitrate, mg/l as $CaCO_3$	1	1 - 2
Silica, mg/l as SiO_2	13	10 - 15
Iron, mg/l as Fe	<0.03	-
pH	7.7	7.2 - 8.1

Appendix D

Photographs

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 1: East embankment interior slope, looking north.

Photo 2: South embankment exterior slope, looking west.

Photo 3: East embankment crest, looking north.

Photo 4: East embankment interior slope, looking north.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 5: Spillway between SRH Pond and South Bottom Ash Pond at east embankment crest, looking north.

Photo 6: Spillway between SRH Pond and South Bottom Ash Pond at east embankment exterior slope, looking east.

Photo 7: Spillway between SRH Pond and South Bottom Ash Pond at east embankment interior slope, looking west.

Photo 8: SRH Pond clarifier structure at east embankment crest, looking north.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 9: Spillway between SRH Pond and South Bottom Ash Pond at east embankment crest, looking north.

Photo 10: Spillway between SRH Pond and South Bottom Ash Pond at west embankment exterior slope, looking east.

Photo 11: Spillway between SRH Pond and South Bottom Ash Pond at east embankment interior slope, looking west.

Photo 12: East embankment interior slope, looking north.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 13: North embankment crest, looking west.

Photo 14: North embankment interior slope, looking west.

Photo 15: North embankment exterior slope, looking west. #1 Stormwater Runoff Pond at exterior toe.

Photo 16: North embankment exterior slope, looking west.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 17: North embankment interior slope, looking west.

Photo 18: North embankment exterior slope, looking west.

Photo 19: West embankment interior slope, looking south.

Photo 20: East embankment crest, looking south.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 21: West embankment exterior slope, looking south.

Photo 22: West embankment exterior slope, looking south.

Photo 23: Overhead piping at west embankment crest, looking south.

Photo 24: Submerged SRH-north outlet structure at west embankment interior slope, looking south.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 25: Piping at west embankment interior slope, looking northeast.

Photo 26: 8-inch-diameter metal SRH-south inlet pipe labeled "Plant Drain System III", looking northeast.

Photo 27: Submerged SRH-south outlet structure at west embankment interior slope, looking north.

Photo 28: 6-inch-diameter metal SRH-south inlet pipe labeled "Waste Slurry Sump", looking south.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 29: Label for inlet pipe in Photo 28.

Photo 30: 6-inch-diameter metal SRH-south inlet pipe, looking south.

Photo 31: 6-inch-diameter SRH-south inlet pipe labeled "SRH Pond & Clarifier Syst 464", looking west.

Photo 32: 8-inch-diameter SRH-south inlet pipe labeled "SRH Pond & Clarifier Syst 464", looking west.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 33: 6-inch and 8-inch-diameter SRH-north inlet pipe labeled "SRH Pond & Clarifier Syst 464", looking west.

Photo 34: Nine outlet pipes into SRH-south, looking south.

Photo 35: Labels for middle three 6-inch-diameter inlets shown in Photo 34.

Photo 36: Labels for left two 6-inch-diameter inlets shown in Photo 34.

CDM
Smith

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 37: Labels for right four 4-inch-diameter inlets shown in Photo 34.

Photo 38: Nine outlet pipes into SRH-north, looking north.

Photo 39: Labels for right two 6-inch-diameter inlets shown in Photo 38.

Photo 40: Labels for middle three 6-inch-diameter inlets shown in Photo 38.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 41: Labels for left four 4-inch-diameter inlets shown in Photo 38.

Photo 42: 6-inch-diameter metal SRH-north inlet pipe labeled “Waste Slurry Sump”, looking north.

Photo 43: 6-inch-diameter metal SRH-north inlet pipe, looking north.

Photo 44: 8-inch-diameter metal SRH-north inlet pipe labeled “Plant Drain System III”, looking southeast.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 45: West embankment interior slope, looking south.

Photo 46: West embankment exterior slope, looking south.

Photo 47: West embankment crest, looking south.

Photo 48: Interior slope at southwest corner interior slope, looking southeast.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 49: Exterior slope at southwest corner, looking southwest.

Photo 50: South embankment crest, looking east.

Photo 51: South embankment interior slope, looking east.

Photo 52: South embankment exterior slope, looking east.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 53: South embankment interior slope, looking east.

Photo 54: South embankment exterior slope, looking east.

Photo 55: V-notch weir outfall for SRH Pond.

Photo 56: V-notch weir outfall for SRH Pond.

EPA Assessment – SRH Pond Photos August 27, 2012

Photo 57: SRH outfall 109, looking south.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 58: East Embankment crest, looking north.

Photo 59: East embankment interior slope, looking north.

Photo 60: Loose soils on east embankment exterior slope.

Photo 61: East embankment exterior slope, looking north.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 62: Loose soils on east embankment exterior slope.

Photo 63: East embankment exterior toe, looking north.

Photo 64: Loose soils near east embankment exterior toe.

Photo 65: East embankment exterior slope measured approximately 4H:1V.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 66: North embankment exterior slope, looking west.

Photo 67: North embankment exterior slope, looking west.

Photo 68: North embankment crest, looking west.

Photo 69: North embankment interior slope, looking west.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 70: East embankment interior slope, looking south.

Photo 71: North embankment exterior slope, looking east.

Photo 72: North embankment exterior slope, looking east. Note trees near exterior toe.

Photo 73: Trees at north embankment exterior toe, looking east.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 74: West embankment interior slope, looking south.

Photo 75: West embankment exterior slope, looking south.

Photo 76: West embankment crest, looking south.

Photo 77: West embankment exterior slope, looking southwest.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 78: Approximately 18-inch-deep animal burrow at west embankment exterior slope.

Photo 79: West embankment interior slope, looking south.

Photo 80: West embankment exterior slope, looking south.

Photo 81: Pond signage near southwest corner.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 82: South embankment crest, looking east.

Photo 83: South embankment interior slope, looking east.

Photo 84: South embankment exterior slope, looking southeast.

Photo 85: Exposed soil at south embankment exterior slope, looking north.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 86: South embankment exterior slope measured approximately 3H:1V.

Photo 87: South embankment exterior slope, looking east.

Photo 88: South embankment interior slope, looking east.

Photo 89: South embankment exterior slope, looking east.

EPA Assessment - Evaporation Pond Photos August 28, 2012

Photo 90: Interior slope at southeast corner, looking northwest.

Appendix D
Photo GPS Locations

Site: J.K. Spruce Power Plant
Datum: NAD 1983
Coordinate Units: Degrees Decimal Minutes

Photo No.	Latitude	Longitude
1	N 29 18.422'	W 98 19.040'
2	N 29 18.430'	W 98 19.044'
3	N 29 18.436'	W 98 19.048'
4	N 29 18.449'	W 98 19.046'
5	N 29 18.450'	W 98 19.044'
6	N 29 18.454'	W 98 19.044'
7	N 29 18.454'	W 98 19.043'
8	N 29 18.457'	W 98 19.046'
9	N 29 18.471'	W 98 19.044'
10	N 29 18.474'	W 98 19.043'
11	N 29 18.475'	W 98 19.044'
12	N 29 18.484'	W 98 19.045'
13	N 29 18.502'	W 98 19.049'
14	N 29 18.499'	W 98 19.048'
15	N 29 18.508'	W 98 19.052'
16	N 29 18.509'	W 98 19.065'
17	N 29 18.501'	W 98 19.079'
18	N 29 18.506'	W 98 19.109'
19	N 29 18.501'	W 98 19.109'
20	N 29 18.498'	W 98 19.110'
21	N 29 18.505'	W 98 19.114'
22	N 29 18.490'	W 98 19.115'
23	N 29 18.469'	W 98 19.113'
24	N 29 18.470'	W 98 19.104'
25	N 29 18.463'	W 98 19.109'
26	N 29 18.463'	W 98 19.106'
27	N 29 18.462'	W 98 19.105'
28	N 29 18.466'	W 98 19.080'
29	N 29 18.467'	W 98 19.080'
30	N 29 18.465'	W 98 19.077'
31	N 29 18.463'	W 98 19.052'
32	N 29 18.463'	W 98 19.052'
33	N 29 18.469'	W 98 19.053'
34	N 29 18.467'	W 98 19.058'
35	N 29 18.467'	W 98 19.058'
36	N 29 18.467'	W 98 19.058'
37	N 29 18.467'	W 98 19.058'
38	N 29 18.466'	W 98 19.058'
39	N 29 18.465'	W 98 19.058'
40	N 29 18.466'	W 98 19.058'
41	N 29 18.465'	W 98 19.058'
42	N 29 18.467'	W 98 19.075'
43	N 29 18.467'	W 98 19.075'
44	N 29 18.470'	W 98 19.107'
45	N 29 18.460'	W 98 19.109'
46	N 29 18.460'	W 98 19.113'

Appendix D
Photo GPS Locations

Site: J.K. Spruce Power Plant
Datum: NAD 1983
Coordinate Units: Degrees Decimal Minutes

Photo No.	Latitude	Longitude
47	N 29 18.459'	W 98 19.111'
48	N 29 18.442'	W 98 19.110'
49	N 29 18.436'	W 98 19.113'
50	N 29 18.431'	W 98 19.107'
51	N 29 18.432'	W 98 19.106'
52	N 29 18.429'	W 98 19.109'
53	N 29 18.431'	W 98 19.079'
54	N 29 18.425'	W 98 19.070'
55	N 29 18.398'	W 98 19.055'
56	N 29 18.398'	W 98 19.054'
57	N 29 18.402'	W 98 19.056'
58	N 29 19.396'	W 98 18.843'
59	N 29 19.406'	W 98 18.848'
60	N 29 19.407'	W 98 18.835'
61	N 29 19.404'	W 98 18.836'
62	N 29 19.438'	W 98 18.839'
63	N 29 19.441'	W 98 18.829'
64	N 29 19.453'	W 98 18.831'
65	N 29 19.453'	W 98 18.836'
66	N 29 19.493'	W 98 18.852'
67	N 29 19.501'	W 98 18.850'
68	N 29 19.487'	W 98 18.852'
69	N 29 19.480'	W 98 18.858'
70	N 29 19.483'	W 98 18.858'
71	N 29 19.487'	W 98 18.948'
72	N 29 19.497'	W 98 18.923'
73	N 29 19.496'	W 98 18.909'
74	N 29 19.479'	W 98 18.928'
75	N 29 19.472'	W 98 18.938'
76	N 29 19.474'	W 98 18.932'
77	N 29 19.447'	W 98 18.932'
78	N 29 19.448'	W 98 18.937'
79	N 29 19.435'	W 98 18.923'
80	N 29 19.411'	W 98 18.926'
81	N 29 19.397'	W 98 18.919'
82	N 29 19.393'	W 98 18.909'
83	N 29 19.396'	W 98 18.910'
84	N 29 19.392'	W 98 18.906'
85	N 29 19.385'	W 98 18.907'
86	N 29 19.387'	W 98 18.906'
87	N 29 19.390'	W 98 18.891'
88	N 29 19.395'	W 98 18.882'
89	N 29 19.392'	W 98 18.870'
90	N 29 19.398'	W 98 18.847'

Attachment 13-2

AECOM

J.K. SPRUCE POWER PLANT -

PLANT DRAINS POND -

Alternative Composite Liner Design Documentation

June 2022
AECOM Project 60566130

Delivering a better world

Prepared for:

CPS Energy Calaveras Power Station
12940 U.S. Highway 181 South
San Antonio, Texas 78223

Prepared by:

AECOM
12640 Briarwick Drive, Suite 250
Austin, TX 78729
aecom.com

J.K. SPRUCE POWER PLANT
ALTERNATIVE COMPOSITE LINER DESIGN DOCUMENTATION
TAC Title 30, Part 1, § 352, Subchapter F, § 352.721 and 40 CFR § 257.72
PLANT DRAINS POND (PDP)

<u>Liner Design Criteria</u>	<u>Liner Documentation</u>
30 TAC §352.721 Liner Design Criteria for New and Lateral Expansions of Coal Combustion Residuals Surface Impoundments. *The commission adopts by reference 40 Code of Federal Regulations §257.72 (Liner design criteria for new CCR surface impoundments and any lateral expansion of a CCR surface impoundment) as amended through the April 17, 2015, issue of the Federal Register (80 FR 21301).* ***40 CFR § 257.72 (a) New CCR surface impoundments and lateral expansions of existing and new CCR surface impoundments must be designed, constructed, operated, and maintained with either a composite liner or an alternative composite liner that meets the requirements of § 257.70(b) or (c).*** § 257.70 (b) *A composite liner must consist of two components; the upper component consisting of, at a minimum, a 30-mil geomembrane liner (GM), and the lower component consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1x10^{-7} centimeters per second (cm/sec). GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. The GM or upper liner component must be installed in direct and uniform contact with the compacted soil or lower liner component. The composite liner must be* *(1) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the CCR or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;* *(2) Constructed of materials that provide appropriate shear resistance of the upper and lower component interface to prevent sliding of the upper component including on slopes;* *(3) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and* *(4) Installed to cover all surrounding earth likely to be in contact with the CCR or leachate.*	Texas Administrative Code adopts by reference 40 CFR § 257.72. 40 CFR § 257.72 allows for a new surface impoundment to be constructed with a composite liner that meets the requirements of 40 CFR § 257.70 (b) or (c). This documentation demonstrates that the Plant Drains Pond (PDP) is designed with an alternative composite liner that meets the requirements of 40 CFR § 257.70 (c). The upper component of the alternative composite liner is a 60 mil HDPE geomembrane. The lower component is a CETCO Resistex 200 FLW9 geosynthetic clay liner (GCL), which is a dry-blended, polymer-treated GCL with a manufacturer-certified hydraulic conductivity (k) of 3 x 10^{-9} cm/sec (ASTM D5887) and a reported thickness (t) of 0.8 cm (CETCO, personal communication). When exposed to a composite leachate prepared from CPS Spruce Plant CCR and FGD, compatibility testing yielded the result of 7.59 x 10^{-10} cm/sec (ASTM D6766) after 858.2 hours and 3.2 pore volumes, at which time the test was terminated. Using Equation 1 in § 257.70 (c) (2), using the site-specific leachate compatibility testing result of 7.59 x 10^{-10} cm/s, the liquid flow rate (Q) was calculated as Q = 23.88 cm^3/sec for the CETCO Resistex 200 FLW9 GCL and was calculated as Q = 52.58 cm^3/sec for two feet of 1 x 10^{-7} cm/sec compacted soil; in the calculations, the pond surface area (A) was established as 2.83 acres, hydraulic conductivity (k) and thickness (t) for the GCL were obtained from manufacturer data and leachate-specific conductivity testing, 2 feet (60.96 cm) of compacted soil, and hydraulic head (h) acting on the two liners was specified as 7.19 feet (219.15 cm), which is height of the maximum normal pond operating level above the upper surface of the installed liner. The alternative composite liner is constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients, physical contact with CCR or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation. The pond will have 3.5:1 side slopes, a gently sloping base, and a maximum side-slope height of approximately 9 feet. The configuration and application of liner materials in the PDP are well-demonstrated and conventional. In daily operation, the alternative composite liner system on the base of the pond will be subject to the weight of a12-inch sand protective layer, a 6-inch concrete working surface, and the loaders and trucks used to muck out the solids. The alternative composite liner is constructed of materials that provide appropriate shear resistance between the upper and lower components to prevent sliding on the 3.5:1 side slopes. The HDPE is textured to increase friction between the geomembrane and the GCL; both components are anchored by an anchor trench. Sliding of the liner components is not considered to be a possible failure mechanism. The alternate composite liner is founded on a minimum 1-foot thick over-excavated layer that is compacted to at least 95% of the maximum dry density as per Standard Proctor ASTM D698. In addition, a minimum of 1-foot below the over-excavation, subgrade is scarified and compacted to at least 95% of the maximum dry density as per Standard Proctor ASTM D698. The native formation below the compacted soil is fine-grained soils, which, in turn are underlain by clayey to silty clayey sands. The native soils are assessed to be competent and capable of supporting the loads and stresses of pond construction and operation. The alternative composite liner covers the entire surface impoundment surface and extends beyond the top of the embankments into an anchor trench. The height of the pond embankments allows for 2 feet of freeboard above the maximum normal operating level.
257.70 (c) If the owner or operator elects to install an alternative composite liner, all of the following requirements must be met: (1) An alternative composite liner must consist of two components; the upper component consisting of, at a minimum, a 30-mil GM, and a lower component, that is not a geomembrane, with a liquid flow rate no greater than the liquid flow rate of two feet of compacted soil with a hydraulic conductivity of no more than 1x10^{-7} cm/sec. GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. If the lower component of the alternative liner is compacted soil, the GM must be installed in direct and uniform contact with the compacted soil. (2) The owner or operator must obtain certification from a qualified professional engineer that the liquid flow rate through the lower component of the alternative composite liner is no greater than the liquid flow rate through two feet of compacted soil with a hydraulic conductivity of 1x10^{-7} cm/sec. The hydraulic conductivity for the two feet of compacted soil used in the comparison shall be no greater than 1x10^{-7} cm/sec. The hydraulic conductivity of any alternative to the two feet of compacted soil must be determined using recognized and generally accepted methods. The liquid flow rate comparison must be made using Equation 1 of this section, which is derived from Darcy's Law for gravity flow through porous media.	

Certification Statement 30 TAC §352.721 and 40 CFR § 257.72(c) – Design of the Liner for a New CCR Surface Impoundment

CCR Unit: CPS Energy; Spruce Plant; Plant Drains Pond

I, Alexander W. Gourlay, being a Registered Professional Engineer in good standing in the State of Texas, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the documentation as to whether the construction of the CCR Unit meets the requirements of 30 TAC §352.721 and 40 CFR § 257.72(a) is accurate.

Alexander W. Gourlay, P.E.

Printed Name

June 28, 2022

Date

ALEXANDER W. GOURLAY

143733

6/28/22

aecom.com

aecom.com

Attachment 13-3

RABA
KISTNER

GEOTECHNICAL ENGINEERING STUDY

FOR

J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

RABA KISTNER
CONSULTANTS

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

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

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.

Samrawit Haile.
Sam Haile, E.I.T.
Graduate Engineer

ERIC J. NEUNER
116311
2/5/2018
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

RABAKISTNER

TABLE OF CONTENTS

TABLE OF CONTENTS

ATTACHMENTS

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 x 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.

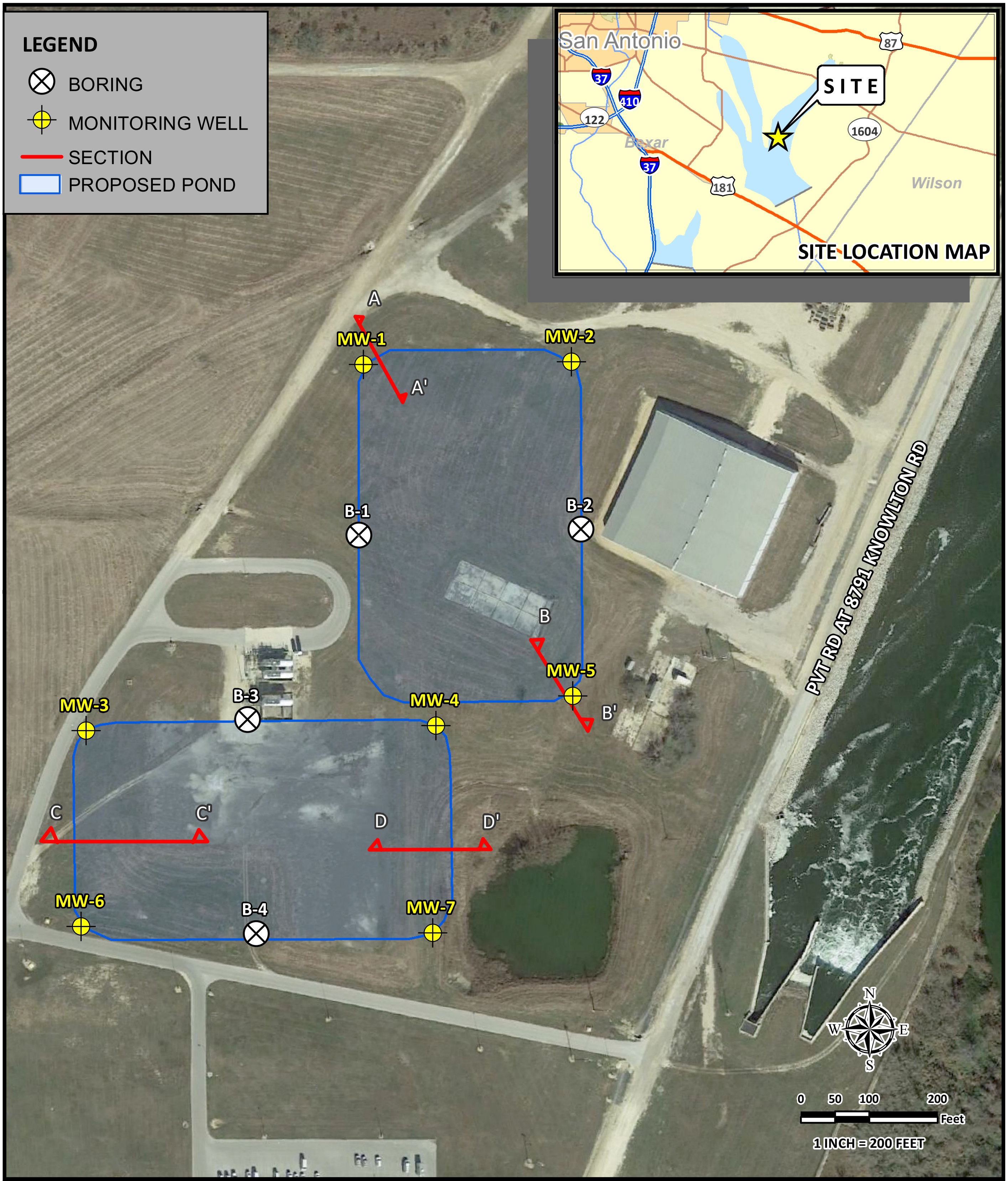
The recommendations submitted in this report are based on the data obtained from 11 borings drilled at this site and our understanding of the project information provided to us. If the project information described in this report is incorrect, is altered, or if new information is available, we should 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



RABA KISTNER CONSULTANTS

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

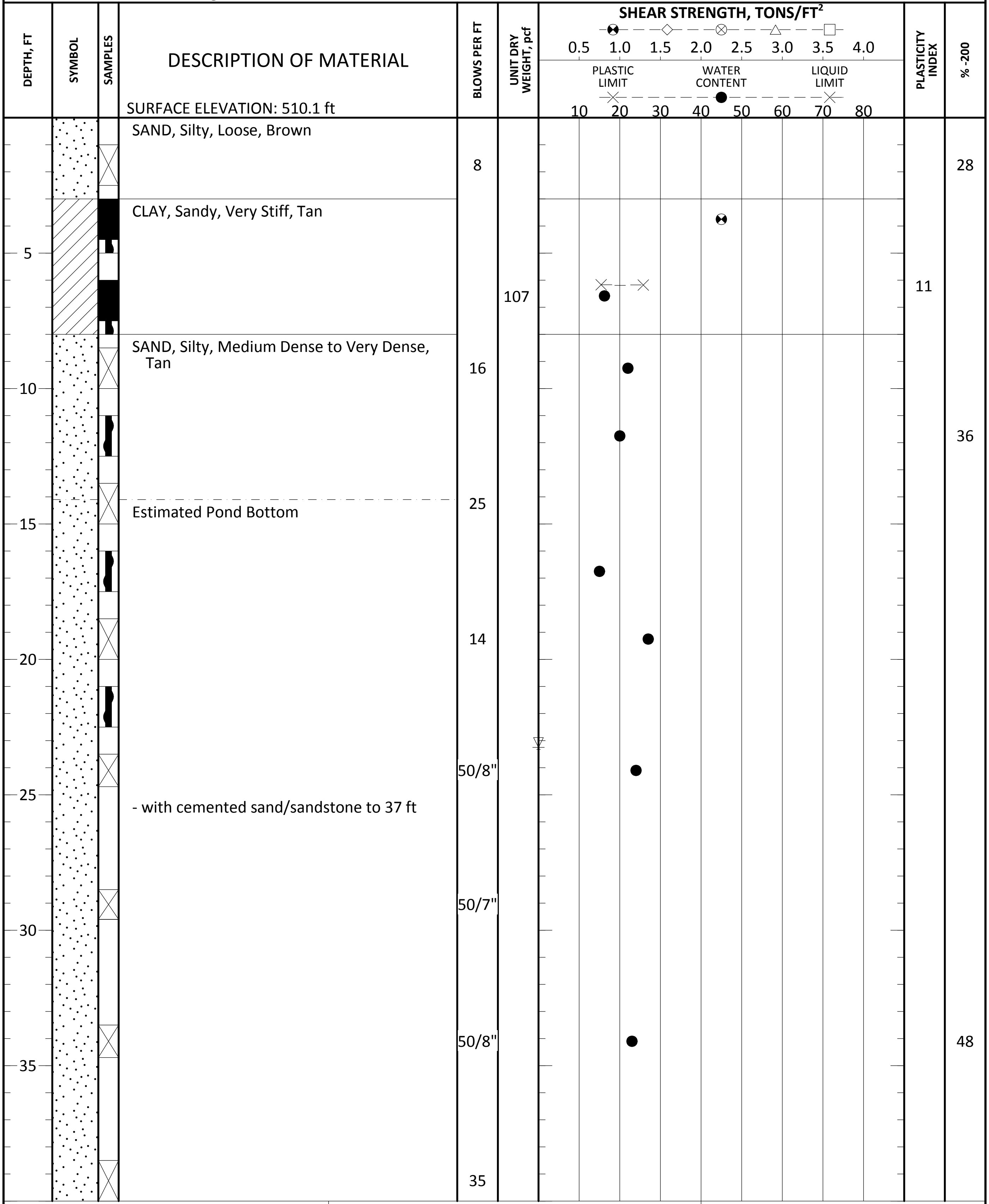
J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31326; W 98.31708

SURFACE ELEVATION: 510.1 ft



DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	SAND, Silty, Loose, Brown				
		8			28
	CLAY, Sandy, Very Stiff, Tan				
5					
			107	11	
	SAND, Silty, Medium Dense to Very Dense, Tan				
		16			
10					
					36
	Estimated Pond Bottom	25			
15					
		14			
20					
		50/8"			
25	- with cemented sand/sandstone to 37 ft				
		50/7"			
30					
		50/8"			48
35					
		35			

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

LOG OF BORING NO. B-1

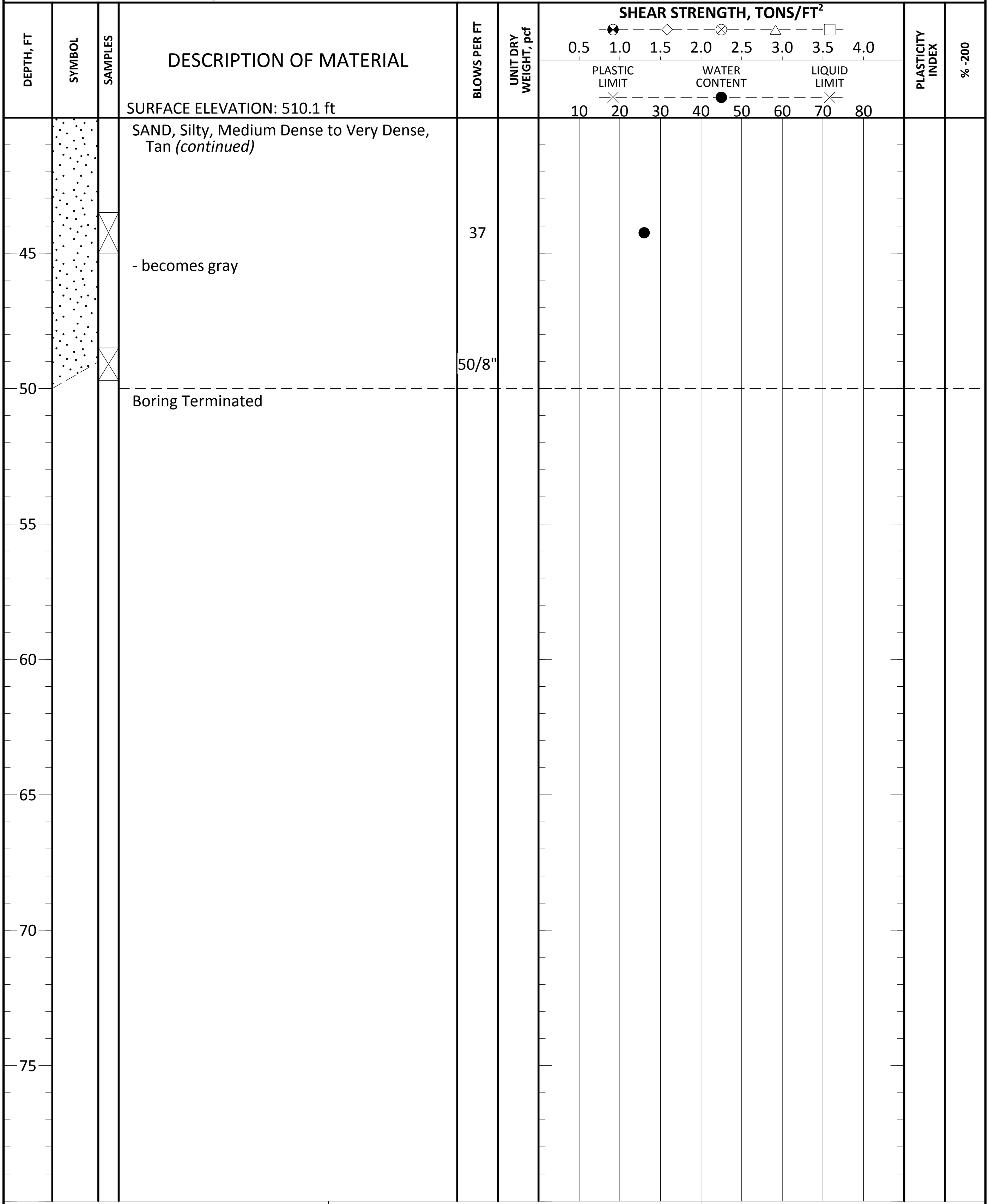
J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31326; W 98.31708

SURFACE ELEVATION: 510.1 ft



SAND, Silty, Medium Dense to Very Dense, Tan *(continued)*

- becomes gray

Boring Terminated

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

LOG OF BORING NO. B-2

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

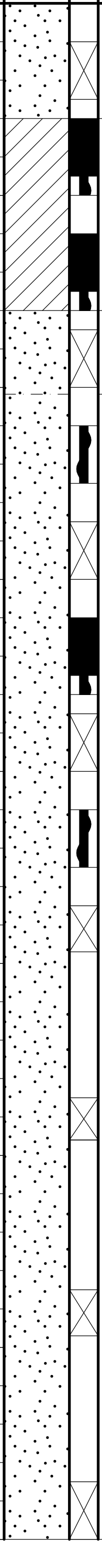
RABA KISTNER
TBPE Firm Registration No. F-3257

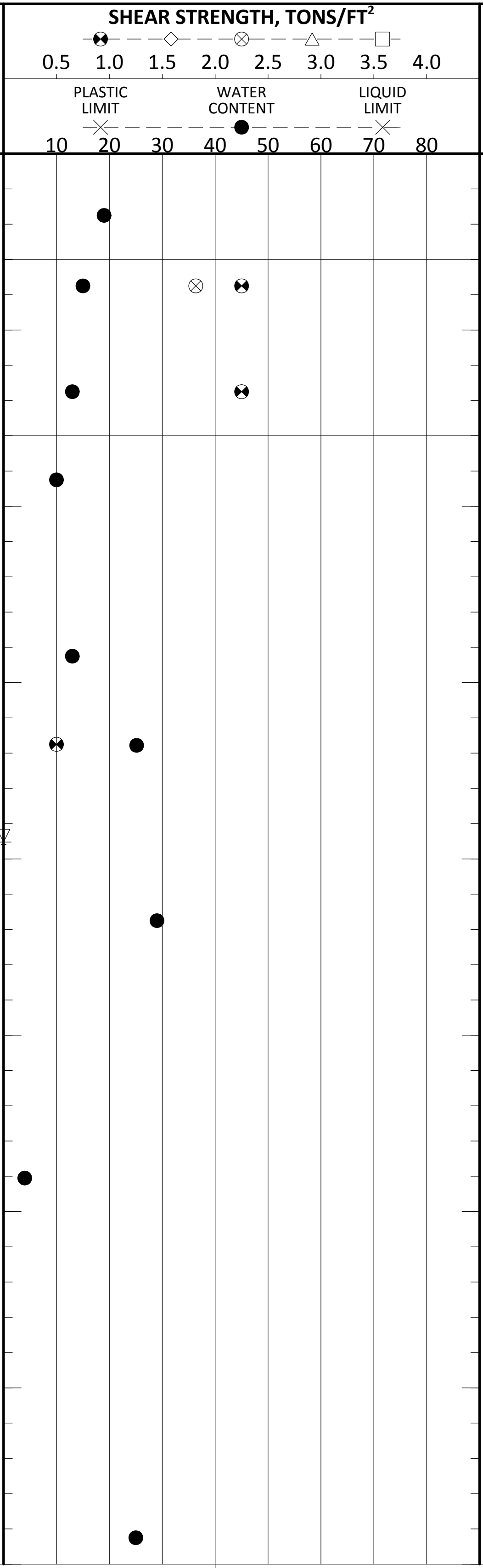
DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31328; W 98.31606

SURFACE ELEVATION: 506.18 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	SAND, Silty, Loose, Brown	7			
	CLAY, Sandy, Very Stiff, Tan		114		52
5	- Hydraulic Conductivity = 1.88x10^{-7} cm/sec				
			115		
	SAND, Silty, Medium Dense, Tan	15			
10	- Estimated Pond Bottm				
		28			
15			1		27
		44			
20					
		28			
25	- with cemented sand/sandstone to 30 ft				
30					
	- becomes gray	40			
35					
		50			





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

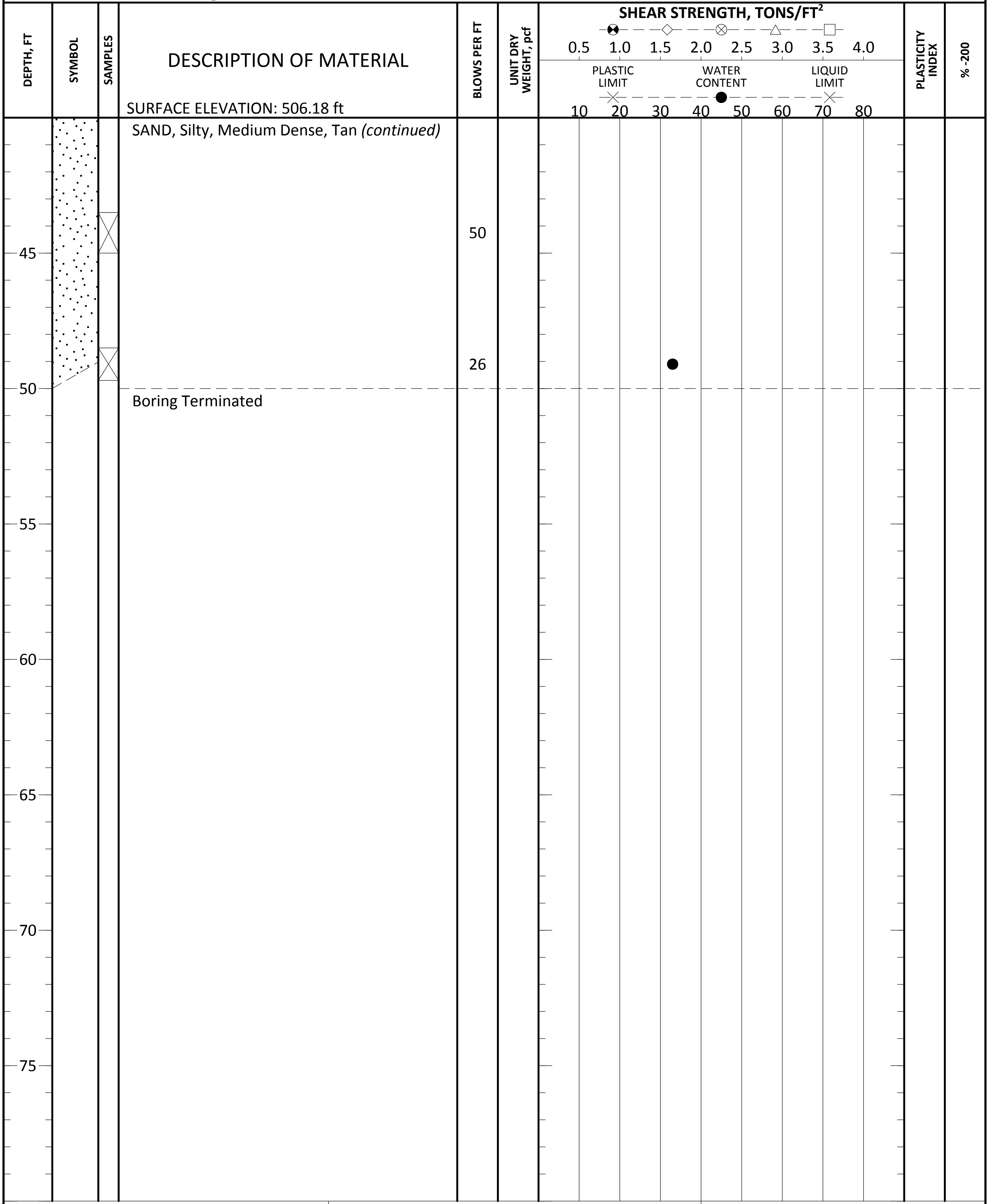
J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31328; W 98.31606

SURFACE ELEVATION: 506.18 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT
SAND, Silty, Medium Dense, Tan *(continued)*	
	50
	26
Boring Terminated	

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

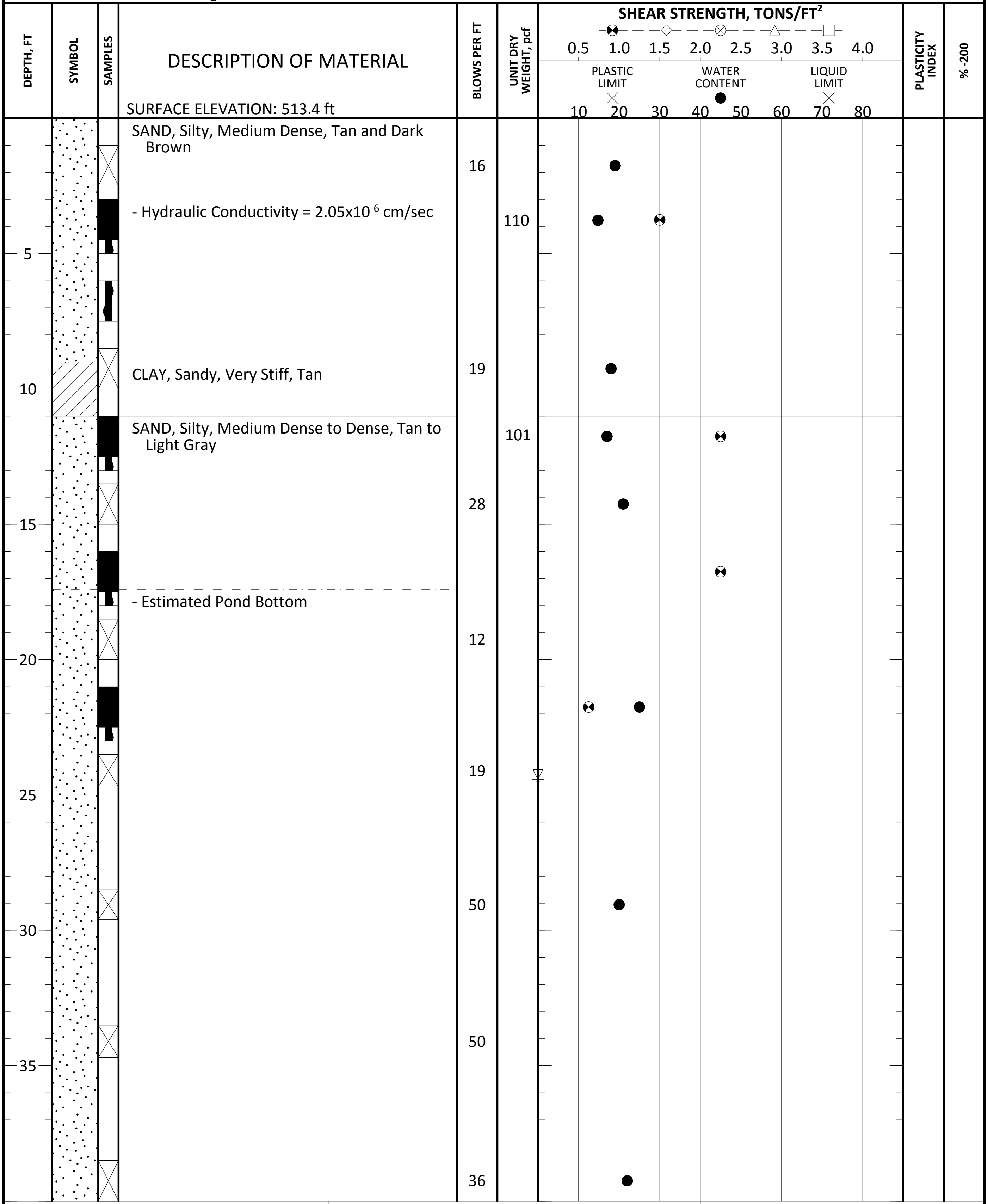
LOG OF BORING NO. B-3

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31245; W 98.31760



SURFACE ELEVATION: 513.4 ft

SAND, Silty, Medium Dense, Tan and Dark Brown

- Hydraulic Conductivity = 2.05x10^{-6} cm/sec

CLAY, Sandy, Very Stiff, Tan

SAND, Silty, Medium Dense to Dense, Tan to Light Gray

- Estimated Pond Bottom

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 50.0 ft
DATE DRILLED: 1/2/2018
DEPTH TO WATER: 24.42 ft
DATE MEASURED: 1/2/2018
PROJ. No.: ASA17-096-00
FIGURE: 4a

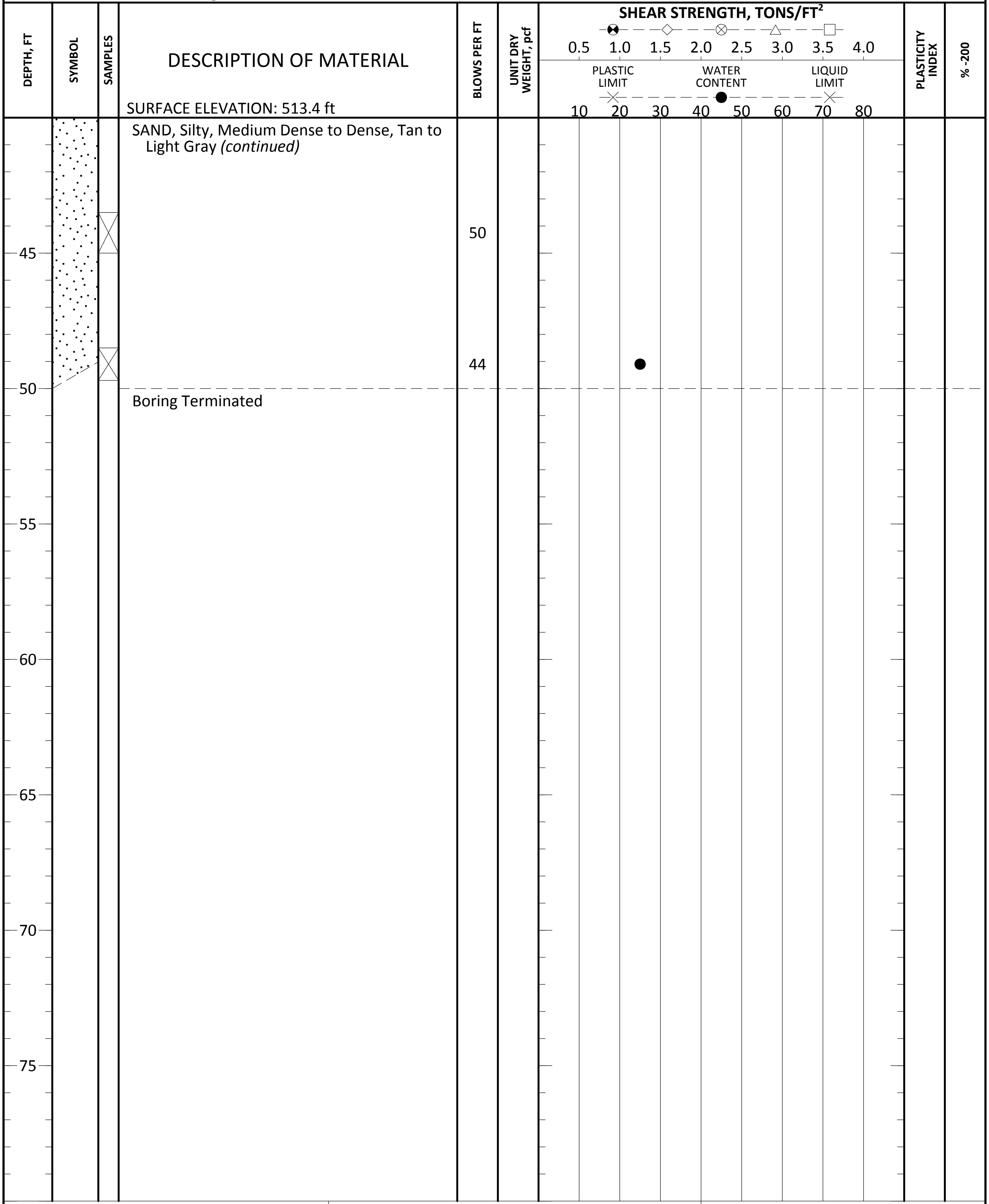
LOG OF BORING NO. B-3

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31245; W 98.31760



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

LOG OF BORING NO. B-4

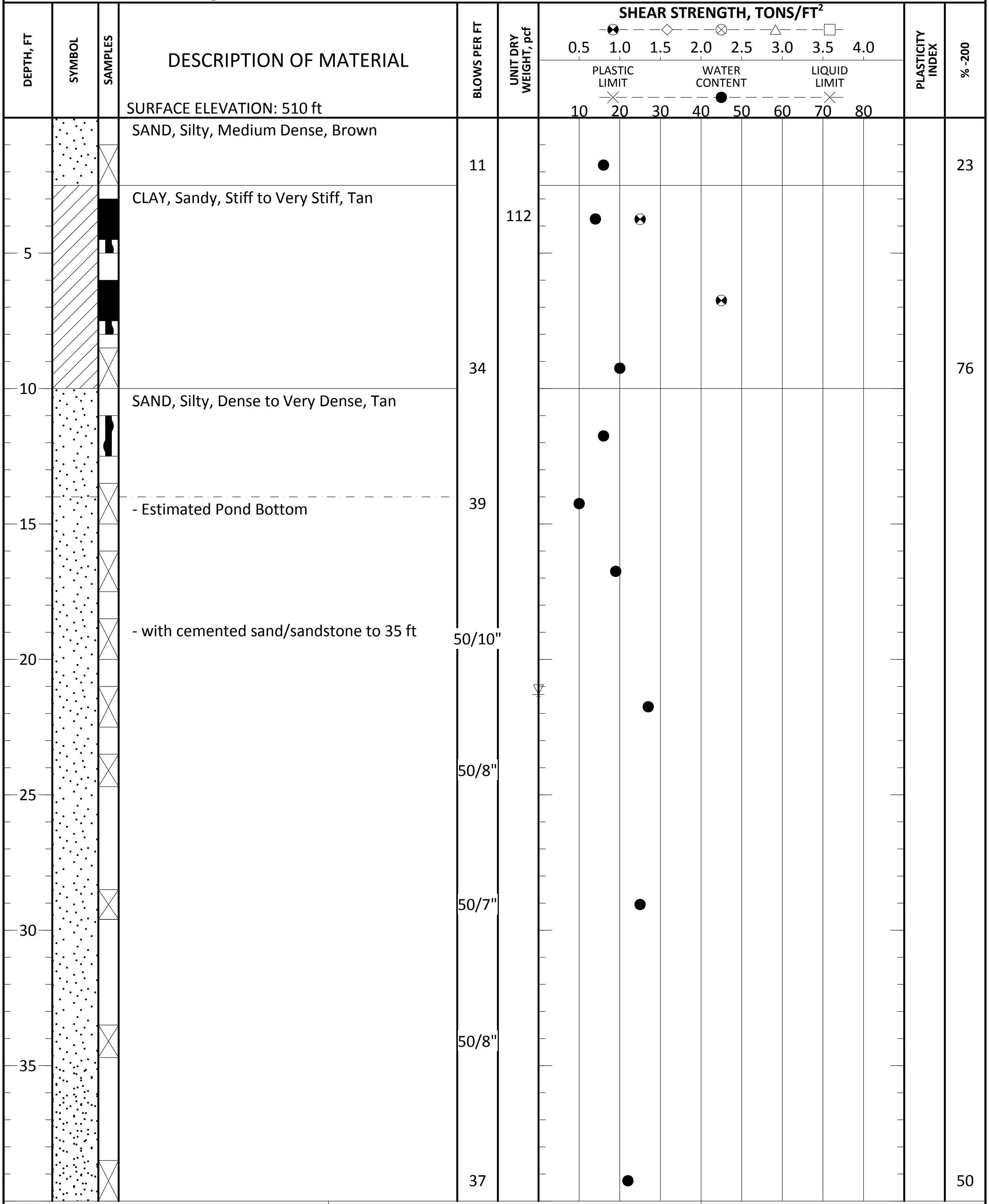
J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31166; W 98.31756

SURFACE ELEVATION: 510 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
SAND, Silty, Medium Dense, Brown	11			23
CLAY, Sandy, Stiff to Very Stiff, Tan		112		
	34			76
SAND, Silty, Dense to Very Dense, Tan				
- Estimated Pond Bottom	39			
- with cemented sand/sandstone to 35 ft	50/10"			
	50/8"			
	50/7"			
	50/8"			
	37			50

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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:**	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

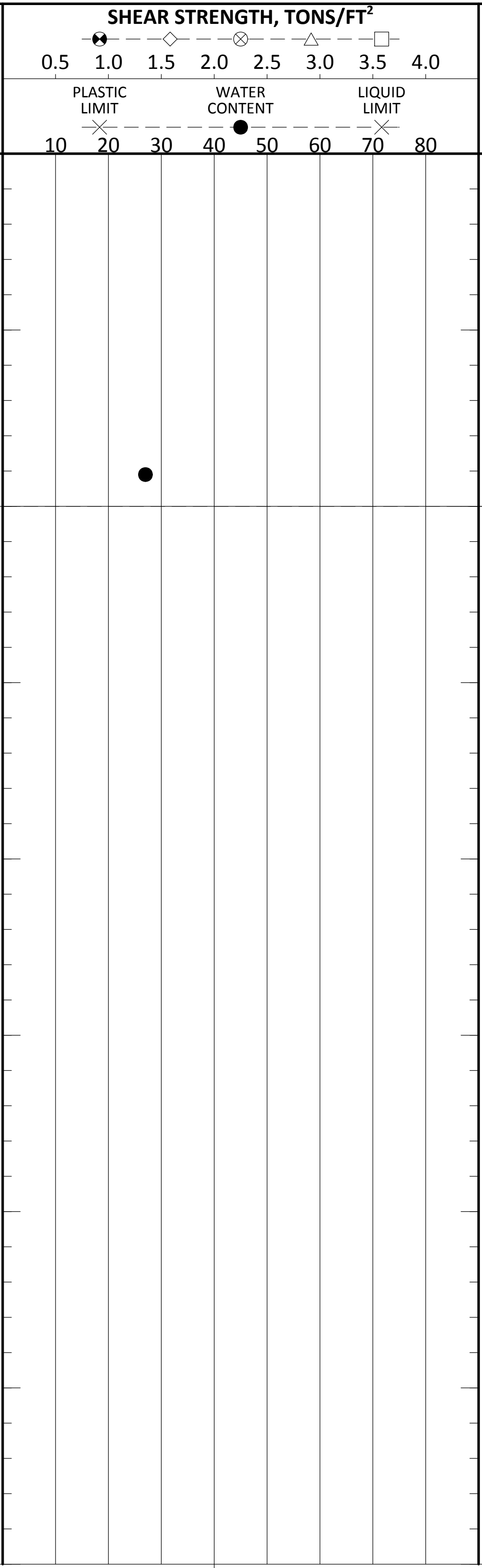
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31166; W 98.31756

SURFACE ELEVATION: 510 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
			SAND, Silty, Dense to Very Dense, Tan *(continued)* - becomes gray - becomes gray *(continued)*				
45		☒		50/10"			
		☒		50/8"			
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	**DEPTH TO WATER:**	21.3 ft	**PROJ. No.:**	ASA17-096-00
DATE DRILLED:	12/20/2017	**DATE MEASURED:**	12/20/2017	**FIGURE:**	5b

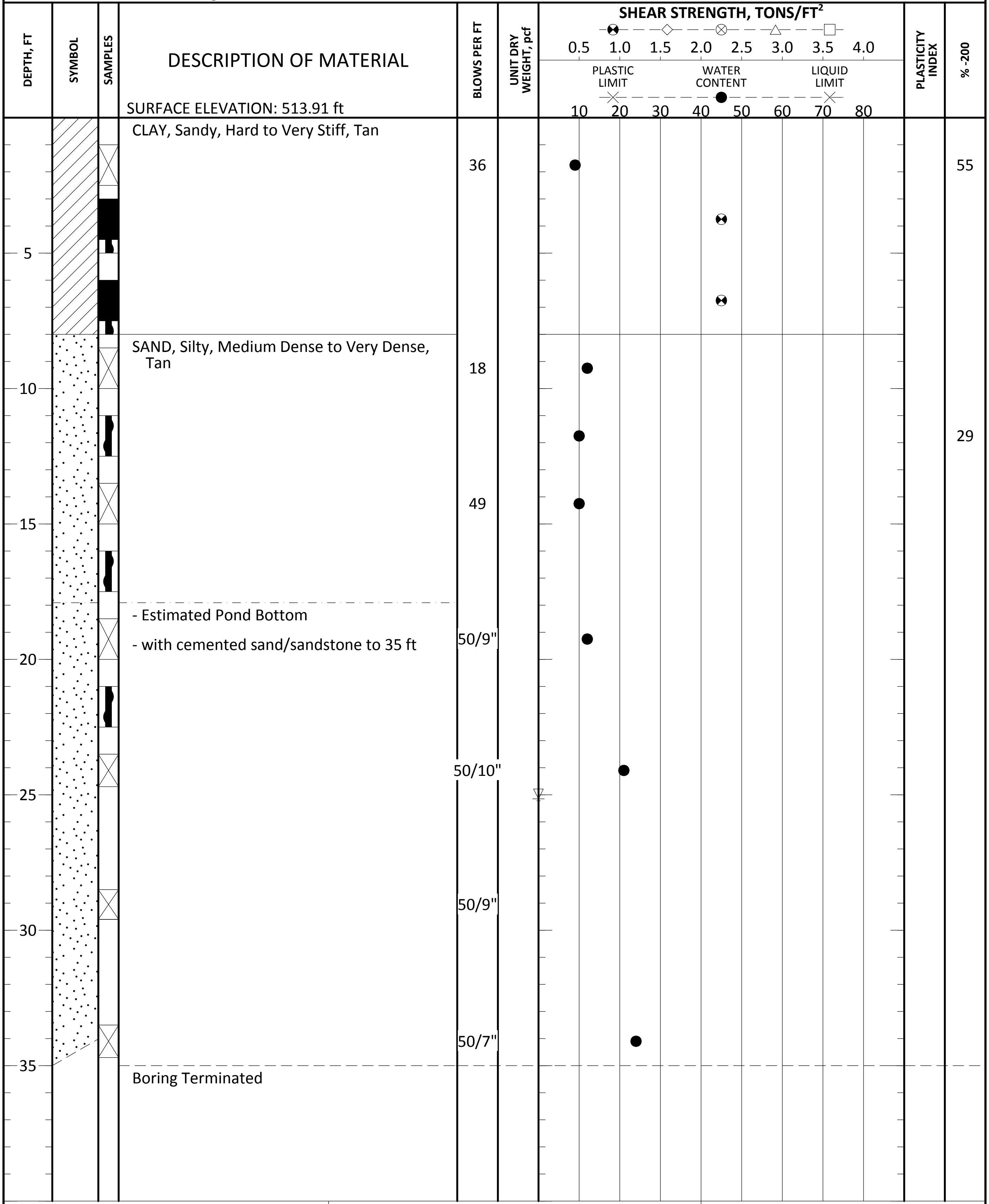
LOG OF BORING NO. MW-1

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31395; W 98.31705



DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	% -200
0	CLAY, Sandy, Hard to Very Stiff, Tan		
		36	55
8	SAND, Silty, Medium Dense to Very Dense, Tan	18	
			29
		49	
18	- Estimated Pond Bottom		
	- with cemented sand/sandstone to 35 ft	50/9"	
		50/10"	
		50/9"	
		50/7"	
35	Boring Terminated		

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

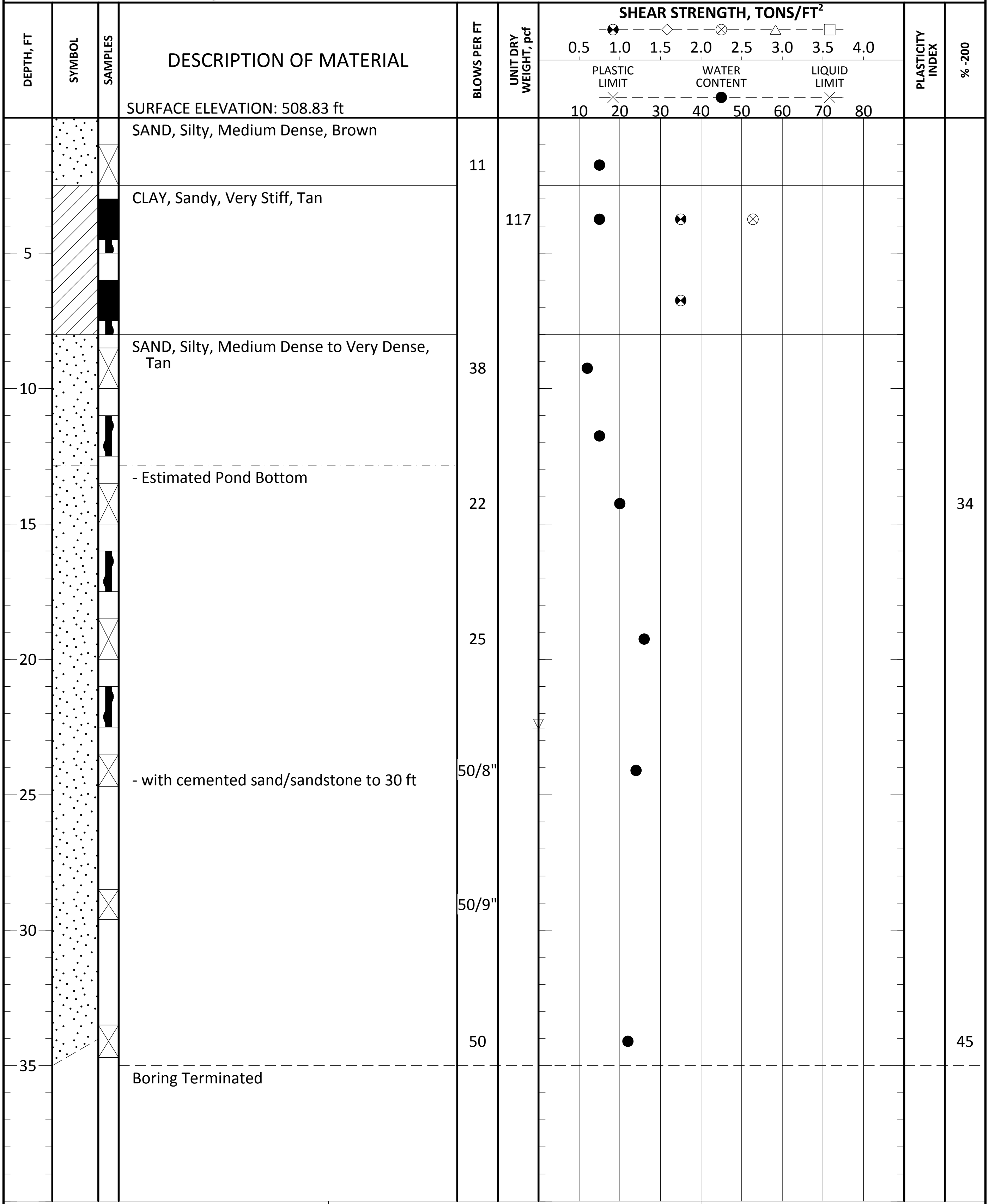
LOG OF BORING NO. MW-2

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31395; W 98.31610



SAND, Silty, Medium Dense, Brown

CLAY, Sandy, Very Stiff, Tan

SAND, Silty, Medium Dense to Very Dense, Tan

- Estimated Pond Bottom

- with cemented sand/sandstone to 30 ft

Boring Terminated

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

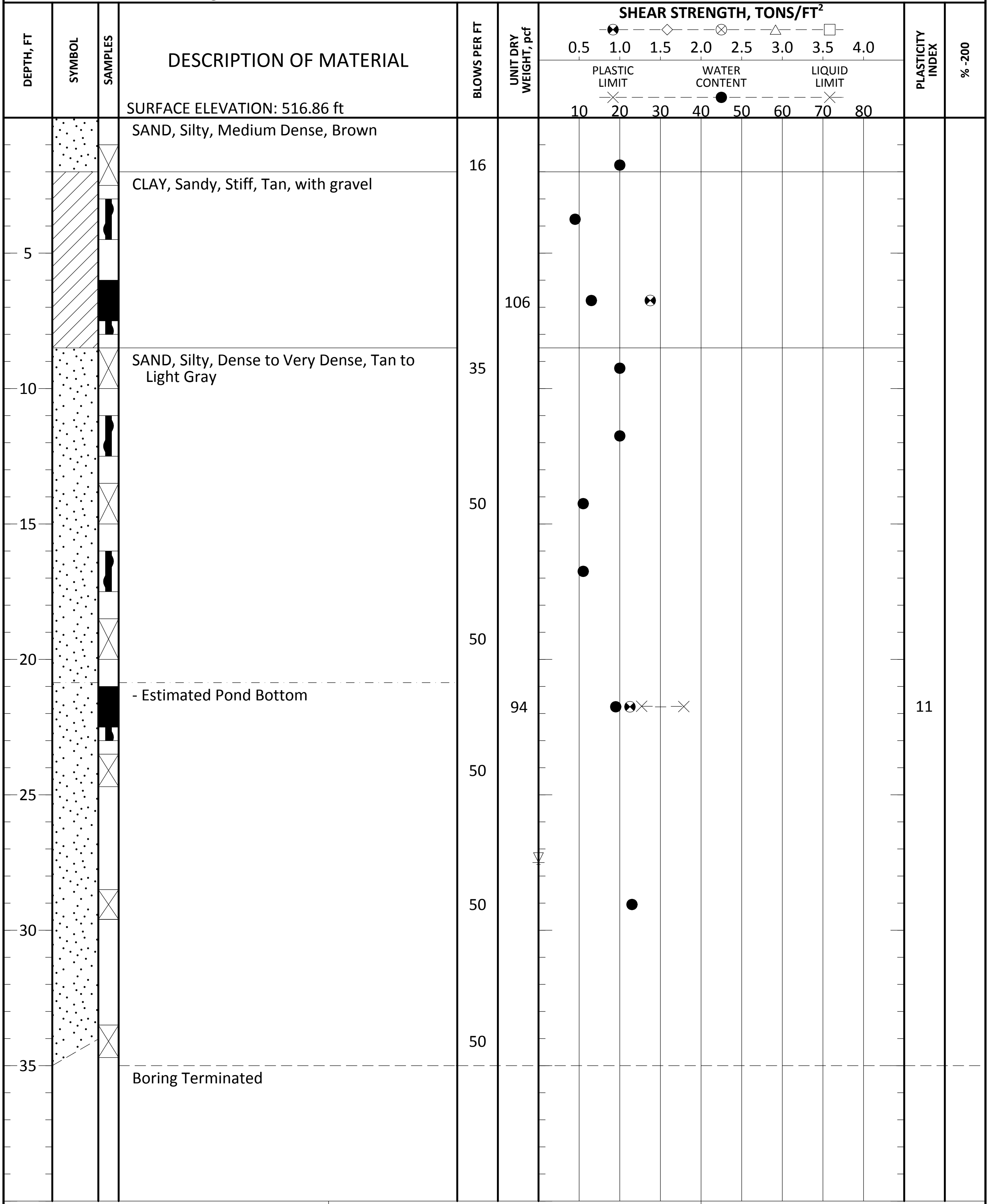
DEPTH DRILLED:	35.0 ft	**DEPTH TO WATER:**	22.57 ft
DATE DRILLED:	12/20/2017	**DATE MEASURED:**	12/20/2017
PROJ. No.:	ASA17-096-00	**FIGURE:**	7

LOG OF BORING NO. MW-3

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger
LOCATION: N 29.31249; W 98.31836



SURFACE ELEVATION: 516.86 ft

Description of Material	Blows per ft	Unit Dry Weight, pcf	Plasticity Index	% -200
SAND, Silty, Medium Dense, Brown	16			
CLAY, Sandy, Stiff, Tan, with gravel		106		
SAND, Silty, Dense to Very Dense, Tan to Light Gray	35			
	50			
	50			
- Estimated Pond Bottom		94	11	
	50			
	50			
	50			
Boring Terminated				

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	35.0 ft	**DEPTH TO WATER:**	27.5 ft	**PROJ. No.:**	ASA17-096-00
DATE DRILLED:	1/3/2018	**DATE MEASURED:**	1/3/2018	**FIGURE:**	8

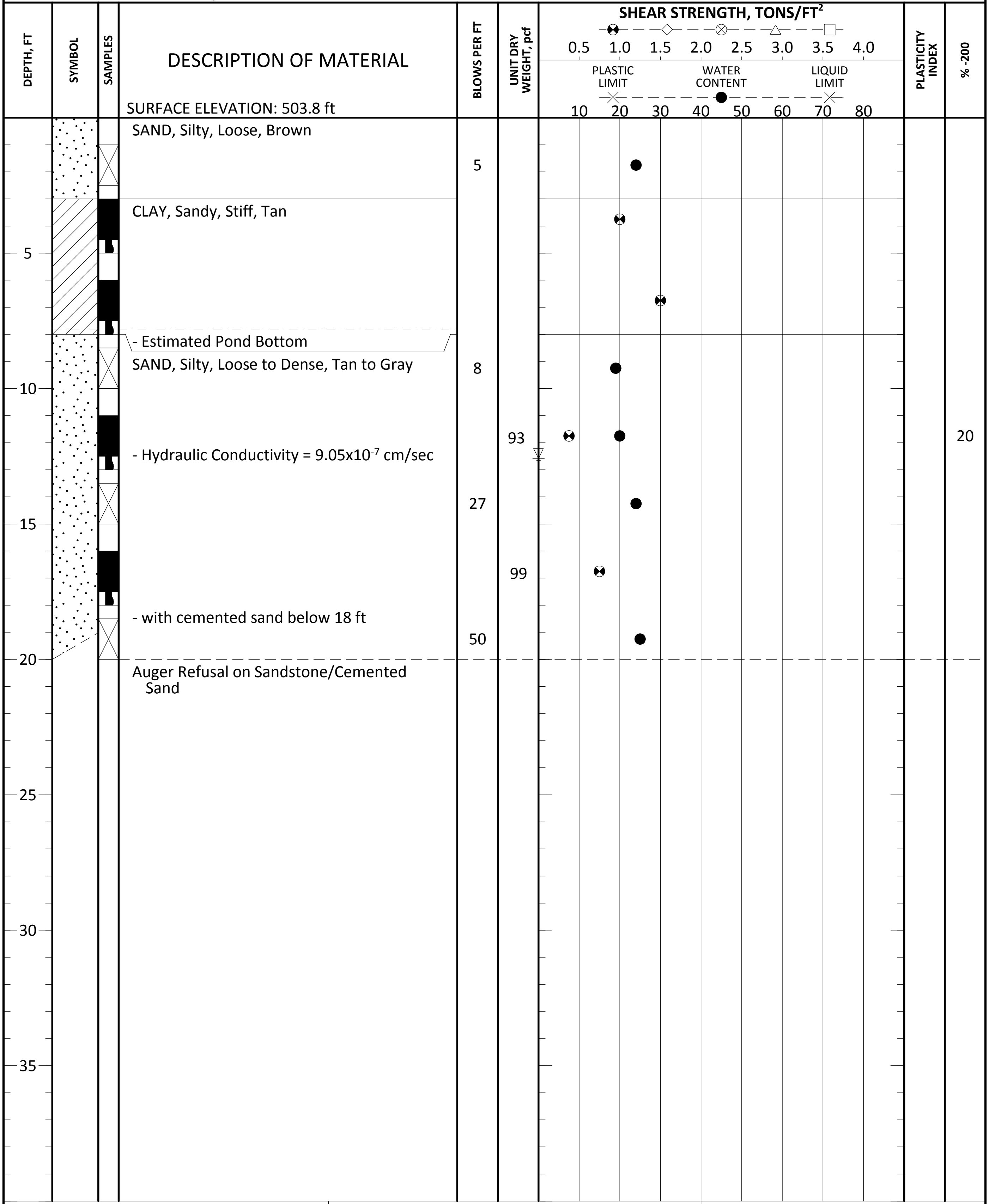
LOG OF BORING NO. MW-4

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31250; W 98.31673



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	% -200
SURFACE ELEVATION: 503.8 ft			
SAND, Silty, Loose, Brown	5		
CLAY, Sandy, Stiff, Tan			
- Estimated Pond Bottom			
SAND, Silty, Loose to Dense, Tan to Gray	8		
		93	20
- Hydraulic Conductivity = 9.05x10^{-7} cm/sec			
	27		
		99	
- with cemented sand below 18 ft			
	50		
Auger Refusal on Sandstone/Cemented Sand			

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

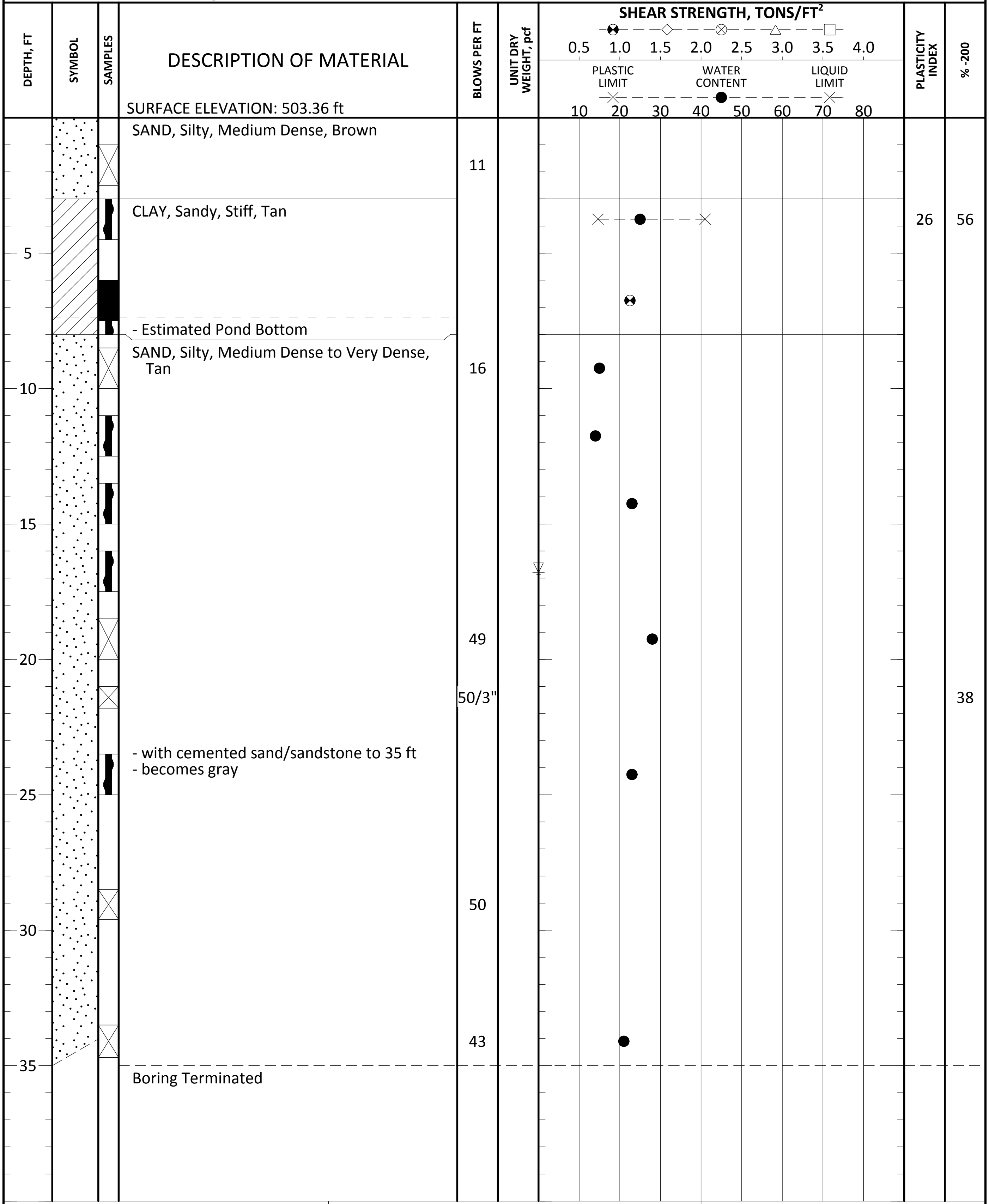
LOG OF BORING NO. MW-5

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31261; W 98.31610



DESCRIPTION OF MATERIAL	BLOWS PER FT	PLASTICITY INDEX	% -200
SURFACE ELEVATION: 503.36 ft			
SAND, Silty, Medium Dense, Brown	11		
CLAY, Sandy, Stiff, Tan		26	56
- Estimated Pond Bottom			
SAND, Silty, Medium Dense to Very Dense, Tan	16		
	49		
	50/3"		38
- with cemented sand/sandstone to 35 ft - becomes gray			
	50		
	43		
Boring Terminated			

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

LOG OF BORING NO. MW-6

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

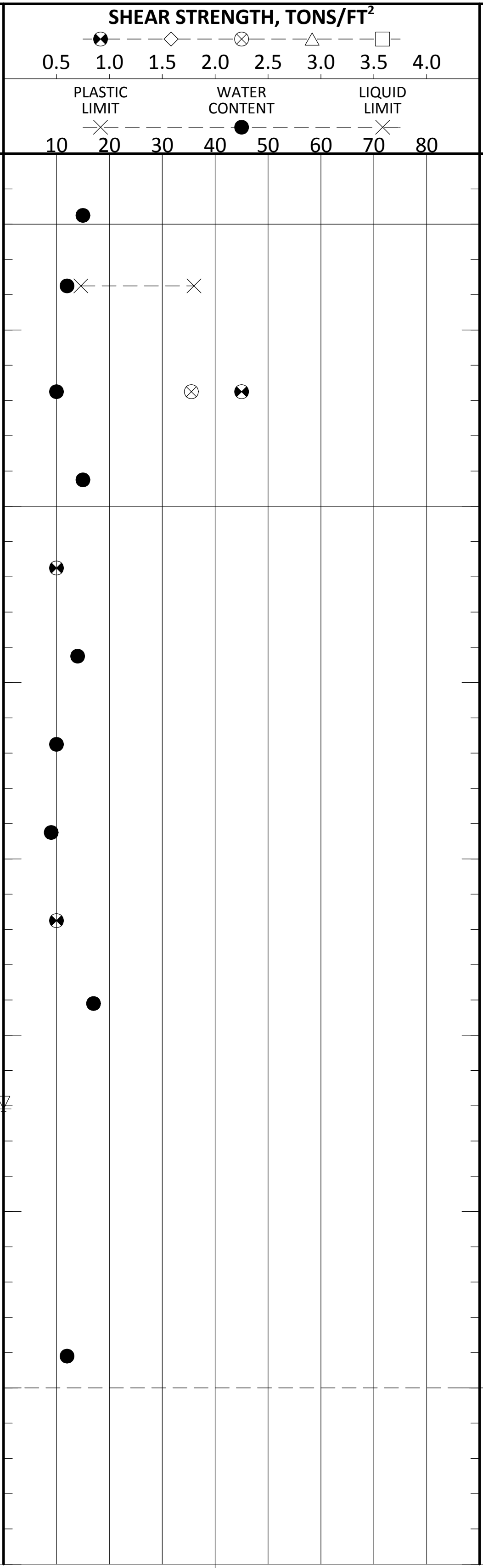
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31177; W 98.31841

SURFACE ELEVATION: 514.49 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
SAND, Silty, Medium Dense, Brown	10			
SAND, Clayey, Medium Dense, Tan	28		21	37
		111		
	13			
SAND, Silty, Very Dense, Tan to Gray - with cemented sand/sandstone to 35 ft				
	50/7"			
				22
- Estimated Pond Bottom	50			
	50			
-DRILLER'S NOTE: WATER encountered at 27 ft				
	50			
	50			
Boring Terminated				



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: 27.09 ft
DATE MEASURED: 1/3/2018
PROJ. No.: ASA17-096-00
FIGURE: 11

LOG OF BORING NO. MW-7

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

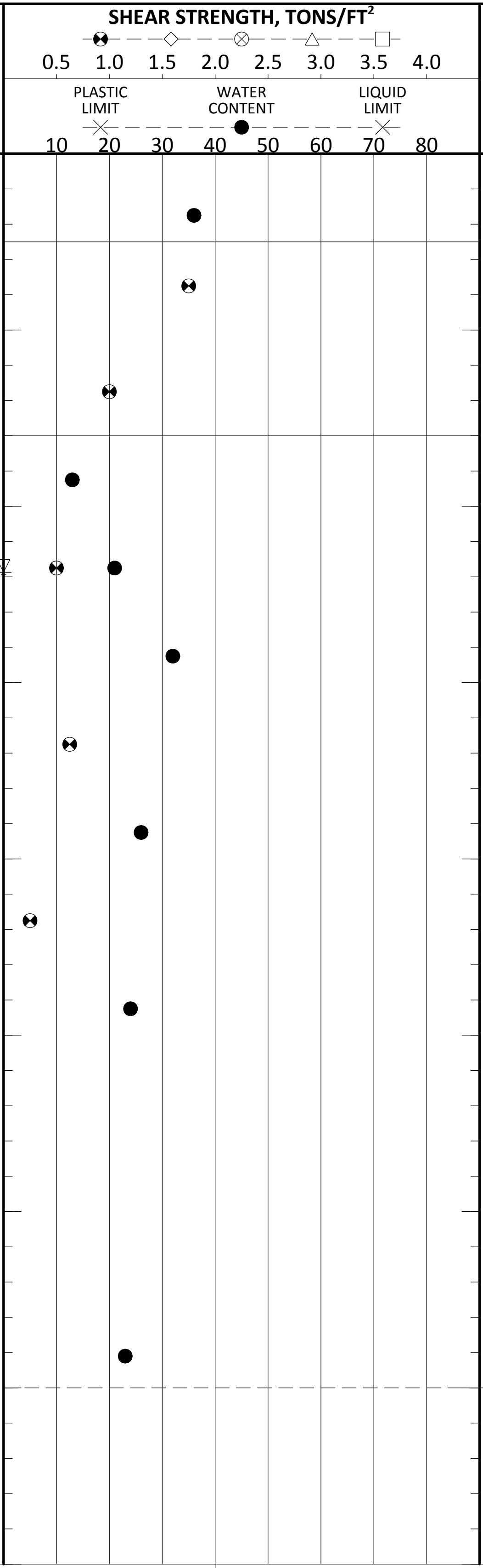
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31166; W 98.31675

SURFACE ELEVATION: 500.22 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	SAND, Silty, Loose, Brown,				
		4			
	SAND, Silty, Medium Dense to Dense, Tan				40
5	- Estimated Pond Bottom				
	SAND, Clayey, Medium Dense to Dense, Tan				
		25			
10					
			108		
		27			
15					
		50			
20					
	- with cemented sand/sandstone to 30 ft	49			
25					
	- becomes gray	50			
30					
		28			
35	Boring Terminated				



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 35.0 ft
DATE DRILLED: 12/22/2017

DEPTH TO WATER: 11.87 ft
DATE MEASURED: 12/22/2017

PROJ. No.: ASA17-096-00
FIGURE: 12

KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

SOIL TERMS

- CALCAREOUS
- CALICHE
- CLAY
- CLAYEY
- GRAVEL
- GRAVELLY
- PEAT
- SAND
- SANDY
- SILT
- SILTY
- FILL

ROCK TERMS

- CHALK
- CLAYSTONE
- CLAY-SHALE
- CONGLOMERATE
- DOLOMITE
- IGNEOUS
- LIMESTONE
- MARL
- METAMORPHIC
- SANDSTONE
- SHALE
- SILTSTONE

OTHER

- ■ ASPHALT
- BASE
- CONCRETE/CEMENT
- BRICKS / PAVERS
- WASTE
- □ NO INFORMATION

WELL CONSTRUCTION AND PLUGGING MATERIALS

- BLANK PIPE
- SCREEN
- BENTONITE
- CEMENT GROUT
- BENTONITE & CUTTINGS
- CONCRETE/CEMENT
- CUTTINGS
- GRAVEL
- SAND
- VOLCLAY

SAMPLE TYPES

- AIR ROTARY
- GRAB SAMPLE
- CORE
- GEOPROBE SAMPLER
- ROTOSONIC -DAMAGED
- MUD ROTARY
- NO RECOVERY
- NX CORE
- PITCHER
- ROTOSONIC -INTACT
- SHELBY TUBE
- SPLIT BARREL
- SPLIT SPOON
- TEXAS CONE PENETROMETER
- DISTURBED

STRENGTH TEST TYPES

- ● POCKET PENETROMETER
- ◇ TORVANE
- ⊗ UNCONFINED COMPRESSION
- △ TRIAXIAL COMPRESSION UNCONSOLIDATED-UNDRAINED
- □ TRIAXIAL COMPRESSION CONSOLIDATED-UNDRAINED

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

Penetration Resistance Blows per ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE STRENGTH

Resistance Blows per ft	Consistency	Cohesion TSF
0 - 2	Very Soft	0 - 0.125
2 - 4	Soft	0.125 - 0.25
4 - 8	Firm	0.25 - 0.5
8 - 15	Stiff	0.5 - 1.0
15 - 30	Very Stiff	1.0 - 2.0
> 30	Hard	> 2.0

PLASTICITY

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

ABBREVIATIONS

B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
BTEX = Total BTEX
TPH = Total Petroleum Hydrocarbons
ND = Not Detected
NA = Not Analyzed
NR = Not Recorded/No Recovery
OVA = Organic Vapor Analyzer
ppm = Parts Per Million

Qam, Qas, Qal = Quaternary Alluvium
Qat = Low Terrace Deposits
Qbc = Beaumont Formation
Qt = Fluviatile Terrace Deposits
Qao = Seymour Formation
Qle = Leona Formation
Q-Tu = Uvalde Gravel
Ewi = Wilcox Formation
Emi = Midway Group
Mc = Catahoula Formation
El = Laredo Formation
Kknm = Navarro Group and Marlbrook Marl
Kpg = Pecan Gap Chalk
Kau = Austin Chalk

Kef = Eagle Ford Shale
Kbu = Buda Limestone
Kdr = Del Rio Clay
Kft = Fort Terrett Member
Kgt = Georgetown Formation
Kep = Person Formation
Kek = Kainer Formation
Kes = Escondido Formation
Kew = Walnut Formation
Kgr = Glen Rose Formation
Kgru = Upper Glen Rose Formation
Kgrl = Lower Glen Rose Formation
Kh = Hensell Sand

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					110		1.50	PP
	4.5 to 5.0										
	6.0 to 7.5										

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

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		
	43.5 to 45.0	50/10"									
	48.5 to 49.7	50/8"	27								
MW-1	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

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								
	28.5 to 29.6	50/9"									
	33.5 to 34.7	50/7"	24								
MW-2	1.0 to 2.5	11	15								
	3.0 to 4.5		15					117		2.64	UC
	4.5 to 5.0										
	6.0 to 7.5									1.75	PP
	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		
	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"									
	33.5 to 34.7	50	22						45		
MW-3	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										
	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									
	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-4	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

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										
	8.5 to 10.0	8	19								
	11.0 to 12.5		20					93	20	0.38	PP
	12.5 to 13.0										
	13.5 to 15.0	27	24								
	16.0 to 17.5		28					99		0.75	PP
	17.5 to 18.0										
	18.5 to 20.0	50	25								
MW-5	1.0 to 2.5	11									
	3.0 to 4.5		25	41	15	26	CL		56		
	6.0 to 7.5									1.13	PP
	7.5 to 8.0										
	8.5 to 10.0	16	15								
	11.0 to 12.5		14								
	13.5 to 15.0		23								
	16.0 to 17.5										
	18.5 to 20.0	49	28								
	21.0 to 21.8	50/3"							38		
	23.5 to 25.0		23								
	28.5 to 29.6	50									
	33.5 to 34.7	43	21								
MW-6	1.0 to 2.5	10	15								
	3.0 to 4.5	28	12	36	15	21	SC		37		
	6.0 to 7.5		10					111		1.78	UC
	7.5 to 8.0										
	8.5 to 10.0	13	15								
	11.0 to 12.5									0.50	PP
	12.5 to 13.0										
	13.5 to 15.0	50/7"	14								
	16.0 to 17.5		10						22		
	18.5 to 20.0	50	9								
	21.0 to 22.5									0.50	PP
	22.5 to 23.0										
	23.5 to 24.7	50	17								
	28.5 to 29.6	50									
	33.5 to 34.7	50	12								
MW-7	1.0 to 2.5	4	36								
	3.0 to 4.5								40	1.75	PP
	4.5 to 5.0										

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

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

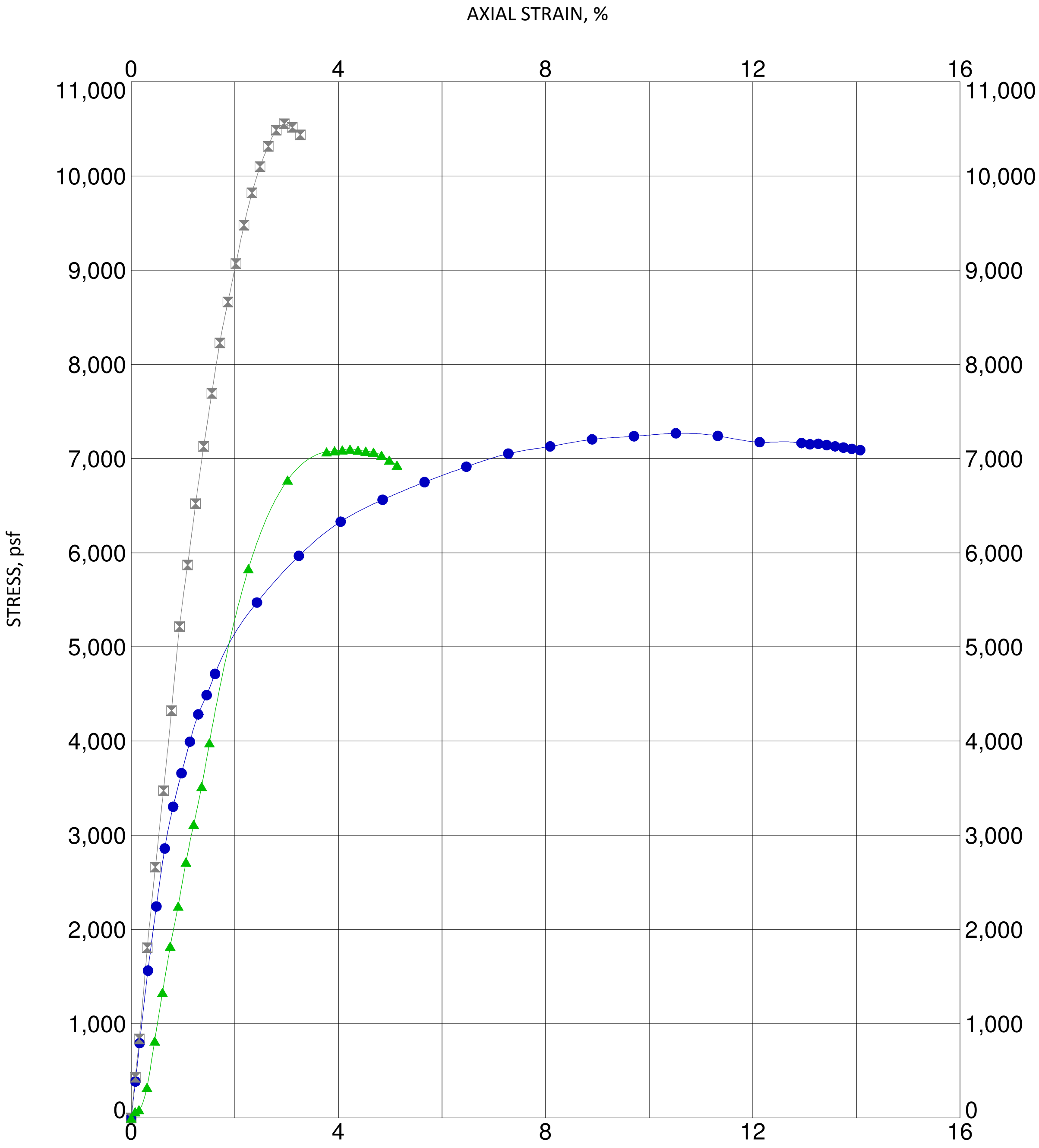
FILE NAME: ASA17-096-00.GPJ 2/5/2018

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



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

RABA KISTNER
TBPE Firm Registration No. F-3257

12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

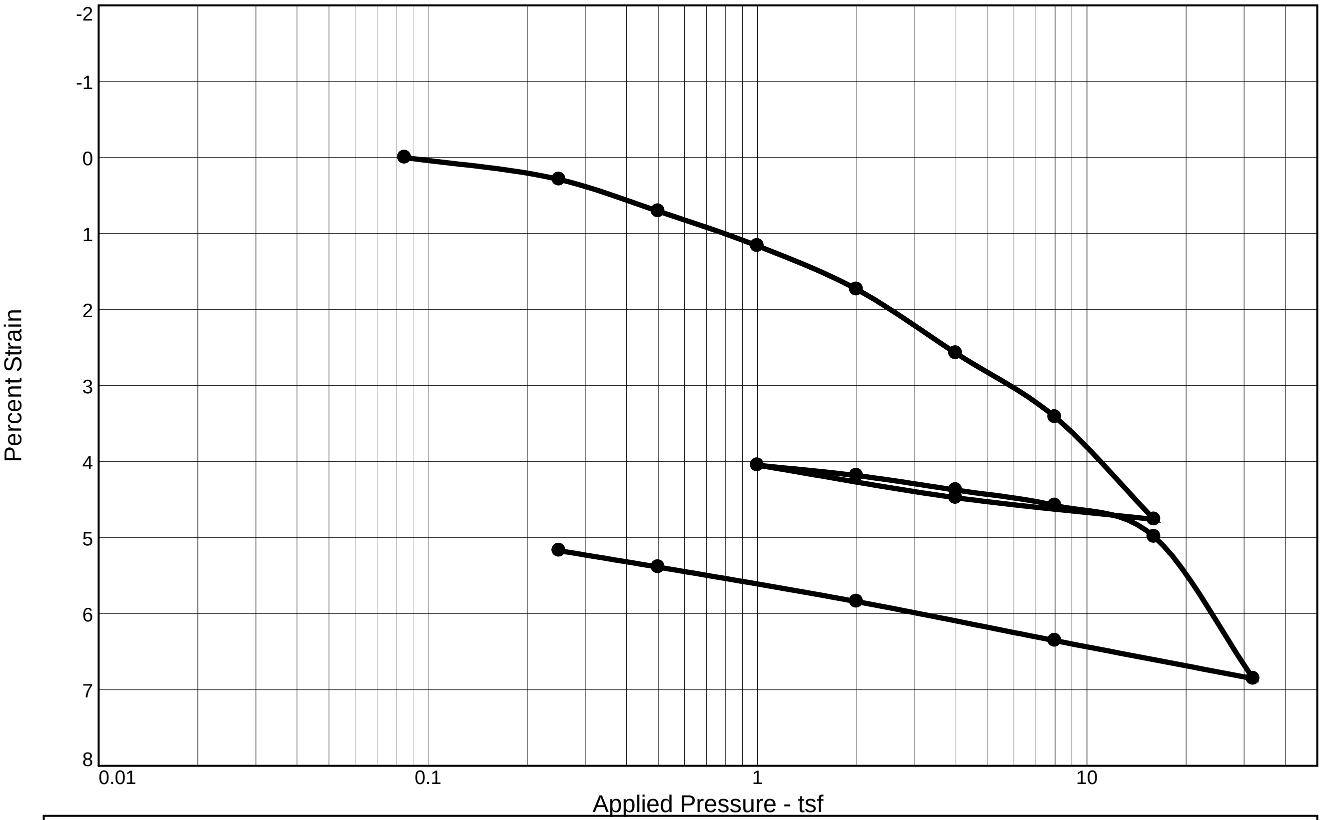
UNCONFINED COMPRESSION

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual
Containment Ponds
San Antonio, Texas

FIGURE 15

R-K UNCONFINED COMPRESSION ASA17-096-00.GPJ RKCI SAN ANTONIO-1.GDT 1/25/18

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

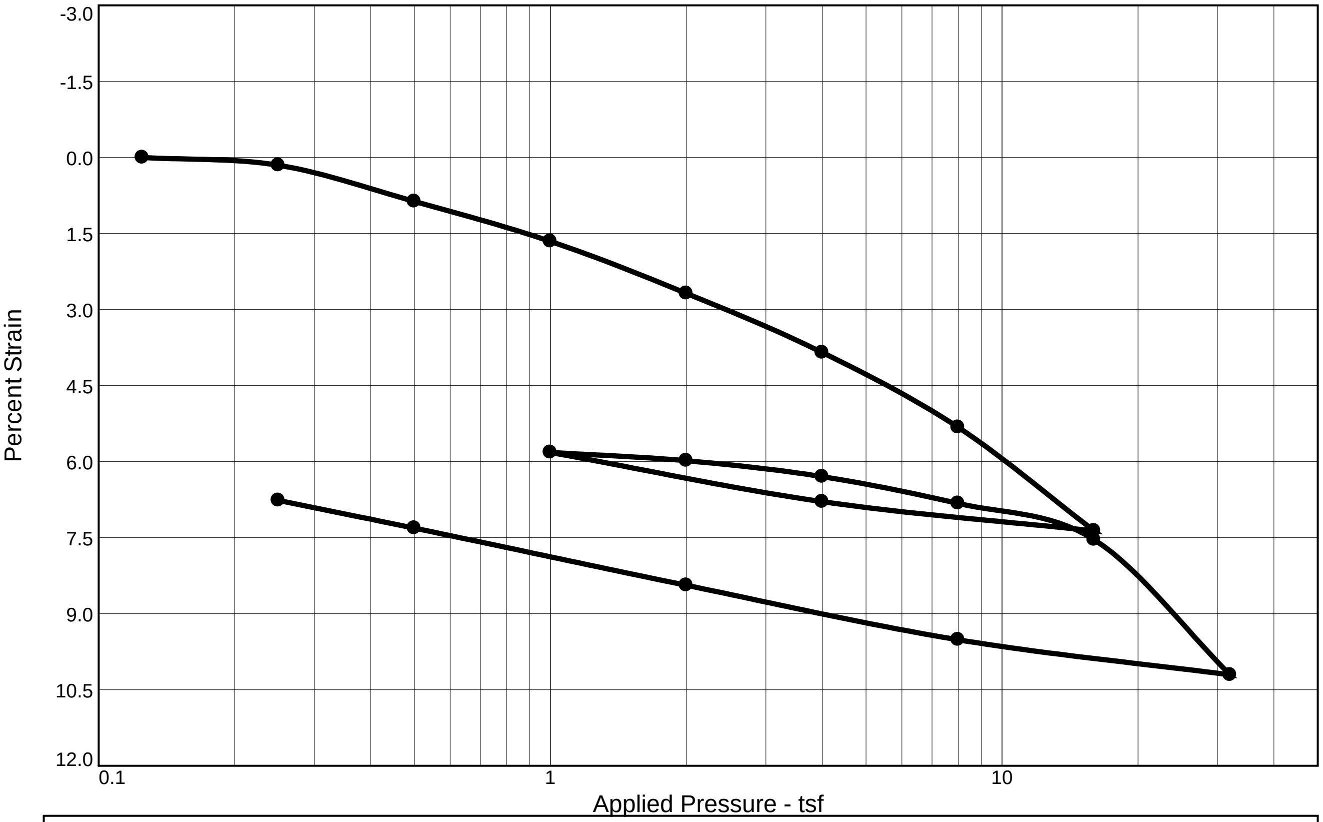
Remarks:

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

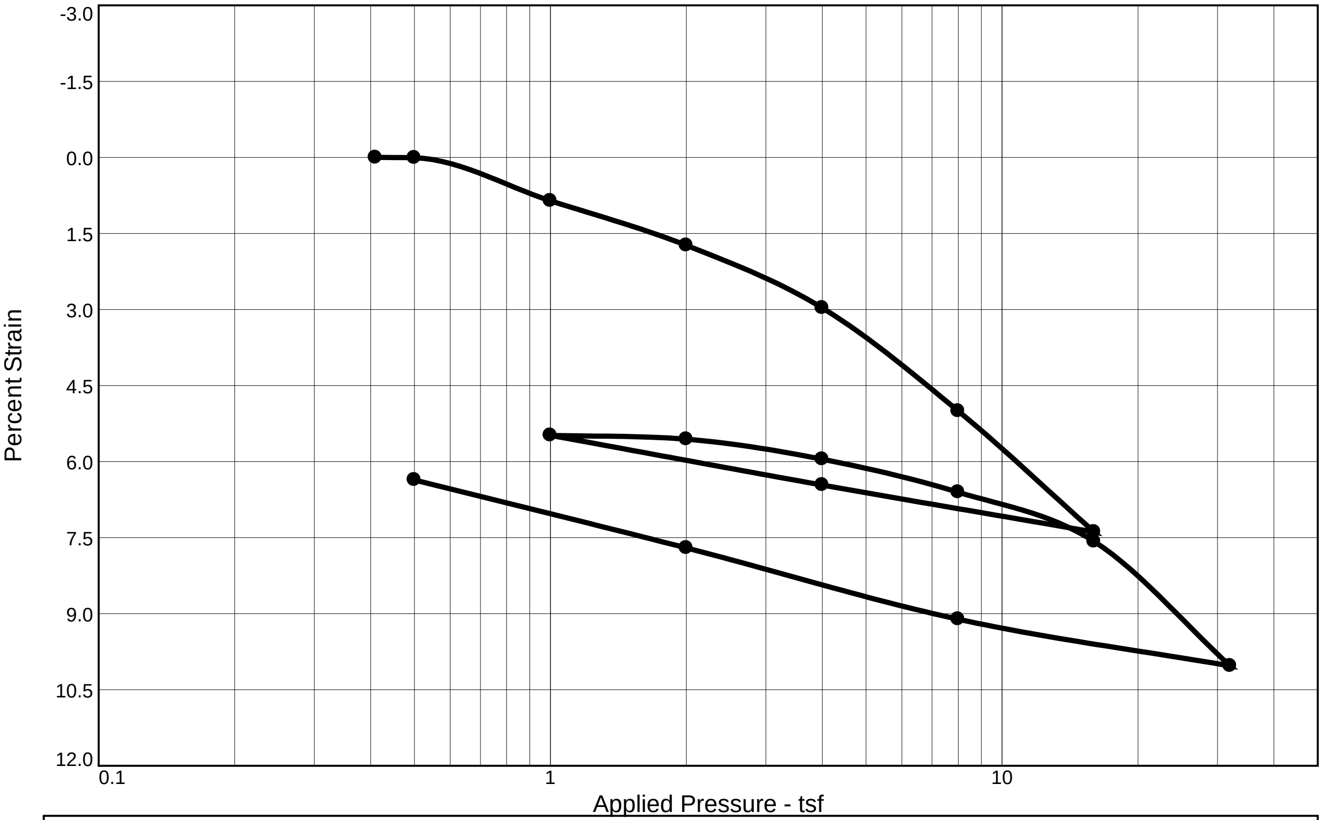
Remarks:

ASTM D2435
estimated specific gravity
weight added to prevent swell after inundation=0.125tsf

RABA KISTNER CONSULTANTS, INC.

Figure 16b

CONSOLIDATION TEST REPORT



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

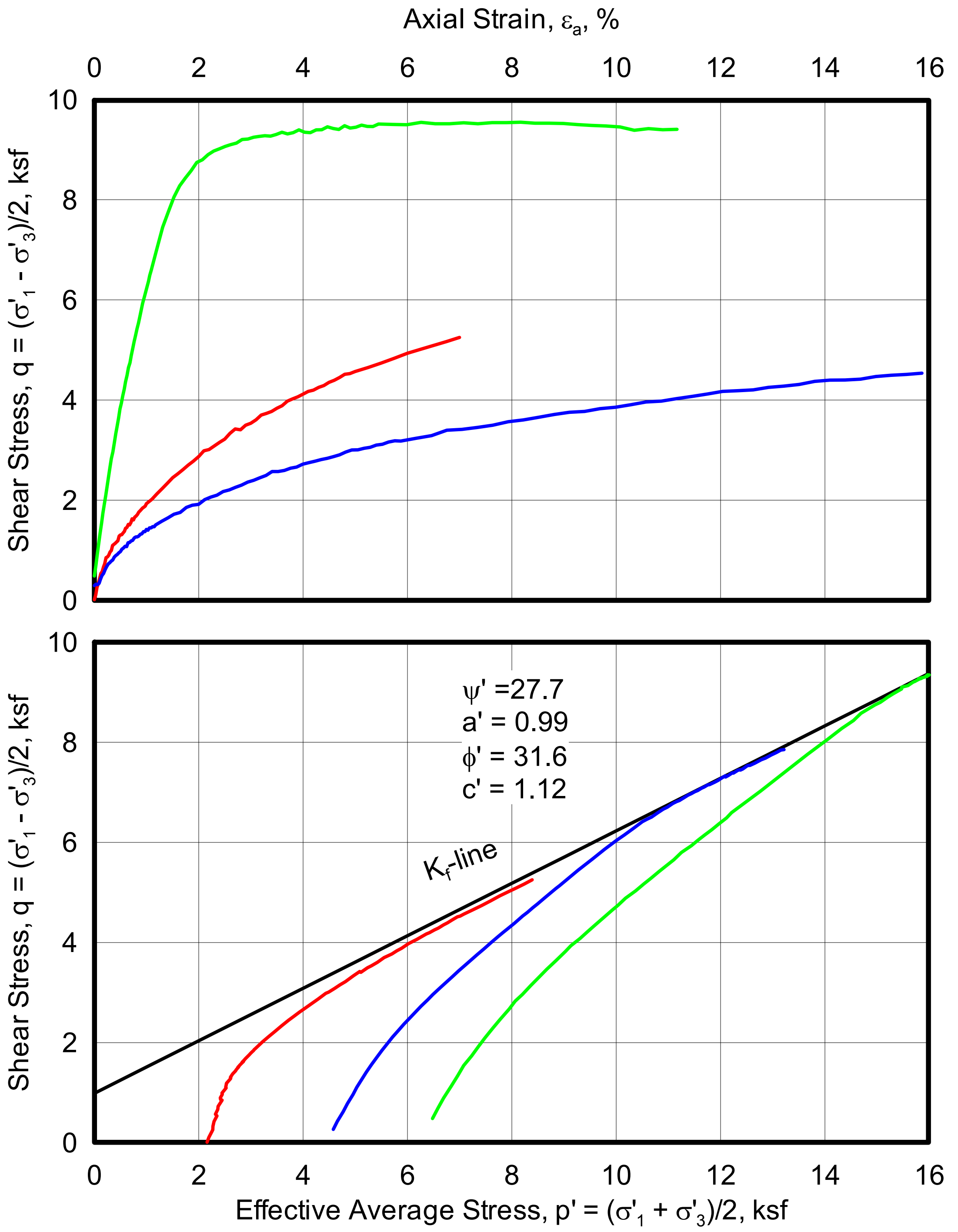
Remarks:

ASTM D2435
estimated specific gravity
weigth added to prevent swell after inundation=0.41tsf

RABA KISTNER CONSULTANTS, INC.

Figure 16c

PROJECT ASA17-096-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION 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%

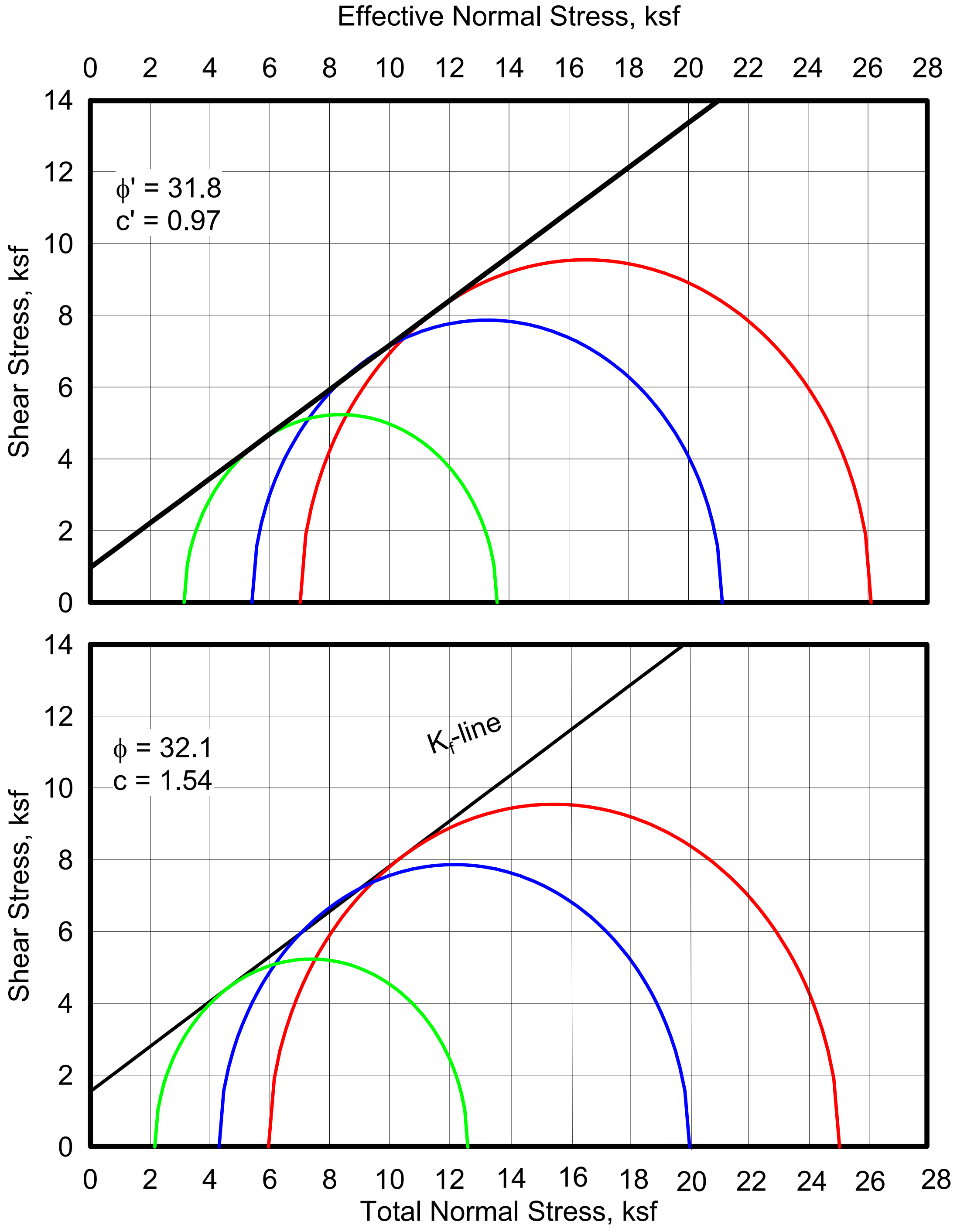
RABA KISTNER
TBPE Firm Registration No. F-3257

3602 Westchase
Houston, Texas 77042
(713) 996-8990 TEL
(713) 996-8993 FAX
www.rkci.com

J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS
STRESS PATH
BORING MW-4, DEPTH 16 TO 18 FT

FIGURE 17a

PROJECT ASA17-096-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
SINGLE SAMPLE MULTI-STAGE CU

MMATERIAL: 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%

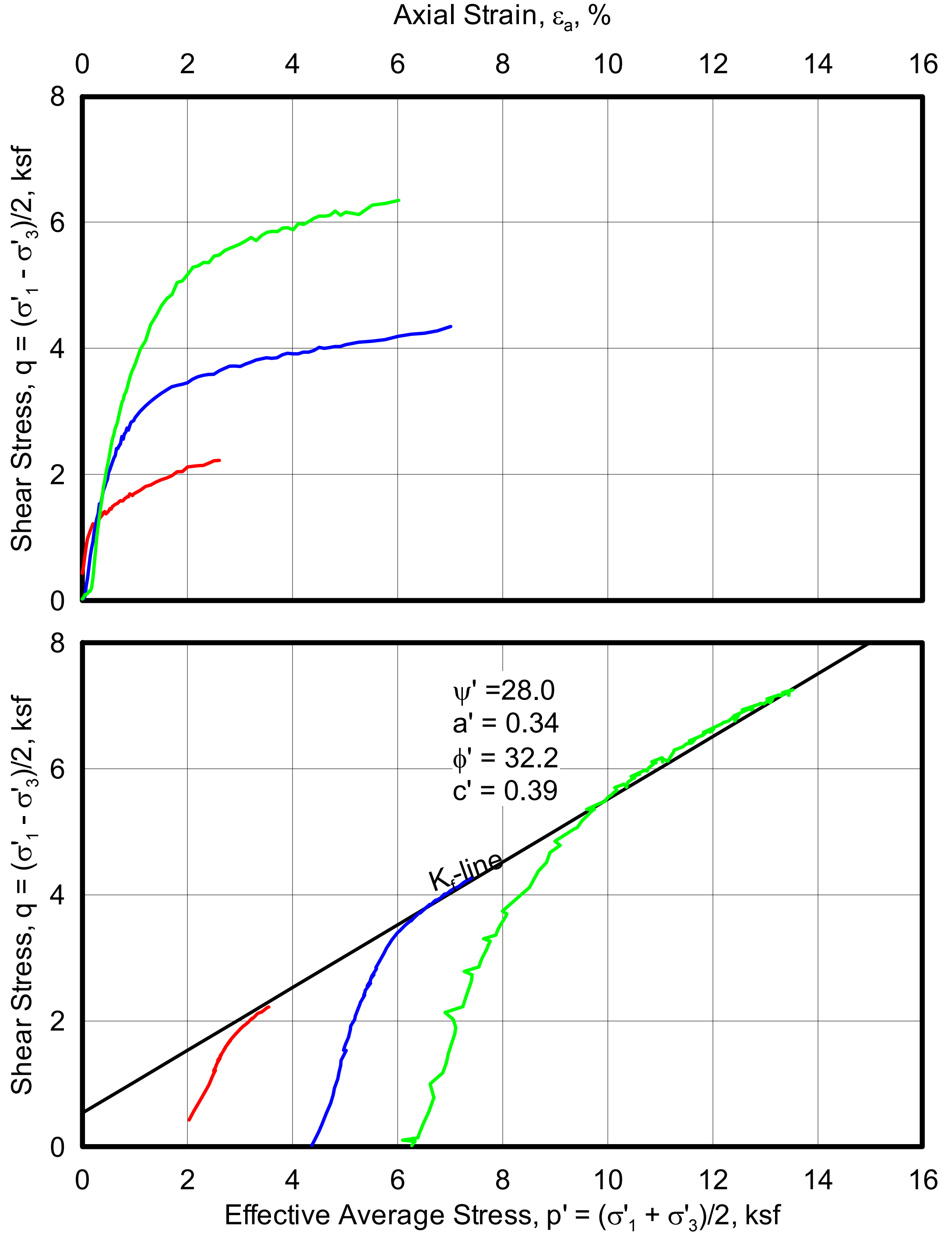
RABA KISTNER
TBPE Firm Registration No. F-3257

3602 Westchase
Houston, Texas 77042
(713) 996-8990 TEL
(713) 996-8993 FAX
www.rkci.com

J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS
MOHR CIRLE
BORING MW-4, DEPTH 16 TO 18 FT

FIGURE 17b

PROJECT NO. ASA17-096-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH

SINGLE SAMPLE MULTI STAGE CU

MATERIAL: Sandy Clay-(SC)	
INITIAL WATER CONTENT: 16.29%	FINAL WATER CONTENT: 19.92%
INITIAL DRY UNIT WEIGHT: 107.26 pcf	INITIAL DEGREE OF SATURATION: 75.0%
INITIAL VOID RATIO: 0.60	FINAL DEGREE OF SATURATION: 100.0%
SPECIFIC GRAVITY: 2.74 (measured)	LL = 27 ; PL = 16 ; PI = 11

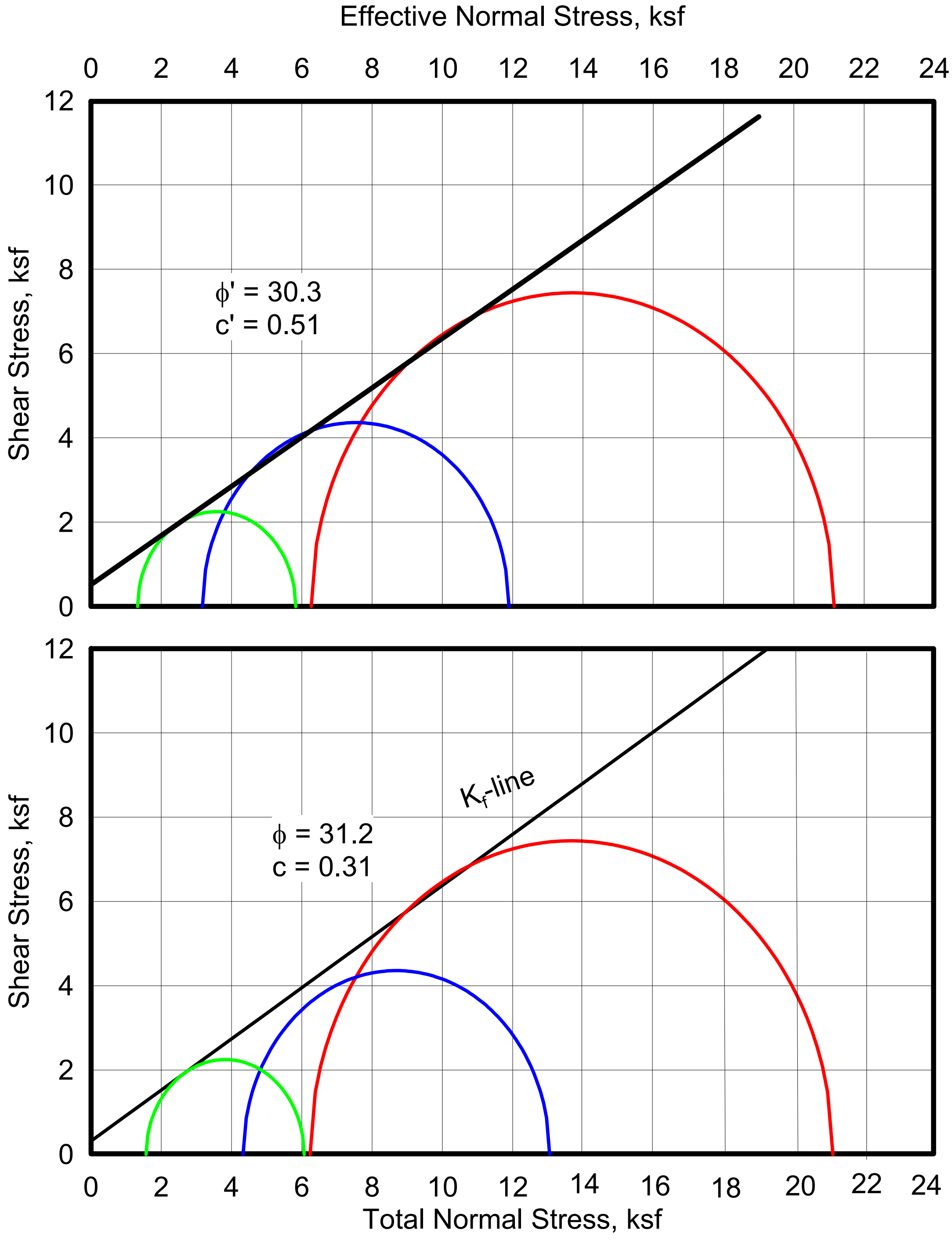
RABA KISTNER
TBPE Firm Registration No. F-3257

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
STRESS PATH
BORING B-1, DEPTH 6 TO 8 FT

FIGURE 17c

PROJECT No. ASA17-096-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
SINGLE SAMPLE MULTI STAGE CU

MMATERIAL: Reddish brown Clayey Sand (SC), w/ stone and clay layers

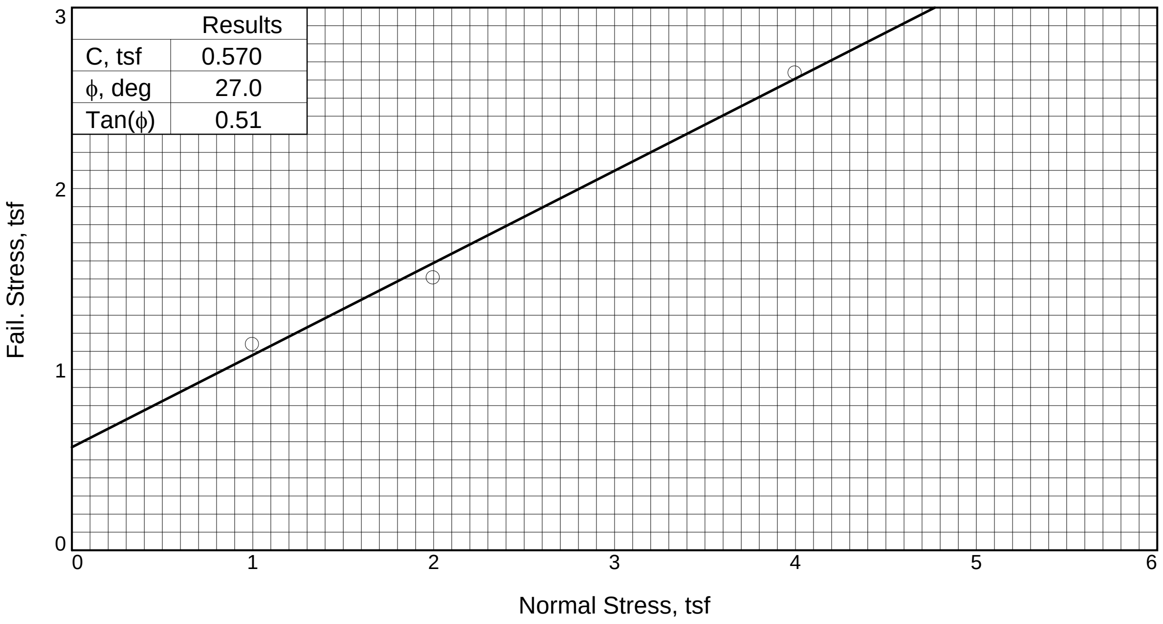
INITIAL WATER CONTENT: 16.29%	FINAL WATER CONTENT: 19.92%
INITIAL DRY UNIT WEIGHT: 107.26 pcf	INITIAL DEGREE OF SATURATION: 75.0%
INITIAL VOID RATIO: 0.60	FINAL DEGREE OF SATURATION: 100.0%
SPECIFIC GRAVITY: 2.74 (measured)	LL = 27; PL = 16; PI = 11

FIGURE

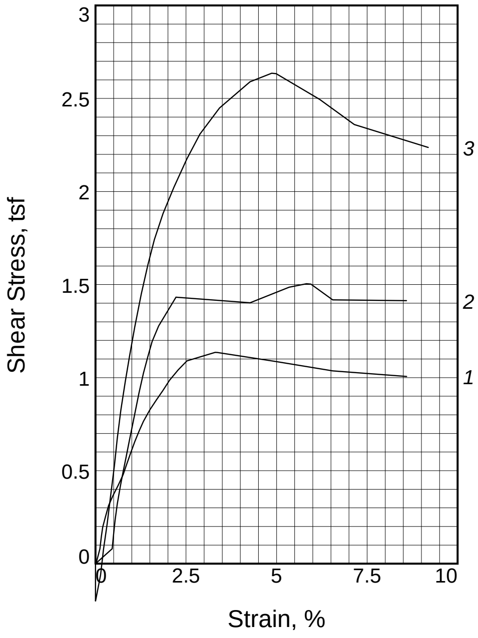
RABA KISTNER
TBPE Firm Registration No. F-3257

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



	Results
C, tsf	0.570
ϕ, deg	27.0
Tan(ϕ)	0.51



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

Figure 18

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.

Tested By: Chain **Checked By:** JB

APPENDIX A
Seismic Vs100 Geophysical Investigation

GEOPHYSICS AND NDE FOR INFRASTRUCTURE ASSESSMENT
MEASURING CONCERNS • MITIGATING RISKS

Olson ENGINEERING
Corporate Office:
12401 W. 49th Avenue
Wheat Ridge, CO 80033 USA
phone: 303.423.1212
fax: 303.423.6071

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.

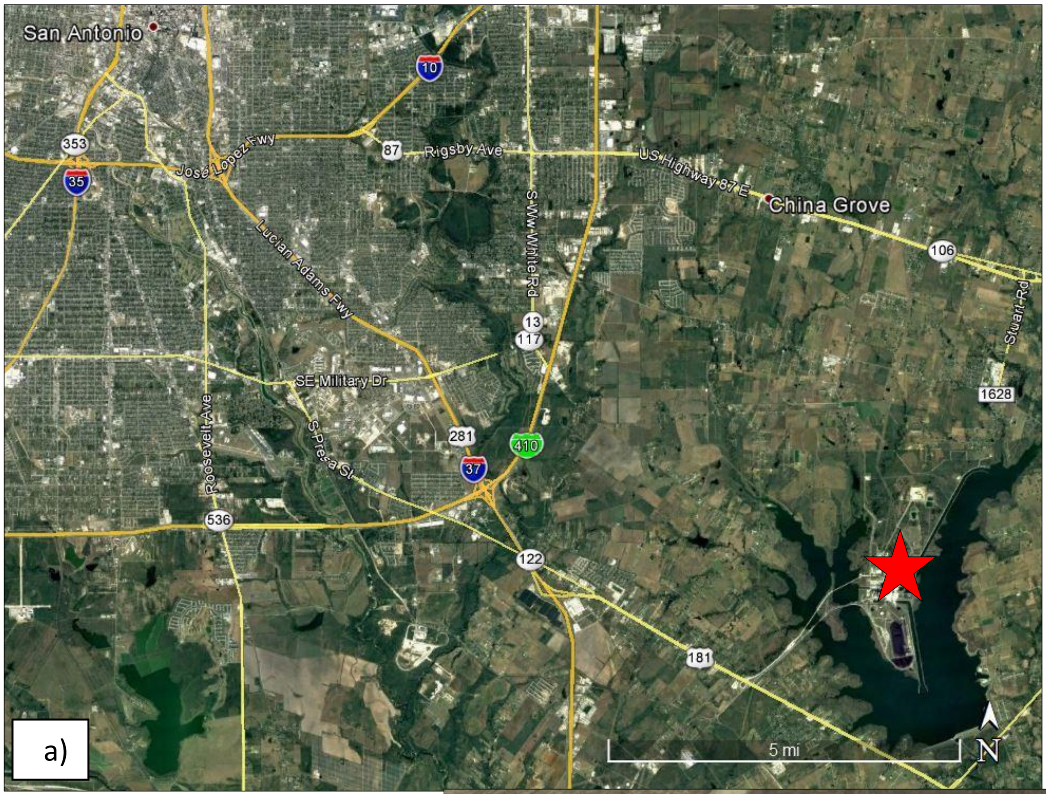


Figure 1. A) Approximate site location indicated by red star; b) line locations indicated by red lines.

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 propogates 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.

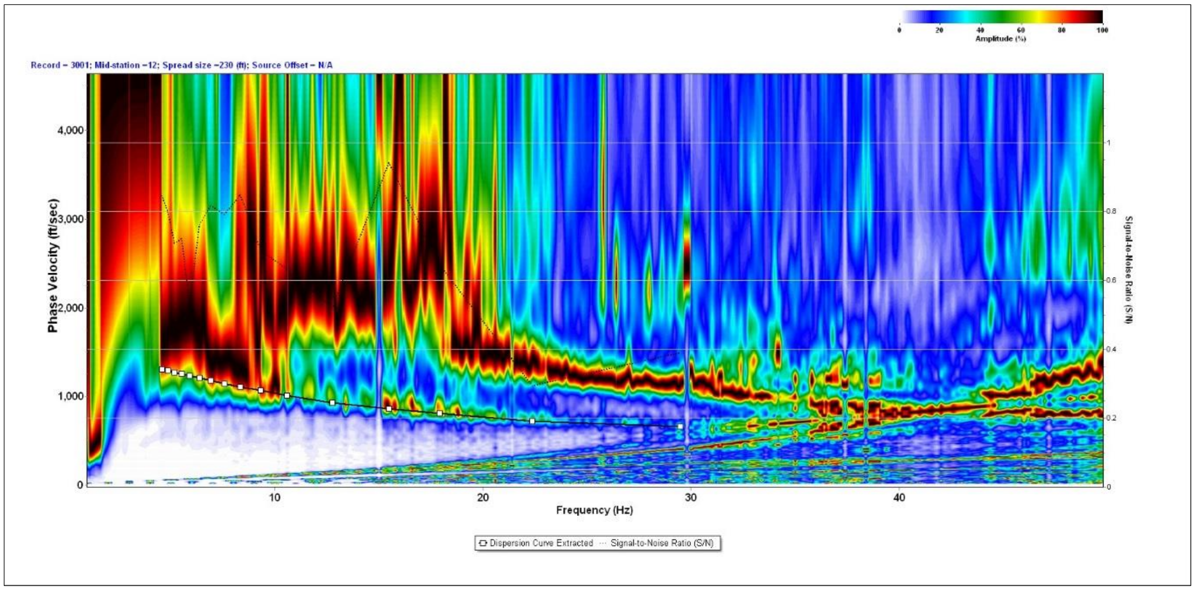


Figure 2. Example dispersion curve from Line 3 of this investigation.

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

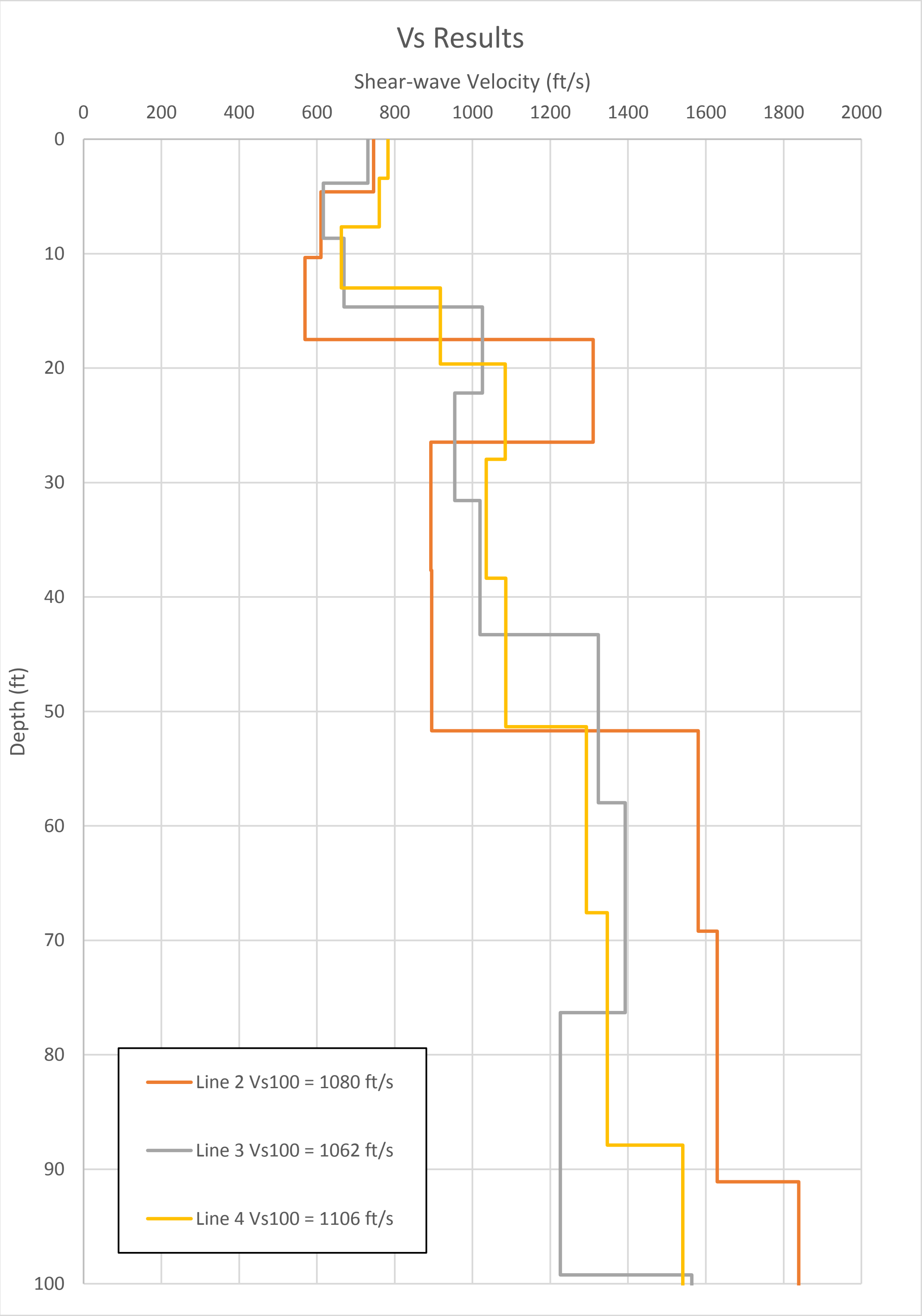


Figure 3. 1D Shear-wave velocity models for Lines 2 through 4.

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

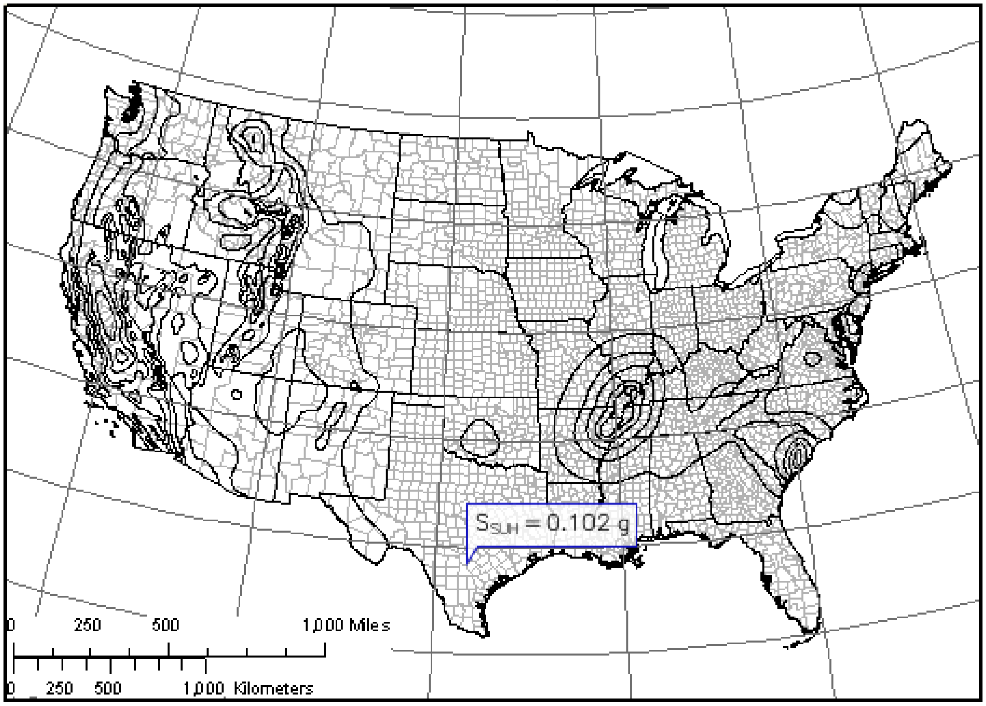


Figure 22–2: Uniform–Hazard (2% in 50–Year) Ground Motions of 1.0-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B

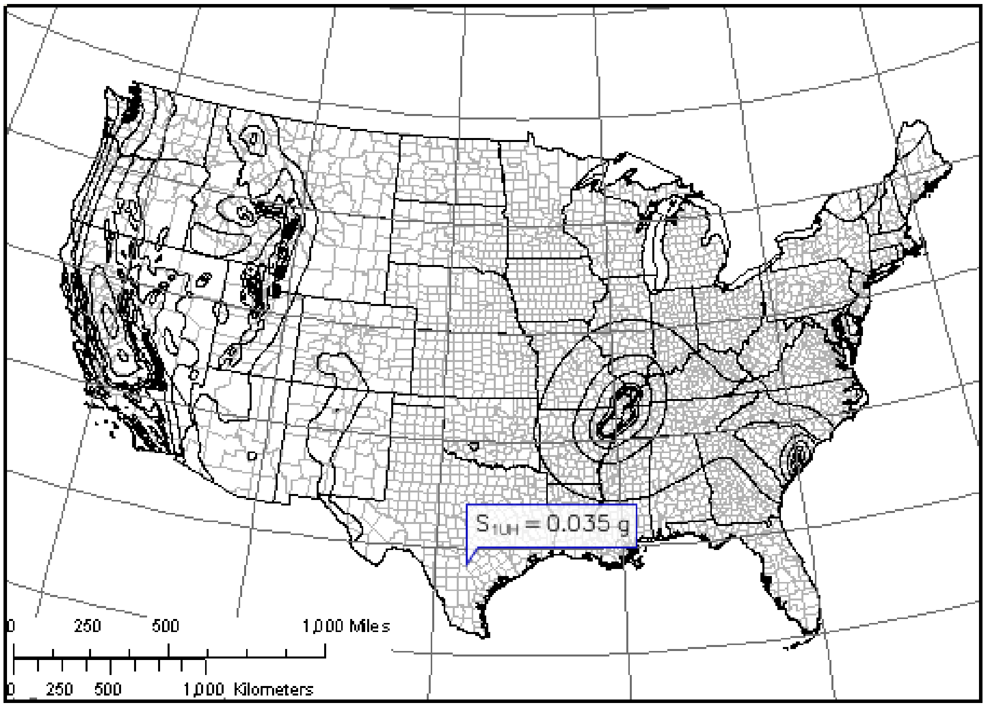

S_{1UH} = 0.035 g
0 250 500 1,000 Miles
0 250 500 1,000 Kilometers

Figure 22–3: Risk Coefficient at 0.2-Second Spectral Response Period

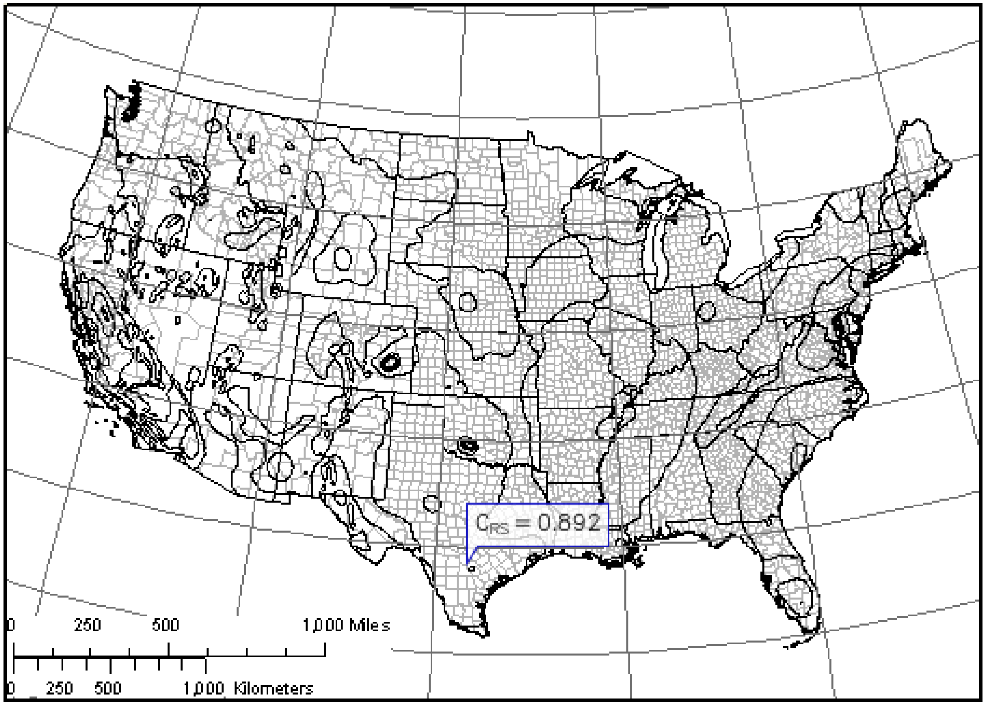


Figure 22–4: Risk Coefficient at 1.0-Second Spectral Response Period

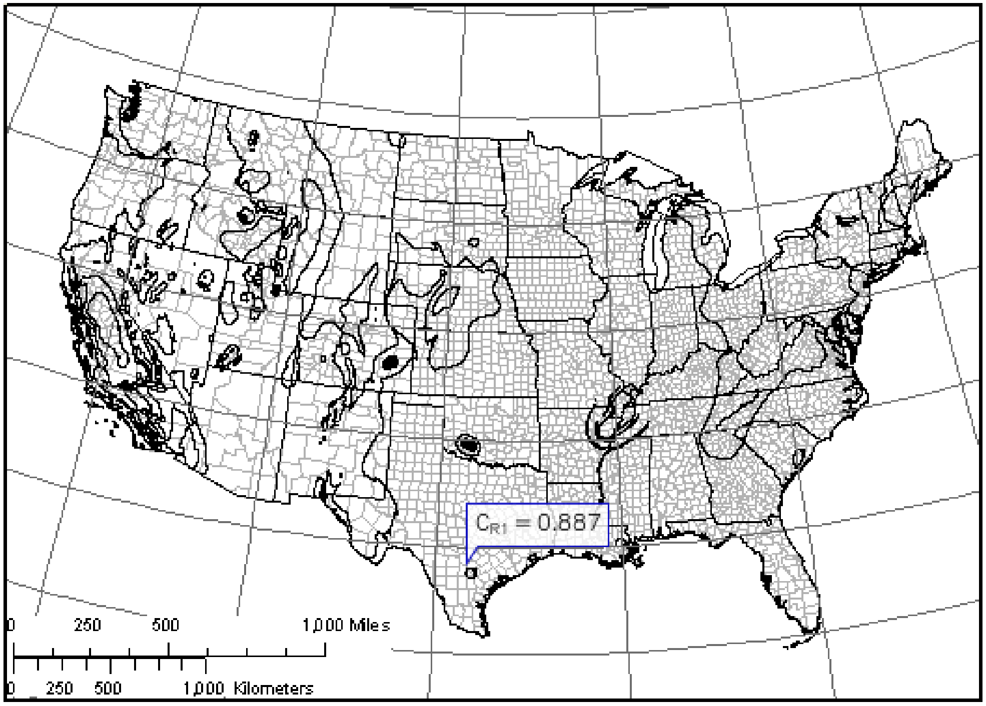


Figure 22–5: Deterministic Ground Motions of 0.2-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B

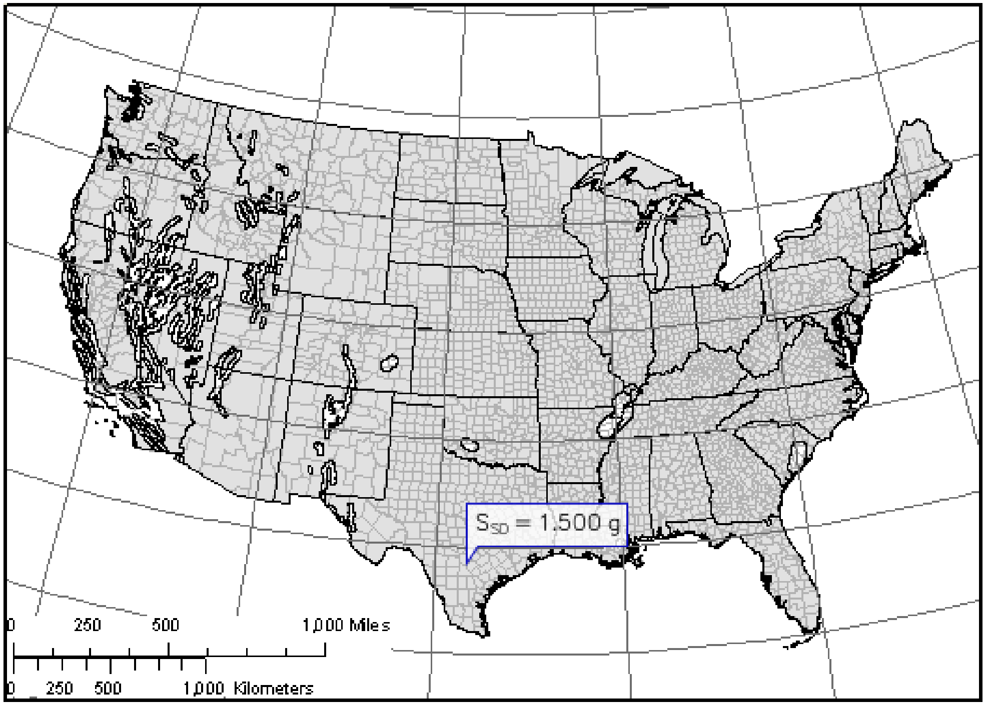
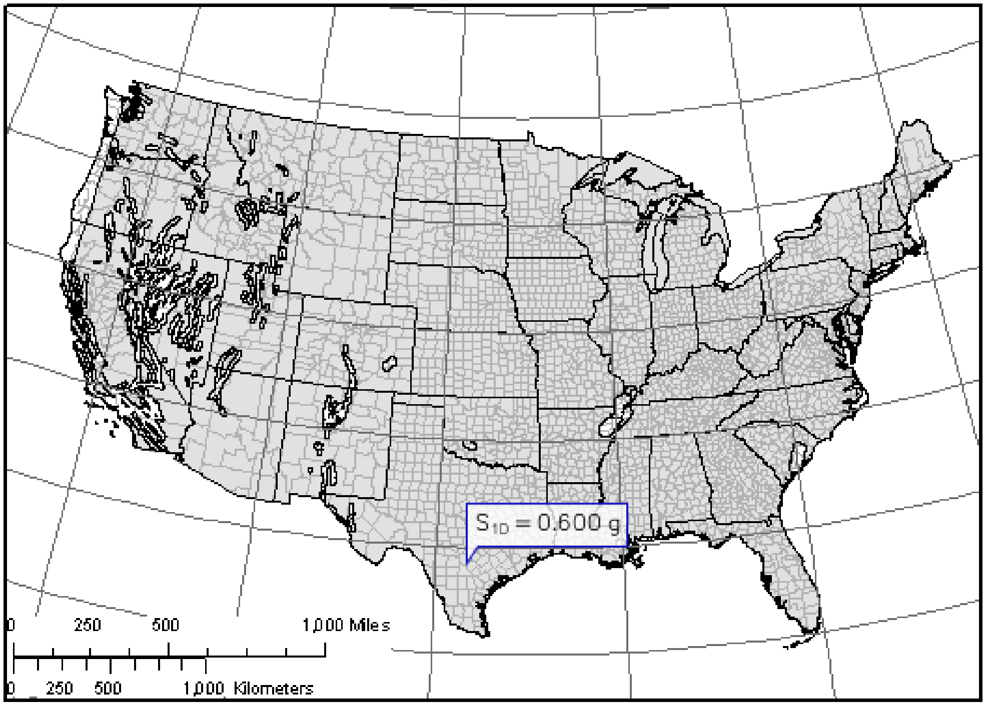


Figure 22–6: Deterministic Ground Motions of 1.0-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B



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: • Plasticity index *PI* > 20, • Moisture content *w* ≥ 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 x 0.102 = 0.091 g

Equation (11.4–2): S_{SD} = 1.500 g

S_S ≡ “Lesser of values from Equations (11.4–1) and (11.4–2)” = 0.091 g

Equation (11.4–3): $C_{R1}S_{1UH}$ = 0.887 x 0.035 = 0.031 g

Equation (11.4–4): S_{1D} = 0.600 g

S_1 ≡ “Lesser of values from Equations (11.4–3) and (11.4–4)” = 0.031 g

Table 11.4–1: Site Coefficient F_a

Site Class	Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
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				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
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): $S_{MS} = F_aS_S = 1.600 \times 0.091 = 0.146$ g

---

Equation (11.4–6): $S_{M1} = F_vS_1 = 2.400 \times 0.031 = 0.075$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4–7): $S_{DS} = \tfrac{2}{3} S_{MS} = \tfrac{2}{3} \times 0.146 = 0.097$ g

---

Equation (11.4–8): $S_{D1} = \tfrac{2}{3} S_{M1} = \tfrac{2}{3} \times 0.075 = 0.050$ g

Section 11.4.5 — Design Response Spectrum

Figure 22–7: Long–period Transition Period, T_L (s)

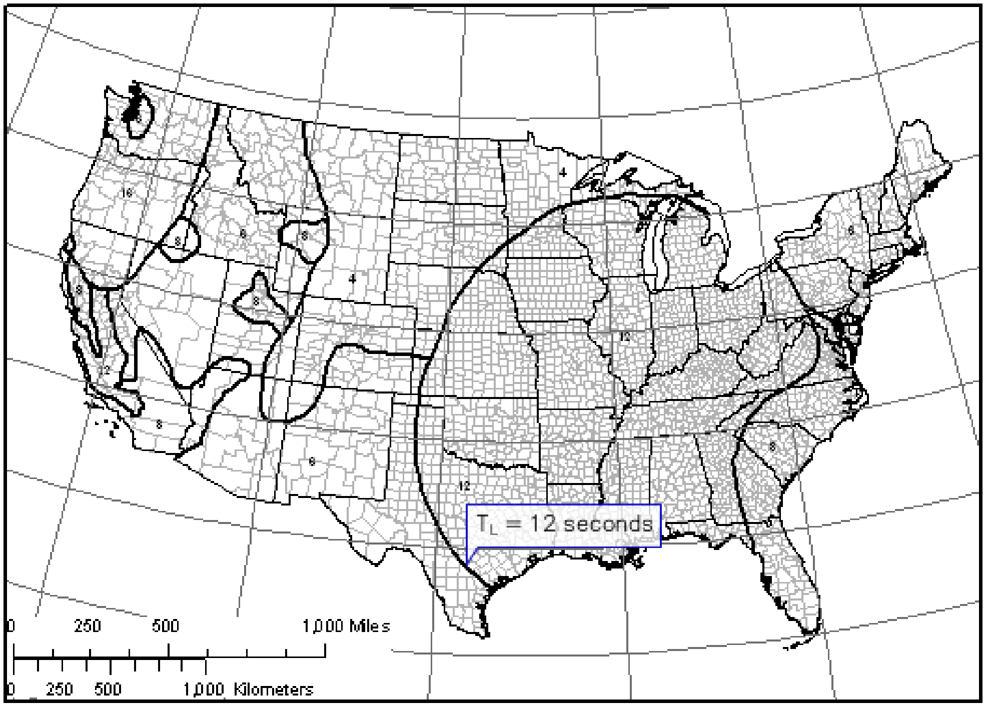
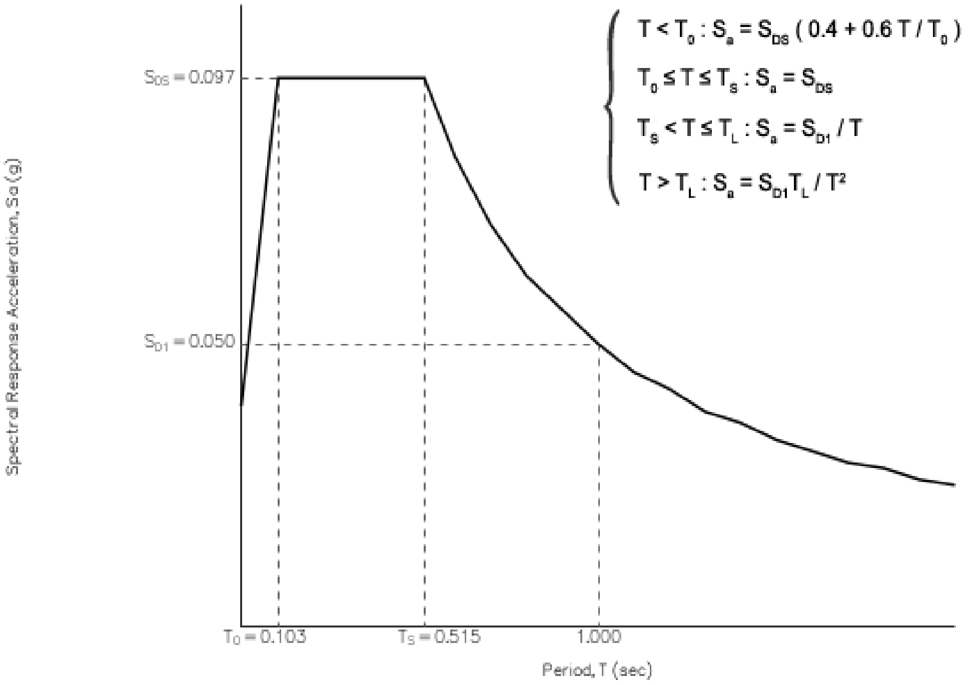
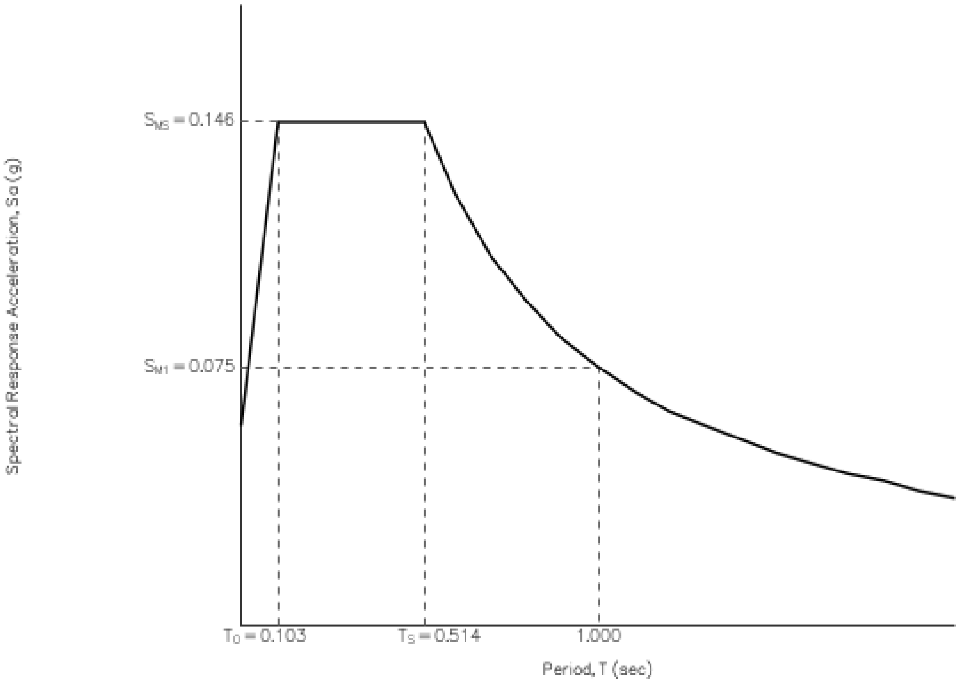


Figure 11.4–1: Design Response Spectrum



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):	$PGA_M = F_{PGA}PGA = 1.600 \times 0.047 = 0.075$ 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	Thick-ness	Soil Type	Unit Weight	Over-burden Stress	Pore Water Pressure	Effective Overburden Stress	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	EQ induced Volumetric Strain (%)			Post Liquefaction Settlement (in)		
(ft)	(ft)		(pcf)	(psf)	(psf)	(psf)	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	(ft)	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						
																													Total (in)		
																												0.00	0.00	0.00

$$Cyclic\ Ratio = 0.65 \times \frac{a_{max}}{g} \times \frac{\sigma_o}{\overline{\sigma}_o}$$ *(Seed & Idriss, 1982)*

Where

γ_d: Stress Reduction Coefficient (Fig. 40, " Ground Motions and Soil Liquefaction During Earthquakes" , Seed & Idriss, 1982)

$$N_{corrected} = N_{field} \times C_N \times \frac{E_r}{60\%} \times \eta_2 \times \eta_3 \times \eta_4$$ *(Bowles, " Foundation Analysis and Design" , 4th Edition)*

Where

$$C_N = 1 / \sqrt{\overline{\sigma}_0} \qquad \overline{\sigma}_0 \text{ in tsf}$$

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

$S = \varepsilon_v \times H$ (FHWA - SA - 97 - 076, ch8)

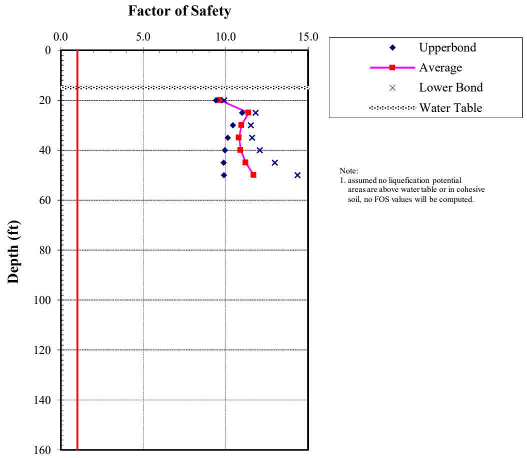
Where

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*



Note:
1. assumed no liquefication potential areas are above water table or in cohesive soil, no FOS values will be computed.

Project Name: CPS CCR Ponds
Boring No.: B-2
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)	Thickness (ft)	Soil Type	Unit Weight (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	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	7	2.408	87	21	24	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	15	1.313	87	24	29	Above GWT	Above GWT	Above GWT	27	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	28	1.059	87	37	43	Above GWT	Above GWT	Above GWT	27	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	44	0.976	87	53	62	0.055	0.053	0.054	27	0.526	0.695	13	13	13	20						
25	5	Sand	130	3060	624.0	2436	0.982	0.913	0.948	28	0.906	87	31	37	0.060	0.056	0.058	27	0.526	0.695	12	12	12	25						
35	10	Sand	130	4360	1248.0	3112	0.957	0.834	0.895	40	0.802	87	40	46	0.065	0.057	0.061	27	0.526	0.695	11	12	11	35						
40	5	Sand	130	5010	1560.0	3450	0.939	0.773	0.856	50	0.761	87	47	55	0.066	0.055	0.061	27	0.526	0.695	10	13	11	40						
45	5	Sand	130	5660	1872.0	3788	0.919	0.699	0.809	50	0.727	87	45	53	0.067	0.051	0.059	27	0.526	0.695	10	14	12	45						
50	5	Sand	130	6310	2184.0	4126	0.897	0.618	0.758	26	0.696	87	22	26	0.067	0.046	0.056	27	0.526	0.695	10	15	12	50						
																												Total (in)		
																												0.00	0.00	0.00

$$Cyclic\ Ratio = 0.65 \times \frac{a_{max}}{g} \times \frac{\sigma_o}{\overline{\sigma}_o} \quad (Seed\ \&\ Idriss,\ 1982)$$

Where

γ_d: Stress Reduction Coefficient (Fig. 40, " Ground Motions and Soil Liquefaction During Earthquakes" , Seed & Idriss, 1982)

$$N_{corrected} = N_{field} \times C_N \times \frac{E_r}{60\%} \times \eta_2 \times \eta_3 \times \eta_4 \quad (Bowles,\ "Foundation\ Analysis\ and\ Design",\ 4th\ Edition)$$

Where

$C_N = 1 / \sqrt{\overline{\sigma}_0}$ $\quad \overline{\sigma}_0$ *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

$S = \varepsilon_v \times H$ *(FHWA - SA - 97 - 076, ch8)*

Where

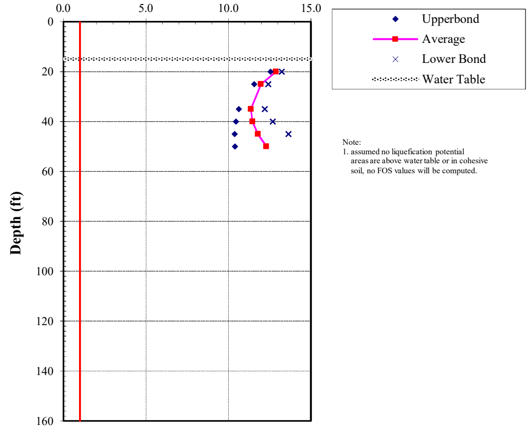
ε_v: Volumetic Strain for Different EQ Magnitude, (%) (Tokimatsu & Seed, 1987)

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*

Factor of Safety



Note:
1. assumed no liquefication potential areas are above water table or in cohesive soil, no FOS values will be computed.

Project Name: CPS CCR Ponds
Boring No.: B-3
Job No.: ASA17-096-00
Total Depth: 50.0 ft
Design Maximum Acceleration: 0.075 g
Water Level: 22 ft
Design EQ Magnitude: 7.5

Depth (ft)	Thickness (ft)	Soil Type	Unit Weight (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	Upper Bound	Lower Bound	Average
0.0				0	0.0	0	1.000	1.000	1.000																					
9	9	Sand	115	1035	0.0	1035	0.996	0.975	0.986	16	1.390	87	28	32	Above GWT	Above GWT	Above GWT	28	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	9						
11	2	Clay	115	1265	0.0	1265	0.996	0.969	0.982	0	1.257	87	0	0	Above GWT	Above GWT	Above GWT	52	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	11						
15	4	Sand	120	1745	0.0	1745	0.993	0.957	0.975	28	1.071	87	37	43	Above GWT	Above GWT	Above GWT	27	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	15						
20	5	Sand	125	2370	0.0	2370	0.989	0.938	0.963	12	0.919	87	14	16	Above GWT	Above GWT	Above GWT	27	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	20						
25	5	Sand	125	2995	187.2	2808	0.982	0.913	0.948	19	0.844	87	20	23	0.051	0.047	0.049	27	0.400	0.528	10	11	11	25						
30	5	Sand	130	3645	499.2	3146	0.971	0.880	0.926	50	0.797	87	49	58	0.055	0.050	0.052	27	0.516	0.682	12	14	13	30						
35	5	Sand	130	4295	811.2	3484	0.957	0.834	0.895	50	0.758	87	47	55	0.058	0.050	0.054	27	0.516	0.682	12	14	13	35						
40	5	Sand	130	4945	1123.2	3822	0.939	0.773	0.856	36	0.723	87	32	38	0.059	0.049	0.054	27	0.516	0.682	12	14	13	40						
45	5	Sand	130	5595	1435.2	4160	0.919	0.699	0.809	50	0.693	87	43	50	0.060	0.046	0.053	27	0.516	0.682	11	15	13	45						
50	5	Sand	130	6245	1747.2	4498	0.897	0.618	0.758	44	0.667	87	36	42	0.061	0.042	0.051	27	0.516	0.682	11	16	13	50						
																												Total (in)		
																												0.00	0.00	0.00

Cyclic Ratio $= 0.65 \times \frac{a_{max}}{g} \times \frac{\sigma_o}{\overline{\sigma}_o}$ *(Seed & Idriss, 1982)*

Where

γ_d: *Stress Reduction Coefficient (Fig. 40, "Ground Motions and Soil Liquefaction During Earthquakes", Seed & Idriss, 1982)*

$N_{corrected} = N_{field} \times C_N \times \frac{E_r}{60\%} \times \eta_2 \times \eta_3 \times \eta_4$ *(Bowles, "Foundation Analysis and Design", 4th Edition)*

Where

$C_N = 1 / \sqrt{\overline{\sigma}_0}$ $\quad \overline{\sigma}_0$ *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

$S = \varepsilon_v \times H$ *(FHWA - SA - 97 - 076, ch8)*

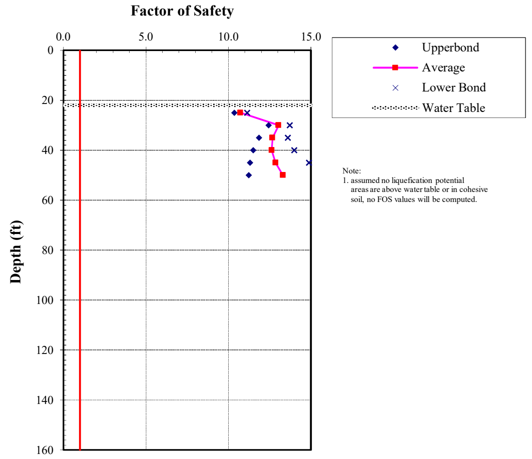
Where

ε_v: *Volumetic 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*



Note:
1. assumed no liquefaction potential areas are above water table or in cohesive soil, no FOS values will be computed.

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

Depth	Thickness	Soil Type	Unit Weight	Overburden Stress	Pore Water Pressure	Effective Overburden Stress	γ_d (stress reduction coefficient)			Field SPT Value	Correction Factor		SPT (Corrected)		Computed CSR for γ_d @			% of Fine	Expected CSR vs. N_{60}		Factor of Safety			Depth	EQ induced Volumetric Strain (%)			Post Liquefaction Settlement (in)		
(ft)	(ft)		(pcf)	(psf)	(psf)	(psf)	Upper Bound	Lower Bound	Average	(N)	CN	Er %	N_{70}	N_{60}	Upper Bound	Lower Bound	Average		@ given % Fine & M7.5	@ given % Fine & Magnitude	Upper Bound	Lower Bound	Average	(ft)	Upper Bound	Lower Bound	Average	Upper Bound	Lower Bound	Average
0.0				0	0.0	0	1.000	1.000	1.000																					
2	2	Sand	115	230	0.0	230	0.998	0.995	0.996	11	2.949	87	40	47	Above GWT	Above GWT	Above GWT	23	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	2						
4	2	Clay	115	460	0.0	460	0.998	0.989	0.993	0	2.085	87	0	0	Above GWT	Above GWT	Above GWT	76	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	4						
10	6	Sand	120	1180	0.0	1180	0.996	0.972	0.984	34	1.302	87	55	64	Above GWT	Above GWT	Above GWT	27	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	10						
15	5	Sand	125	1805	0.0	1805	0.993	0.957	0.975	39	1.053	87	51	59	Above GWT	Above GWT	Above GWT	27	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	15						
20	5	Sand	125	2430	62.4	2368	0.989	0.938	0.963	50	0.919	87	57	67	0.049	0.047	0.048	27	0.516	0.682	14	15	14	20						
25	5	Sand	130	3080	374.4	2706	0.982	0.913	0.948	50	0.860	87	53	62	0.054	0.051	0.053	27	0.516	0.682	13	13	13	25						
30	5	Sand	130	3730	686.4	3044	0.971	0.880	0.926	50	0.811	87	50	59	%f>50	%f>50	%f>50	50	%f>50	%f>50	>>1.00	>>1.00	>>1.00	30						
35	5	Sand	130	4380	998.4	3382	0.957	0.834	0.895	50	0.769	87	48	56	0.060	0.053	0.057	27	0.516	0.682	11	13	12	35						
40	5	Sand	130	5030	1310.4	3720	0.939	0.773	0.856	37	0.733	87	34	39	0.062	0.051	0.056	27	0.516	0.682	11	13	12	40						
45	5	Sand	130	5680	1622.4	4058	0.919	0.699	0.809	50	0.702	87	44	51	0.063	0.048	0.055	27	0.516	0.682	11	14	12	45						
50	5	Sand	130	6330	1934.4	4396	0.897	0.618	0.758	50	0.675	87	42	49	0.063	0.043	0.053	27	0.516	0.682	11	16	13	50						
																													Total (in)		
																												0.00	0.00	0.00

$$\text{Cyclic Ratio} = 0.65 \times \frac{a_{max}}{g} \times \frac{\sigma_o}{\overline{\sigma}_o} \quad \text{(Seed \& Idriss, 1982)}$$

Where

γ_d: *Stress Reduction Coefficient (Fig. 40, "Ground Motions and Soil Liquefaction During Earthquakes", Seed & Idriss, 1982)*

$$N_{corrected} = N_{field} \times C_N \times \frac{E_r}{60\%} \times \eta_2 \times \eta_3 \times \eta_4 \quad \text{(Bowles, "Foundation Analysis and Design", 4th Edition)}$$

Where

$C_N = 1 / \sqrt{\overline{\sigma}_0}$ $\quad \overline{\sigma}_0$ *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

$S = \varepsilon_v \times H$ *(FHWA - SA - 97 - 076, ch8)*

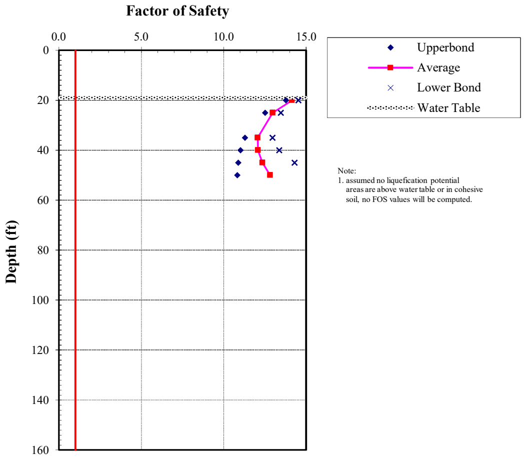
Where

ε_v: *Volumetic Strain for Different EQ Magnitude, (%) (Tokimatsu & Seed, 1987)*

H: *Thickness of Liquefiable Layer*

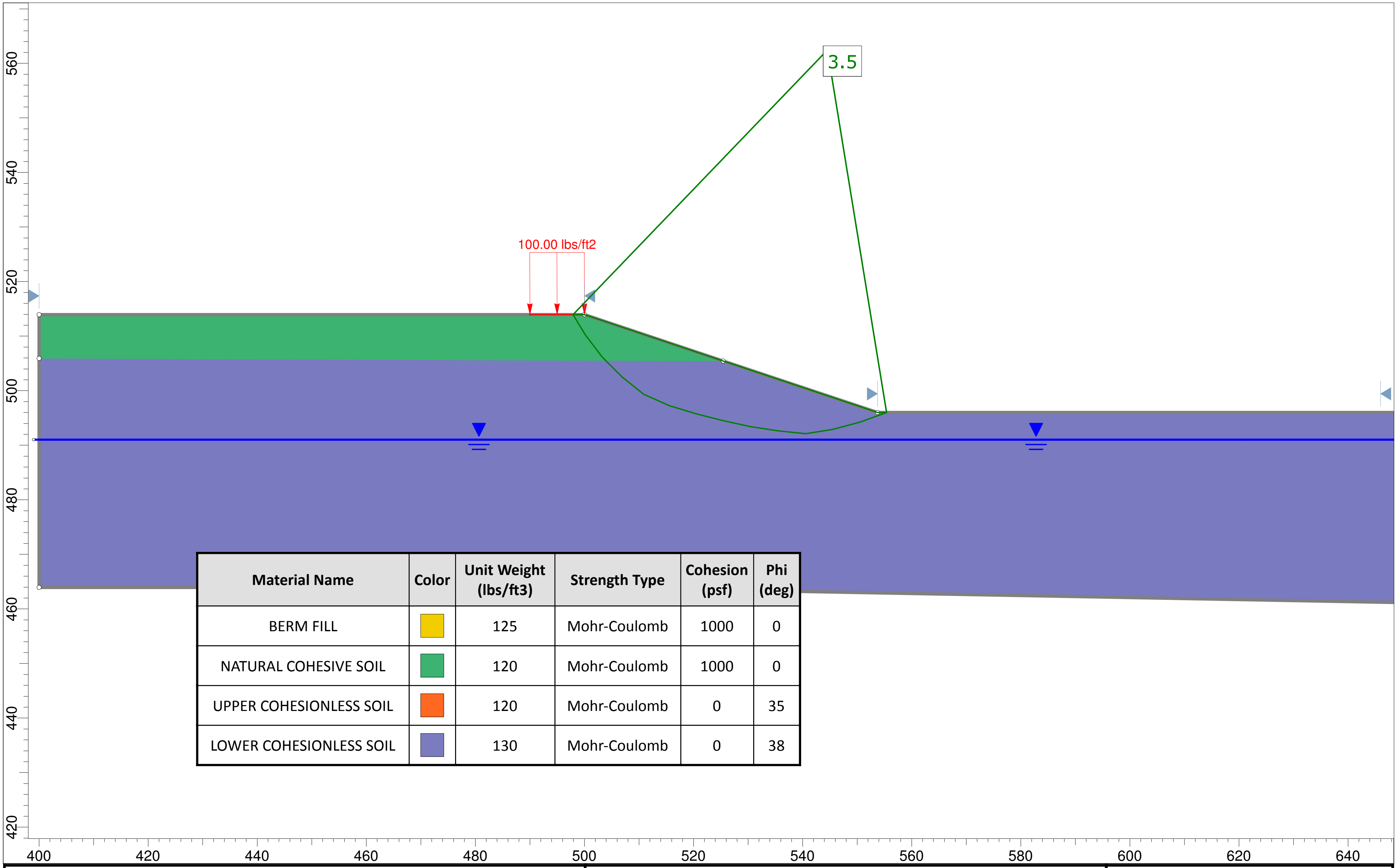
Ratios between M7.5 & Different EQ Magnitude (Seed & Idriss,1982)

M8.5	*0.89*
M7.5	*1.00*
M6.75	*1.13*
M6.0	*1.32*
M5.25	*1.50*



Note:
1. assumed no liquefication potential areas are above water table or in cohesive soil, no FOS values will be computed.

APPENDIX D
Slope Stability Analysis



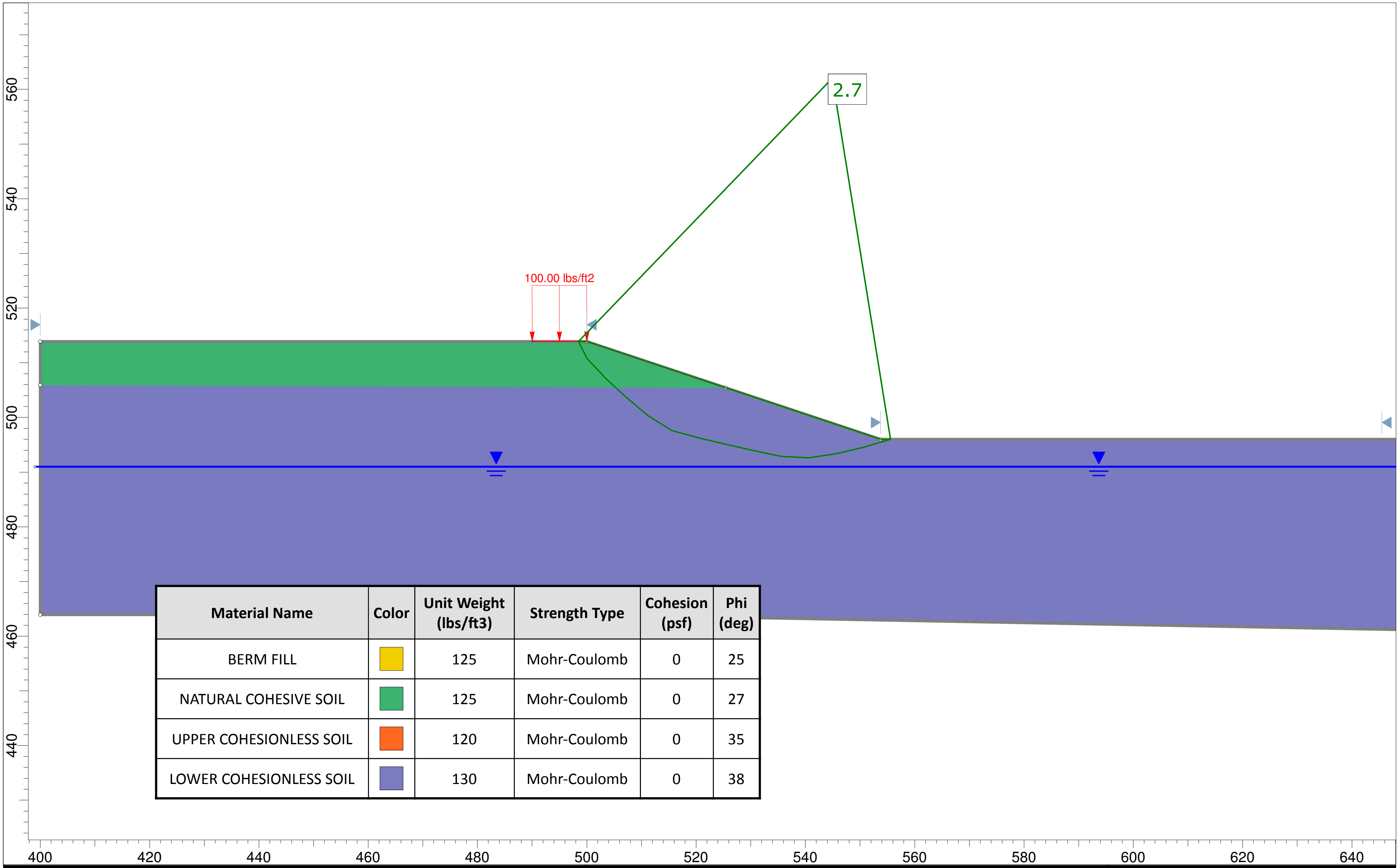
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA
KISTNER
CONSULTANTS



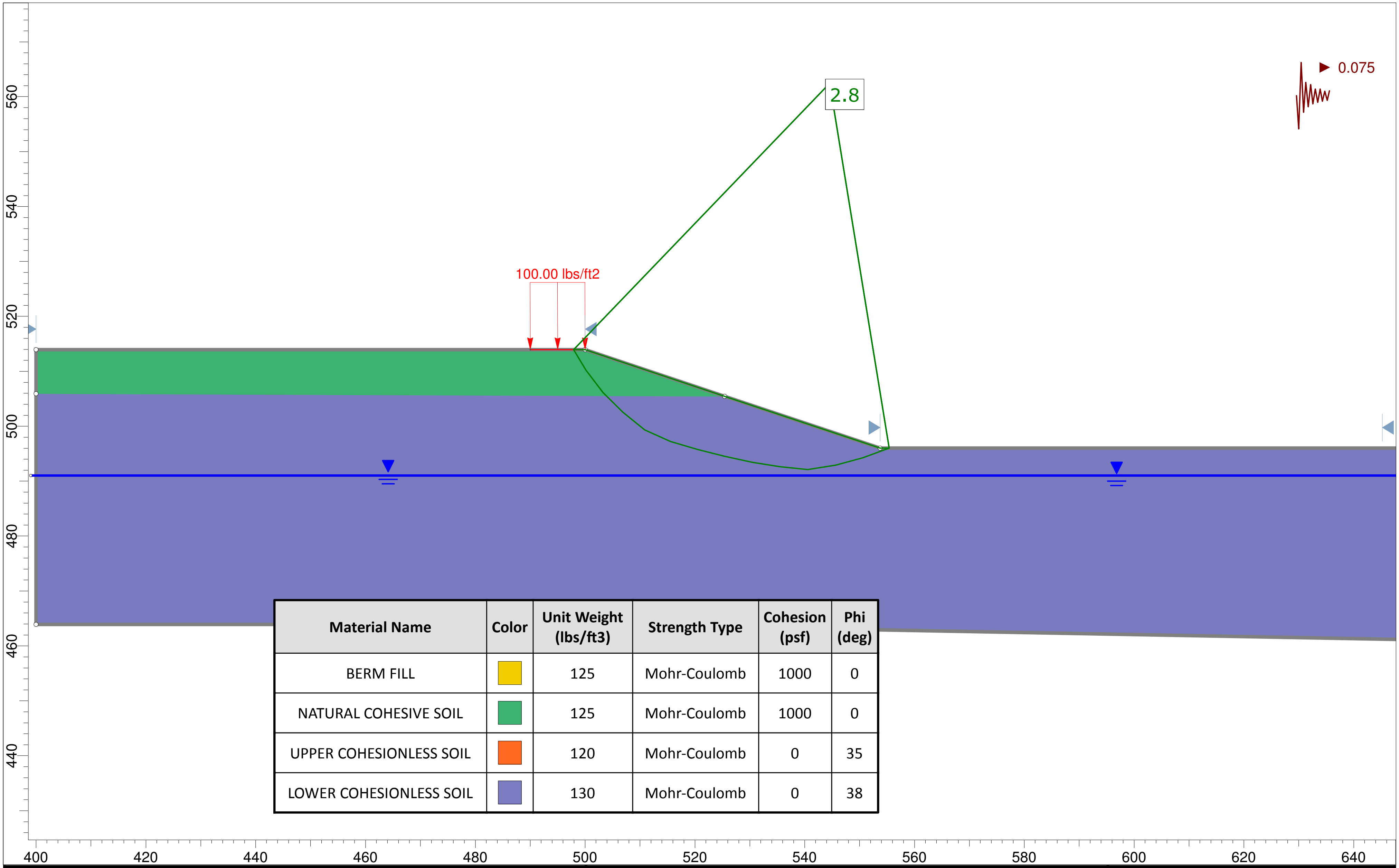
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	125	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA KISTNER CONSULTANTS



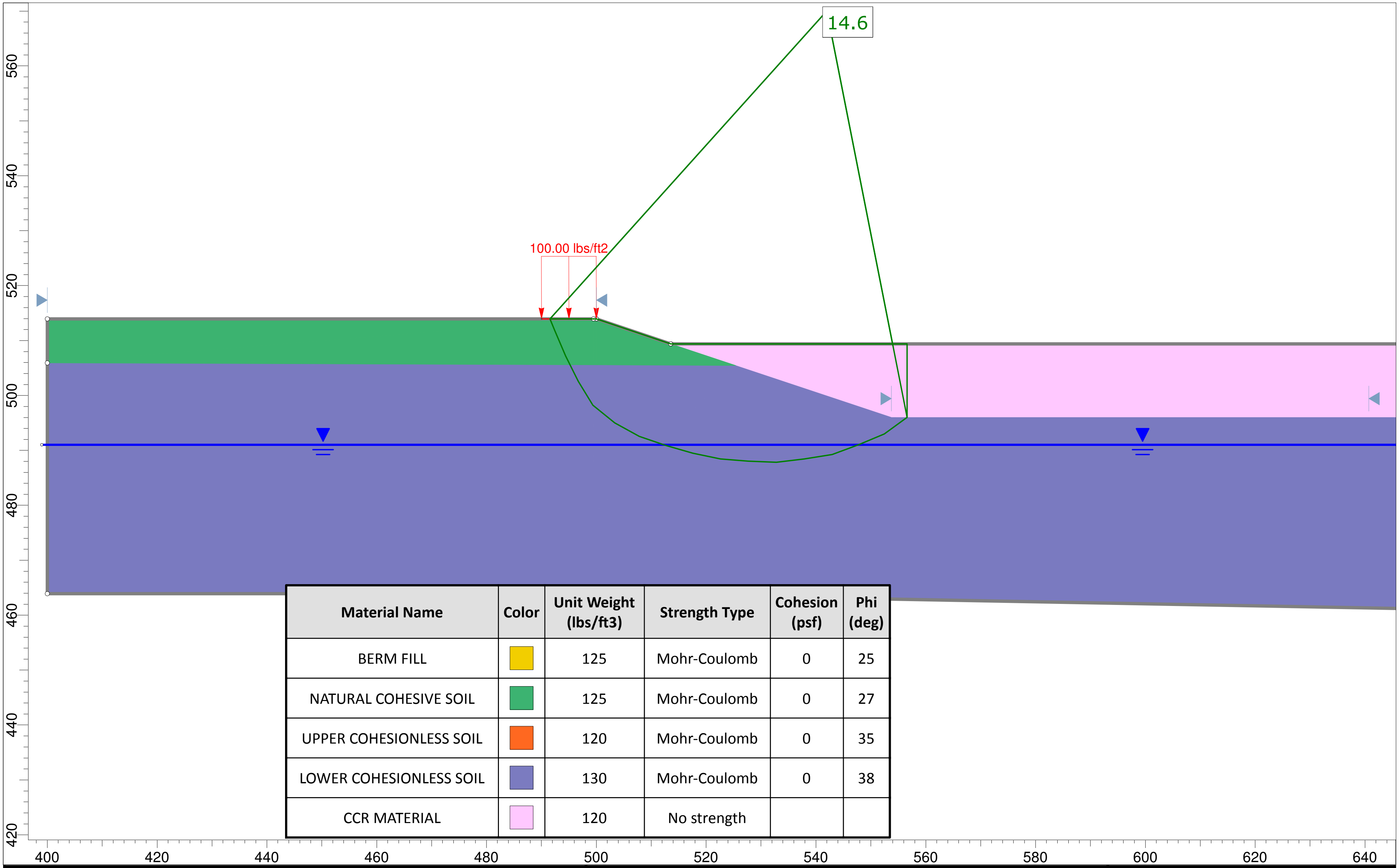
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	125	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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
SEISMIC CONDITION

FIGURE A-3

RABA KISTNER
CONSULTANTS



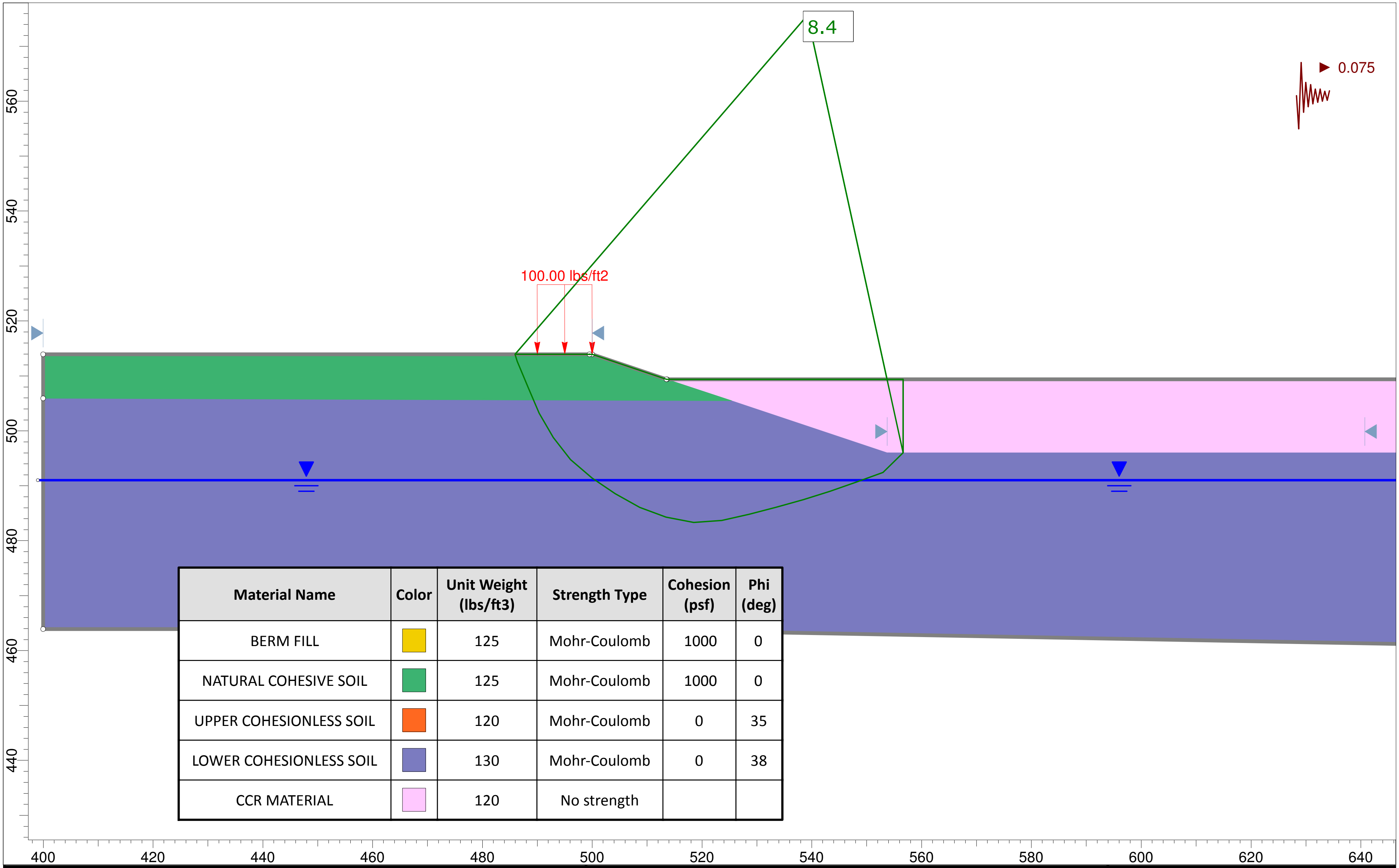
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	125	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟦	130	Mohr-Coulomb	0	38
CCR MATERIAL	🟪	120	No strength		

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

RABA
KISTNER
CONSULTANTS



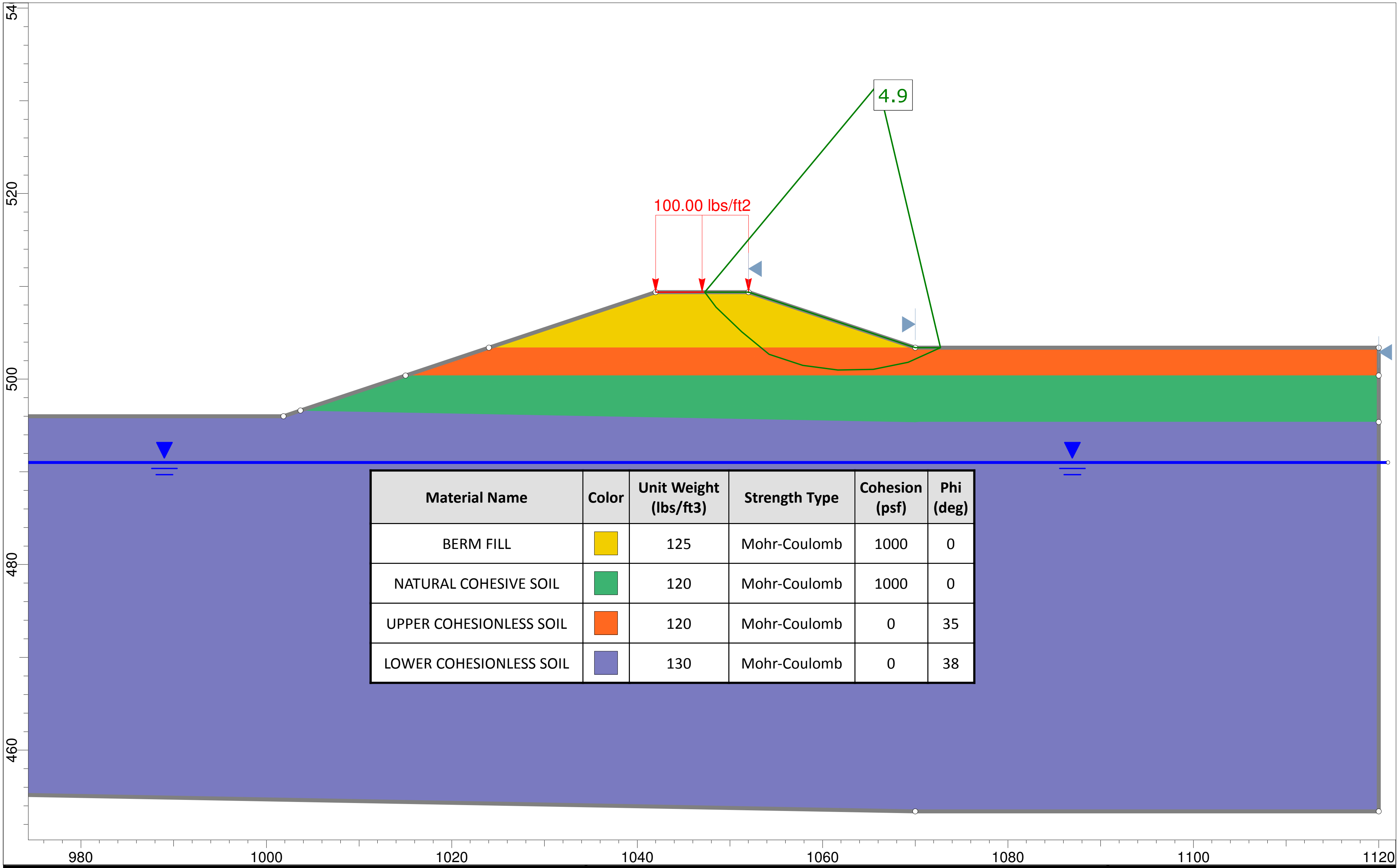
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	125	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟦	130	Mohr-Coulomb	0	38
CCR MATERIAL	🟪	120	No strength		

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

RABA KISTNER CONSULTANTS



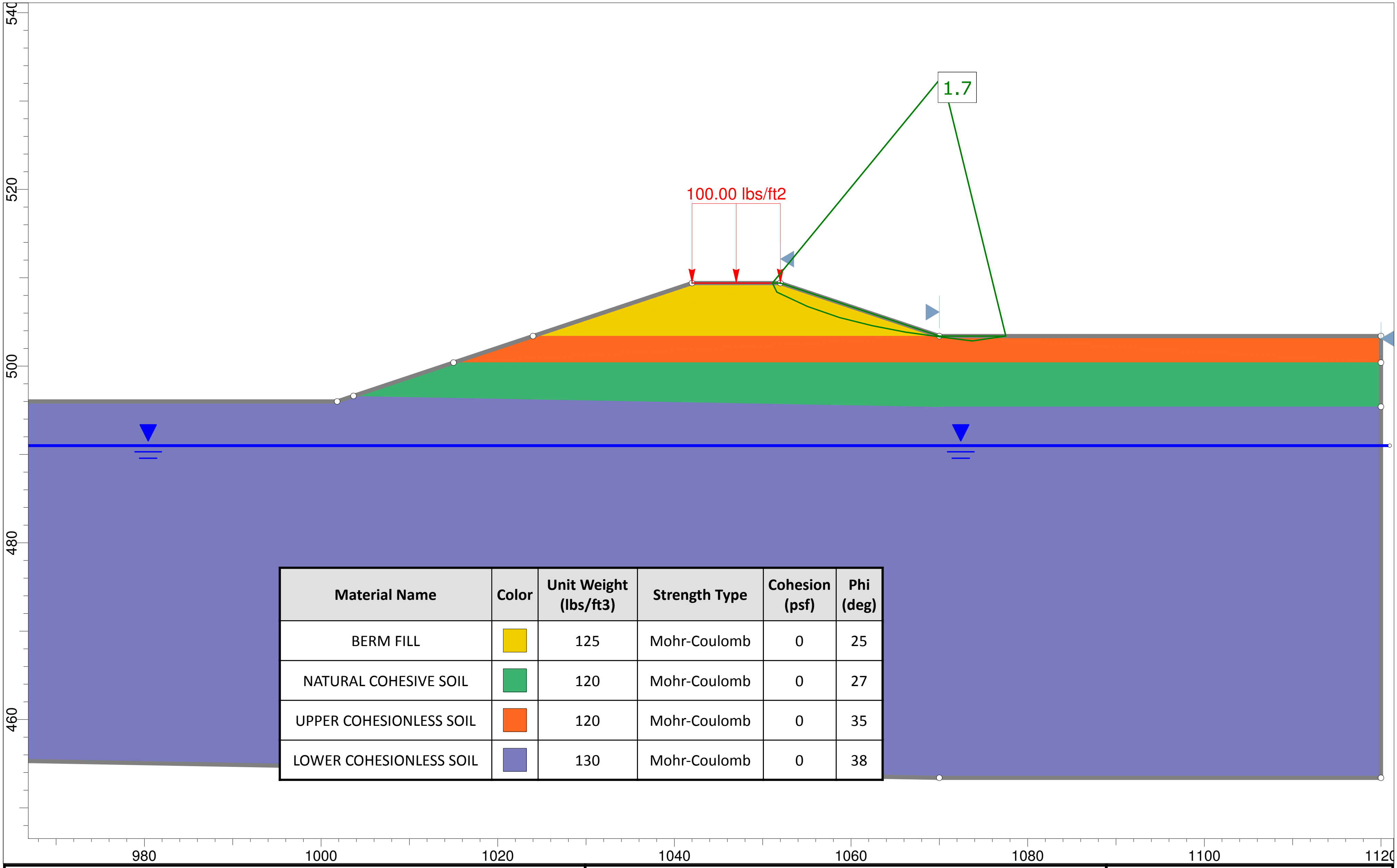
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA KISTNER CONSULTANTS



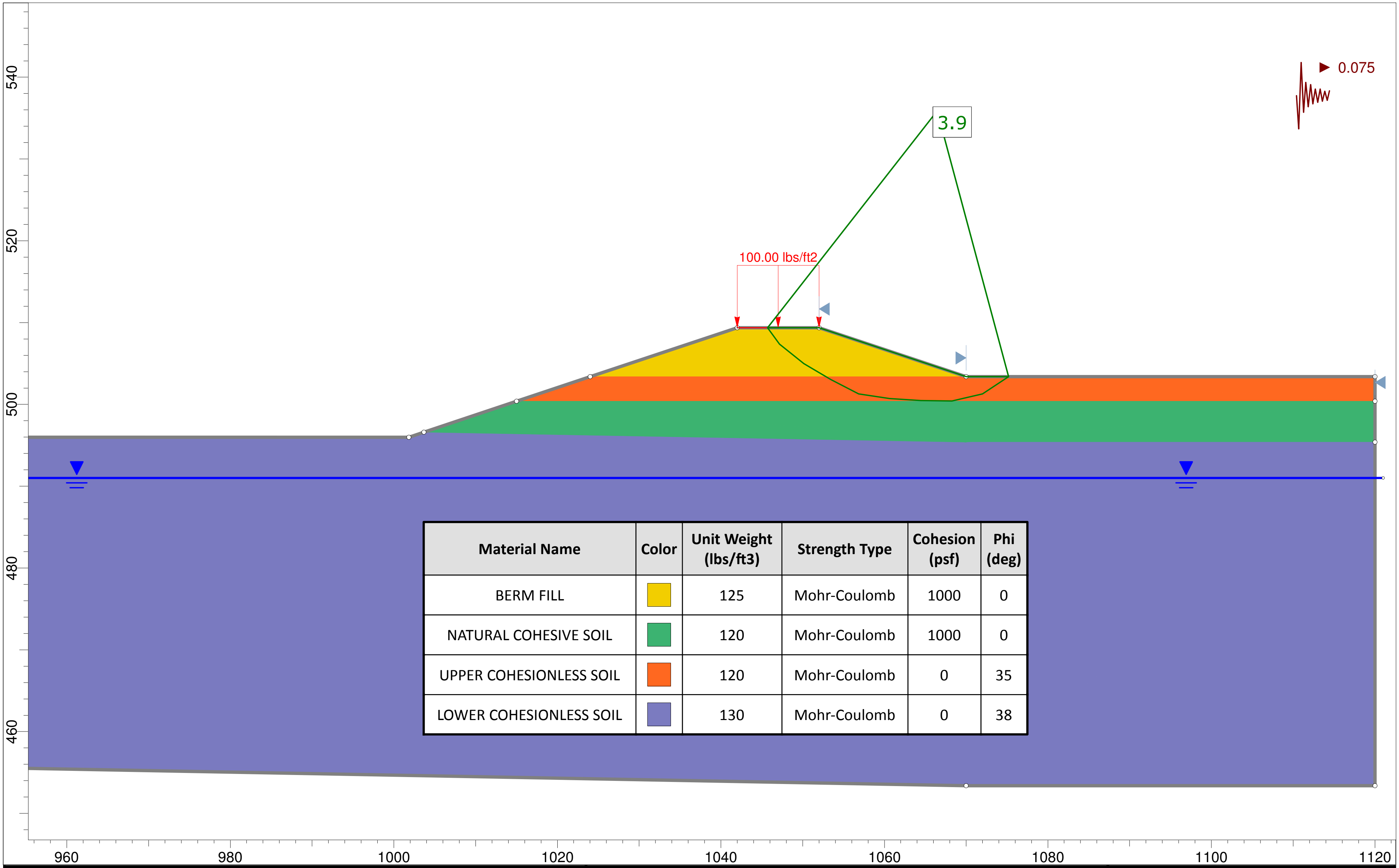
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA KISTNER
CONSULTANTS



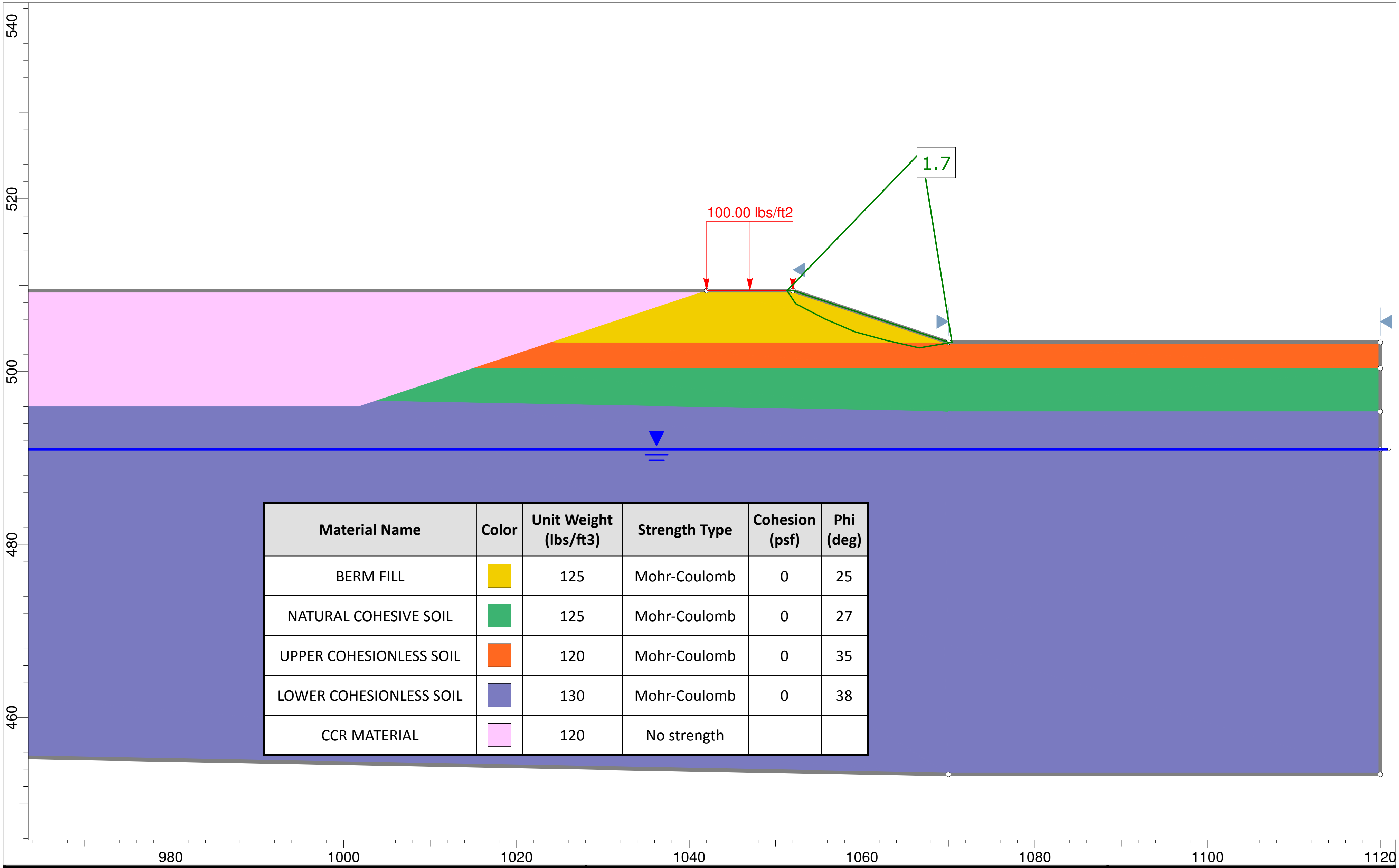
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA KISTNER CONSULTANTS



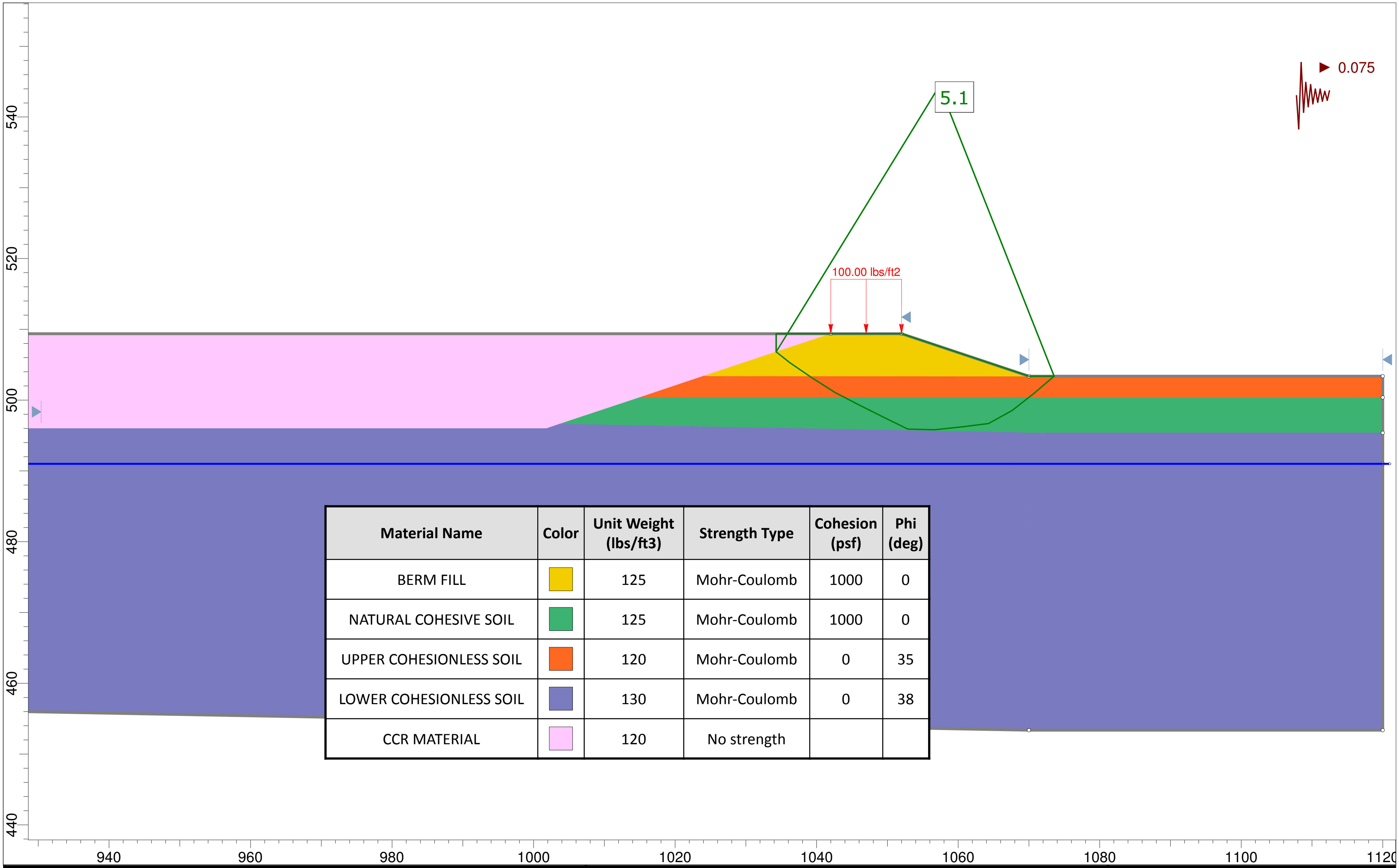
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	125	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38
CCR MATERIAL	▢	120	No strength		

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

RABA KISTNER CONSULTANTS



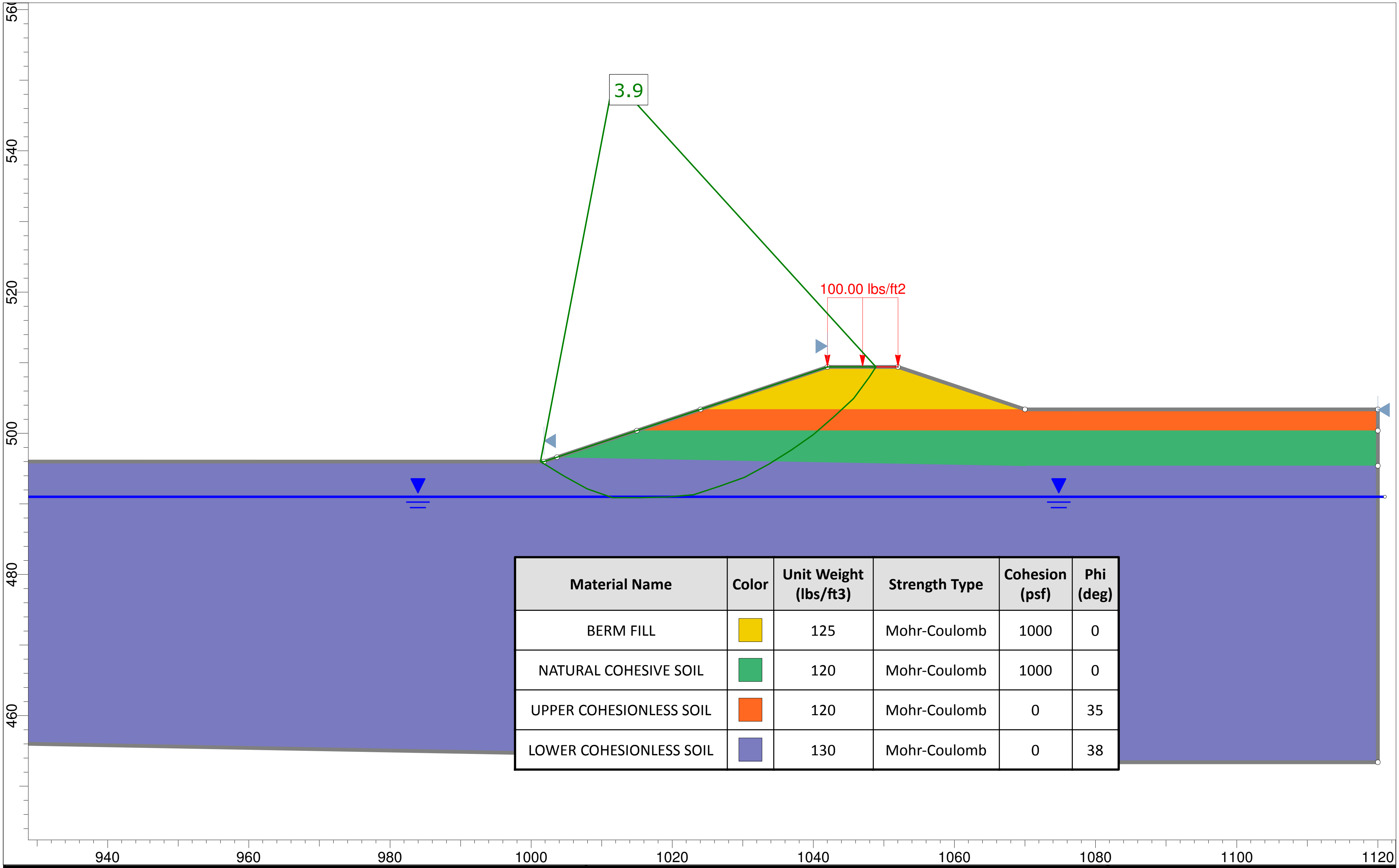
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	125	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟦	130	Mohr-Coulomb	0	38
CCR MATERIAL	🟪	120	No strength		

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

RABA KISTNER
CONSULTANTS



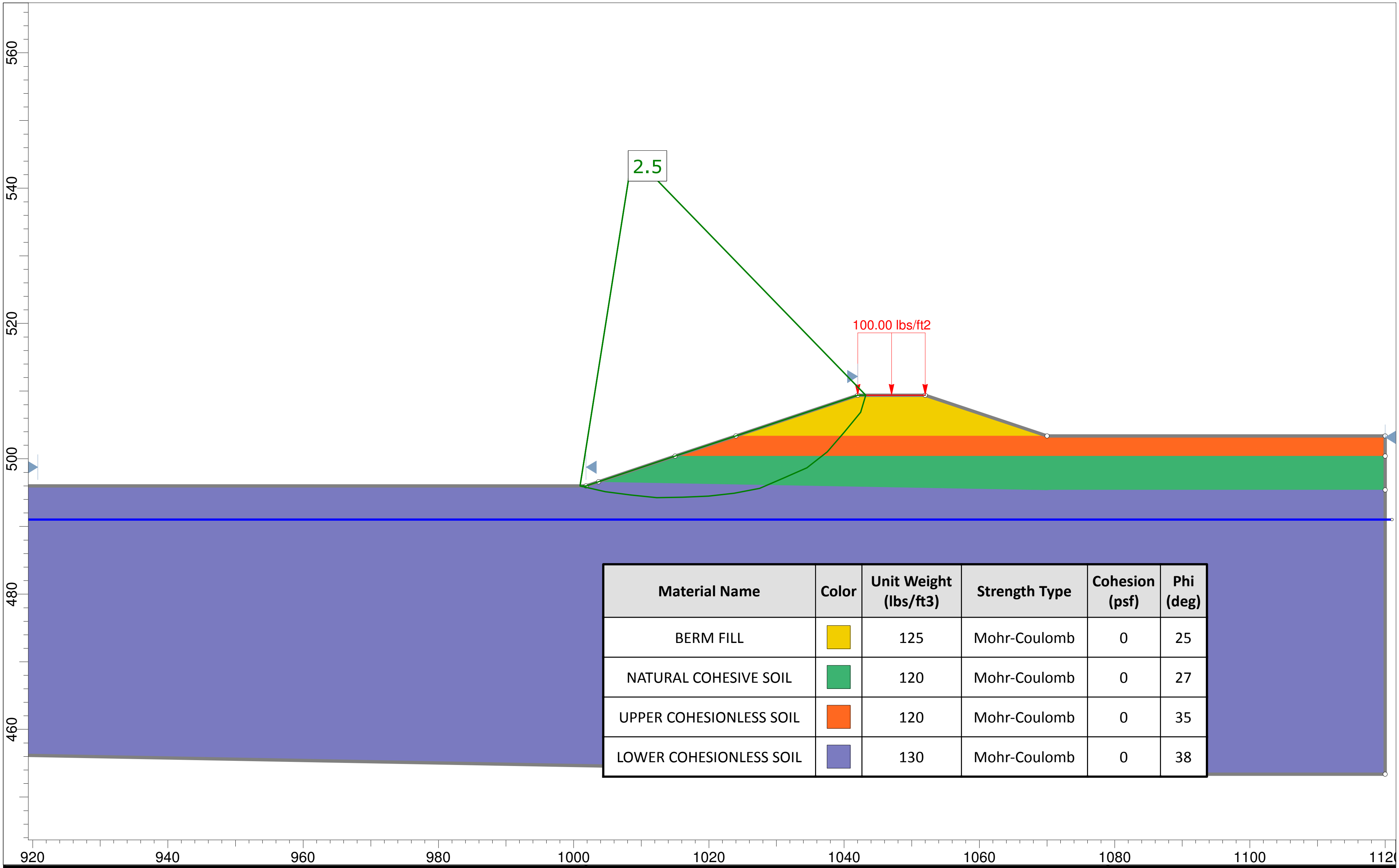
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA KISTNER CONSULTANTS



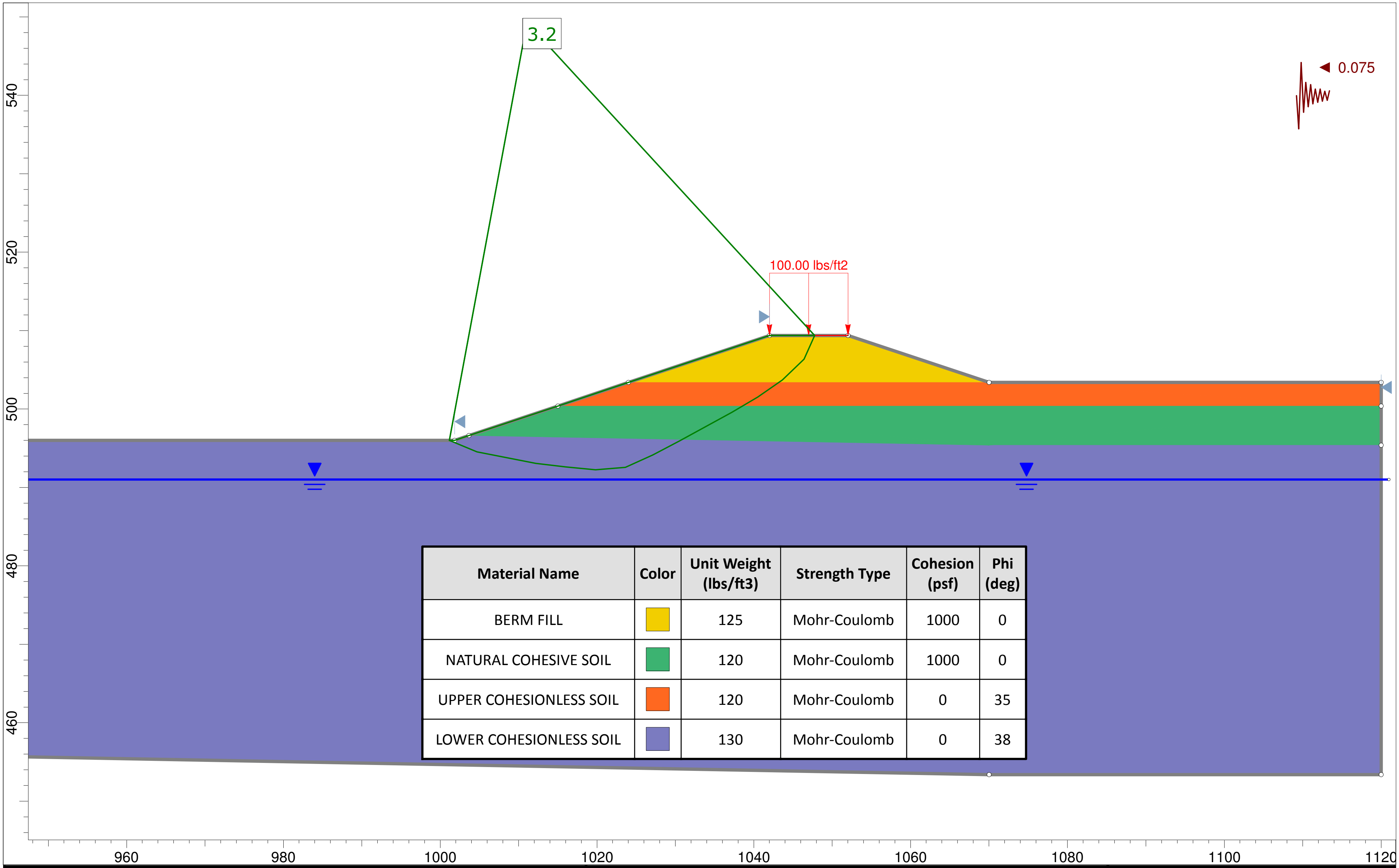
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA
KISTNER
CONSULTANTS



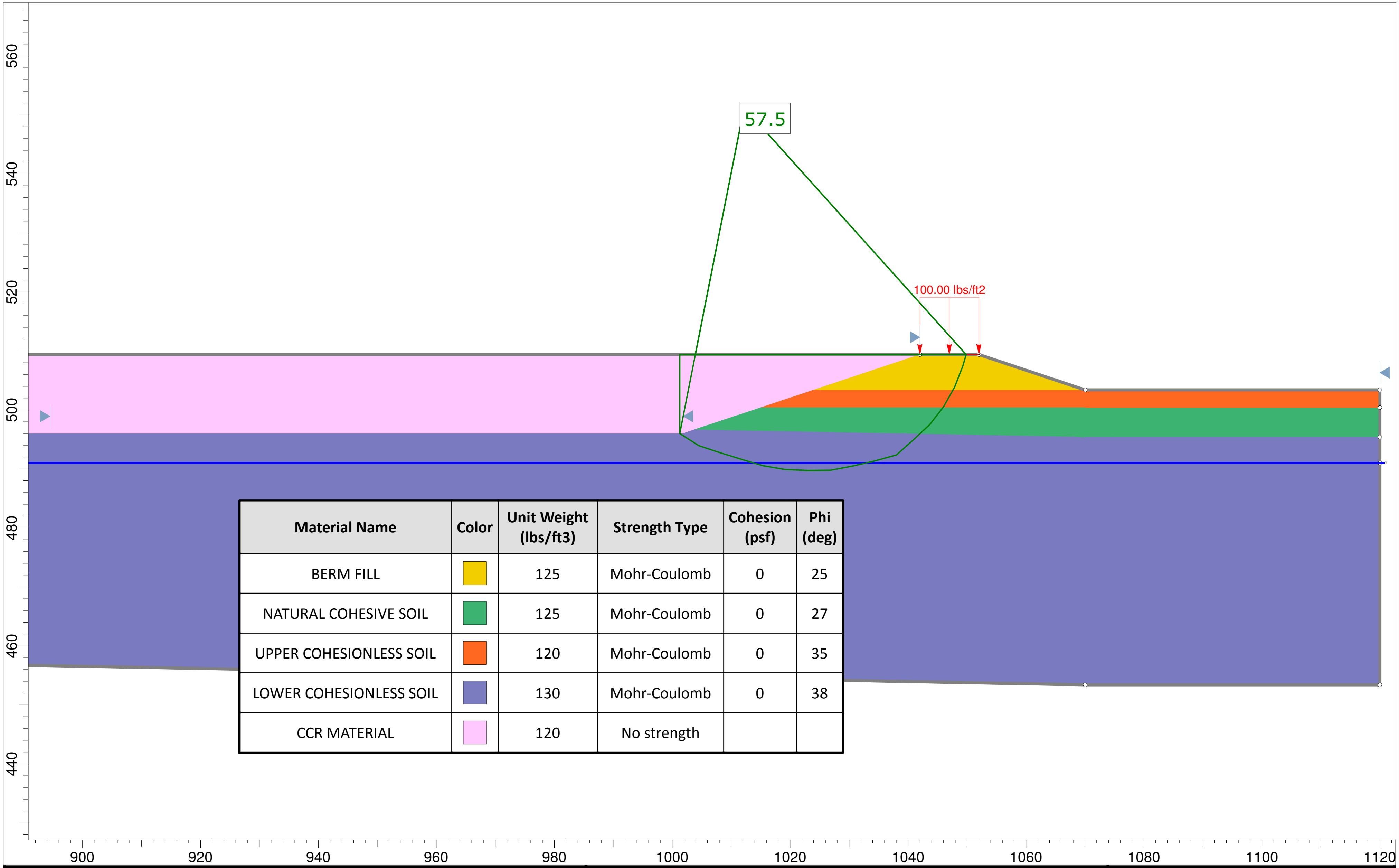
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA KISTNER
CONSULTANTS



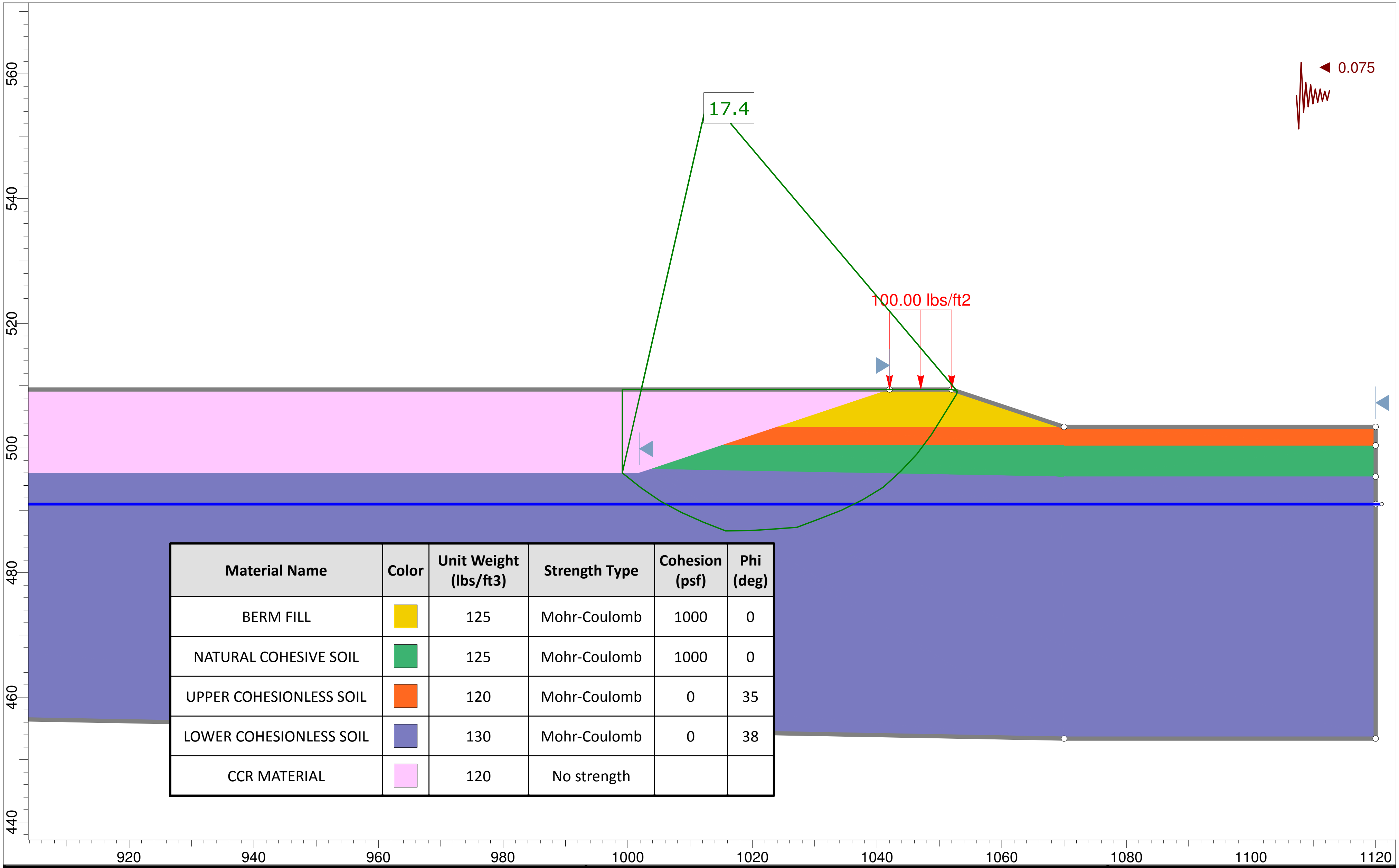
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	125	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟦	130	Mohr-Coulomb	0	38
CCR MATERIAL	🟪	120	No strength		

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

RABA
KISTNER
CONSULTANTS



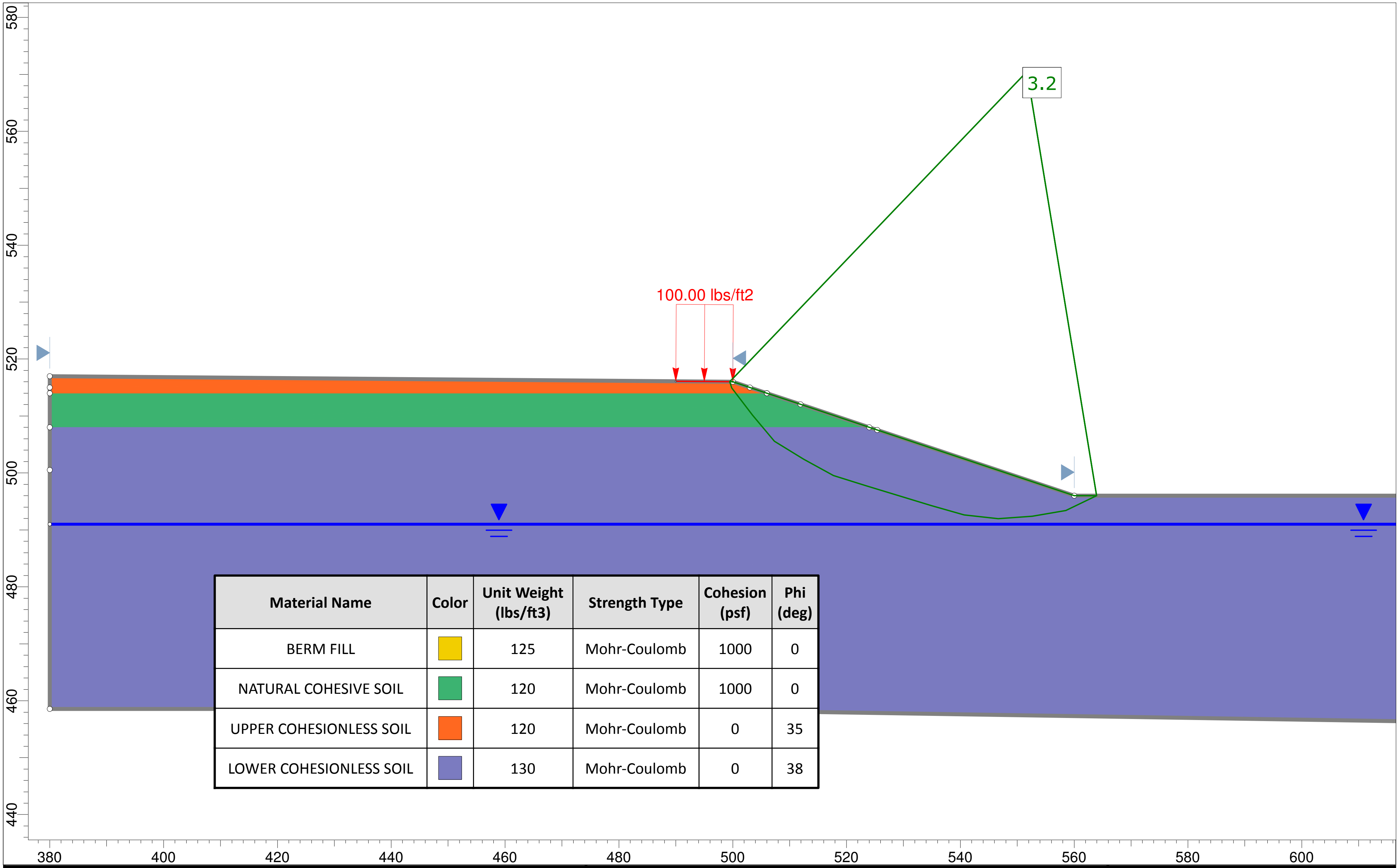
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	125	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38
CCR MATERIAL	⬜	120	No strength		

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

RABA KISTNER
CONSULTANTS



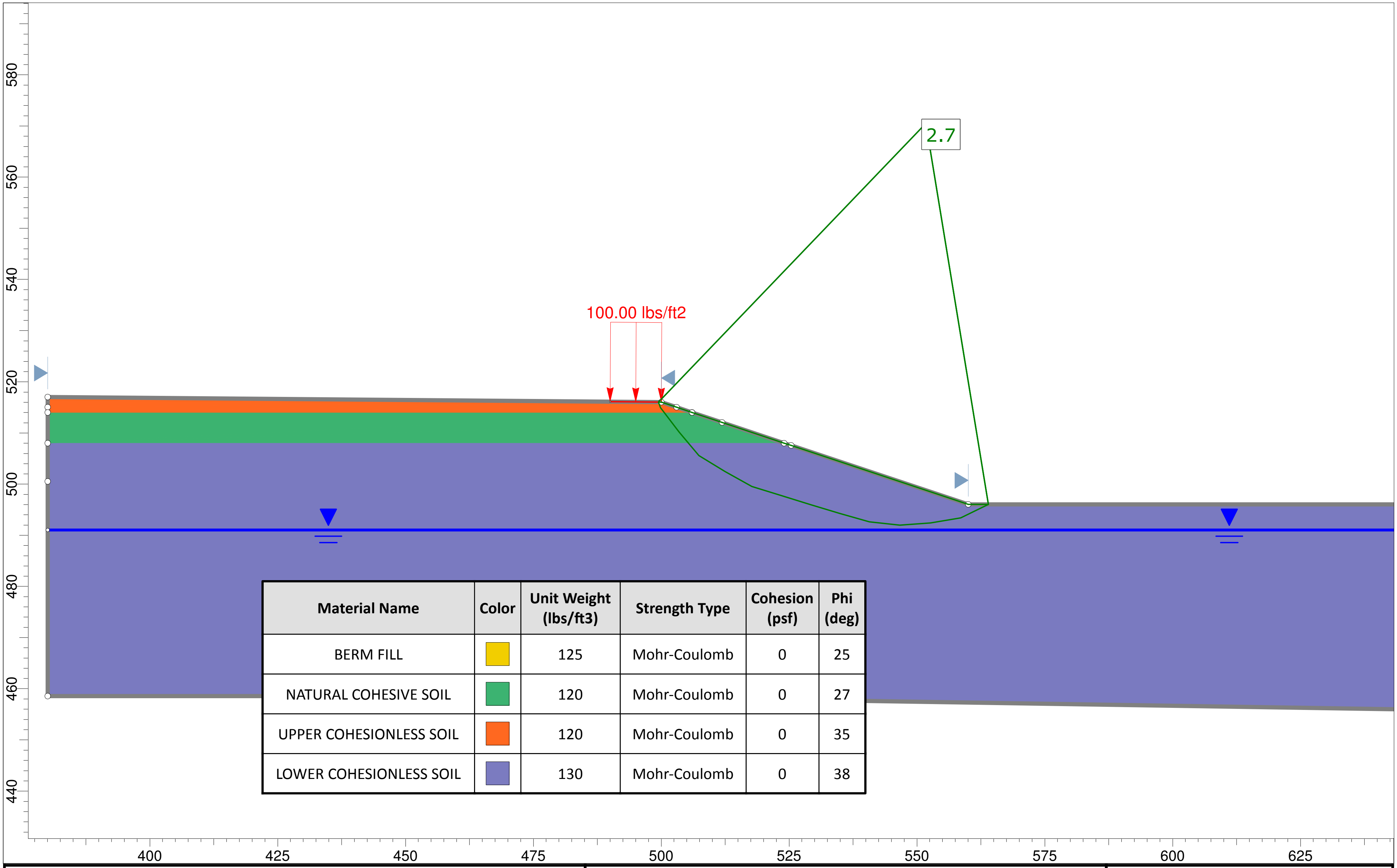
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA KISTNER
CONSULTANTS



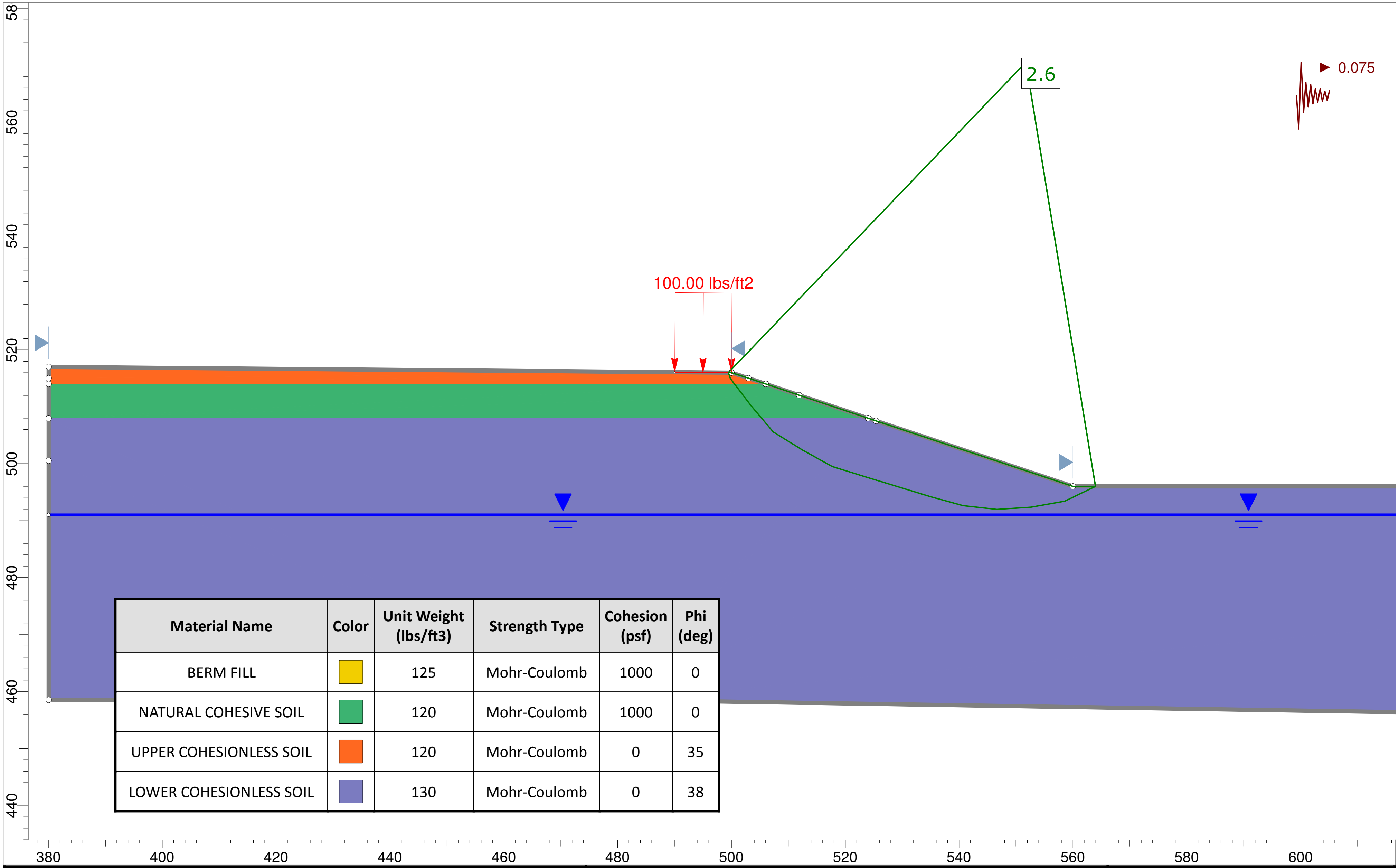
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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-2

RABA KISTNER
CONSULTANTS



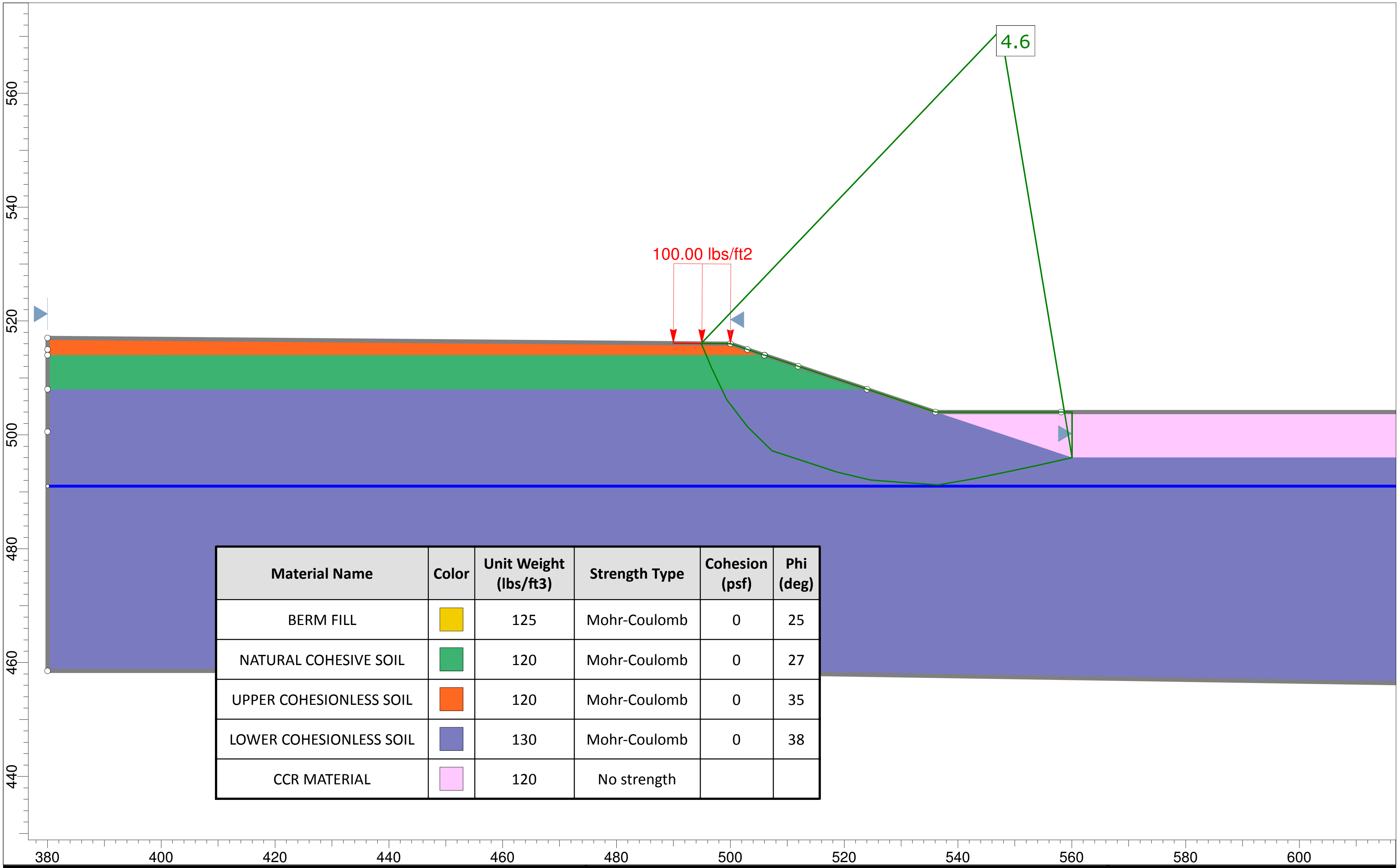
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA
KISTNER
CONSULTANTS



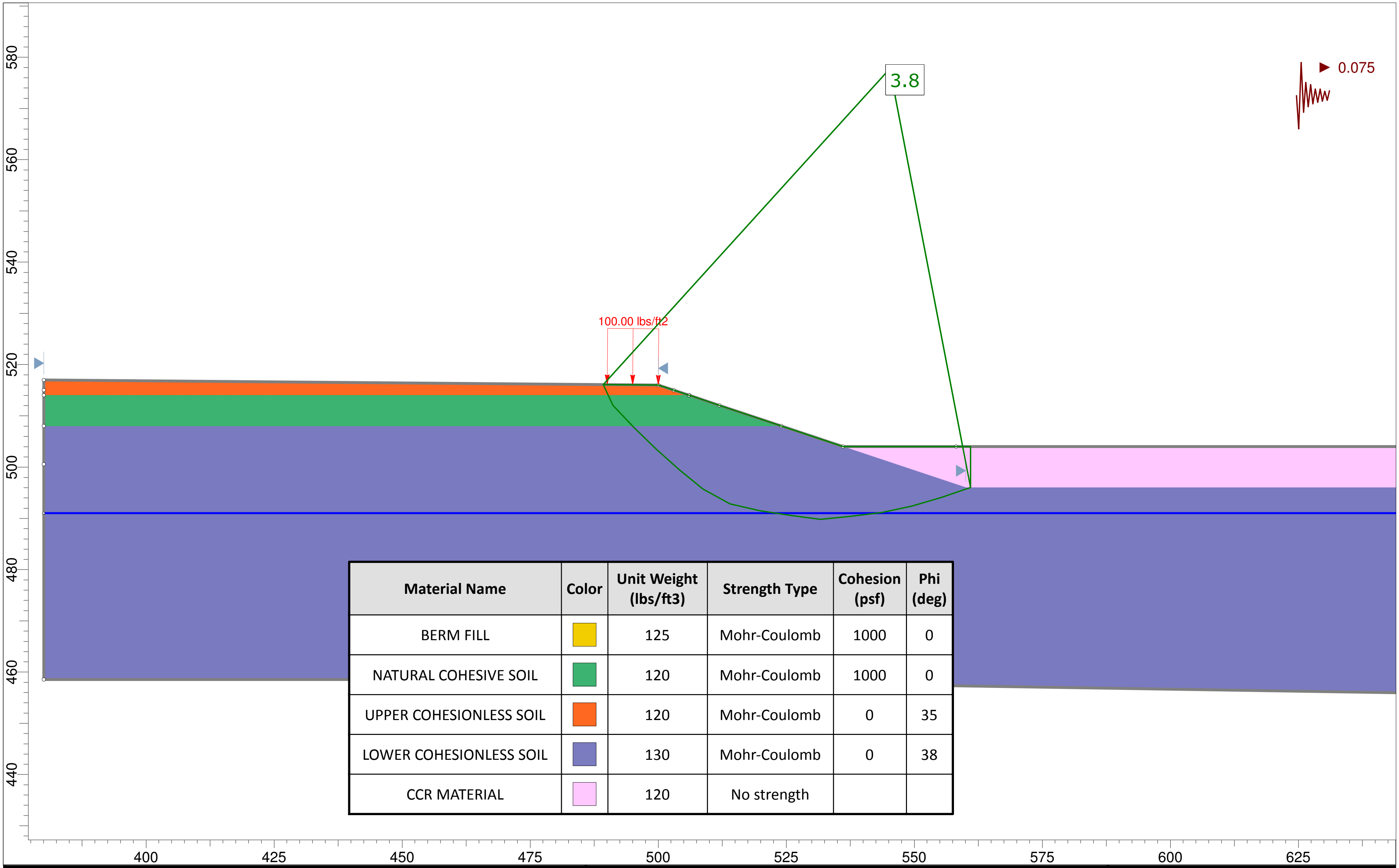
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38
CCR MATERIAL	⬜	120	No strength		

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

RABA KISTNER
CONSULTANTS



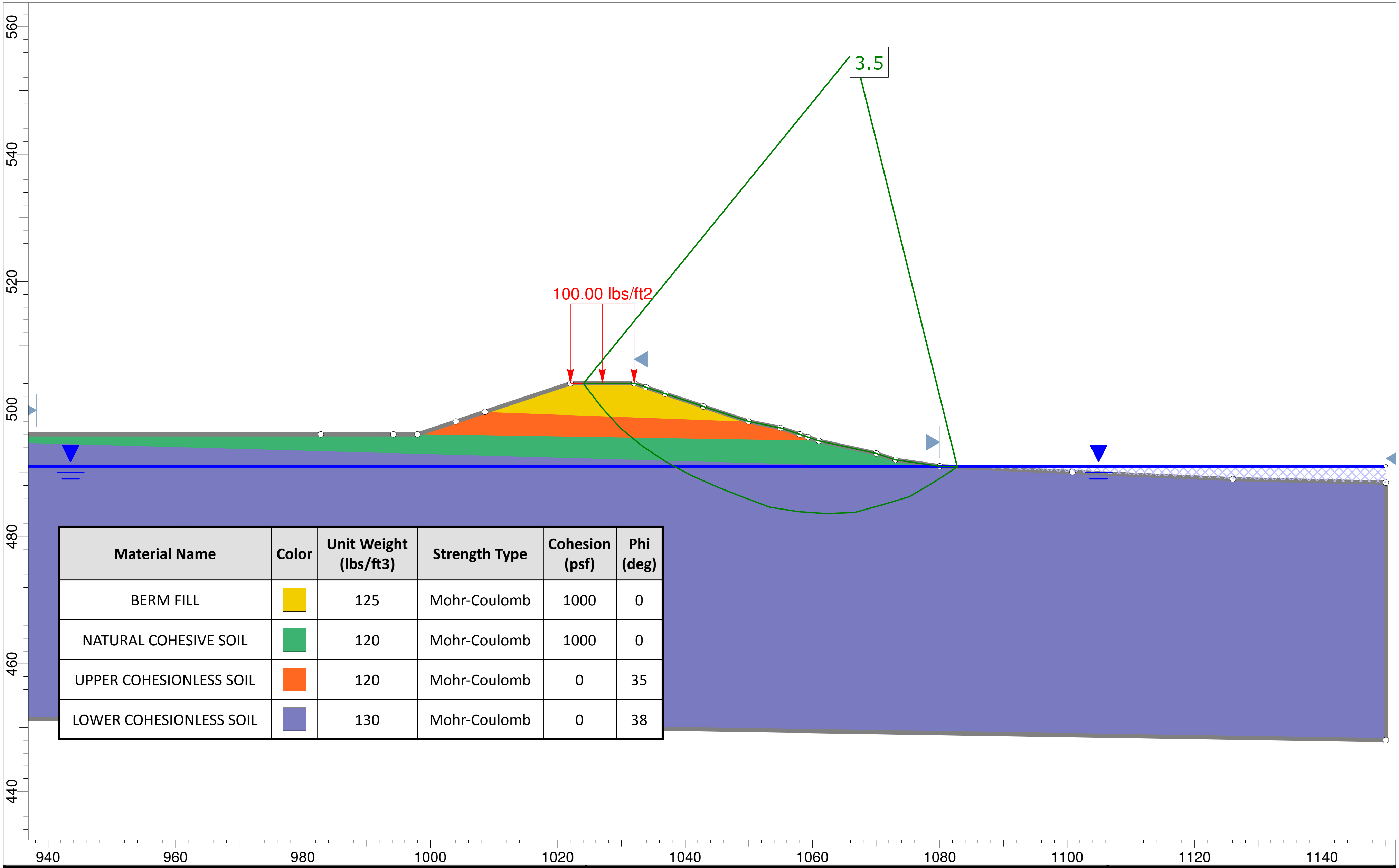
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟦	130	Mohr-Coulomb	0	38
CCR MATERIAL	🟪	120	No strength		

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

RABA KISTNER
CONSULTANTS



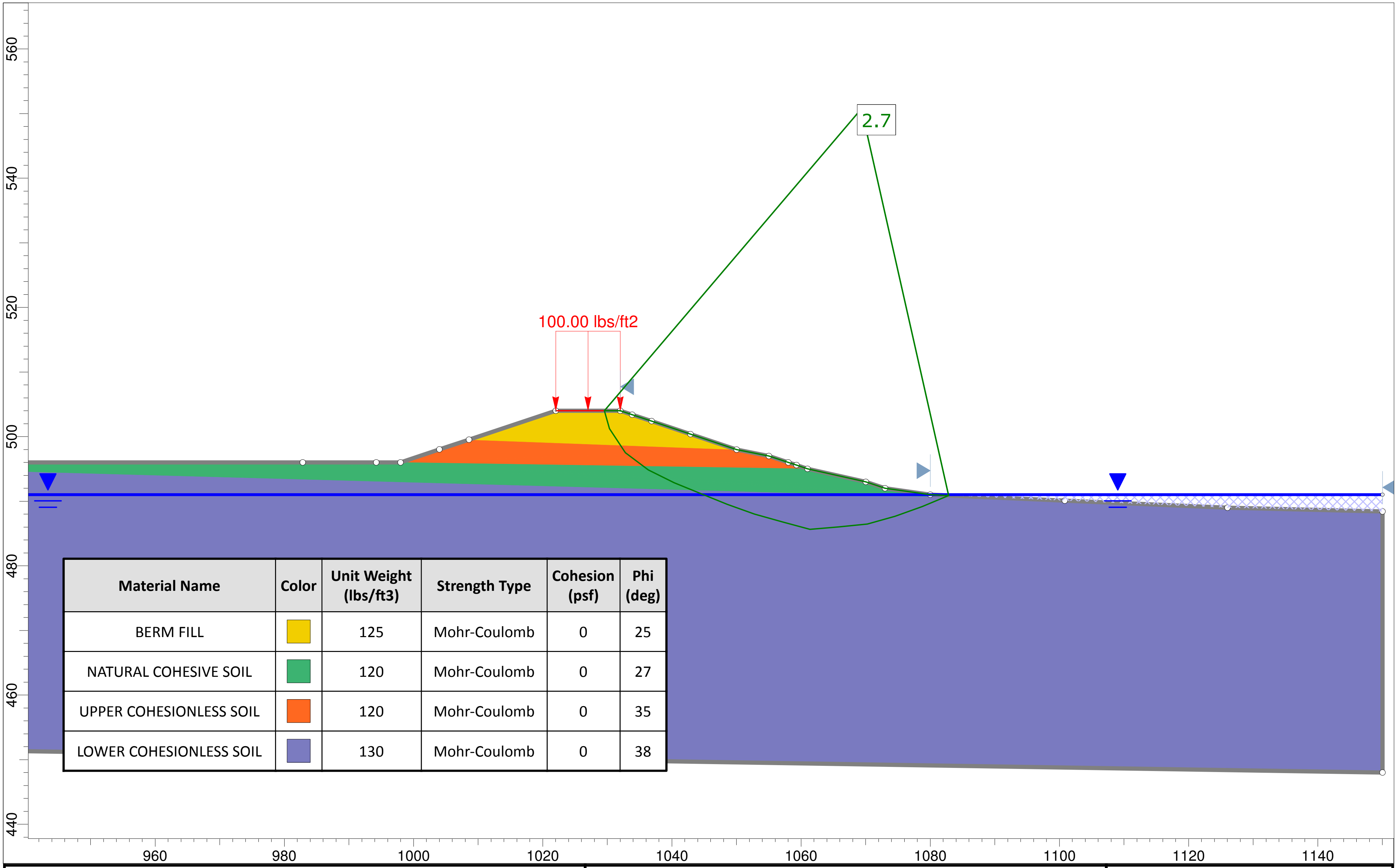
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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
SHORT TERM

FIGURE D-1

RABA
KISTNER
CONSULTANTS



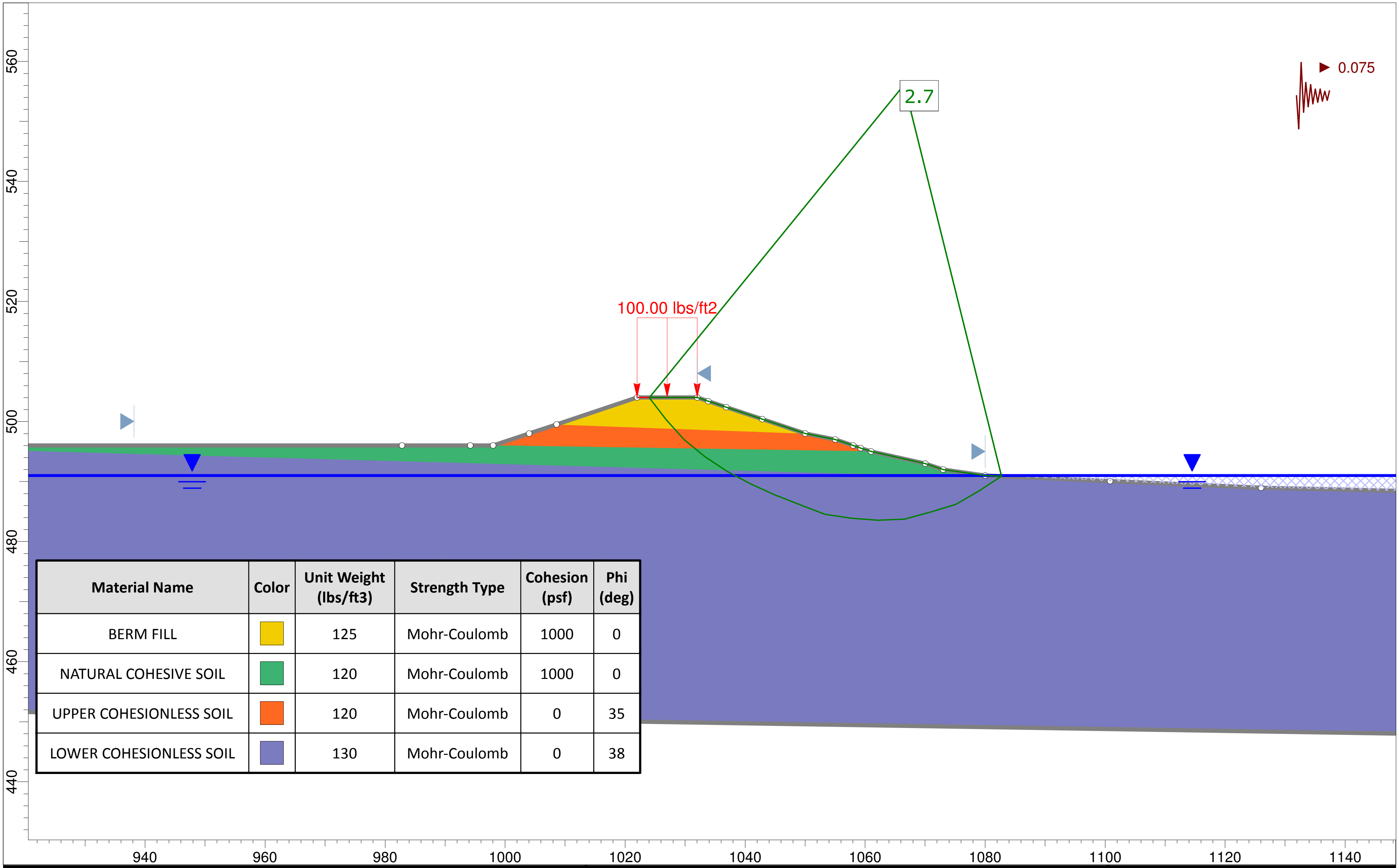
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA KISTNER CONSULTANTS



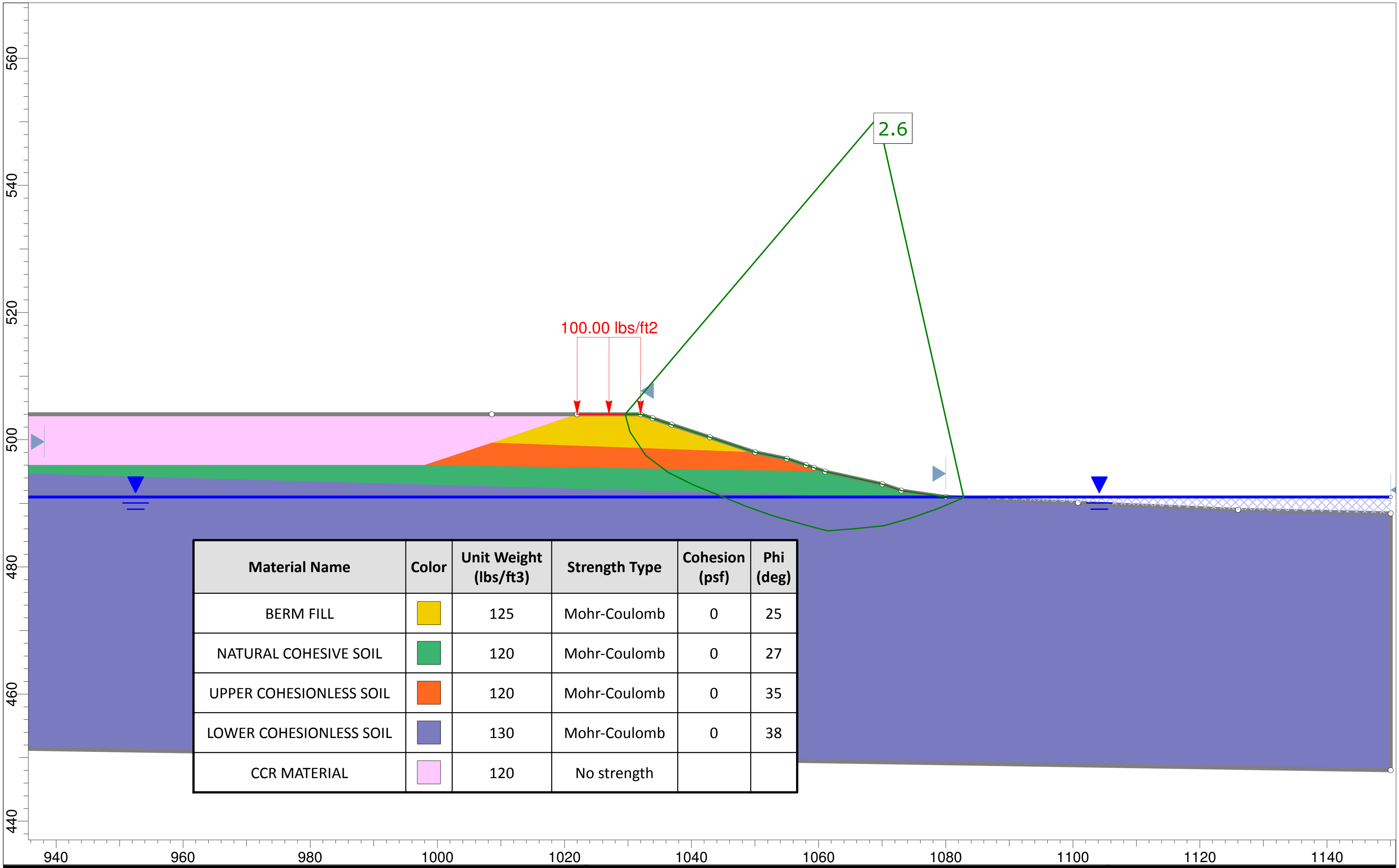
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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
SEISMIC CONDITION

FIGURE D-3

RABA KISTNER CONSULTANTS



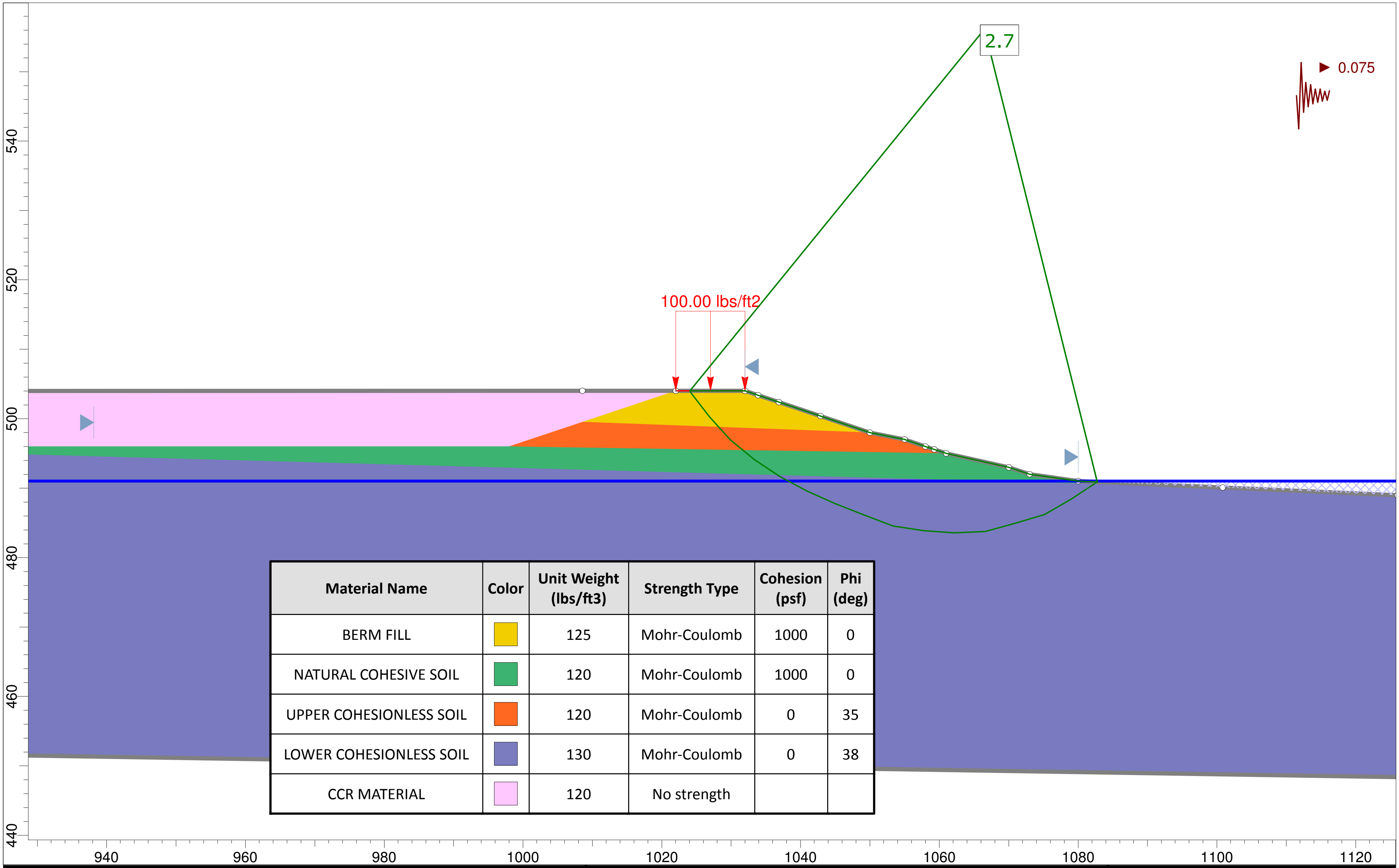
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38
CCR MATERIAL	⬜	120	No strength		

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

RABA KISTNER
CONSULTANTS



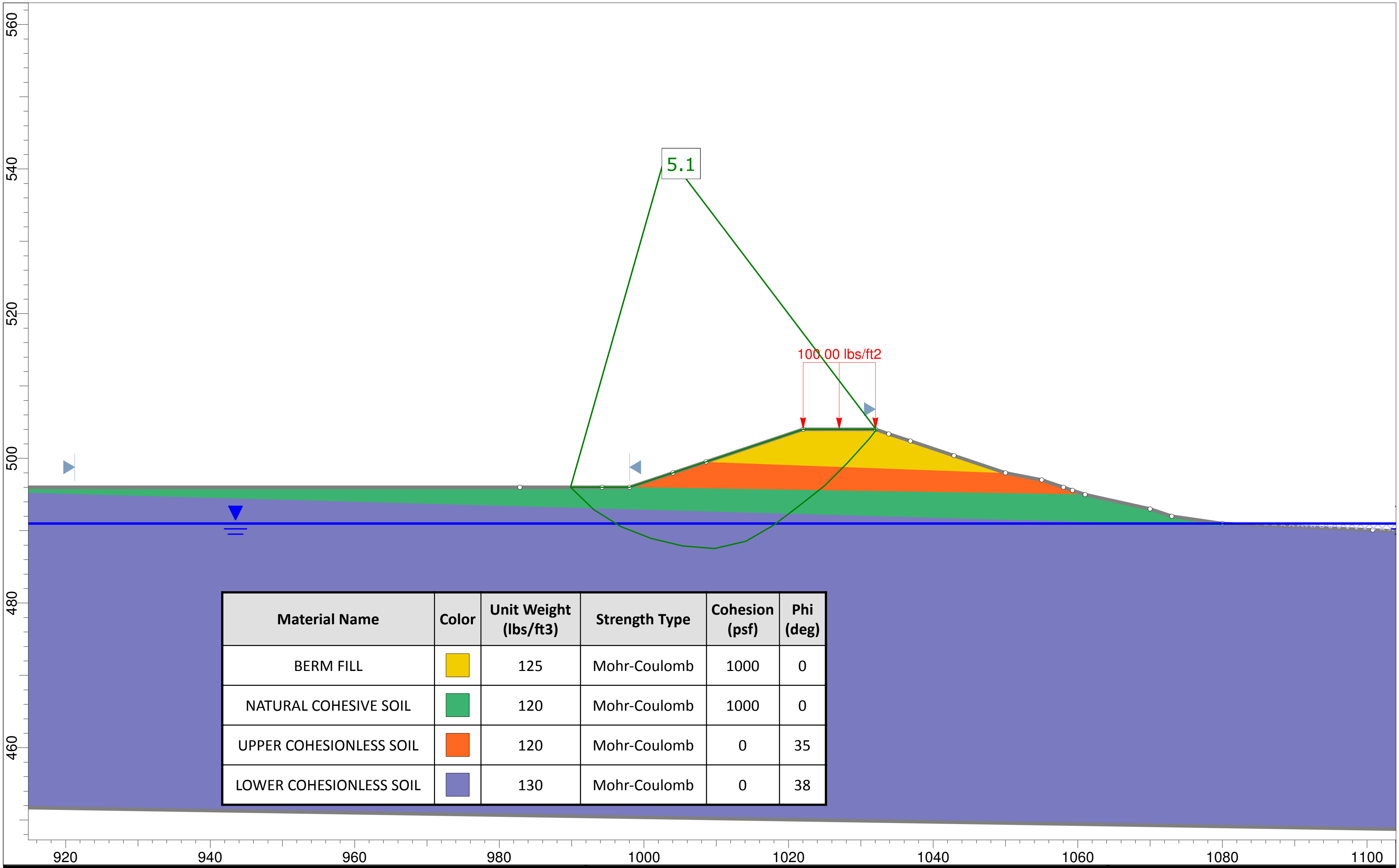
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟦	130	Mohr-Coulomb	0	38
CCR MATERIAL	🟪	120	No strength		

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
SEISMIC CONDITION

FIGURE D-5

RABA KISTNER CONSULTANTS



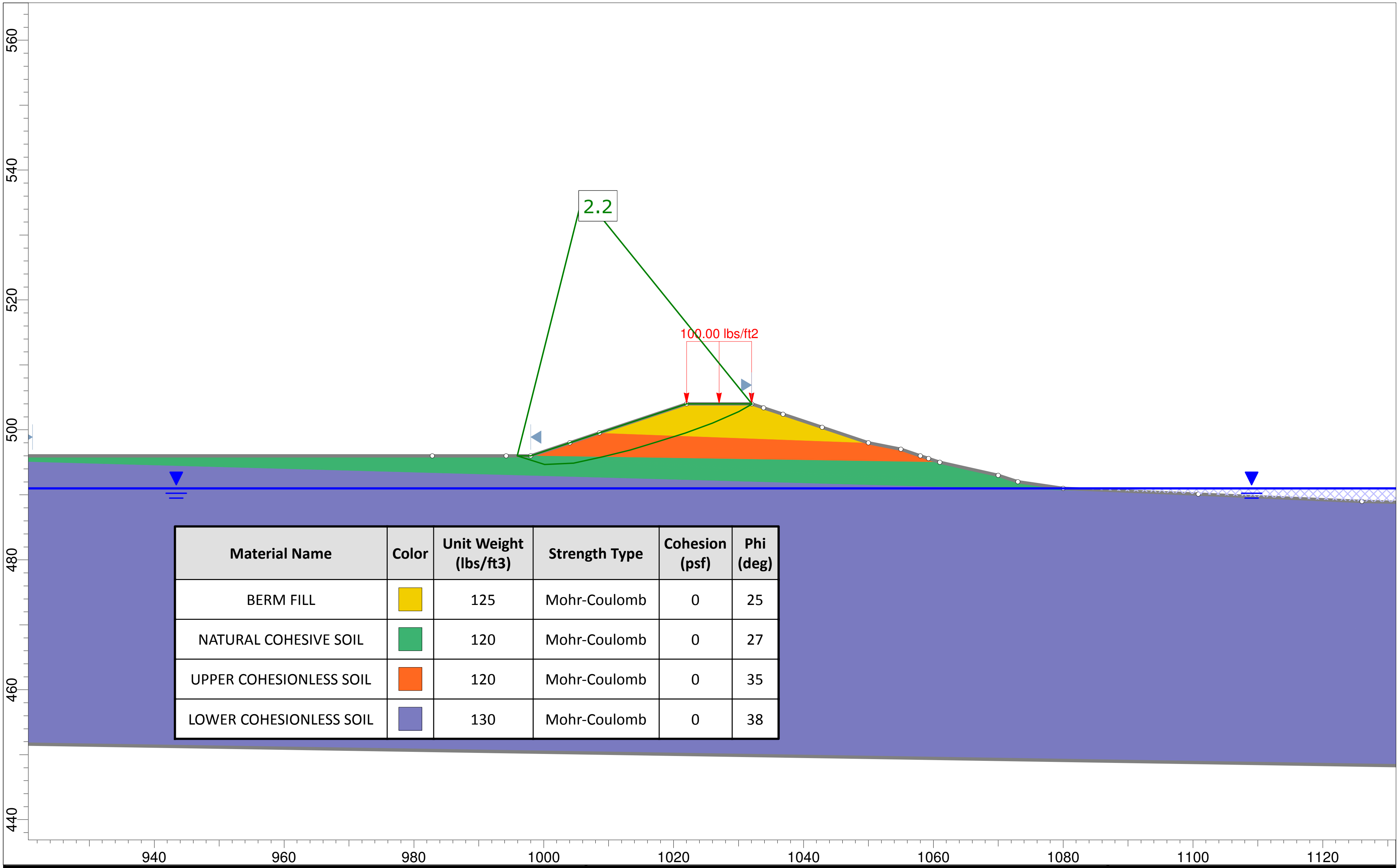
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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

RABA KISTNER CONSULTANTS



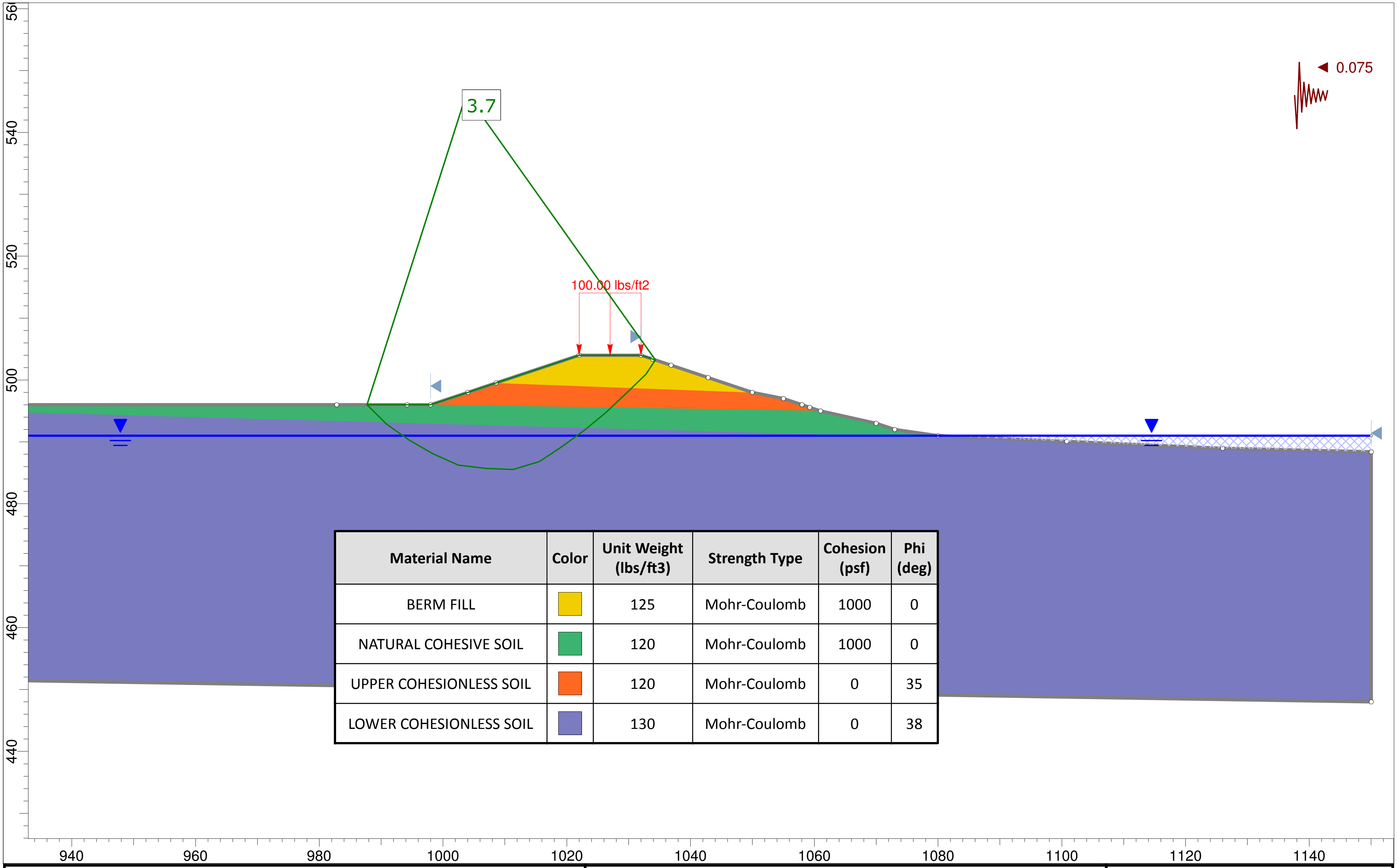
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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-7

RABA KISTNER
CONSULTANTS



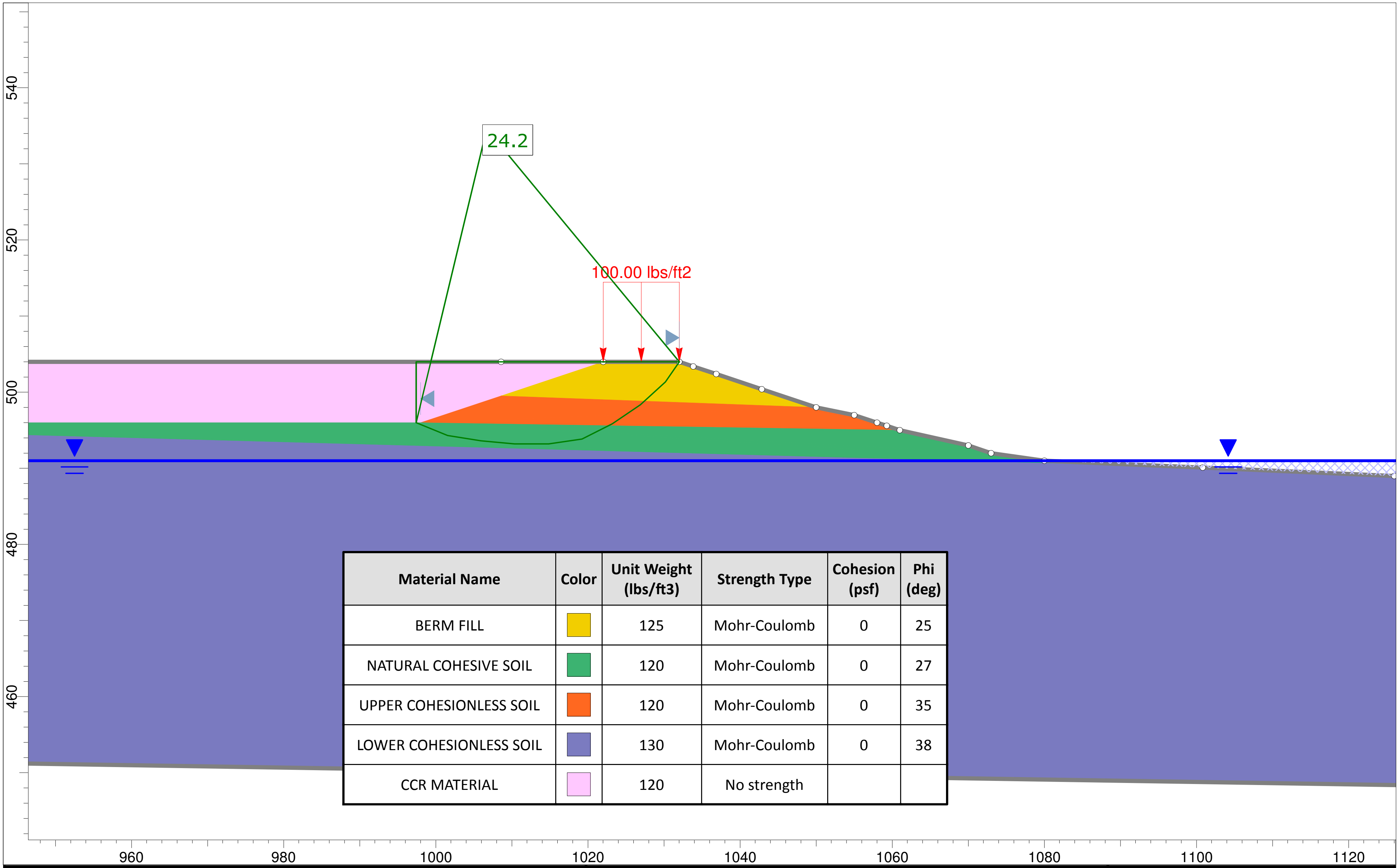
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟪	130	Mohr-Coulomb	0	38

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
SEISMIC CONDITION

FIGURE D-8

RABA KISTNER
CONSULTANTS



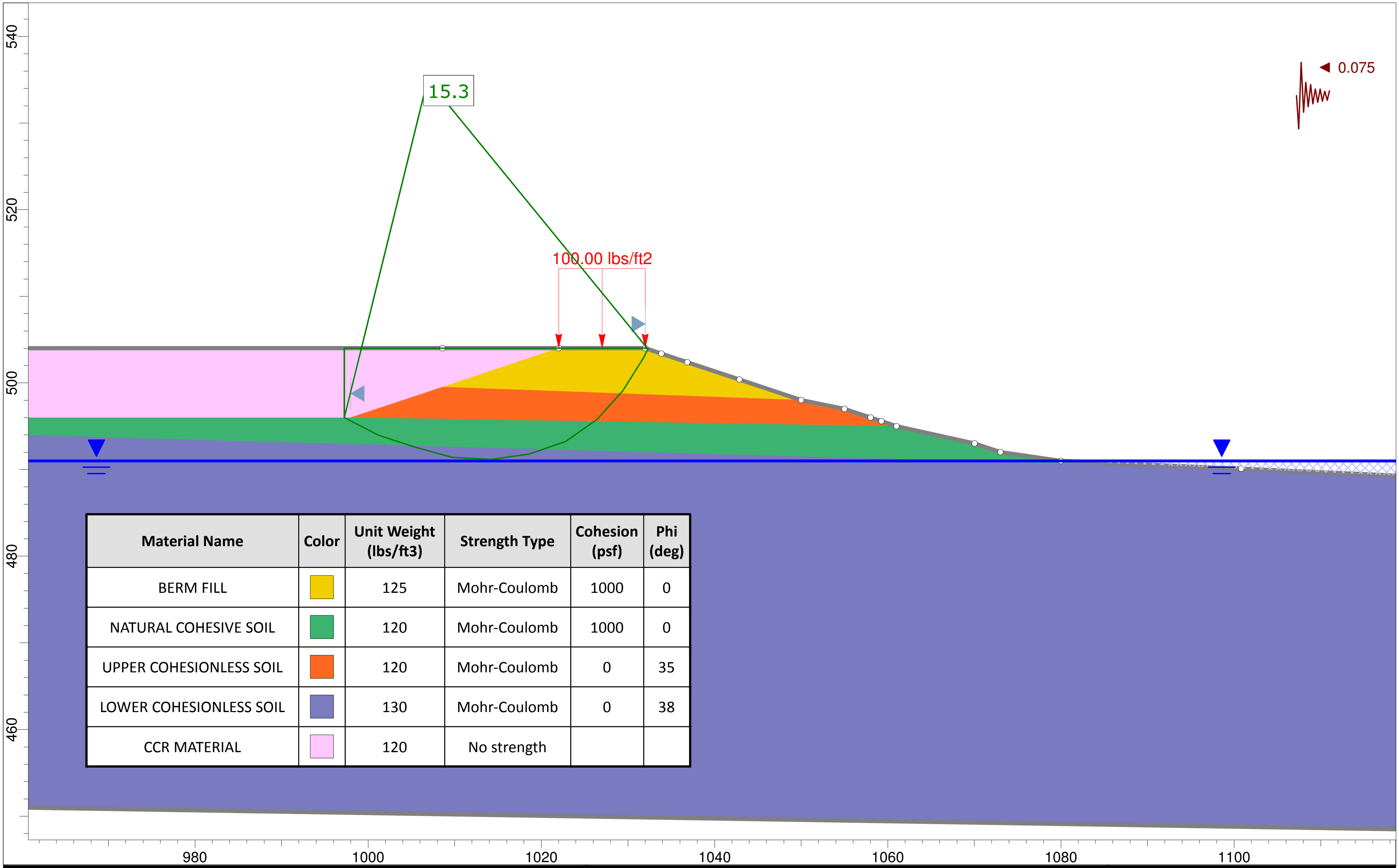
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	0	25
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	0	27
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟦	130	Mohr-Coulomb	0	38
CCR MATERIAL	🟪	120	No strength		

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

RABA KISTNER
CONSULTANTS



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
BERM FILL	🟨	125	Mohr-Coulomb	1000	0
NATURAL COHESIVE SOIL	🟩	120	Mohr-Coulomb	1000	0
UPPER COHESIONLESS SOIL	🟧	120	Mohr-Coulomb	0	35
LOWER COHESIONLESS SOIL	🟦	130	Mohr-Coulomb	0	38
CCR MATERIAL	🟪	120	No strength		

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
SEISMIC CONDITION

FIGURE D-10

RABA KISTNER
CONSULTANTS

Attachment 13-4

RABA KISTNER

GEOTECHNICAL ENGINEERING STUDY

FOR

CALAVERAS GEOTECHNICAL SURVEY
J.K. SPRUCE POWER PLANT
SAN ANTONIO, TEXAS

RABA KISTNER

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

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

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.

R. BLAKE WRIGHT
117753

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

RABAKISTNER

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

ATTACHMENTS

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 stratums 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, RKI 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

		Parameters		
Improvement	**Associated Borings**	**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*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 stratums. 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 a 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 the 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 Heavy Duty	 85,000[(1)] 292,400[(2)]	 77,500[(3)] 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 recompacting 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.

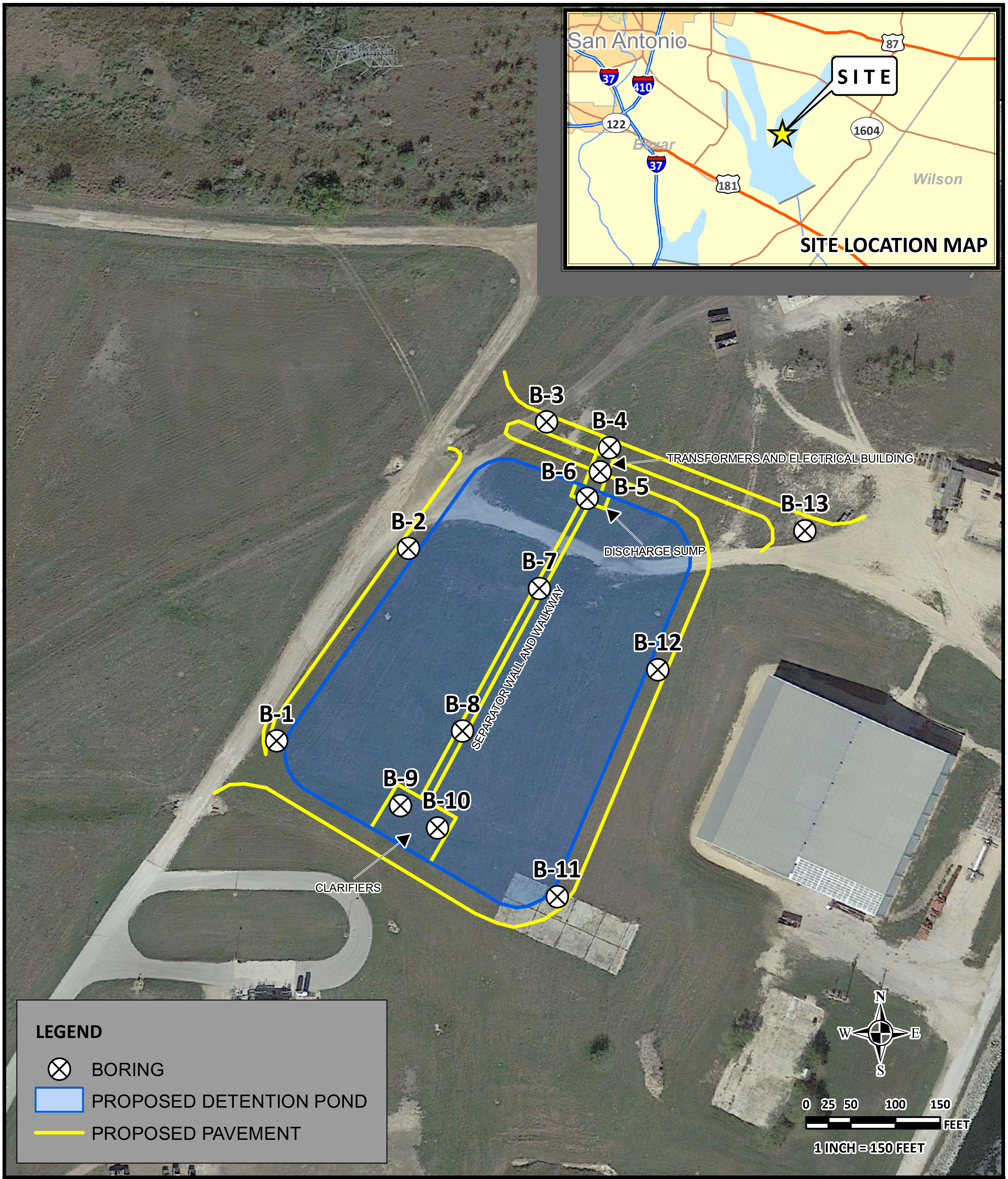
BUDGETING FOR CONSTRUCTION TESTING

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



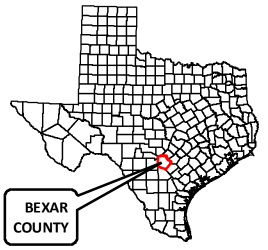
RABA KISTNER

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

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

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

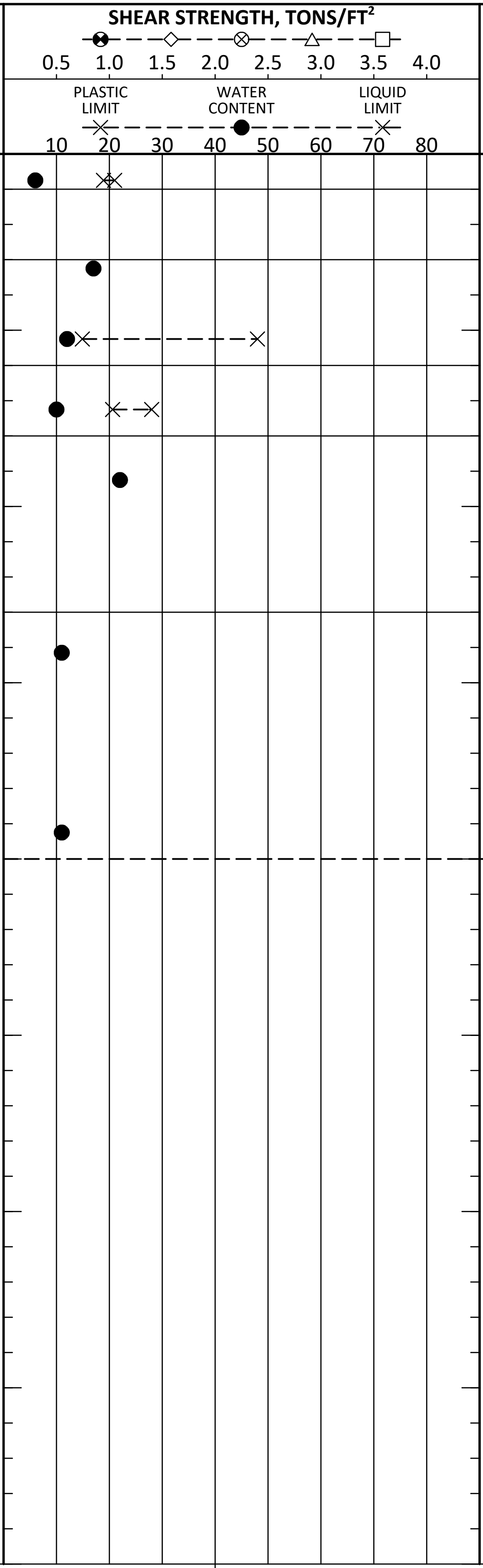
DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664500.53; E 2186398.74

SURFACE ELEVATION: 513.24 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL: GRAVEL, Silty, Medium Dense, Brown and Tan	30		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			
SAND, Silty, Clayey, Very Dense to Medium Dense, Light Gray, with ferrous stains	50/10"			
	24			32
Boring Terminated				

DEPTH, FT: 5, 10, 15, 20, 25, 30, 35



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:	7/30/2020	**DATE MEASURED:**	7/30/2020	**FIGURE:**	2

LOG OF BORING NO. B-2

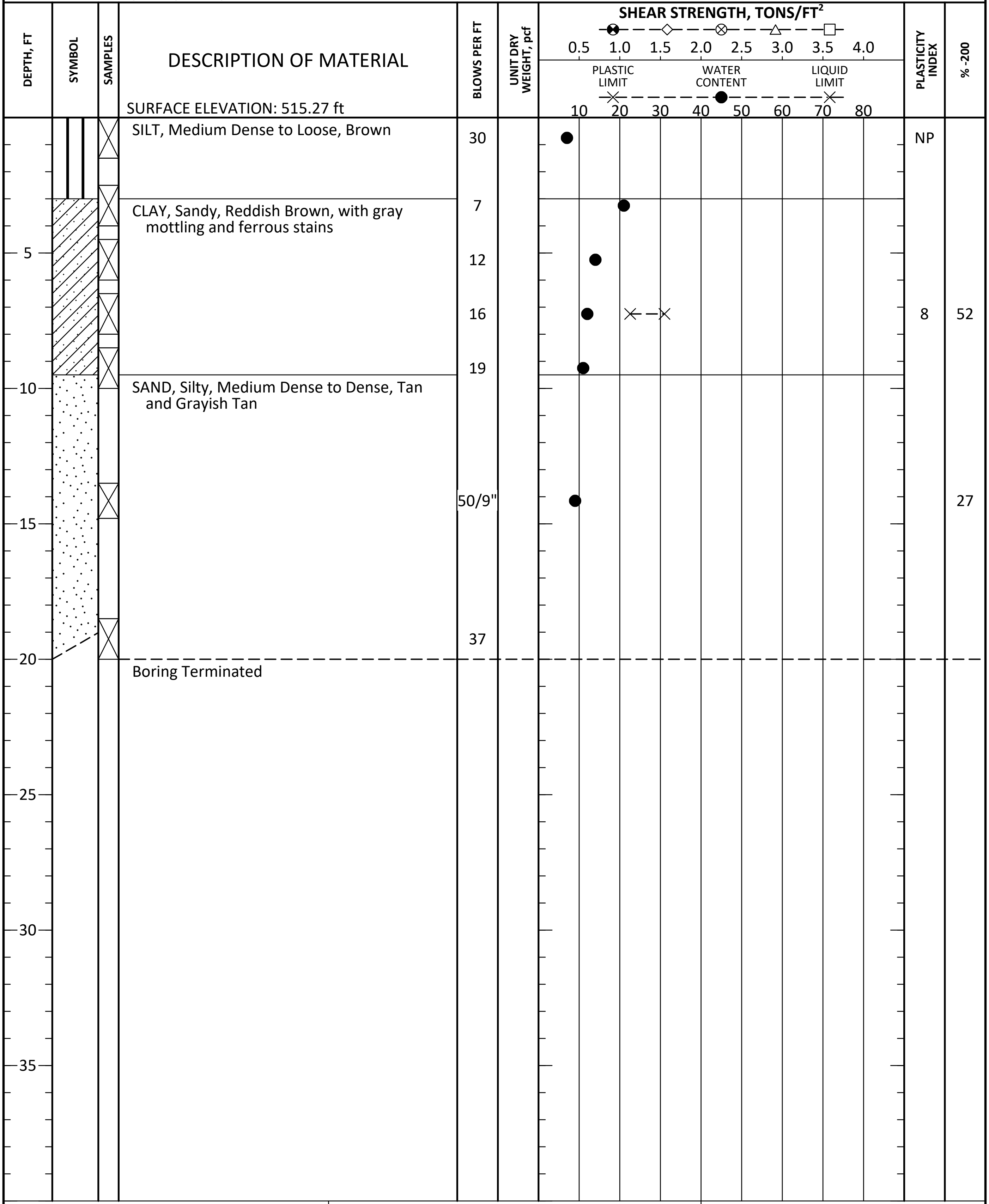
Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664707.14; E 2186527.09

SURFACE ELEVATION: 515.27 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
SILT, Medium Dense to Loose, Brown	30		NP	
CLAY, Sandy, Reddish Brown, with gray mottling and ferrous stains	7			
	12			
	16		8	52
	19			
SAND, Silty, Medium Dense to Dense, Tan and Grayish Tan				
	50/9"			27
	37			
Boring Terminated				

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

LOG OF BORING NO. B-3

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

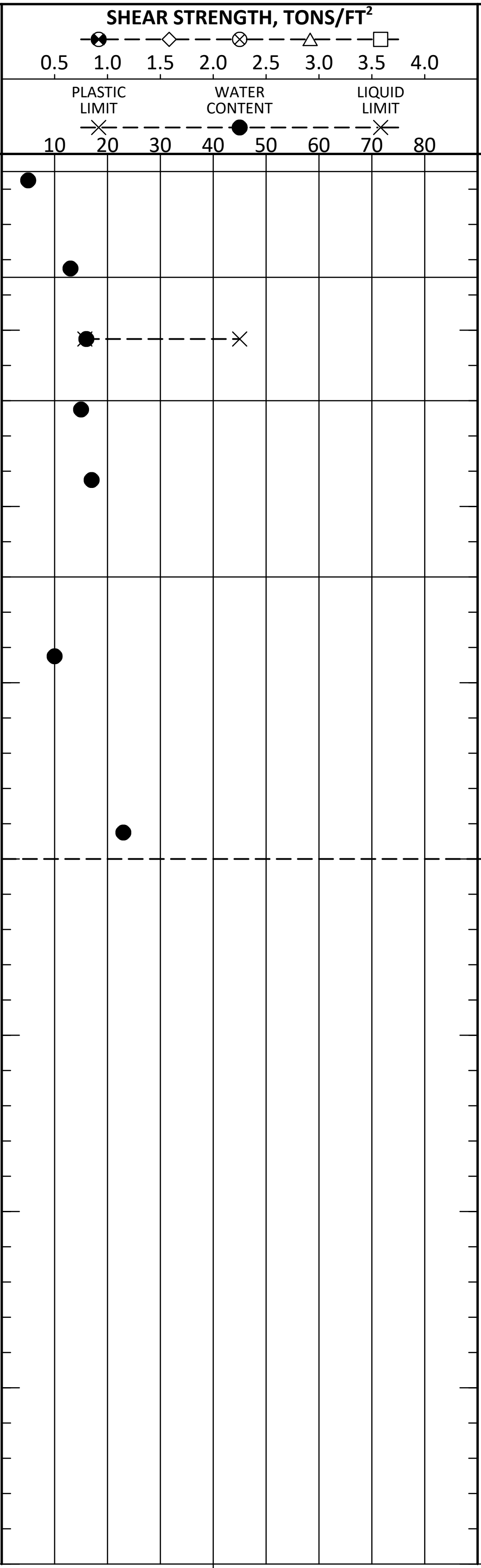
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664866.46; E 2186692.50

SURFACE ELEVATION: 515.21 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL: SAND, Silty, Brown and Dark Gray, with gravel	24			
SAND, Silty, Medium Dense to Loose, Brown	9			49
CLAY, Stiff, Reddish Brown, with sand	11		29	
SAND, Medium Dense, Reddish Brown	10 14			
SAND, Silty, Dense, Tan, with ferrous stains	31		NP	28
- becomes gray below 16 ft	40			47
Boring Terminated				



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:	7/30/2020	**DATE MEASURED:**	7/30/2020	**FIGURE:**	4

LOG OF BORING NO. B-4

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

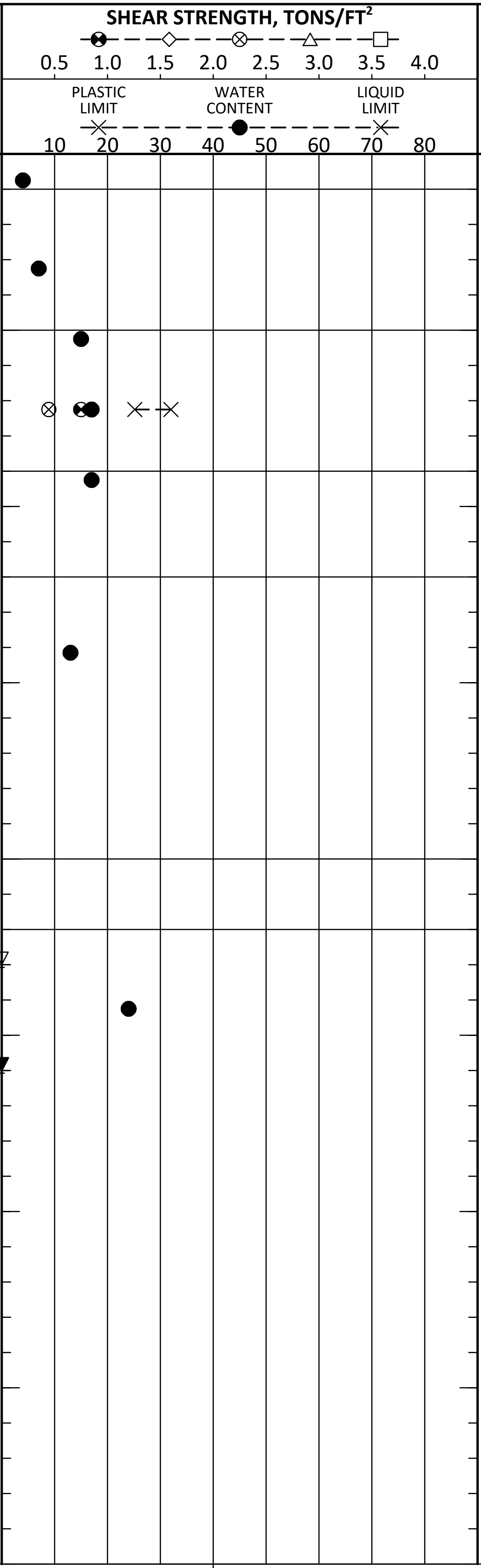
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664824.62; E 2186764.51

SURFACE ELEVATION: 513.09 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL: SAND, Silty, Medium Dense, Dark Brown, with gravel	13			21
SAND, Silty, Loose, Reddish Brown, with dark brown seams	8			23
CLAY, Sandy, Silty, Stiff, Reddish Brown	9			
- with black stains to 7 ft		110	7	
SAND, Clayey, Medium Dense, Reddish Brown	24			34
SAND, Very Dense, Tan to Grayish Tan, with ferrous stains	50/10"			
	50			
CLAY, Tan, with ferrous stains				
CLAY, Sandy, Hard, Tan DRILLER'S NOTE: WATER encountered at 23 ft	45			57
	50/7"			
	50/8"			
	50/11"			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.4 ft
DATE DRILLED: 7/29/2020
DEPTH TO WATER: 26 ft
DATE MEASURED: 7/29/2020
PROJ. No.: ASA20-044-00
FIGURE: 5a

LOG OF BORING NO. B-4

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

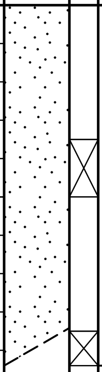
DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664824.62; E 2186764.51

SURFACE ELEVATION: 513.09 ft

SHEAR STRENGTH, TONS/FT^2
⊗ ◇ ⊗ △ □
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



DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	SAND, Dense to Very Dense, Gray, Brown, and Dark Brown, with ferrous stains				
		33			
45					
		50/5"			
	Boring Terminated				
50					
55					
60					
65					
70					
75					

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.4 ft
DATE DRILLED: 7/29/2020
DEPTH TO WATER: 26 ft
DATE MEASURED: 7/29/2020
PROJ. No.: ASA20-044-00
FIGURE: 5b

LOG OF BORING NO. B-5

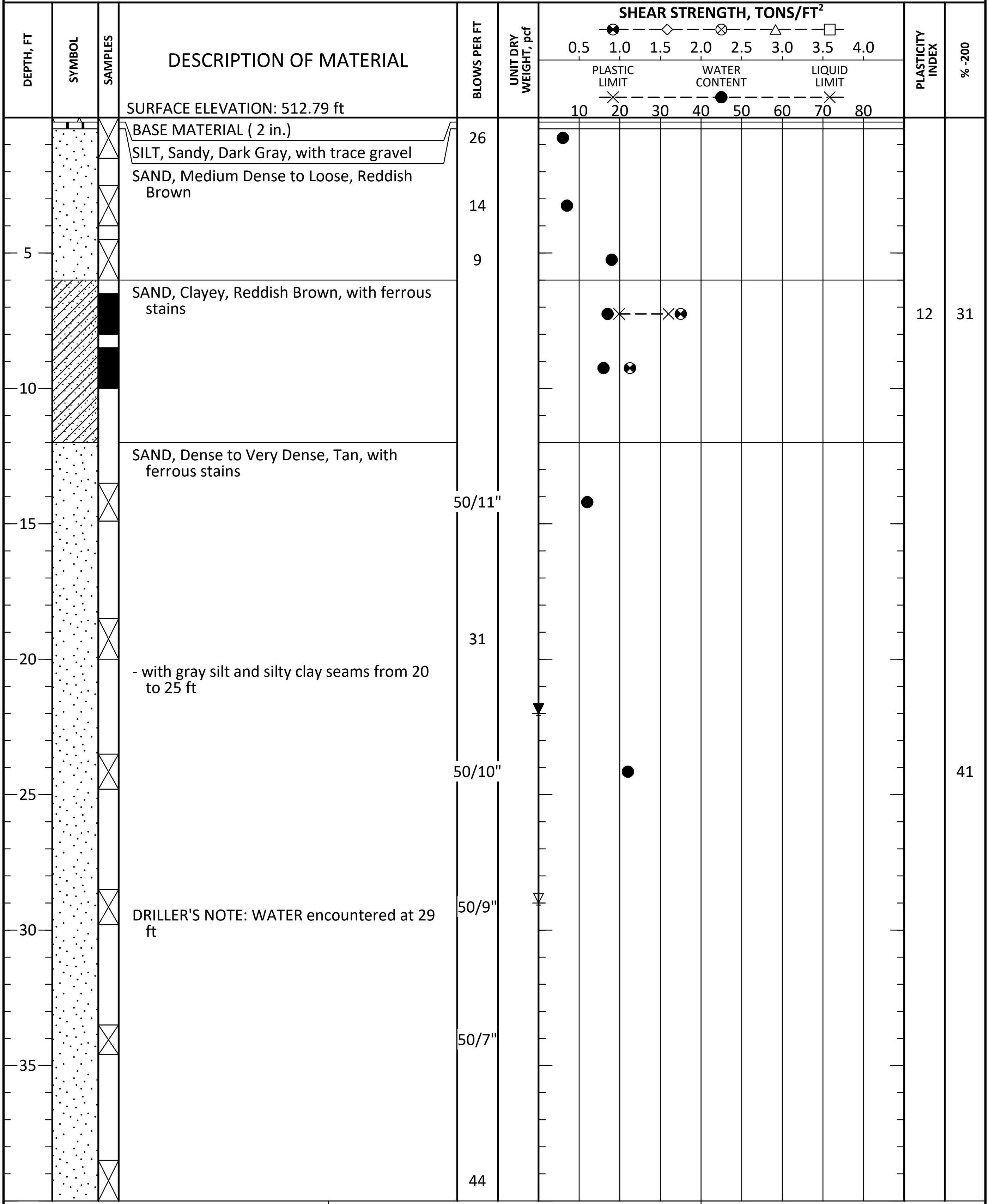
Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664804.06; E 2186757.52

SURFACE ELEVATION: 512.79 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	PLASTICITY INDEX	% -200
BASE MATERIAL (2 in.)			
SILT, Sandy, Dark Gray, with trace gravel	26		
SAND, Medium Dense to Loose, Reddish Brown	14		
	9		
SAND, Clayey, Reddish Brown, with ferrous stains		12	31
SAND, Dense to Very Dense, Tan, with ferrous stains	50/11"		
	31		
- with gray silt and silty clay seams from 20 to 25 ft	50/10"		41
DRILLER'S NOTE: WATER encountered at 29 ft	50/9"		
	50/7"		
	44		

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:**	6a

LOG OF BORING NO. B-5

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

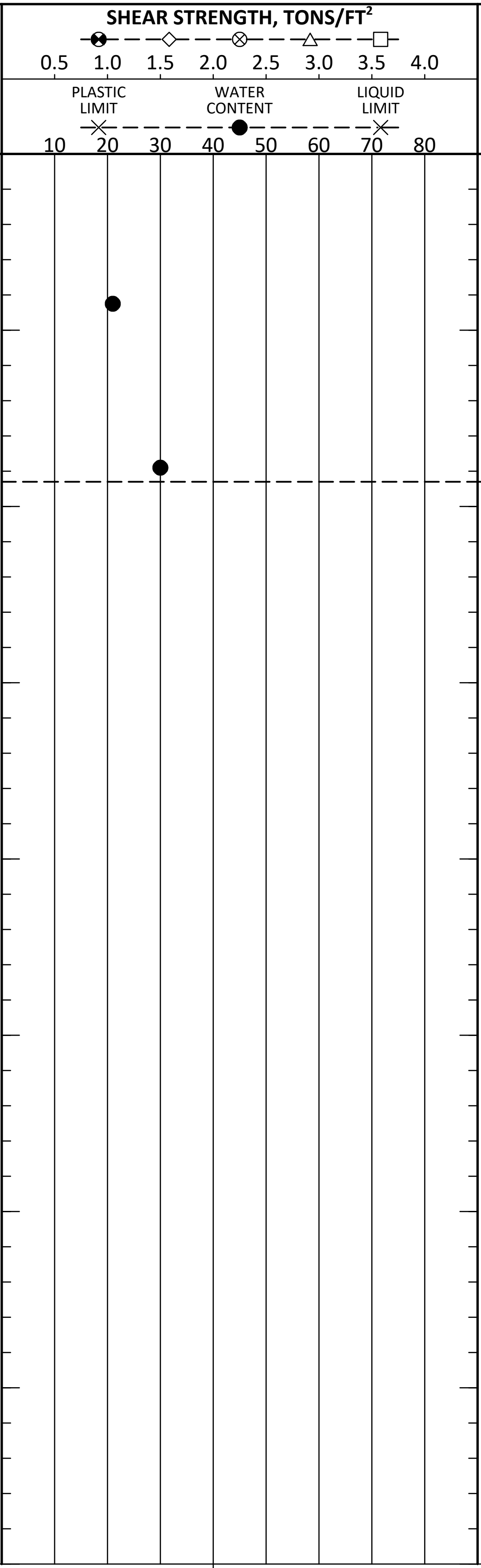
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664804.06; E 2186757.52

SURFACE ELEVATION: 512.79 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
	CLAY, Sandy, Very Stiff to Hard, Light Gray, with ferrous stains				
		21			59
45	- with dark gray below 45 ft				
		50/4"			
	Boring Terminated				
50					
55					
60					
65					
70					
75					



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

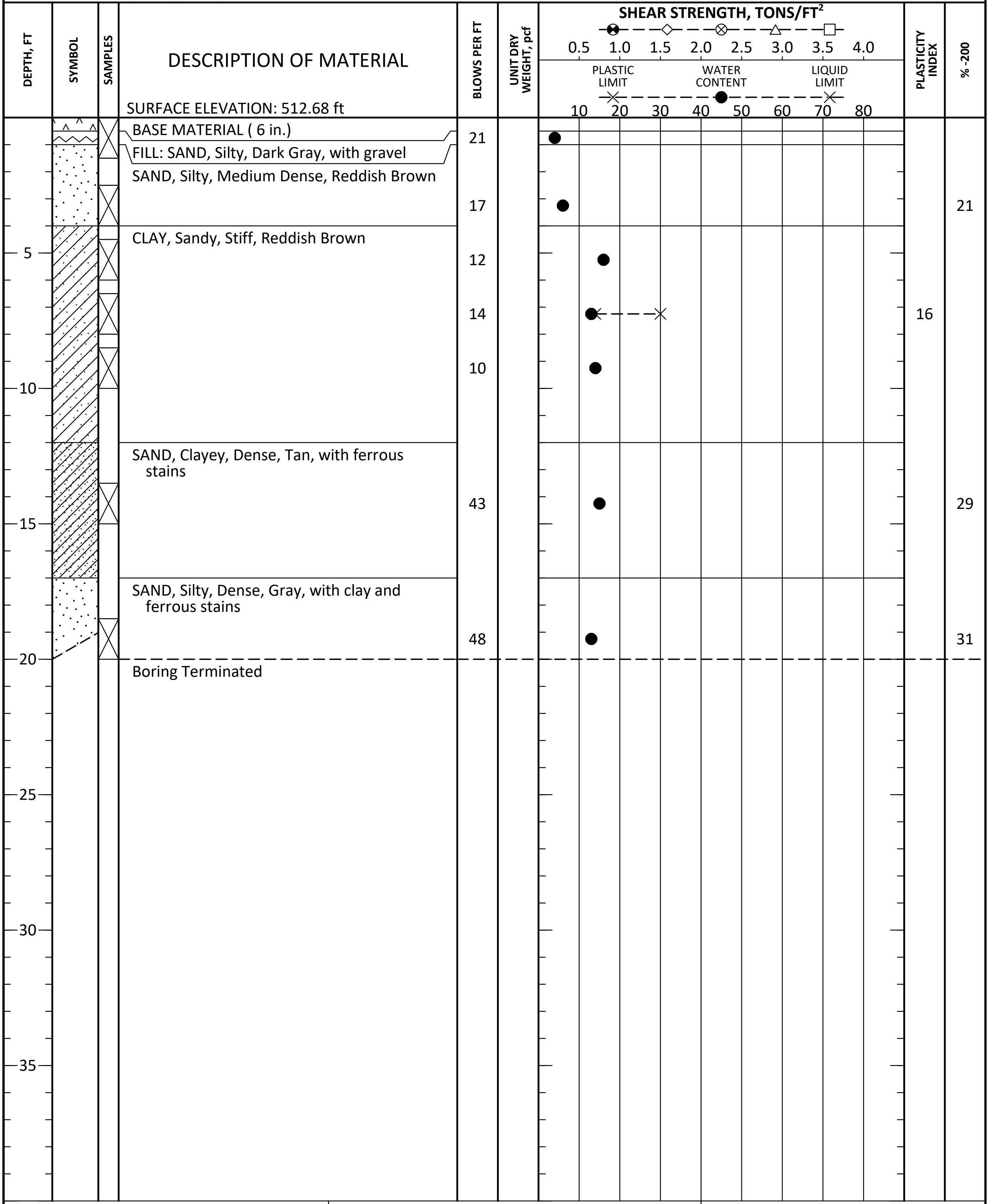
LOG OF BORING NO. B-6

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664772.98; E 2186738.39



SURFACE ELEVATION: 512.68 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
BASE MATERIAL (6 in.)	21			
FILL: SAND, Silty, Dark Gray, with gravel				
SAND, Silty, Medium Dense, Reddish Brown	17			21
CLAY, Sandy, Stiff, Reddish Brown	12 14 10		 16 	
SAND, Clayey, Dense, Tan, with ferrous stains	43			29
SAND, Silty, Dense, Gray, with clay and ferrous stains	48			31
Boring Terminated				

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: 7

LOG OF BORING NO. B-7

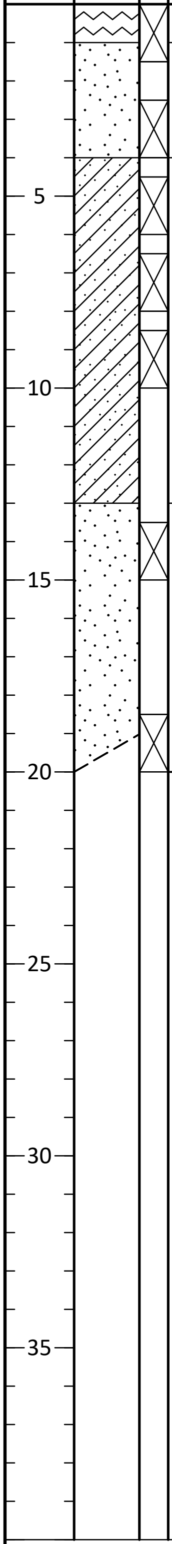
Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

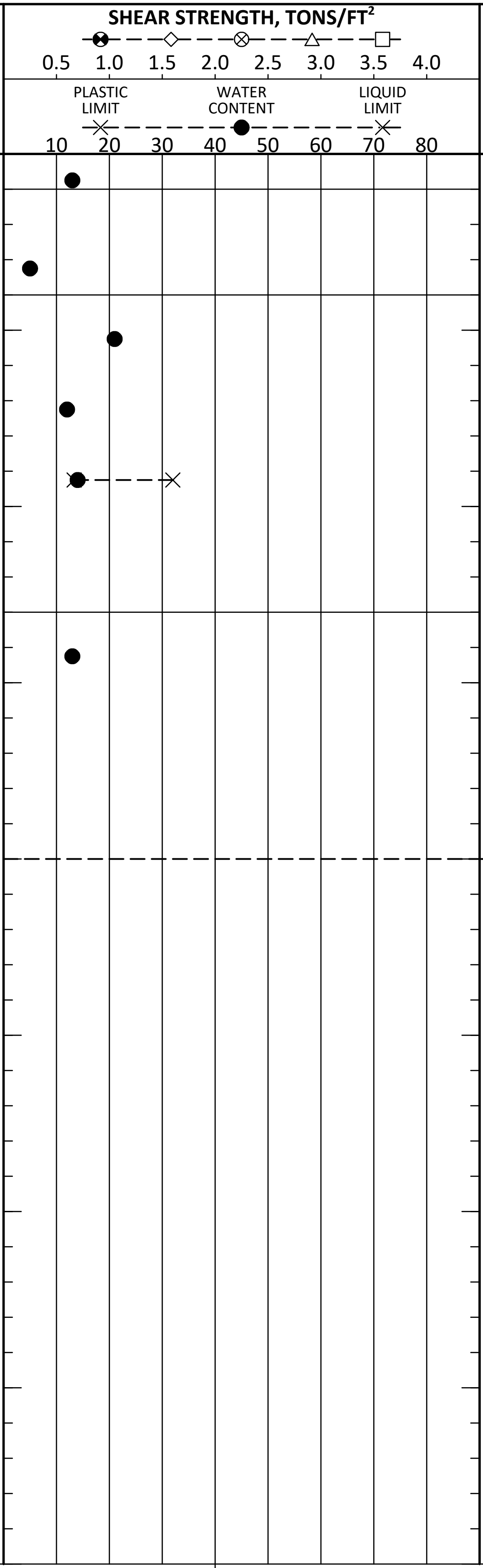
DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664677.95; E 2186684.56

SURFACE ELEVATION: 512.72 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
FILL: SILT, Dense, Gray, with gravel	32		NP	
SAND, Silty, Medium Dense, Reddish Brown	23			21
CLAY, Sandy, Stiff, Reddish Brown, with ferrous stains	9			
	12			
	14		19	
SAND, Dense, Tan, with ferrous stains	49			
	42			
Boring Terminated				



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: 8

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-8

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

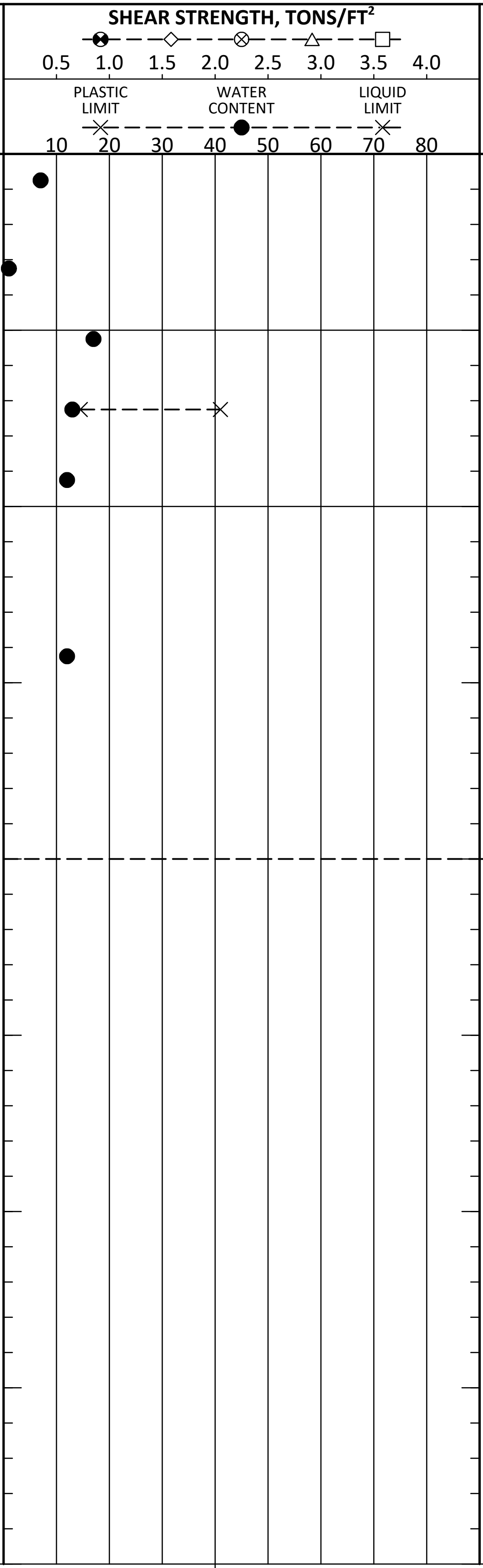
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664520.77; E 2186596.21

SURFACE ELEVATION: 511.86 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
0	SAND, Silty, Stiff, Tan	14			
		21		NP	20
5	CLAY, Tan and Light Gray, Stiff to Very Stiff, with ferrous stains	9			
		16		27	
		25			
10	SAND, Silty, Dense to Medium Dense, Light Gray, with ferrous stains				
		41			35
		22			
20	Boring Terminated				



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:	7/30/2020	**DATE MEASURED:**	7/30/2020	**FIGURE:**	9

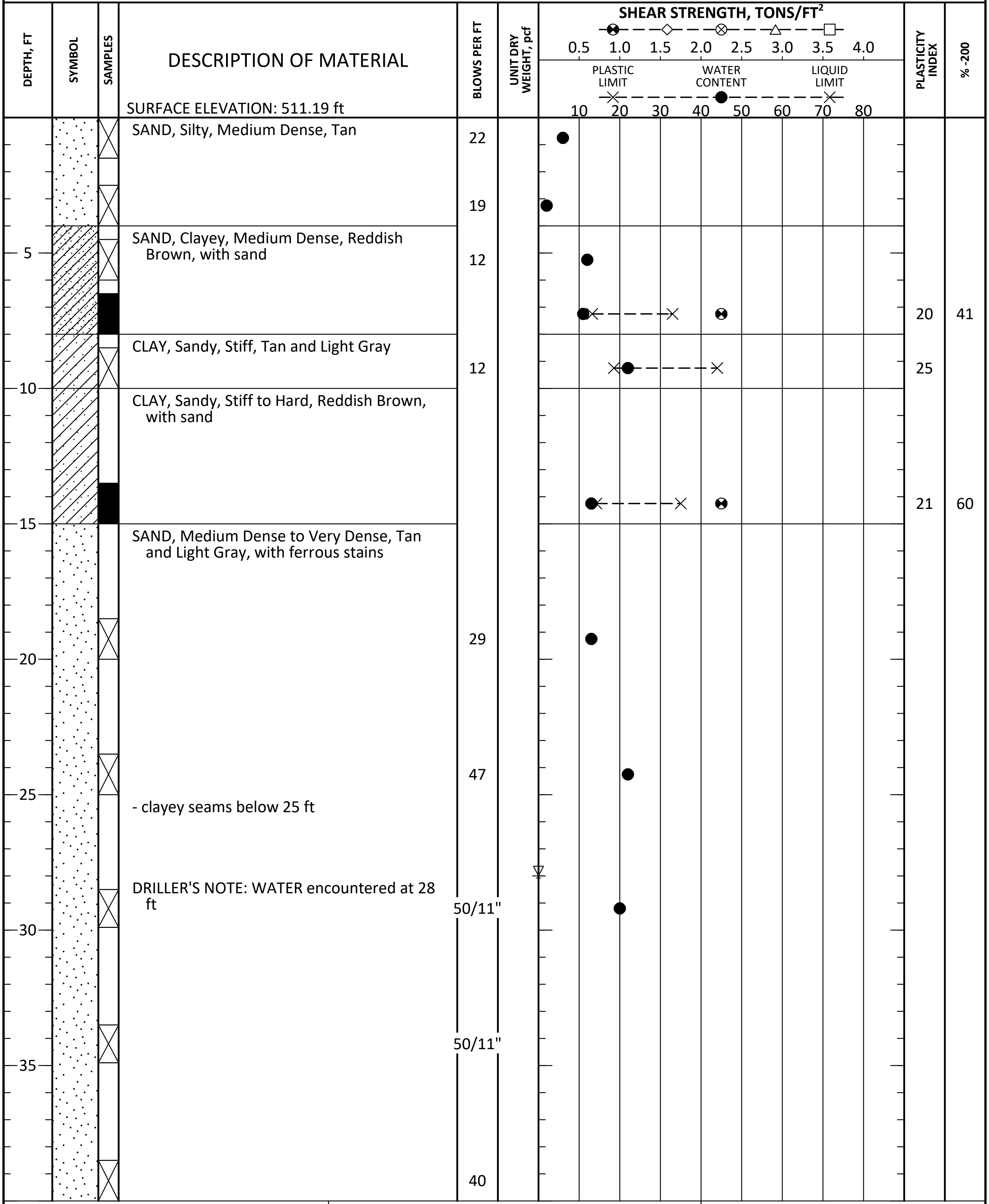
LOG OF BORING NO. B-9

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664428.32; E 2186524.83



SURFACE ELEVATION: 511.19 ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
SAND, Silty, Medium Dense, Tan	22			
	19			
SAND, Clayey, Medium Dense, Reddish Brown, with sand	12			
			20	41
CLAY, Sandy, Stiff, Tan and Light Gray	12		25	
CLAY, Sandy, Stiff to Hard, Reddish Brown, with sand			21	60
SAND, Medium Dense to Very Dense, Tan and Light Gray, with ferrous stains	29			
	47			
- clayey seams below 25 ft				
DRILLER'S NOTE: WATER encountered at 28 ft	50/11"			
	50/11"			
	40			

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

LOG OF BORING NO. B-9

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

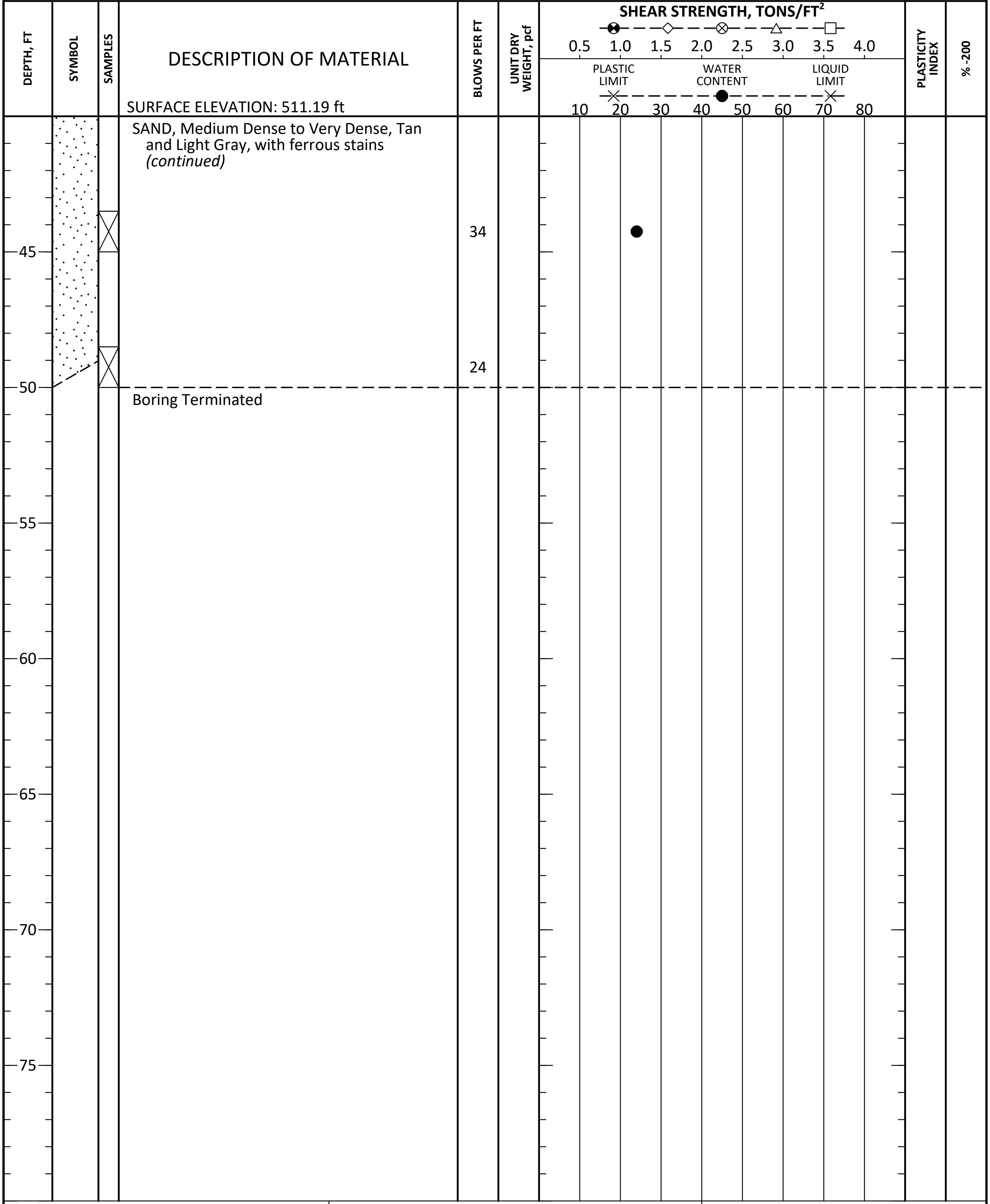
RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664428.32; E 2186524.83

SURFACE ELEVATION: 511.19 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT²	PLASTICITY INDEX	% -200
	SAND, Medium Dense to Very Dense, Tan and Light Gray, with ferrous stains *(continued)*					
45		34				
50		24				
50	Boring Terminated					



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

LOG OF BORING NO. B-10

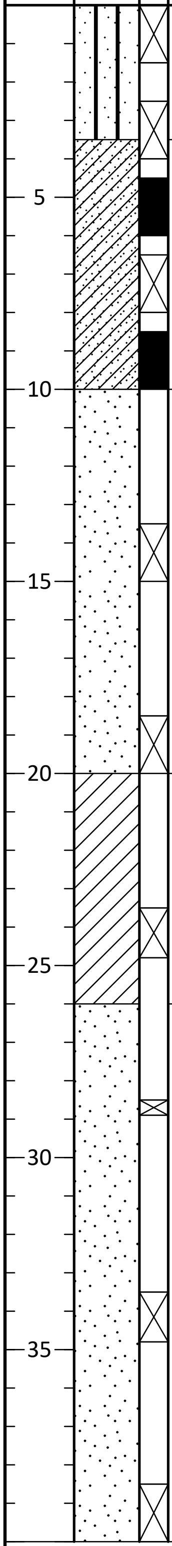
Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

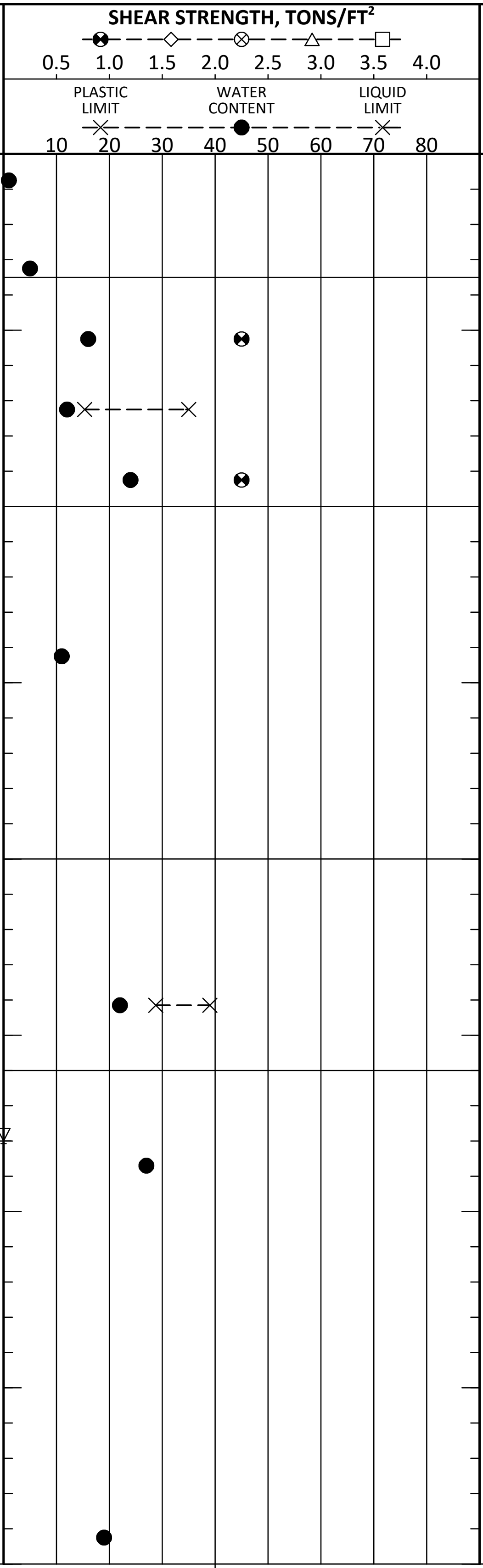
DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664415.18; E 2186568.33

SURFACE ELEVATION: 509.56 ft



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
SILT, Sandy, Medium Dense to Loose, Reddish Brown	26			
	8			54
SAND, Clayey, Medium Dense, Reddish Brown, with gray mottling				
	16		20	36
SAND, Dense, Tan, with ferrous stains				
	40			
- sandstone from 15.5 to 16.5 ft				
	48			
CLAY, Hard, Brown and Light Gray, with ferrous stains and sand				
	50/9"		10	
SAND, Very Dense to Dense, Tan DRILLER'S NOTE: WATER encountered at 28 ft				
	ref/5"			47
- with clay seams to 40 ft				
	50/10"			
	32			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

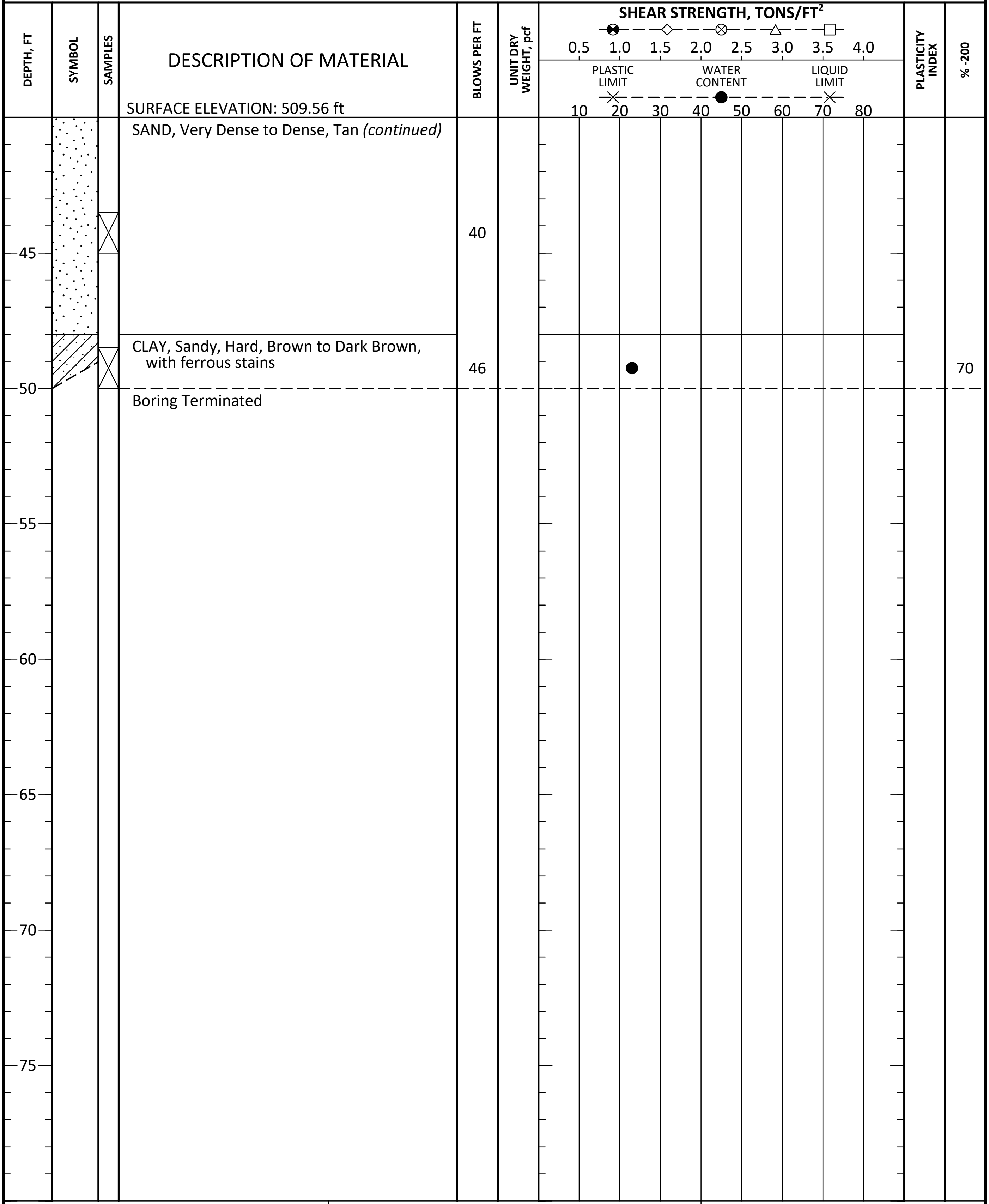
LOG OF BORING NO. B-10

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664415.18; E 2186568.33



DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	% -200
	SAND, Very Dense to Dense, Tan *(continued)*		
45		40	
	CLAY, Sandy, Hard, Brown to Dark Brown, with ferrous stains	46	70
50	Boring Terminated		

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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:**	11b

LOG OF BORING NO. B-11

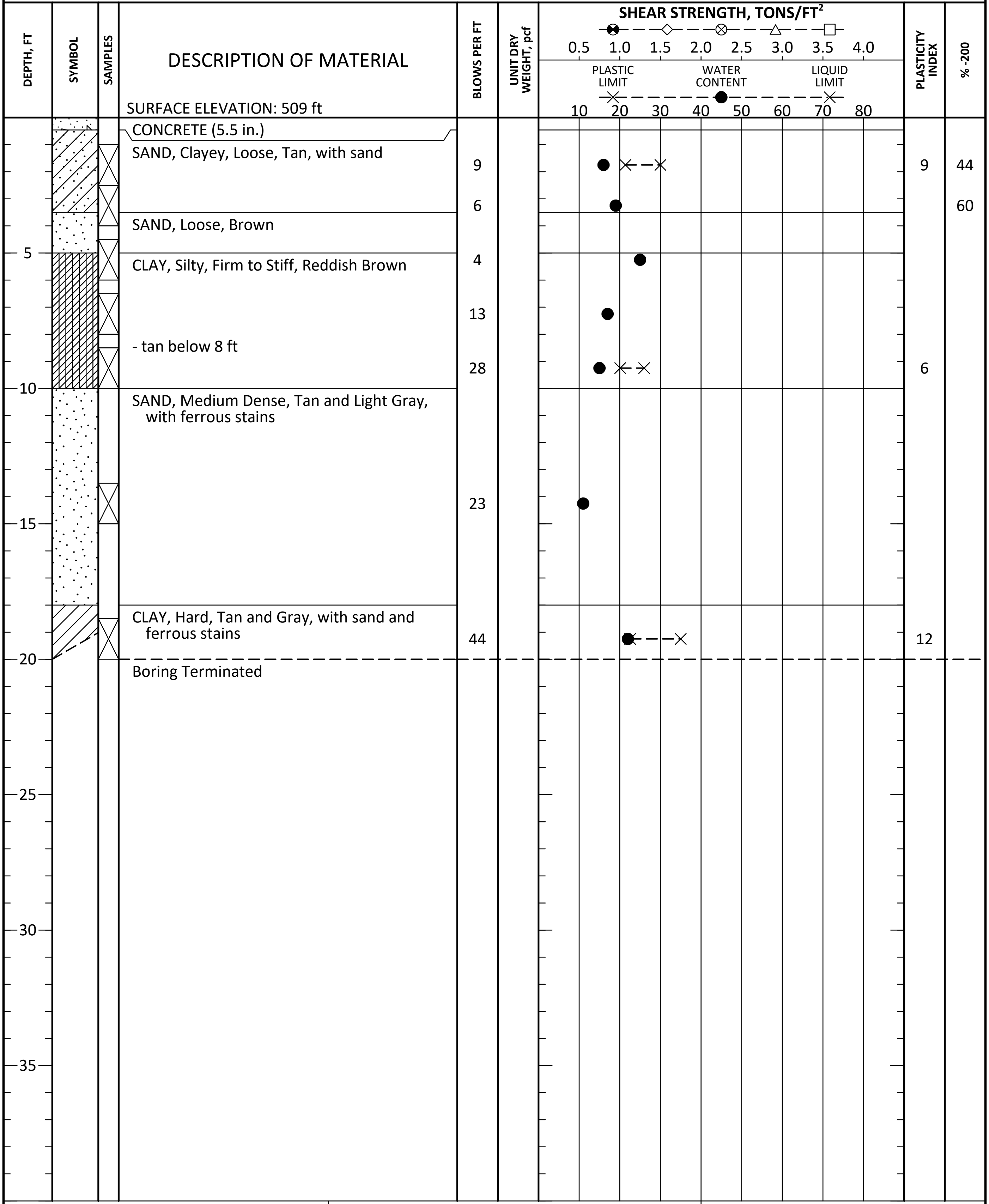
Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664330.40; E 2186703.75

SURFACE ELEVATION: 509 ft



DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
0	CONCRETE (5.5 in.)				
	SAND, Clayey, Loose, Tan, with sand	9		9	44
		6			60
	SAND, Loose, Brown				
5	CLAY, Silty, Firm to Stiff, Reddish Brown	4			
		13			
	- tan below 8 ft	28		6	
10	SAND, Medium Dense, Tan and Light Gray, with ferrous stains				
15		23			
	CLAY, Hard, Tan and Gray, with sand and ferrous stains	44		12	
20	Boring Terminated				

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:	7/30/2020	**DATE MEASURED:**	7/30/2020	**FIGURE:**	12

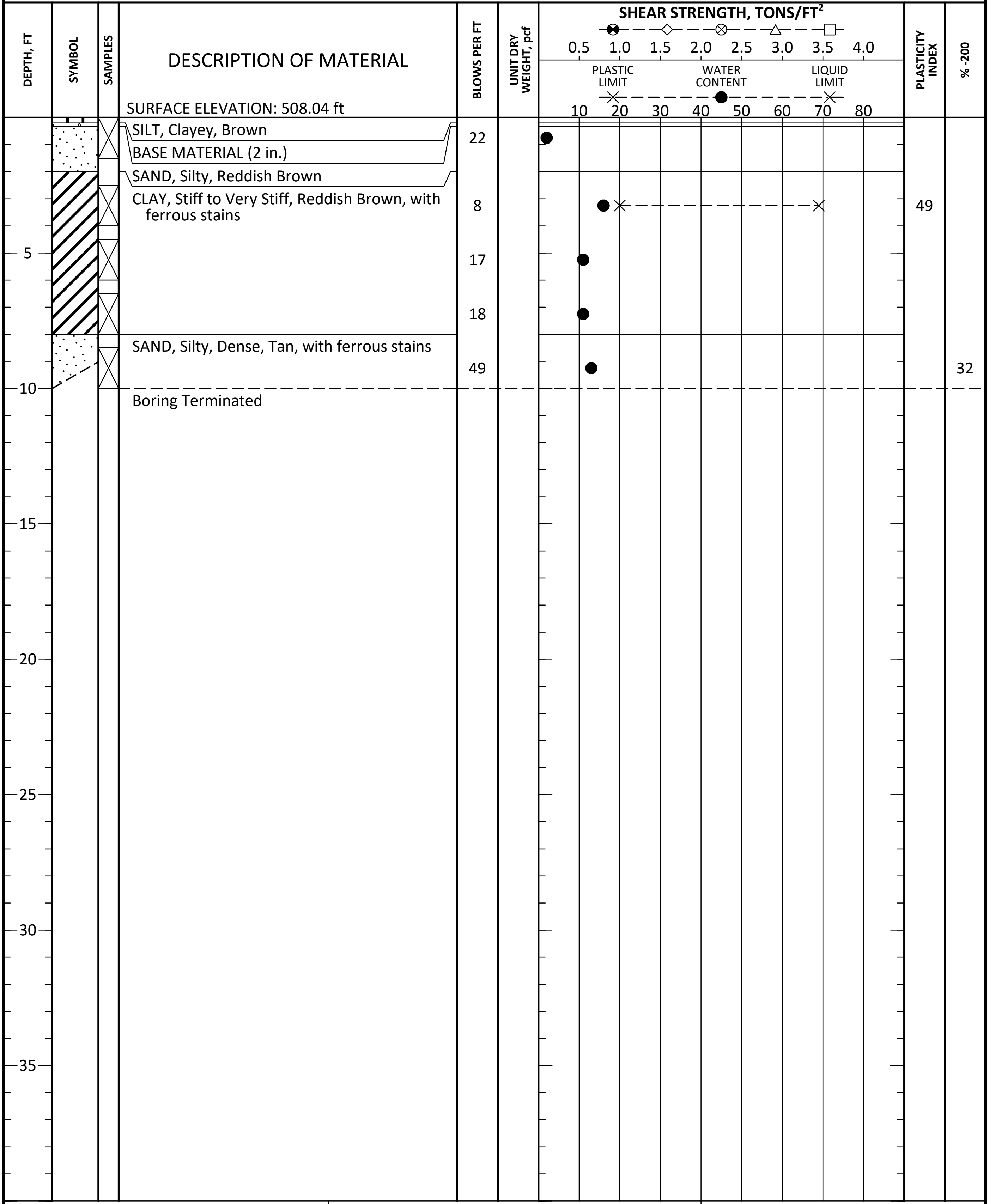
LOG OF BORING NO. B-12

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664578.44; E 2186816.01



DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
SILT, Clayey, Brown	22			
BASE MATERIAL (2 in.)				
SAND, Silty, Reddish Brown				
CLAY, Stiff to Very Stiff, Reddish Brown, with ferrous stains	8		49	
	17			
	18			
SAND, Silty, Dense, Tan, with ferrous stains	49			32
Boring Terminated				

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

LOG OF BORING NO. B-13

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

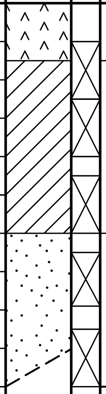
RABA KISTNER
TBPE Firm Registration No. F-3257

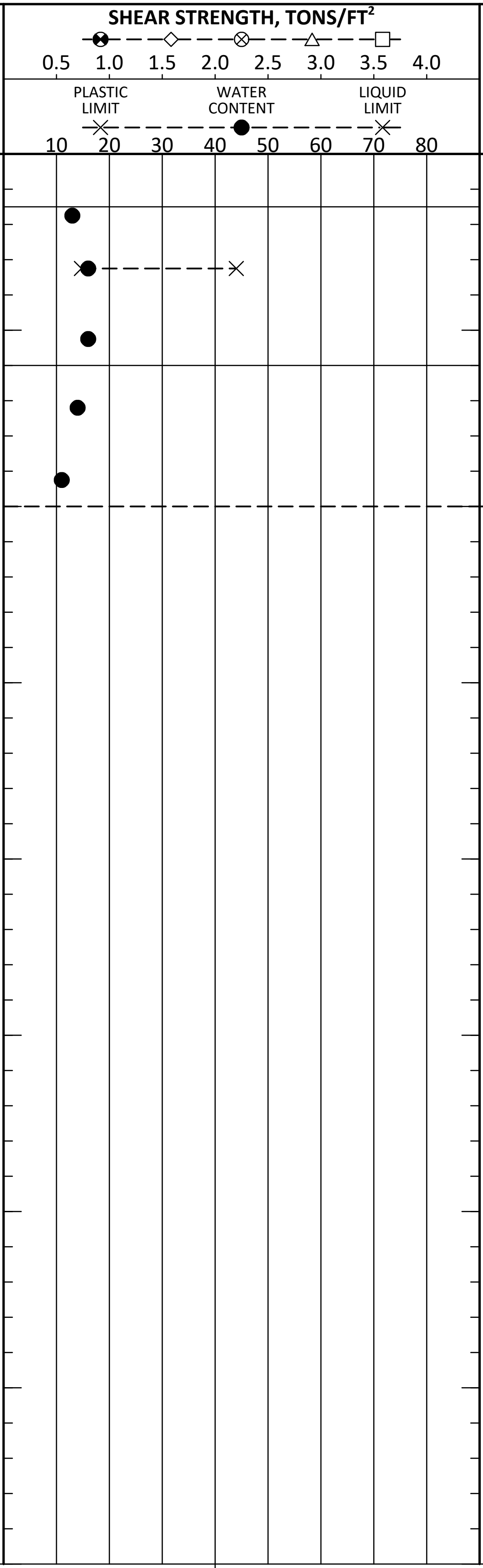
DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664738.20; E 2186975.35

SURFACE ELEVATION: 506.24 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	PLASTICITY INDEX	% -200
0 – 1.5	BASE MATERIAL (18 in.)				
1.5 – 6	CLAY, Stiff to Firm, Brown to Reddish Brown	12			
		7		29	
5		8			
6 – 10	SAND, Silty, Very Dense to Dense, Light Gray, with ferrous stains	50/11"			
		44		NP	31
10	Boring Terminated				





NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

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

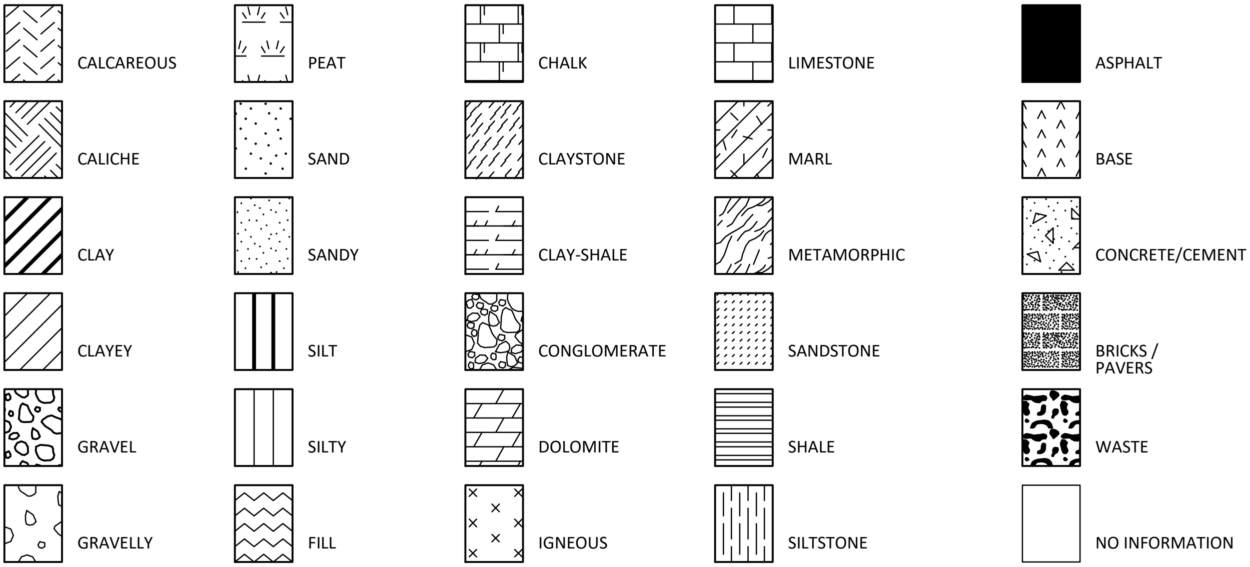
KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

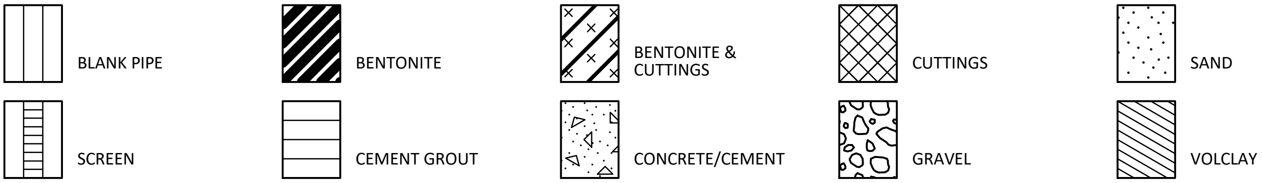
SOIL TERMS

ROCK TERMS

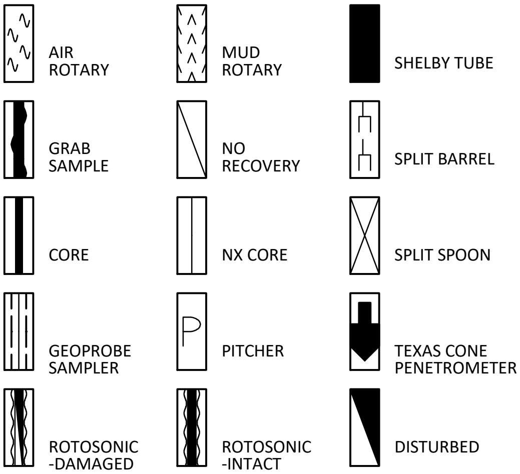
OTHER



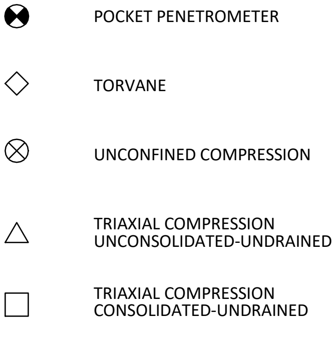
WELL CONSTRUCTION AND PLUGGING MATERIALS



SAMPLE TYPES



STRENGTH TEST TYPES



NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. ASA20-044-00

FIGURE 15a

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

Penetration Resistance Blows per ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE STRENGTH

Resistance Blows per ft	Consistency	Cohesion TSF
0 - 2	Very Soft	0 - 0.125
2 - 4	Soft	0.125 - 0.25
4 - 8	Firm	0.25 - 0.5
8 - 15	Stiff	0.5 - 1.0
15 - 30	Very Stiff	1.0 - 2.0
> 30	Hard	> 2.0

PLASTICITY

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

ABBREVIATIONS

B = Benzene

T = Toluene

E = Ethylbenzene

X = Total Xylenes

BTEX = Total BTEX

TPH = Total Petroleum Hydrocarbons

ND = Not Detected

NA = Not Analyzed

NR = Not Recorded/No Recovery

OVA = Organic Vapor Analyzer

ppm = Parts Per Million

Qam, Qas, Qal = Quaternary Alluvium

Qat = Low Terrace Deposits

Qbc = Beaumont Formation

Qt = Fluviatile Terrace Deposits

Qao = Seymour Formation

Qle = Leona Formation

Q-Tu = Uvalde Gravel

Ewi = Wilcox Formation

Emi = Midway Group

Mc = Catahoula Formation

El = Laredo Formation

Kknm = Navarro Group and Marlbrook Marl

Kpg = Pecan Gap Chalk

Kau = Austin Chalk

Kef = Eagle Ford Shale

Kbu = Buda Limestone

Kdr = Del Rio Clay

Kft = Fort Terrett Member

Kgt = Georgetown Formation

Kep = Person Formation

Kek = Kainer Formation

Kes = Escondido Formation

Kew = Walnut Formation

Kgr = Glen Rose Formation

Kgru = Upper Glen Rose Formation

Kgrl = Lower Glen Rose Formation

Kh = Hensell Sand

PROJECT NO. ASA20-044-00

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.

PROJECT NO. ASA20-044-00

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"									
	43.5 to 45.0	33									
	48.5 to 49.4	50/5"									
B-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

RABA KISTNER

FIGURE 16a

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		
	48.5 to 49.3	50/4"	30								
B-6	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		
	18.5 to 20.0	48	13						31		
B-7	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								
	18.5 to 20.0	42									
B-8	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		
	18.5 to 20.0	22									
B-9	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

FIGURE 16b

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								
	2.5 to 4.0	8	5						54		
	4.5 to 6.0		16							2.25	PP
	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		
B-11	1.0 to 2.5	9	16	30	21	9	SC		44		
	2.5 to 4.0	6	19						60		
	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

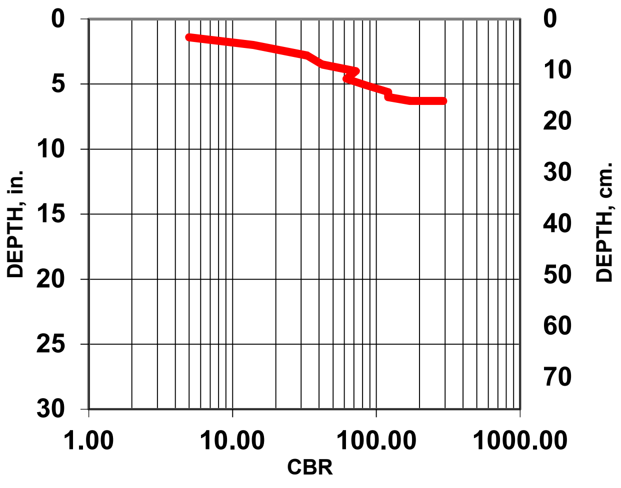
Project Number: ASA20-044-00
Test Date: July 30, 2020

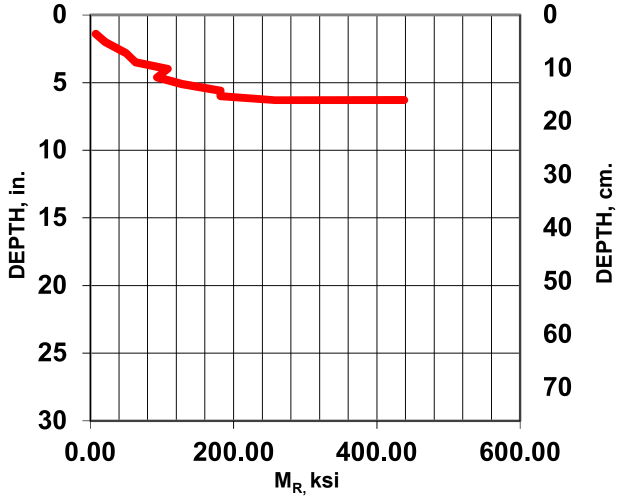
DCP TEST DATA

B-12
Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

Type of Ham.	No. of Blows	Penetration Incre. (mm)	Penetration Cumm. (in)	CBR (%)	M_R (ksi)	q_{ult} (ksf)
1	1	35	1.4	5	7.5	1.59
1	1	15	2	14	21	3.15
1	3	21	2.8	33	49.5	5.57
1	3	17	3.5	42	63	6.54
1	4	14	4	72	108	9.35
1	4	16	4.6	62	93	8.46
1	4	12	5.1	85	127.5	10.44
1	5	11	5.6	121	181.5	13.20
1	5	11	6	121	181.5	13.20
1	5	8	6.3	172	258	16.67
1	1	1	6.3	292	438	23.69
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

NOTES: Hammer 17.6 lbs = 1 Hammer 10.1 lbs = 2





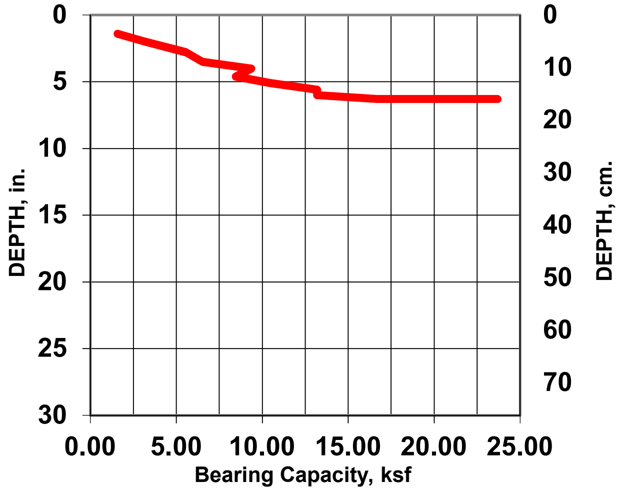


Figure 17a

Project Number: ASA20-044-00
Test Date: July 30, 2020

RABA KISTNER

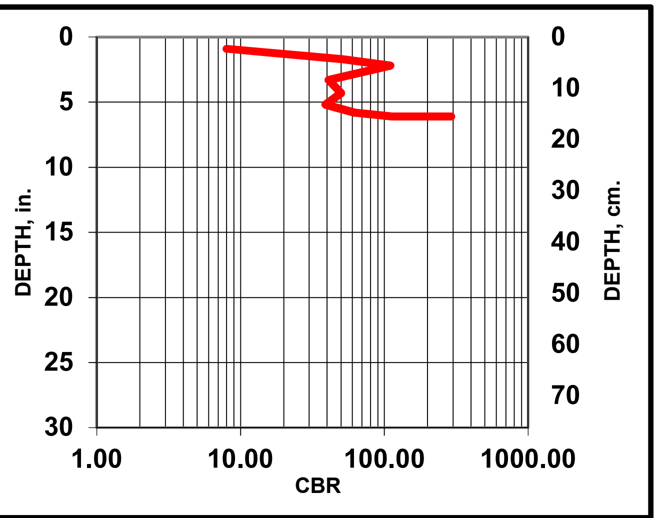
DCP TEST DATA

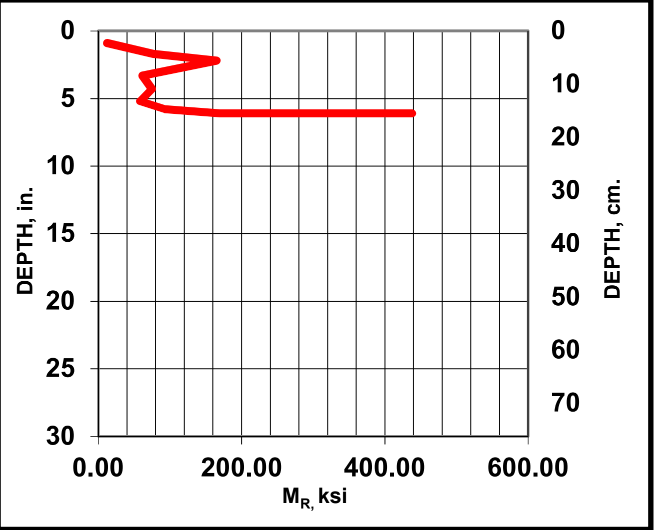
B-13

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

Type of Ham.	No. of Blows	Penetration		CBR (%)	M_R (ksi)	q_{ult} (ksf)
		Incre. (mm)	Cumm. (in)			
1	1	24	0.9	8	12	2.17
1	4	19	1.7	51	76.5	7.43
1	5	12	2.2	110	165	12.39
1	5	29	3.3	41	61.5	6.43
1	5	24	4.3	50	75	7.34
1	4	24	5.2	39	58.5	6.22
1	4	16	5.8	62	93	8.46
1	3	7	6.1	113	169.5	12.61
1	1	1	6.1	292	438	23.69
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

NOTES: Hammer 17.6 lbs = 1 Hammer 10.1 lbs = 2





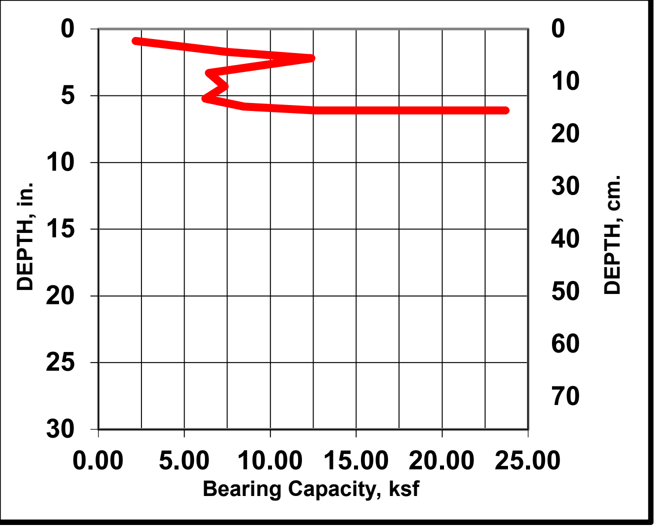
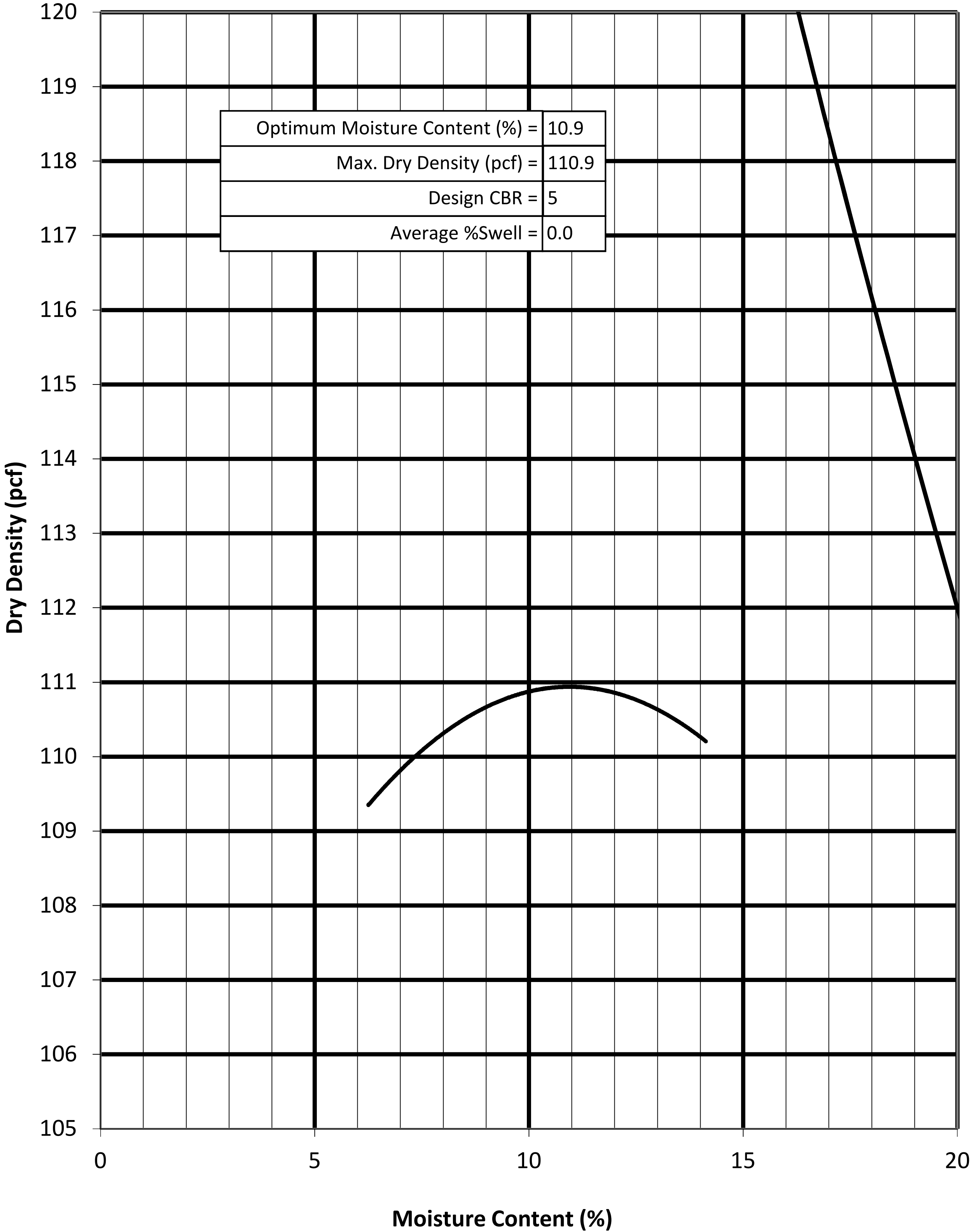


Figure 17b

MOISTURE-DENSITY RELATIONSHIP CURVE (ASTM D698)

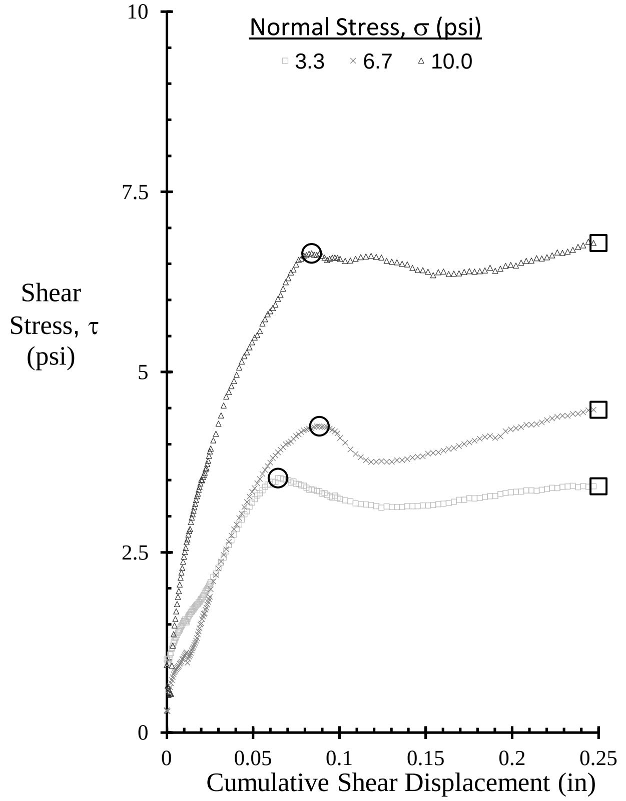
Calaveras Geotechnical Survey
J. K. Spruce Power Plant
San Antonio, Texas

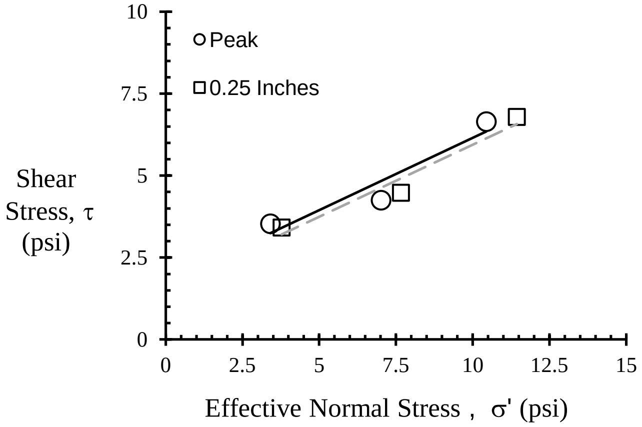


Optimum Moisture Content (%) =	10.9
Max. Dry Density (pcf) =	110.9
Design CBR =	5
Average %Swell =	0.0

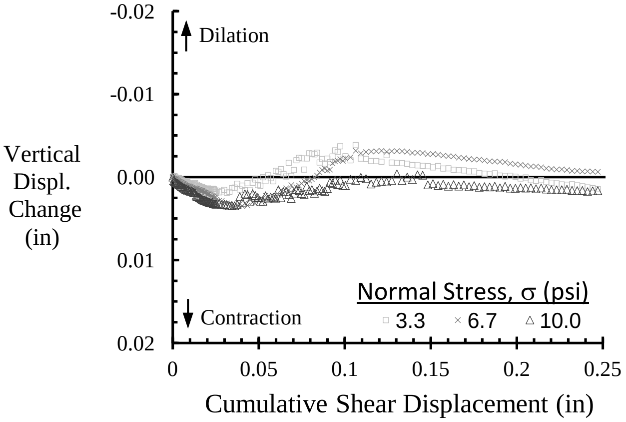
Direct Shear of Soil Under Consolidated-Drained Conditions

Client:	Raba Kistner Consultants	TRI Log#:	58149.1
Project:	Calaveras Geotechnical Survey	Test Method:	ASTM D3080
Sample:	B-5, S-5, (6.5-8)		





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.

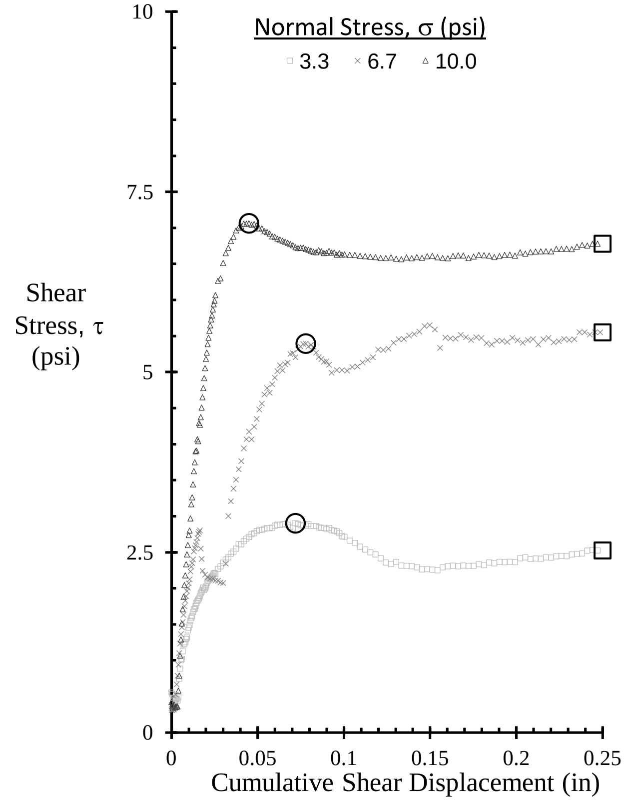
Jeffrey A. Kuhn, Ph.D., P.E., 8/21/20

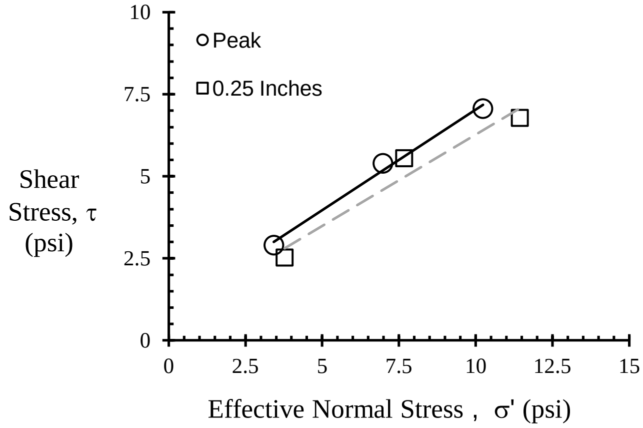
Analysis & Quality Review/Date

Direct Shear of Soil Under Consolidated-Drained Conditions

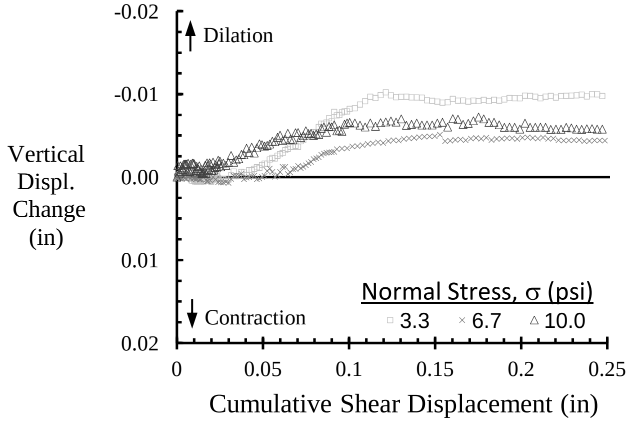
Client: Raba Kistner Consultants
Project: Calaveras Geotechnical Survey
Sample: B-9, S-5 (6.5-8)

TRI Log#: 58149.2
Test Method: ASTM D3080





Note: Area Correction Has Been Applied



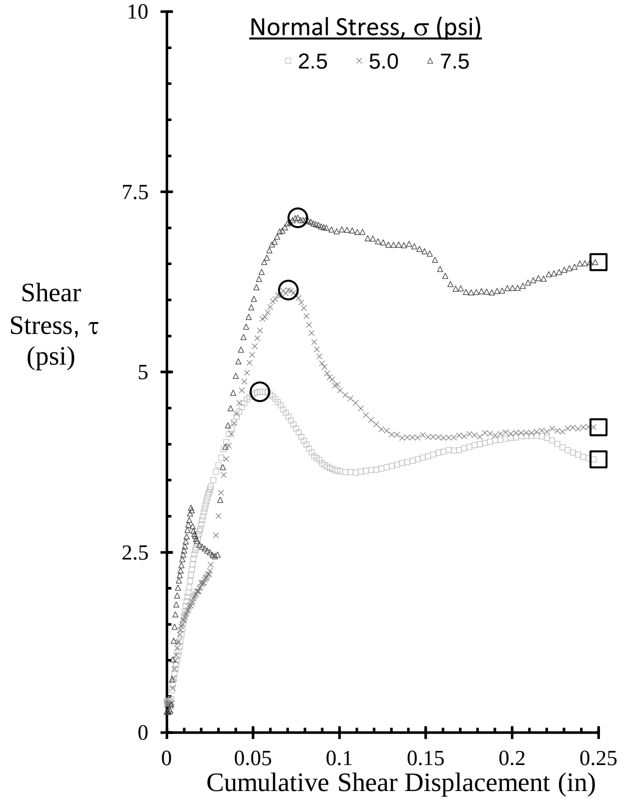
	Specimen Number	1	2	3
Initial Condition	Diameter, in	2.50	2.50	2.50
	Height, in (before consol)	1.00	1.00	1.00
	Water Content, %	10.1	9.1	12.1
	Saturation, %	46.3	47.6	65.5
	Dry Density, pcf	106.2	111.2	112.3
	Void Ratio	0.59	0.51	0.50
	Consolidation Stress, σ' (psi)	3.3	6.7	10
Post-Consol	Height, in (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		

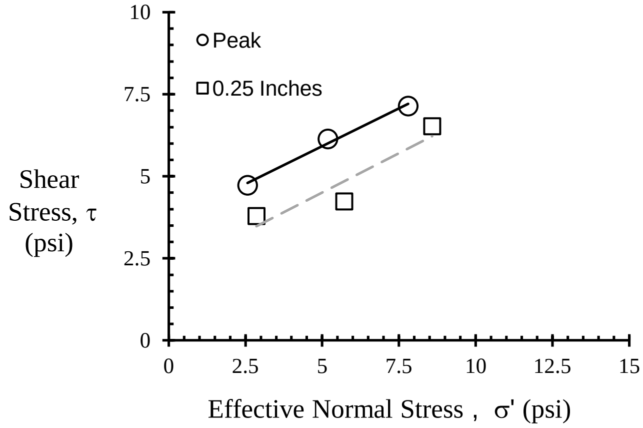
Note: The intact soil sample was extruded and specimens were prepared using a trimming turntable. A specific gravity of 2.70 was assumed for weight-volume calculations.

Jeffrey A. Kuhn, Ph.D., P.E., 9/3/20
Analysis & Quality Review/Date

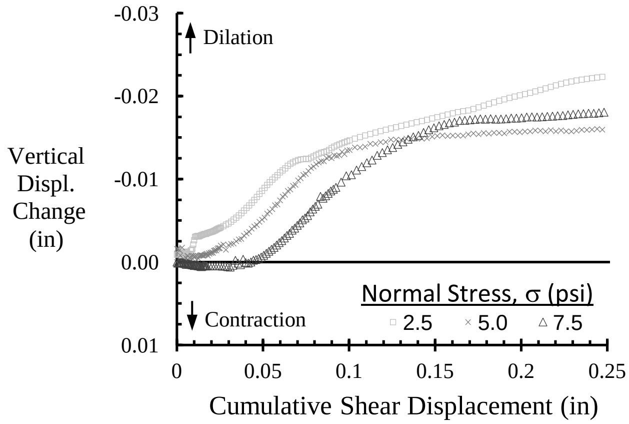
Direct Shear of Soil Under Consolidated-Drained Conditions

Client:	Raba Kistner Consultants	TRI Log#:	58149.3
Project:	Calaveras Geotechnical Survey	Test Method:	ASTM D3080
Sample:	B-10, S-4 (4.5-6)		





Note: Area Correction Has Been Applied



		1	2	3
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

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.

GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

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

ENGINEERING • ENVIRONMENTAL • INFRASTRUCTURE • PROJECT CONTROL

Austin, TX

Brownsville, TX

Dallas, TX

Freeport, TX

► San Antonio, TX

Houston, TX

McAllen, TX

New Braunfels, TX

Lake Worth, FL

Lincoln, NE

Salt Lake City, UT

Mexico

RABA KISTNER

Registration No.: CCR102
Registrant: CPS Energy Calaveras Plant Site

Attachment 14 Structural Stability and Safety Factor Assessment

ERM

CityCentre Four
840 W. Sam Houston Pkwy N.
Suite 600
Houston, Texas 77024

Telephone: +1 281 600 1000
Fax: +1 281 520 4625

www.erm.com

27 October 2021

Mr. Michael Malone
CPS Energy
500 McCullough Avenue
San Antonio, Texas 78215

Project No: 0352436

Subject: Structural Stability and Safety Factor Assessments – 5-Year Update
Calaveras Power Station
San Antonio, Texas

Dear Mr. Malone:

Environmental Resources Management Southwest, Inc. (ERM) is pleased to provide this review of structural stability and safety factor assessments performed at the Calaveras Power Station to assist CPS Energy in complying with Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) [aka. the Coal Combustion Residual (CCR) Rule]. This review of the structural stability and safety factor assessments is the 5-year update required under 40 CFR §257.73 Structural Integrity Criteria for Existing CCR Surface Impoundments.

CPS Energy owns and operates the Calaveras Power Station, which is located in unincorporated Bexar County, Texas, approximately 13 miles southeast of San Antonio. Currently, CPS Energy operates the following two CCR surface impoundments at the Power Station:

- Sludge Recycle Holding (SRH) Pond (separated into the north pond and south pond by a concrete dividing wall); and
- Evaporation Pond (EP).

CPS Energy formerly operated two CCR surface impoundments at the Power Station:

- North Bottom Ash Pond (BAP); and
- South BAP.

The J.T. Deely Power Plant, located at the Calaveras Power Station, ceased operation at the end of December 2018 and sluiced bottom ash has not been received at the BAPs since that time.

All the surface impoundments are constructed as elevated diked structures. The SRH Pond, located adjacent to the Power Plants, receives CCR and non-CCR flows from various sources within the J.K. Spruce Plant and all flows are co-mingled in the SRH Pond. The SRH Pond shares a common embankment with the North and South BAPs. The EP, located approximately a mile north of the Power Plants, currently receives non-CCR flows (industrial wastestreams) that are trucked to the EP from the J.K. Spruce Plant and from other CPS Energy power generation facilities. While these flows are not considered CCR, the EP was originally constructed as a fly ash landfill in 1990, and then converted to a fly ash impoundment in 1996. The North and South BAPs share a common embankment that separates the BAPs, and are immediately east and share an embankment with the SRH Pond. The BAPs have been dewatered and are currently undergoing closure.

40 CFR §257.73(d) requires that facilities conduct initial and periodic structural stability assessments for CCR surface impoundments to document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. Table 1 provides a summary of the requirements within the regulation, and the relevant information for each surface impoundment.

40 CFR §257.73(e) requires that facilities conduct initial and periodic safety factor assessments for CCR surface impoundments to document whether the calculated factors of safety for each CCR unit achieves the minimum factors of safety required by the CCR Rule. Factors of safety were initially calculated by Raba Kistner Consultants, Inc. (RKCI) in May 2014. These assessments were provided in a report entitled "*Geotechnical Engineering Study for Ash Pond Berms – Spruce/Deely Generation Units, San Antonio, Texas.*" ERM reviewed the information in these reports to evaluate whether factors of safety met the limits set forth in 40 CFR §257.73(e). All but one embankment evaluated by RKCI met the safety factor limits. The single non-complying safety factor was for the exterior slope of the northwestern berm on the North BAP, identified as cross-section or Embankment G. The steady-state safety factor for Embankment G was calculated at 1.2, and 1.4 on a reanalysis using a deeper failure surface. The minimum required safety factor for steady-state conditions is 1.5.

The RKCI report indicated that slopes used in the calculation for Embankment G were based on design drawings and field observations, not actual surveys. CPS Energy therefore engaged the services of a land surveyor (Pape-Dawson Engineers, Inc.) to collect measurements in two locations along Embankment G. The results of this survey, and the original RKCI soil data, were provided to HTS, Inc. Consultants (HTS), a geotechnical consulting firm in Houston, Texas. HTS recalculated the steady-state factor of safety utilizing the actual survey data. The calculated safety factors for both slopes were greater than 4. The letter report from HTS is included in Attachment 1.

From the date of the initial review of the structural stability and safety factor assessments, no changes have been made to the construction or operation of the CCR surface impoundments with the exception of the BAPs being dewatered. ERM reviewed the weekly inspection records performed by CPS Energy from 2015 through 2020 and annual inspection reports prepared by ERM from 2015 through 2020 and findings of those inspections included only minor rutting, minor erosion, and woody plant growth on exterior embankments. These maintenance items are routinely addressed by CPS Energy and are not expected to affect the stability or operation of the operating CCR surface impoundments.

Based on our evaluation of the available information for the operating surface impoundments, the construction, operation, and maintenance of the CCR units are consistent with recognized and generally accepted good engineering practices and the structural stability and safety factor assessments meet the requirements of 40 CFR §257.73(d) and (e).

Sincerely,

Environmental Resources Management Southwest, Inc.

Charles Johnson

Charles Johnson, P.E.

CHARLES O. JOHNSON
128280

10/27/2021

TABLE 1

TABLE 1
Summary of Structural Stability Requirements
Structural Stability and Safety Factor Assessments
CPS Energy, Calaveras Power Station
San Antonio, Texas, 10/27/2021

Regulatory Citation	Requirement	Sludge Recycle Holding Pond	Bottom Ash Ponds	Evaporation Pond
(d)(1)(i)	Stable foundations and abutments.	Based on calculated factors of safety, foundations and abutments are stable.	Based on calculated factors of safety, foundations and abutments are stable.	Based on calculated factors of safety, foundations and abutments are stable.
(d)(1)(ii)	Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown.	Slopes are vegetated with a continuous, maintained grass cover and inspected regularly for evidence of erosion.	Slopes are vegetated with a continuous, maintained grass cover and inspected regularly for evidence of erosion.	Slopes are vegetated with a continuous, maintained grass cover and inspected regularly for evidence of erosion.
(d)(1)(iii)	Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.	Based on geotechnical analysis and current slope conditions, it is likely that the dikes were mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit. Construction records documenting this are not available.	Based on geotechnical analysis and current slope conditions, it is likely that the dikes were mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit. Construction records documenting this are not available.	Based on geotechnical analysis and current slope conditions, it is likely that the dikes were mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit. Construction records documenting this are not available.
(d)(1)(iv) *	Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike.	Grass on slopes is regularly mowed to maintain height below six inches.	Grass on slopes is regularly mowed to maintain height below six inches.	Grass on slopes is regularly mowed to maintain height below six inches.
(d)(1)(v)(A)	All spillways must be either: (1) Of non-erodible construction and designed to carry sustained flows; or (2) Earth- or grass-lined and designed to carry short-term, infrequent flows at nonerosive velocities where sustained flows are not expected.	Not applicable - Two concrete-lined overflow spillways have been filled with road base/caliche as of the 2019 annual inspection of this CCR unit.	Not applicable - Historically the BAPs discharged via steel piping for regular and overflow discharges; however, the BAPs have been dewatered and are currently undergoing closure.	Not applicable - There are no spillways for this CCR unit.
(d)(1)(v)(B)	Spillways must adequately manage flow during and following the peak discharge from the required design storm flow.	Inflow during a storm is provided by direct precipitation and water that falls into a portion of the Power Station. Sufficient headboard is maintained to capture design storm flow without requiring discharge.	Not applicable - Historically the inflow during a storm was limited to direct precipitation and sufficient headboard was maintained to capture design storm flow without requiring discharge; however, the BAPs have been dewatered and are currently undergoing closure.	Inflow during a storm is limited to direct precipitation. Sufficient headboard is maintained to capture design storm flow without requiring discharge.
(d)(1)(vi)	Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit must maintain structural integrity.	Not applicable - There are no hydraulic structures underlying this CCR unit.	Not applicable - Historically the steel pipes acting as outfalls were regularly inspected to verify no erosion or damage; however, the BAPs have been dewatered and are currently undergoing closure.	Not applicable - There are no hydraulic structures underlying this CCR unit.
(d)(1)(vii)	Maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.	Toe of embankments are at or above pool elevation of Calaveras Lake, which is maintained artificially. Therefore, no rapid drawdown or low pool conditions are likely.	Toe of embankments are at or above pool elevation of Calaveras Lake, which is maintained artificially. Therefore, no rapid drawdown or low pool conditions are likely.	Toe of embankments are at or above pool elevation of Calaveras Lake, which is maintained artificially. Therefore, no rapid drawdown or low pool conditions are likely.

* Remanded with vacatur (USCA Case #15-1219, Document #1619358).

ATTACHMENT 1 HTS REPORT

HTS, Inc. Consultants
416 Pickering Street, Houston, TX 77091
www.htshouston.com

Phone 713-692-8373
Fax 713-692-8502
Toll Free 1-800-692-TEST

HTS, INC. Consultants

Excellence in Engineering, Consulting, Testing and Inspection

July 20, 2016

ERM, Inc.
840 W. Sam Houston Parkway N.
Suite 600
Houston, Texas 77024

Attn: Mr. Chris Cunningham P.E.

Re: Letter Report
Steady State Slope Stability Analysis
Ash Pond Berms - Spruce/Deely Generation Units
San Antonio, Texas

HTS Project No.: 16-S-303

Dear Mr. Cunningham:

This letter provides results of the slope stability analyses performed on the 2 sections provided by ERM, Inc. The original geotechnical investigation (report dated May 7, 2014) was performed by Raba Kistner Consultants (RKC). HTS was requested to perform steady state slope stability analyses on 2 sections that were modified due to low factors of safety (below 1.5) against a slope stability failure.

Slope stability analyses were performed using the soil parameters provided on page 11 of RKC report and the subsoil profile defined by Geotechnical Boring No. 7 which is located near section G as presented in RKC report, Figures A-1 and C-1b. The 2 section configurations used in our slope stability analyses are presented in Appendix A.

Slope stability analyses were performed in order to determine the factors of safety of the side slopes of the section configurations against a slope stability failure. The long term (steady state) shear strengths of the cohesive soils are based on the shear strength parameters from consolidated undrained triaxial tests performed and presented on the table on page 11 of RKC report. The cohesion and angle of friction for sands were assumed to be zero and 28°, respectively, for a conservative approach. The water gradient was also considered to be close to the ground surface for a conservative analysis. The results of these analyses are shown below and in Appendix B.

SECTION	FACTOR OF SAFETY (LONG TERM CONDITION)
Section Along CSA	4.06
Section Along CSB	4.08

The results of the stability analyses using the shear strength parameters as discussed above suggest that the slopes of the section configurations provided by ERM will be stable in the long term condition.

Should you have any questions or require additional information pertaining to this letter, please do not hesitate to contact us at your convenience.

Sincerely,
HTS, Inc. Consultants

Bonifacio F. Musngi Jr., P.E.
Senior Engineer

BONIFACIO F. MUSNGI, JR.
90666
07/20/16

HTS, Inc. Consultants
F-3478

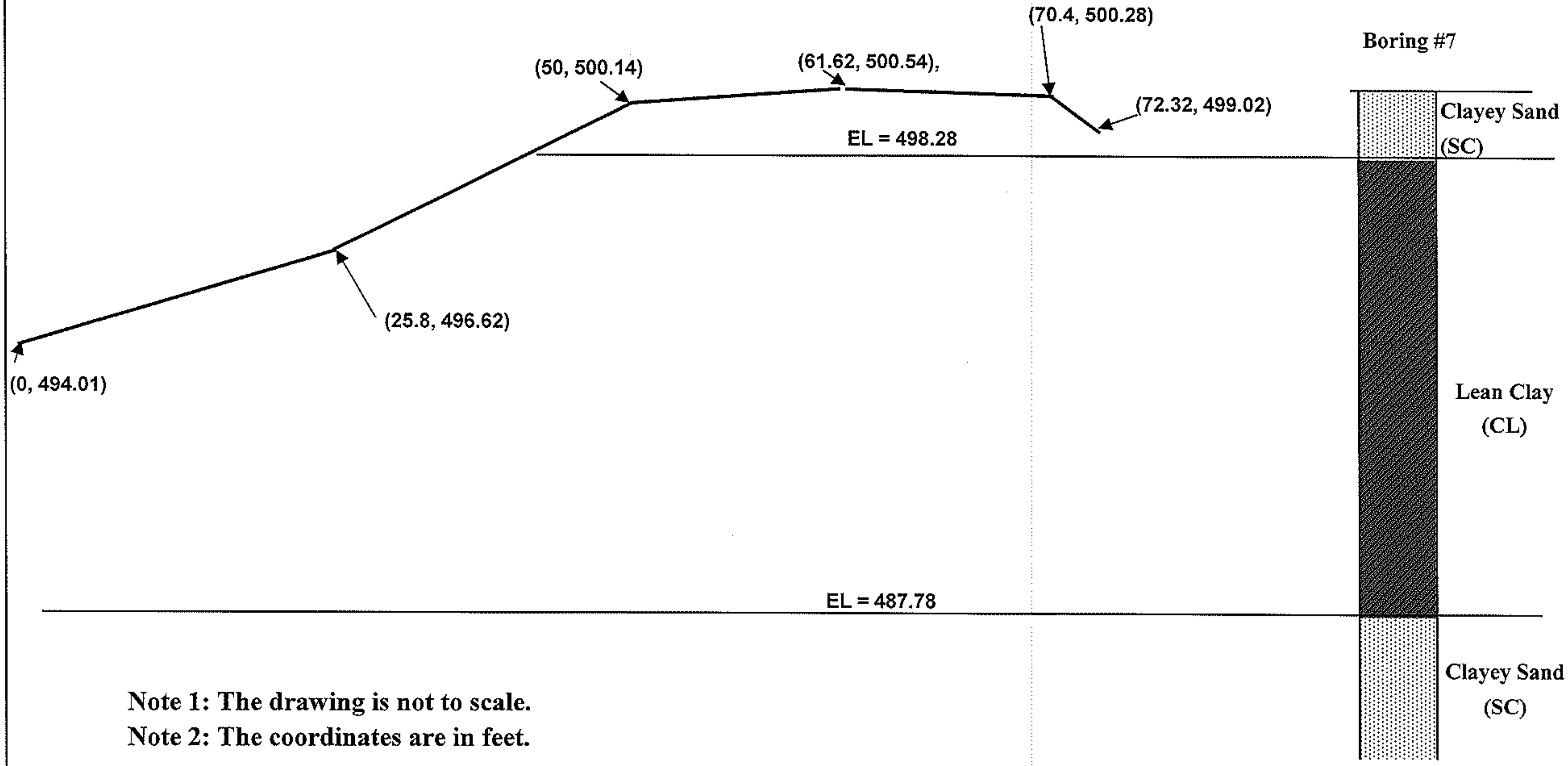
Attachments: Appendix A – Slope Section Configurations
Appendix B – Slope Stability Analyses Results

BFM/ba/cg

h:word/2016/300-349/16-303

APPENDIX A

SECTION ALONG CSA

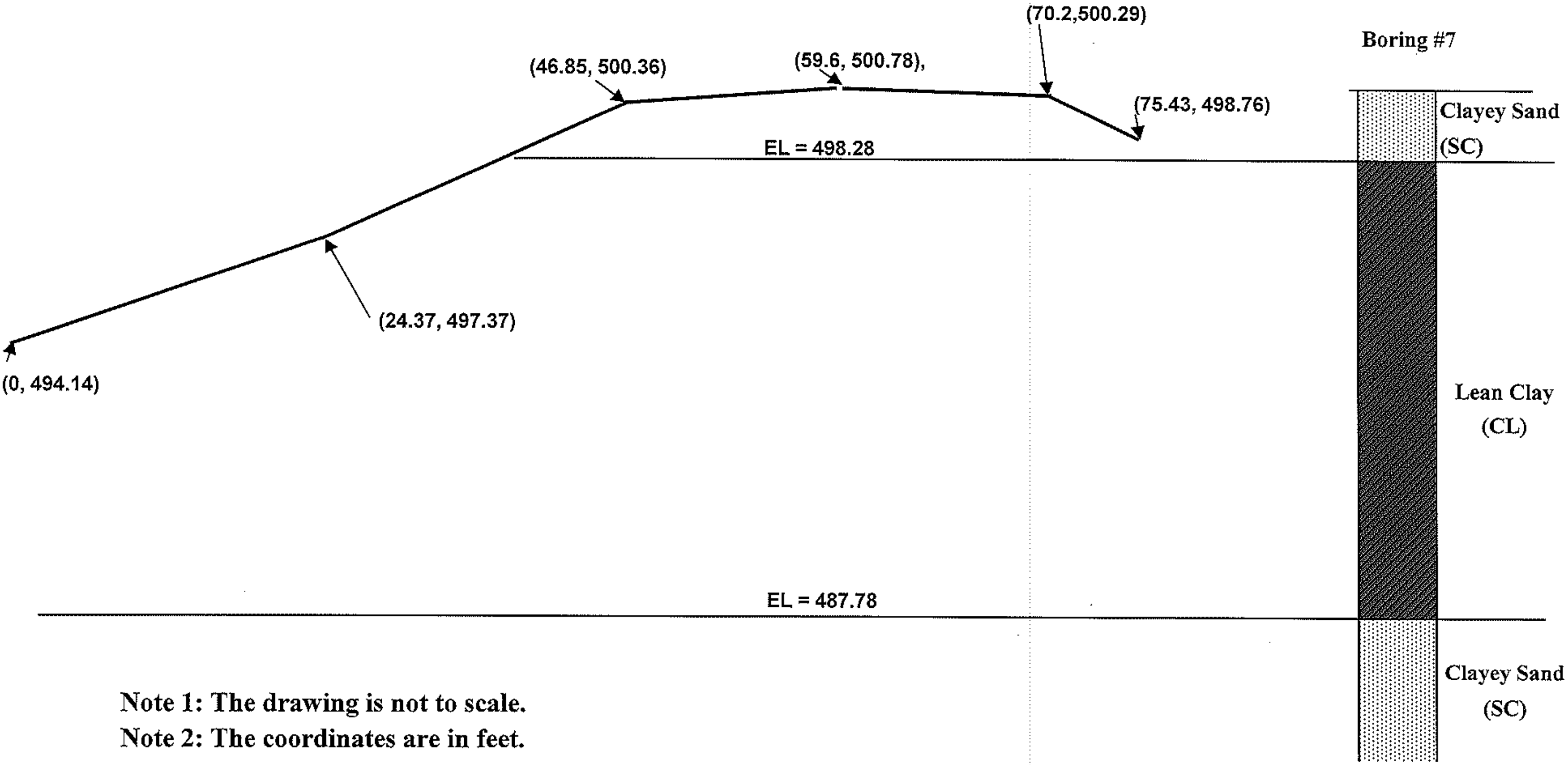


Note 1: The drawing is not to scale.
Note 2: The coordinates are in feet.

HTS, INC.
Consultants

Typical Section Configuration for Slope Stability Analyses - Section Along CSA		
Steady State Slope Stability Analysis Ash Pond Berms - Spruce/Deely Generation Units San Antonio, Texas		
Date: 7/18/16	**HTS Proj No.: 16-S-303**	**Plate 1**

SECTION ALONG CSB



Note 1: The drawing is not to scale.
Note 2: The coordinates are in feet.

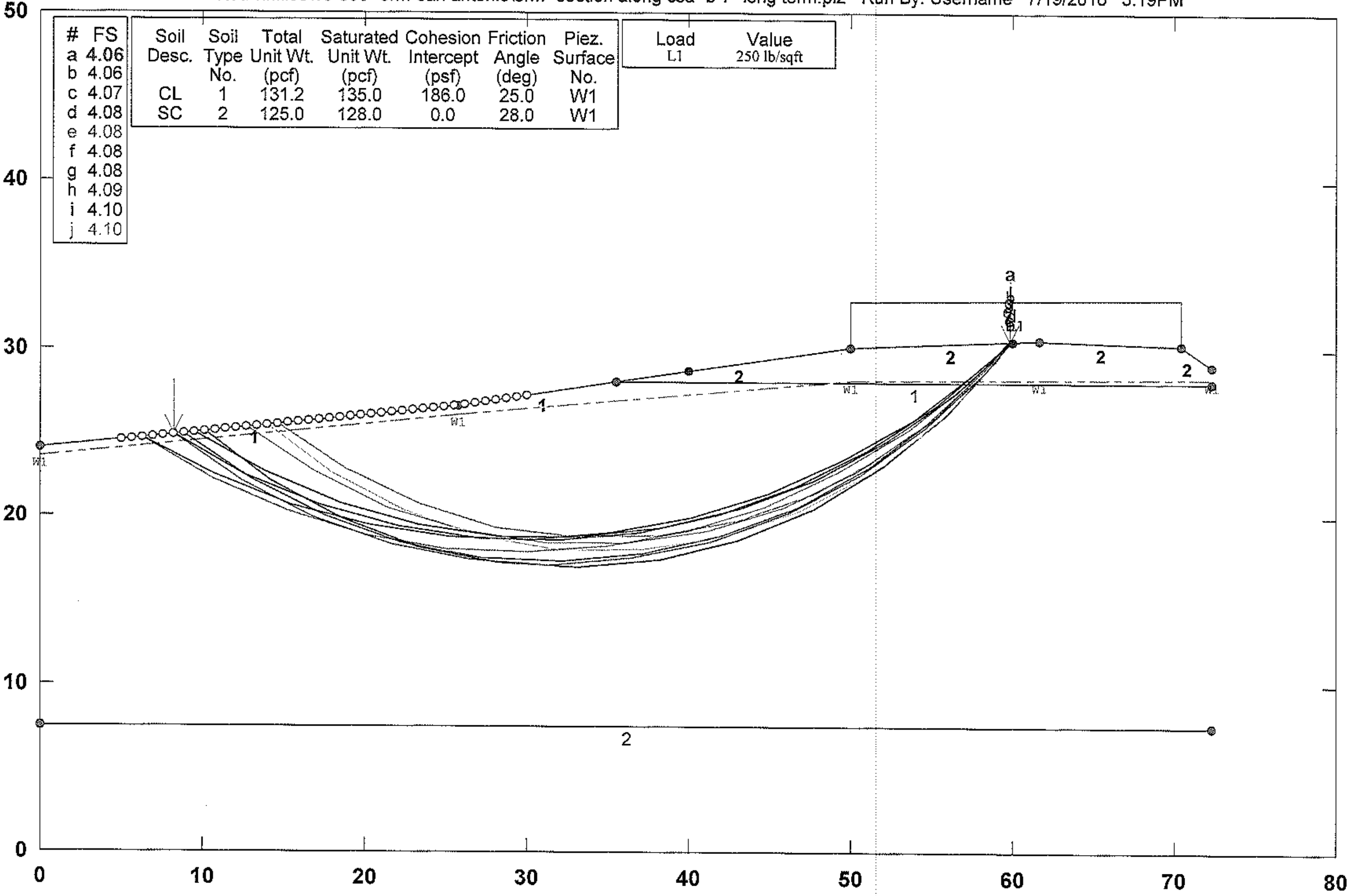
HTS, INC.
Consultants

Typical Section Configuration for Slope Stability Analyses - Section Along CSB		
Steady State Slope Stability Analysis Ash Pond Berms - Spruce/Deely Generation Units San Antonio, Texas		
Date: 7/18/16	**HTS Proj No.: 16-S-303**	**Plate 2**

APPENDIX B

Ash Pond Berms - Spruce/Deely, B-7 Long Term, CSA

h:\stedwinfiles\16-303- erm-san antonio\erm- section along csa- b-7- long term.pl2 Run By: Username 7/19/2016 3:19PM



#	FS
a	4.06
b	4.06
c	4.07
d	4.08
e	4.08
f	4.08
g	4.08
h	4.09
i	4.10
j	4.10

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL	1	131.2	135.0	186.0	25.0	W1
SC	2	125.0	128.0	0.0	28.0	W1

Load	Value
L1	250 lb/sqft

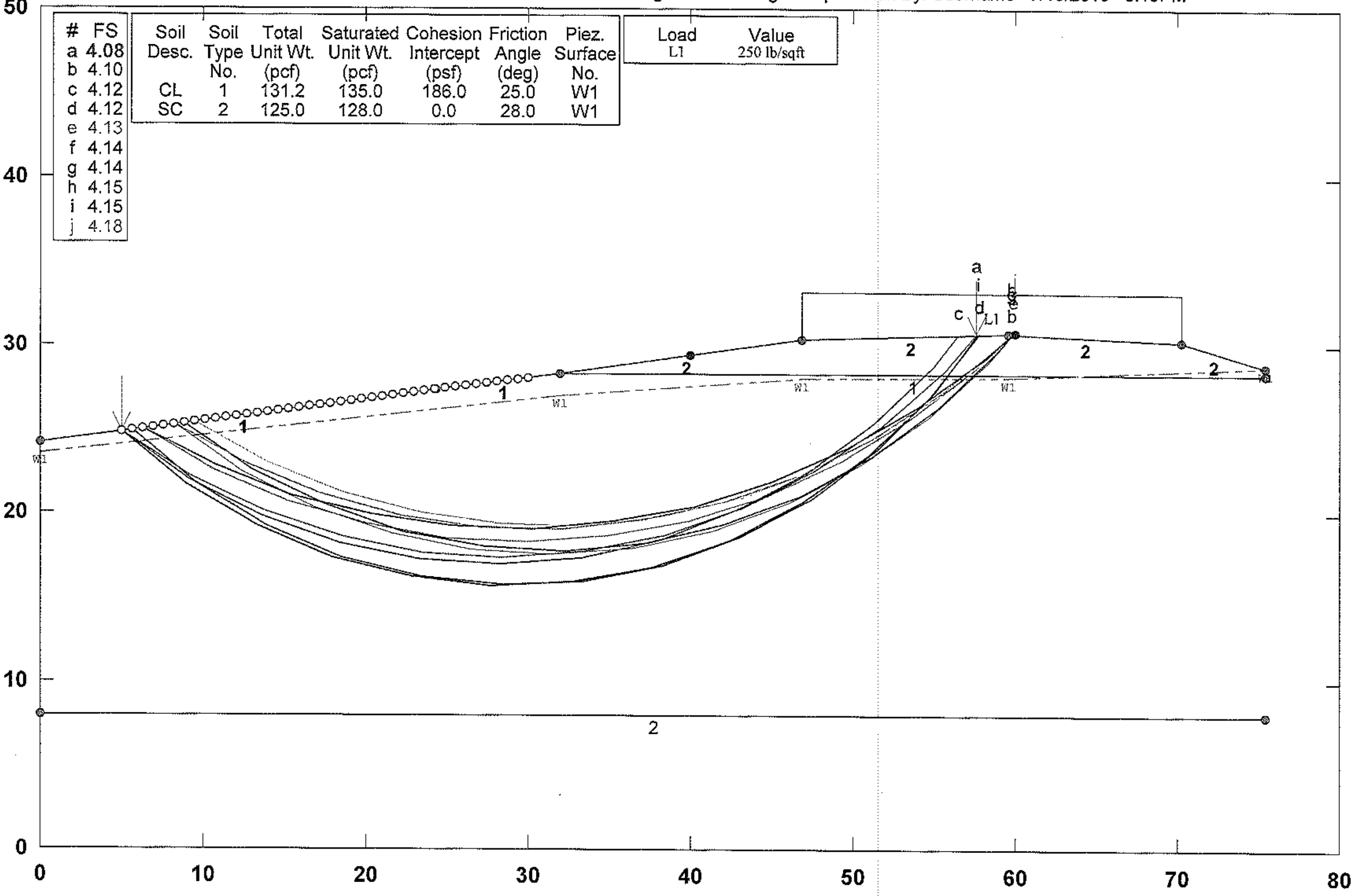
STABL6H FSmin=4.06

Safety Factors Are Calculated By The Modified Bishop Method

HTS, INC.
Consultants

Ash Pond Berms - Spruce/Deely, B-7 Long Term, CSB

h:\stedwinfiles\16-303- erm-san antonio\erm- section along csb- b-7- long term.pl2 Run By: Username 7/19/2016 3:19PM



#	FS
a	4.08
b	4.10
c	4.12
d	4.12
e	4.13
f	4.14
g	4.14
h	4.15
i	4.15
j	4.18

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL	1	131.2	135.0	186.0	25.0	W1
SC	2	125.0	128.0	0.0	28.0	W1

Load	Value
L1	250 lb/sqft

STABL6H FSmin=4.08

Safety Factors Are Calculated By The Modified Bishop Method

HTS, INC.
Consultants

Attachment 15 Written Demonstrations

Attachment 15-1

Environmental
Resources
Management

CityCentre Four
840 West Sam Houston Pkwy N.
Suite 600
Houston, Texas 77024
(281) 600-1000
(281) 600-1001 (Fax)

April 4, 2018

Mr. Michael Malone
CPS Energy
145 Navarro Street
San Antonio, Texas 78205

Project No. 0337367

Subject: Written Demonstration – Responses to Potential Statistically Significant Increases
Calaveras Power Station
San Antonio, Texas

Dear Mr. Malone:

Executive Summary

Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the Coal Combustion Residual (CCR) Rule) was published in the Federal Register in April 2015 and became effective in October 2015. The CCR Rule allows for continued beneficial use of all CCR. CPS Energy operates active surface impoundments and a landfill primarily for temporary storage and historically for disposal of fly ash and bottom ash.

One of the many requirements of the CCR Rule was for CPS Energy to determine if there are impacts to groundwater from any of the surface impoundments and landfill at the Calaveras Power Station that contain CCR, and post the determination to its website by January 31, 2018. As required by the CCR Rule, eight rounds of groundwater sampling were completed by October 17, 2017. The evaluation of the groundwater sample results indicated a potential statistically significant increase (SSI) for a limited number of constituents from the Evaporation Pond (EP), Fly Ash Landfill (FAL), and Bottom Ash Ponds (BAPs). Groundwater sample results from the Sludge Recycling Holding (SRH) Pond did not indicate a potential SSI.

Based on the evidence provided in this Written Demonstration, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy will continue with a detection monitoring program.

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

Introduction

CPS Energy owns and operates the Calaveras Power Station that consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under the CCR Rule. Currently, CPS Energy operates four CCR units at the Power Station: Evaporation Pond (EP), Fly Ash Landfill (FAL), Bottom Ash Ponds (BAPs), and the Sludge Recycle Holding (SRH) Pond. For the purpose of this Written Demonstration, the EP and FAL are collectively referred to as "Northern CCR Units". An *Annual Groundwater Monitoring and Corrective Action Report* was submitted for each of these CCR units. The *Annual Groundwater Monitoring and Corrective Action Reports* indicated that a potential statistically significant increase (SSI) over background levels was determined for one or more Appendix III constituents from monitoring wells associated with the EP, FAL, and BAPs. A potential SSI over background levels was not determined from monitoring wells associated with the SRH Pond.

According to the CCR Rule [§257.94(e)], if the owner or operator of a CCR unit determines there is a SSI over background levels for one or more Appendix III constituents, the owner or operator may demonstrate that a source other than the CCR unit caused the SSI over background levels or that the SSI resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality. The CCR Rule also indicates that the owner or operator must complete the written demonstration within 90 days of detecting a SSI over the background levels. If a successful demonstration is completed within the 90-day period, the owner or operator may continue with a detection monitoring program. If a successful demonstration is not completed within the 90-day period, the owner or operator must initiate an assessment monitoring program.

Groundwater Quality – General Comments

Several groundwater monitoring wells were installed in the northern portion of the property prior to the construction of the Northern CCR Units (EP was initially constructed as a landfill in 1990 and later converted to the surface impoundment in 1996 and the FAL was constructed in 1992). For the purpose of this Written Demonstration, the groundwater monitoring wells installed before the CCR units were constructed are termed "pre-existing monitoring wells". Groundwater monitoring results from the pre-existing monitoring wells were evaluated to compare background water quality and spatial and temporal variability as it relates to potential SSIs. In general, between 1988 and 1992, there was considerable variability in the concentrations in the wells. For example, TDS concentrations ranged from less than 500 mg/L to 9,000 mg/L and pH values ranged between 3.0 and 7.0 standard units (SU) with no apparent pattern in location, screened interval, or sample timing. Spatial variability was also observed at monitoring wells located upgradient from the Northern CCR Units, both before and after these CCR units were constructed. Note that several of the pre-existing monitoring wells are being used in the current groundwater monitoring system/monitoring well network.

Evaporation Pond (EP)

The downgradient monitoring well results from the October 2017 sampling event were used for comparison to historical data. Upper Prediction Limits (UPLs) and Lower Prediction Limits (LPLs) were calculated in the *Annual Groundwater Monitoring and Corrective Action Report* for the purpose of determining a potential SSI over background levels. Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) are shown in Table 1. A potential SSI was not determined in any other monitoring well associated with the EP.

TABLE 1. EP Downgradient Results Exceedances

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Fluoride	JKS-36	--	0.465	2017-10-11	1.32	mg/L
pH	JKS-36	5.68	6.75	2017-10-11	3.24	SU

All initial exceedances of the UPL and LPL were confirmed with re-testing of JKS-36 in January 2018 per the 1-of-2 re-testing scheme.

As shown in Figure 1, fluoride concentrations in JKS-36 from 1988 to 1992 fluctuated between approximately 0.6 and 1.5 mg/L, with no apparent pattern or significant increasing or decreasing trend. The concentrations of fluoride detected in JKS-36 during the initial CCR monitoring period were within this range and appear to be naturally occurring. There is no apparent correlation to screened depth, lithology, or proximity to the unit, and the concentrations reflect natural variability of this constituent.

As shown in Figure 1, data collected in JKS-36 from 1988 to 1992 indicate what should be considered stable background conditions prior to the unit being in long term use, with pH values fluctuating between approximately 3.2 and 4.6 SU. The pH values measured in JKS-36 during the initial CCR monitoring period were within this range and appear to be naturally occurring. In addition, as shown on Figure 2, three other monitoring wells in the northern portion of the property (JKS-31, JKS-40, and JKS-43) have similarly low pH values. There is no apparent correlation to screened depth, lithology, or proximity to the unit, and the values reflect natural variability of this constituent. Furthermore, pH values measured in water within the EP in January 2018 ranged between 8.86 and 9.24 SU, so the expectation would be that a release from the EP would also be alkaline.

Fly Ash Landfill (FAL)

The downgradient monitoring well results from the October 2017 sampling event were used for comparison to historical data. UPLs and LPLs were calculated in the *Annual Groundwater Monitoring and Corrective Action Report* for the purpose of determining a potential SSI over background levels. Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) are shown in Table 2. A potential SSI was not determined in any other monitoring well associated with the FAL.

TABLE 2. FAL Downgradient Results Exceedances

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Calcium	JKS-33	--	450	2017-10-10	531	mg/L
Chloride	JKS-33	--	314	2017-10-10	666	mg/L
Chloride	JKS-60	--	314	2017-10-10	352	mg/L
pH	JKS-31	4.02	6.73	2017-10-10	3.98	SU
pH	JKS-46	4.02	6.73	2017-10-10	3.20	SU

All initial exceedances of the UPL and LPL were confirmed with re-testing of JKS-31, JKS-33, JKS-46, and JKS-60 in January 2018 per the 1-of-2 re-testing scheme.

The apparent elevated concentrations of calcium and chloride measured in JKS-33 and JKS-60 are consistent with historical results of monitoring wells in the vicinity of the FAL before the unit was constructed and appear to be naturally occurring. As shown in Figure 3, calcium concentrations in JKS-33 have fluctuated between approximately 300 and 1,400 mg/L since monitoring began in 1988, with no significant change in concentrations since construction of the FAL. As also shown in Figure 3, chloride concentrations in JKS-33 have decreased from approximately 1,600 to less than 800 mg/L since monitoring began in 1988.

As shown in Figure 2, data collected in JKS-31 from 1988 to 1992 indicate stable background conditions, with pH values fluctuating between approximately 2.8 and 5.0 SU. The pH values measured in JKS-31 and JKS-46 during the initial CCR monitoring period were within this range and appear to be naturally occurring. As mentioned above, and as also shown in Figure 2, three other monitoring wells in the northern portion of the property (JKS-36, JKS-40, and JKS-43) have similarly low pH values. There is no apparent correlation to screened depth, lithology, or proximity to the unit, and the values reflect natural variability of this constituent.

Note: The FAL is primarily used for storage of fly ash prior to offsite beneficial use.

Bottom Ash Ponds (BAPs)

The downgradient monitoring well results from the October 2017 sampling event were used for comparison to historical data. UPLs and LPLs were calculated in the *Annual Groundwater Monitoring and Corrective Action Report* for the purpose of determining a potential SSI over background levels. Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) are shown in Table 3. A potential SSI was not determined in any other monitoring well associated with the BAPs.

TABLE 3. BAPs Downgradient Results Exceedances

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Fluoride	JKS-48	--	0.857	2017-10-10	1.22	mg/L
Fluoride	JKS-55	--	0.857	2017-10-10	0.864	mg/L
Boron	JKS-50R	--	3.52	2017-10-10	4.54	mg/L

All initial exceedances of the UPL were confirmed with re-testing of JKS-48, JKS-50R, and JKS-55 in January 2018 per the 1-of-2 re-testing scheme.

As shown on Figure 4, historical results from monitoring wells located upgradient of the Northern CCR Units, before and after the CCR units were constructed, indicate fluoride concentrations fluctuating between approximately 0.2 and 4.2 mg/L. The apparent elevated concentrations of fluoride detected in JKS-48 and JKS-55 during the initial CCR monitoring period are within the range of concentrations historically detected in these other monitoring wells, and appear to be naturally occurring.

Boron concentrations detected in the monitoring wells located near the BAPs range from approximately 0.6 and 4.7 mg/L. While the highest boron concentration detected exceeds the UPL for the BAPs, background monitoring wells for the BAPs and other monitoring wells located in the northern portion of the property have boron concentrations within the same order of magnitude. These boron concentrations in the monitoring wells located in the northern portion of the property reflect the natural variability in groundwater quality before the CCR units were constructed.

For comparison, a study of groundwater contamination from coal power plants across the southeast United States documented a 1 to 2 order of magnitude increase in boron concentrations between background and affected monitoring wells (Harkness et al., 2016). The detections in the wells in the study had boron concentrations of 1 to 6 mg/L, compared to background levels ranging from non-detect to 0.04 mg/L. Another study of affected groundwater from a CCR site in Indiana (Buszka et al., 2007) documented a 2 to 3 order of magnitude increase in boron concentrations between background and affected monitoring wells.

In addition, the statistical analysis shows that no other Appendix III constituents are elevated above background concentrations. If the elevated boron concentration was associated with a release, other elevated Appendix III constituent concentrations would also be expected (Milligan and Ruane, 1980).

Finally, the concentration of boron within the BAPs was considered with respect to concentrations in the surrounding monitoring wells. During two sampling events in February 2018, grab samples of effluent water from the BAPs had reported boron concentrations of 1.03 mg/L and 1.16 mg/L. Because boron is concentrated in coal ash compared to the original coal (Openshaw, 1992), and because boron is one of the more easily leached constituents in coal ash (Izquierdo and Querol, 2012), a low concentration of boron in the effluent indicates that the leachable boron concentration in the bottom ash is relatively low. In February 2018, a grab sample of the bottom ash that is being sent to the BAPs had a boron concentration of 122 mg/kg, and the toxicity characteristic leaching procedure (TCLP) analysis on this same sample had a boron concentration of 1.1 mg/L. The concentration of boron in the effluent and the leachable concentration of boron in the bottom ash are less than the concentration in JKS-50R.

Summary

EP – The concentrations of constituents associated with potential SSIs (fluoride and pH) appear to be naturally occurring and reflect natural variation in groundwater quality in the vicinity of the CCR unit.

FAL – The concentrations of constituents associated with potential SSIs (calcium, chloride, and pH) appear to be naturally occurring and reflect natural variation in groundwater quality in the vicinity of the CCR unit.

BAPs – The concentrations of constituents associated with potential SSIs (fluoride and boron) appear to be naturally occurring and reflect natural variation in groundwater quality in the vicinity of the CCR unit. In addition, if the boron concentration was associated with a release, other elevated Appendix III constituents would be expected and the expectation would be that the detected boron concentration would be lower based on the effluent water and bottom ash analyses.

Conclusions

Based on the evidence provided in this Written Demonstration, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy will continue with a detection monitoring program.

References

Buszka, P. M., J. Fitzpatrick, L. R. Watson, and R. T. Kay. 2007. Evaluation of Ground-Water and Boron Sources by Use of Boron Stable-Isotope Ratios, Tritium, and Selected Water-Chemistry Constituents near Beverly Shores, Northwestern Indiana, 2004. U.S. Geological Survey Scientific Investigations Report Series 2007-5166.

Harkness, J. S., B. Sulkin, and A. Vengosh. 2016. Evidence for Coal Ash Ponds Leaking in the Southeastern United States. Environmental Science and Technology, v. 50 no. 12, p 6583-6592.

Izquierdo, M. and X. Querol. 2012. Leaching behaviour of elements from coal combustion fly ash: An overview. International Journal of Coal Geology. v. 94., p. 54-66.

Milligan, J. D. and R. J. Ruane. 1980. Effects of Coal-ash Leachate on Ground Water Quality. USEPA Interagency Energy/Environment R&D Program Report, EPA-600/7-80-066.

Openshaw, S. C. 1992. Utilization of Coal Fly Ash. MS Thesis. University of Florida.

Certification

Certification from a qualified professional engineer verifying the accuracy of the information provided in this Written Demonstration is provided in Attachment 1.

We appreciate the opportunity to work with you on this project. Please contact me if you should have any questions.

Sincerely,

Environmental Resources Management

Melissa Boysun, P.G.

Texas Professional Geoscientist No. 11387

MELISSA BOYSUN
GEOLOGY
No. 11387

4/4/18

Figures

April 2018
Project No. 0337367
CPS Energy

Environmental Resources Management
CityCentre Four
840 West Sam Houston Pkwy N. Suite 600
Houston, Texas 77024
(281) 600-1000

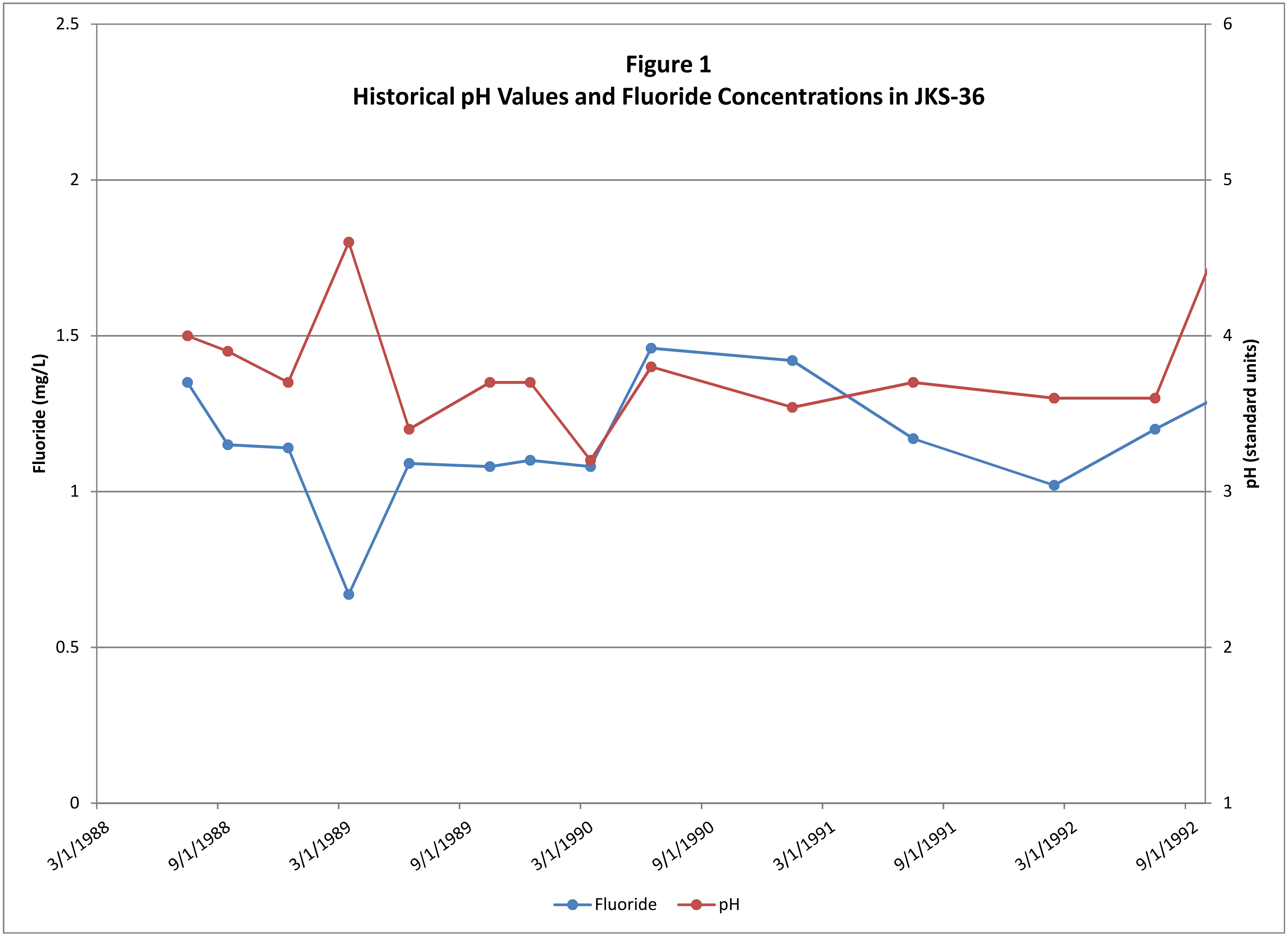


Figure 1
Historical pH Values and Fluoride Concentrations in JKS-36

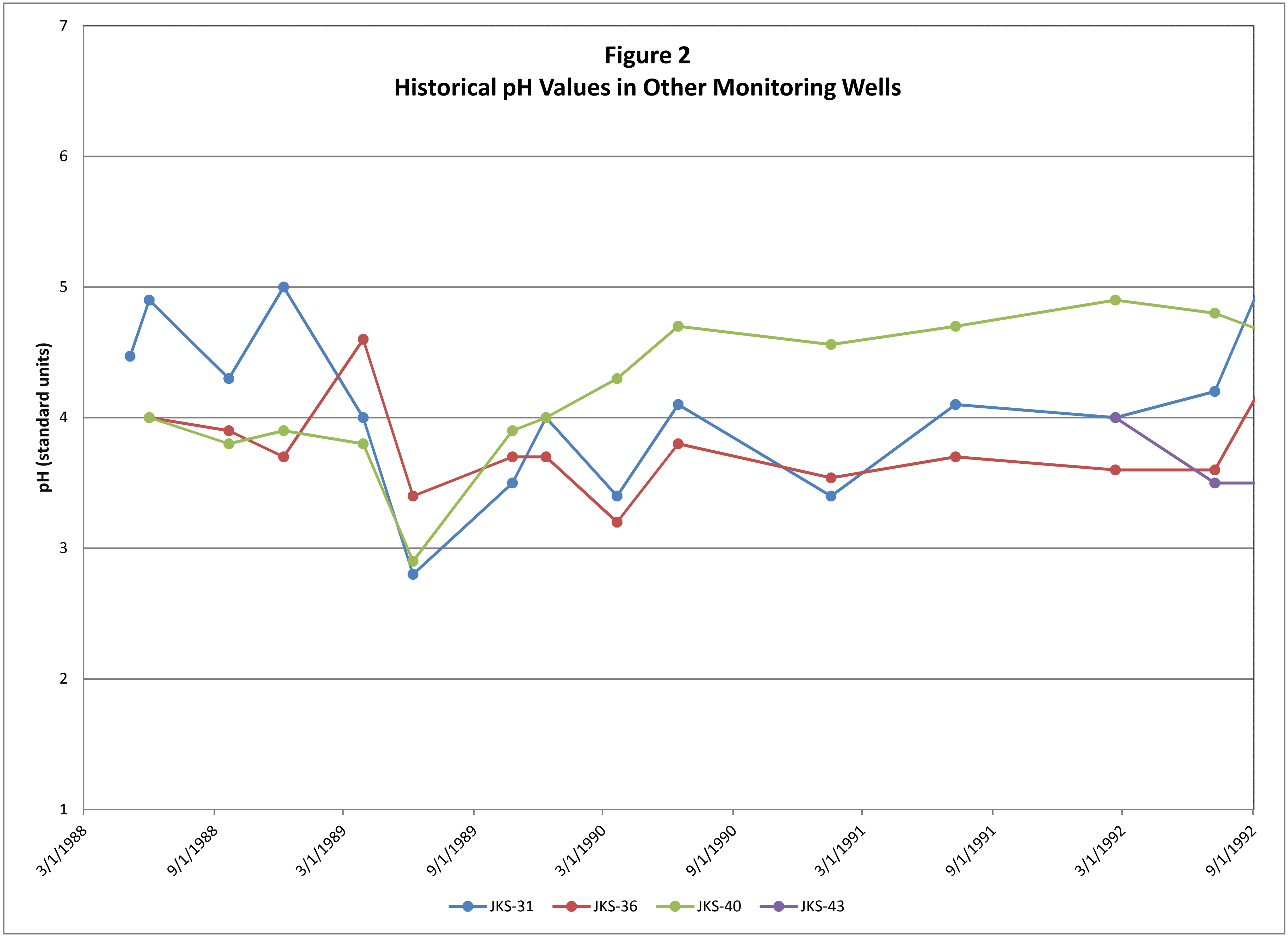


Figure 2
Historical pH Values in Other Monitoring Wells

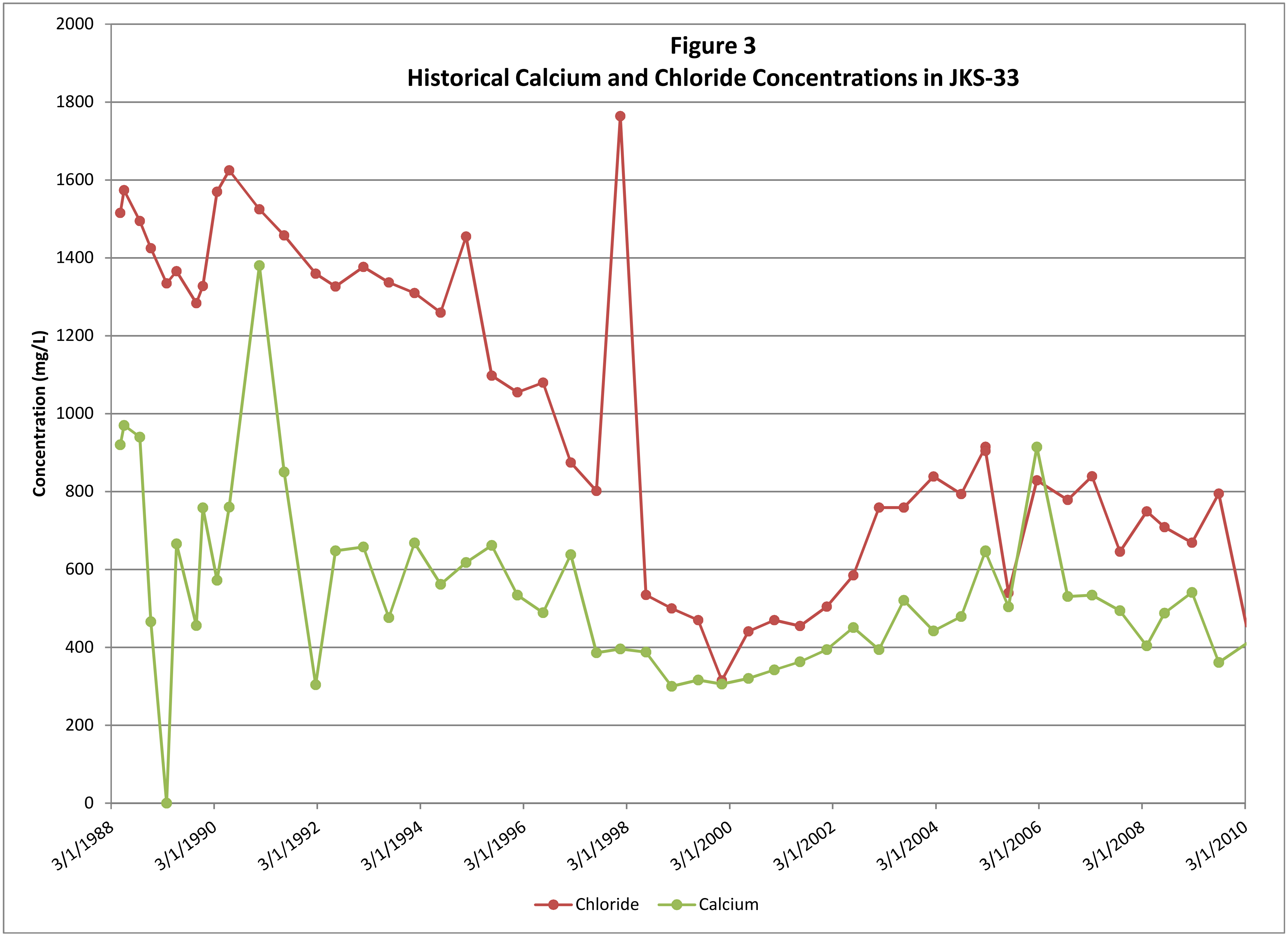


Figure 3
Historical Calcium and Chloride Concentrations in JKS-33

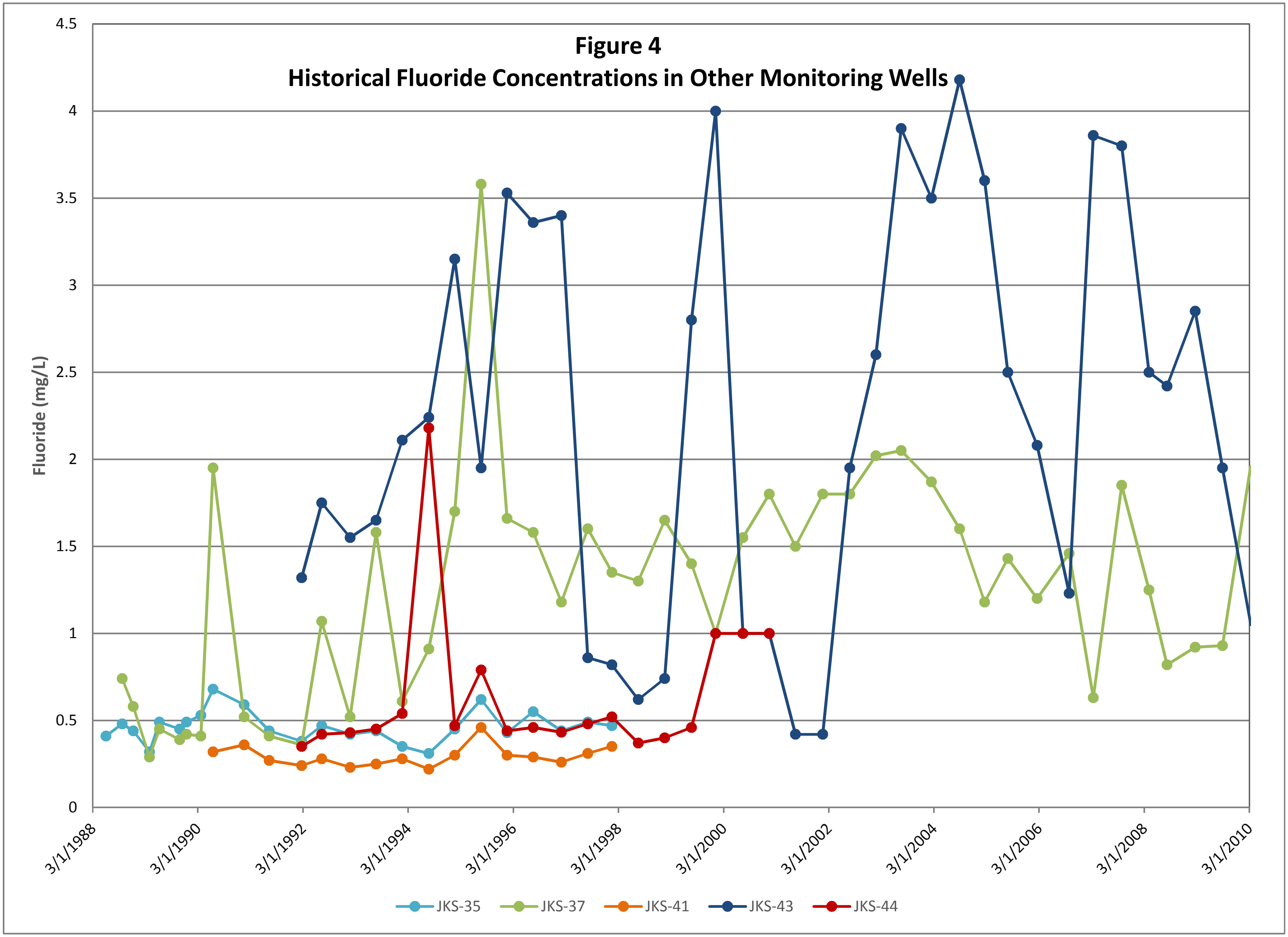


Figure 4
Historical Fluoride Concentrations in Other Monitoring Wells

Certification

Attachment 1

April 2018
Project No. 0337367
CPS Energy

Environmental Resources Management
CityCentre Four
840 West Sam Houston Pkwy N. Suite 600
Houston, Texas 77024
(281) 600-1000

WRITTEN DEMONSTRATION CERTIFICATION

Calaveras Power Station
San Antonio, Texas
CPS Energy

CERTIFICATION

I hereby verify the accuracy of the information provided in this Written Demonstration in accordance with the requirements of 40 CFR §257.94(e)(2).

JEFFERY L. BAUGUSS
86195

Jeffery L. Bauguss, P.E.

Texas Licensed Professional Engineer No. 86195

4/4/18

Attachment 15-2

ERM

CityCentre Four
840 West Sam Houston Parkway
North, Suite 600
Houston, Texas 77024-3920

Telephone: +281-600-1000
Fax: +281-520-4625

www.erm.com

ERM

27 February 2019

Mr. Michael Malone
CPS Energy
145 Navarro Street
San Antonio, Texas 78205

Reference: Project No. 0337367

Dear Mr. Malone:

Subject: *Written Demonstration* – Responses to Potential Statistically Significant Increases
Calaveras Power Station
San Antonio, Texas

Executive Summary

Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the Coal Combustion Residual (CCR) Rule) was published in the Federal Register in April 2015 and became effective in October 2015. The CCR Rule allows for continued beneficial use of all CCR. CPS Energy operates active surface impoundments and a landfill primarily for temporary storage and historically for disposal of fly ash and bottom ash.

One of the many requirements of the CCR Rule was for CPS Energy to determine if there are impacts to groundwater from any of the surface impoundments and landfill at the Calaveras Power Station that contain CCR, and post the evaluation to its website on an annual basis. The evaluation of the October 2018 groundwater sample results indicated a potential statistically significant increase (SSI) for a limited number of constituents from the Evaporation Pond (EP), Fly Ash Landfill (FAL), and Bottom Ash Ponds (BAPs). Groundwater sample results from the Sludge Recycling Holding (SRH) Pond did not indicate a potential SSI.

Based on the evidence provided in this *Written Demonstration,* no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy will continue with a detection monitoring program.

Introduction

CPS Energy owns and operates the Calaveras Power Station that consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under the CCR Rule. Currently, CPS Energy operates four CCR units at the Power Station: Evaporation Pond (EP), Fly Ash Landfill (FAL), Bottom Ash Ponds (BAPs), and the Sludge Recycle Holding (SRH) Pond. An *Annual Groundwater Monitoring and Corrective Action Report* (Report) was submitted for each of these CCR units. Upper Prediction Limits (UPLs) and Lower Prediction Limits (LPLs) were calculated in each Report for the purpose of determining a potential statistically significant increase (SSI) over background levels. The Reports indicated that a potential SSI over background levels was determined for one or more Appendix III constituents from monitoring wells associated with the EP, FAL, and BAPs. A potential SSI over background levels was not determined from monitoring wells associated with the SRH Pond.

According to the CCR Rule [§257.94(e)], if the owner or operator of a CCR unit determines there is a SSI over background levels for one or more Appendix III constituents, the owner or operator may demonstrate that a source other than the CCR unit caused the SSI over background levels or that the SSI resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality. The CCR Rule also indicates that the owner or operator must complete the written demonstration within 90 days of detecting a SSI over the background levels. If a successful demonstration is completed within the 90-day period, the owner or operator may continue with a detection monitoring program. If a successful demonstration is not completed within the 90-day period, the owner or operator must initiate an assessment monitoring program.

General Comments and Terms

- Several groundwater monitoring wells were installed in the northern portion of the property prior to the construction of the EP and FAL (collectively termed Northern CCR Units). The EP was initially constructed as a landfill in 1990 and later converted to the surface impoundment in 1996 and the FAL was constructed in 1992.
- 'historical data' refers to analytical data collected from 1988 through 1992 from monitoring wells that were in existence before the EP and FAL were operated. These monitoring wells are located over one mile north of the BAPs, and although the BAPs were constructed in 1977, the historical data collected from these wells and the current data collected from upgradient wells of the Northern CCR Units is useful in evaluating BAP data.
- 'background monitoring period' refers to the period from December 2016 to October 2017 when eight independent samples were collected from each background and downgradient well within the CCR monitoring well network.

Evaporation Pond (EP)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the EP are discussed below.

Boron (JKS-61)

Boron concentrations detected in EP monitoring wells were not previously identified as potential SSIs necessitating discussion in the April 2018 *Written Demonstration*. The boron concentrations detected in JKS-61 during the October 2018 monitoring event (3.25 mg/L) and the February 2019 resampling event (3.12 mg/L and 2.87 mg/L for the duplicate sample) are within the range of boron concentrations (between 2.67 to 3.48 mg/L) detected in upgradient monitoring well JKS-57 and are in the same order of magnitude (up to 2.27 mg/L) detected in upgradient monitoring well JKS-45 for the other Northern CCR Unit during the background monitoring period. The boron concentrations in these upgradient monitoring wells reflect the natural variability in groundwater quality.

Fluoride (JKS-36, JKS-61 and JKS-62)

Fluoride concentrations detected in JKS-36 were previously discussed in the April 2018 *Written Demonstration* and no SSI was determined for fluoride in this well based on the same lines of evidence provided below. The fluoride concentrations detected in JKS-36, JKS-61, and JKS-62 during the October 2018 monitoring event (1.47 mg/L, 0.43 mg/L and 0.309 mg/L, respectively) are within the range of fluoride concentrations detected in these wells during the background monitoring period. The historical data from JKS-36 indicate naturally occurring fluoride concentrations up to 1.5 mg/L. In addition, historical data from JKS-43 located in the vicinity of the EP indicate naturally occurring fluoride concentrations up to 1.75 mg/L.

pH (JKS-36)

pH values detected in JKS-36 were previously discussed in the April 2018 *Written Demonstration* and no SSI was determined for pH in this well based on the same lines of evidence provided below. The pH value in JKS-36 during the October 2018 monitoring event (3.61 SU) was within the range of pH values from the background monitoring period (between 3.24 and 6.98 SU). In addition, the historical data from JKS-36 indicate naturally occurring pH values ranging between 3.2 and 4.6 SU.

Fly Ash Landfill (FAL)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the FAL are discussed below.

Chloride (JKS-33)

Chloride concentrations detected in JKS-33 were previously discussed in the April 2018 *Written Demonstration* and no SSI was determined for chloride in this well based on the same line of evidence provided below. The chloride concentration detected in JKS-33 during the October 2018 monitoring event (758 mg/L) is lower than the chloride concentrations historically detected in this well. Chloride concentrations in JKS-33 have decreased from approximately 1,600 mg/L to less than 800 mg/L since monitoring began in 1988.

<u>pH (JKS-31 and JKS-46)</u>

pH values detected in JKS-31 and JKS-46 were previously discussed in the April 2018 *Written Demonstration* and no SSI was determined for pH in these wells based on the same lines of evidence provided below. The pH value detected in JKS-31 during the October 2018 monitoring event (3.07 SU) is below the range of pH values detected in this well during the background monitoring period (between 3.84 and 6.34 SU); however, historical data from JKS-31 indicate naturally occurring pH values ranging between 2.8 and 5.0 SU. The pH value detected in JKS-46 during the October 2018 monitoring event (3.00 SU) is within the range of pH values detected in this well during the background monitoring period (between 2.1 and 3.6 SU). In addition, historical data from JKS-36, JKS-40, and JKS-43 located in the vicinity of the Northern CCR Units indicate naturally occurring pH values ranging between 2.9 and 4.9 SU.

Note: The FAL is primarily used for storage of fly ash prior to offsite beneficial use.

Bottom Ash Ponds (BAPs)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the BAPs are discussed below.

<u>Boron (JKS-50R and JKS-56)</u>

Boron concentrations detected in JKS-50R were previously discussed in the April 2018 *Written Demonstration* and no SSI was determined for boron in this well based on the same lines of evidence provided below. The boron concentrations detected in JKS-50R and JKS-56 during the October 2018 monitoring event (5.17 mg/L and 3.95 mg/L, respectively) are in the same order of magnitude detected in upgradient monitoring wells JKS-57 and JKS-45 (up to 3.48 mg/L and 2.27 mg/L, respectively) for the Northern CCR Units during the background monitoring period. The boron concentrations in these upgradient monitoring wells reflect the natural variability in groundwater quality.

For comparison, a study of groundwater contamination from coal power plants across the southeast United States documented a 1 to 2 order of magnitude increase in boron concentrations between background and affected monitoring wells (Harkness et al., 2016). The detections in the wells in the study had boron concentrations of 1 to 6 mg/L, compared to background levels ranging from non-detect to 0.04 mg/L. Another study of affected groundwater from a CCR site in Indiana (Buszka et al., 2007) documented a 2 to 3 order of magnitude increase in boron concentrations between background and affected monitoring wells.

In addition, the statistical analysis shows that no other Appendix III constituents were identified as potential SSIs in JKS-50R or JKS-56. If the elevated boron concentrations were associated with a release, other elevated Appendix III constituent concentrations would also be expected (Milligan and Ruane, 1980).

Finally, the concentration of boron within the BAPs was considered with respect to concentrations in the surrounding monitoring wells. During two sampling events in February 2018, grab samples of effluent water from the BAPs had reported boron concentrations of 1.03 mg/L and 1.16 mg/L. Because boron is concentrated in coal ash compared to the original coal (Openshaw, 1992), and because boron is one of the more easily leached constituents in coal ash (Izquierdo and Querol, 2012), a low concentration of boron in the effluent indicates that the leachable boron concentration in the bottom ash is relatively low. In February 2018, a grab sample of the bottom ash being sent to the BAPs had a boron concentration of 122 mg/kg, and the toxicity characteristic leaching procedure (TCLP) analysis on this same sample had a boron concentration of 1.1 mg/L. The concentration of boron in the effluent and the leachable concentration of boron in the bottom ash are less than the concentrations in JKS-50R or JKS-56.

Fluoride (JKS-48)

Fluoride concentrations detected in JKS-48 were previously discussed in the April 2018 *Written Demonstration* and no SSI was determined for fluoride in this well based on the same lines of evidence provided below. The fluoride concentration detected in JKS-48 during the October 2018 monitoring event (1.31 mg/L) is within the range of fluoride concentrations detected in this well during the background monitoring period (between less than 0.2 and 1.62 mg/L). In addition, historical data from JKS-43 located in the vicinity of the Northern CCR Units indicates naturally occurring fluoride concentrations up to 1.75 mg/L.

Summary

EP – The concentrations of constituents associated with potential SSIs (boron, fluoride and pH) appear to be naturally occurring and reflect natural variability in groundwater quality.

FAL – The concentrations of constituents associated with potential SSIs (chloride and pH) appear to be naturally occurring and reflect natural variability in groundwater quality.

BAPs – The concentrations of constituents associated with potential SSIs (boron and fluoride) appear to be naturally occurring and reflect natural variability in groundwater quality. In addition, if the boron concentrations were associated with a release, other elevated Appendix III constituents would be expected and the expectation would be that the detected boron concentrations would be lower based on the effluent water and bottom ash analyses.

Conclusions

Based on the evidence provided in this *Written Demonstration*, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy will continue with a detection monitoring program.

References

Buszka, P. M., J. Fitzpatrick, L. R. Watson, and R. T. Kay. 2007. Evaluation of Ground-Water and Boron Sources by Use of Boron Stable-Isotope Ratios, Tritium, and Selected Water-Chemistry Constituents near Beverly Shores, Northwestern Indiana, 2004. U.S. Geological Survey Scientific Investigations Report Series 2007-5166.

Harkness, J. S., B. Sulkin, and A. Vengosh. 2016. Evidence for Coal Ash Ponds Leaking in the Southeastern United States. Environmental Science and Technology, v. 50 no. 12, p 6583-6592.

Izquierdo, M. and X. Querol. 2012. Leaching behaviour of elements from coal combustion fly ash: An overview. International Journal of Coal Geology. v. 94. p. 54-66.

Milligan, J. D. and R. J. Ruane. 1980. Effects of Coal-ash Leachate on Ground Water Quality. USEPA Interagency Energy/Environment R&D Program Report, EPA-600/7-80-066.

Openshaw, S. C. 1992. Utilization of Coal Fly Ash. MS Thesis. University of Florida.

Certification

Certification from a qualified professional engineer verifying the accuracy of the information provided in this *Written Demonstration* is provided in Attachment 1.

We appreciate the opportunity to work with you on this project. Please contact me if you should have any questions.

Yours sincerely,

Walter Zverina

Walter Zverina
Senior Project Manager

ATTACHMENT 1 CERTIFICATION

WRITTEN DEMONSTRATION CERTIFICATION

Calaveras Power Station
San Antonio, Texas
CPS Energy

CERTIFICATION

I hereby verify the accuracy of the information provided in this *Written Demonstration* in accordance with the requirements of 40 CFR §257.94(e)(2).

JEFFERY L. BAUGUSS
86195

2/27/19

Jeffery L. Bauguss, P.E.
Texas Licensed Professional Engineer No. 86195

Attachment 15-3

ERM

CityCentre Four
840 West Sam Houston Parkway
North, Suite 600
Houston, Texas 77024-3920

Telephone: +281 600 1000
Fax: +281 520 4625

www.erm.com

ERM

27 April 2020

Mr. Michael Malone
CPS Energy
145 Navarro Street
San Antonio, Texas 78205

Reference: Project No. 0503422

Dear Mr. Malone:

Subject: Written Demonstration – Responses to Potential Statistically Significant Increases
Calaveras Power Station
San Antonio, Texas

Executive Summary

Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the Coal Combustion Residual (CCR) Rule) was published in the Federal Register in April 2015 and became effective in October 2015. The CCR Rule allows for continued beneficial use of all CCR. CPS Energy operates active surface impoundments and a landfill primarily for temporary storage and historically for disposal of fly ash and bottom ash.

One of the many requirements of the CCR Rule was for CPS Energy to determine if there are impacts to groundwater from any of the surface impoundments and landfill at the Calaveras Power Station that contain CCR, and post the evaluation to its website on an annual basis. The evaluation of the October 2019 groundwater sample results indicated a potential statistically significant increase (SSI) for a limited number of constituents from the Evaporation Pond (EP), Fly Ash Landfill (FAL), and Bottom Ash Ponds (BAPs). Groundwater sample results from the Sludge Recycle Holding (SRH) Pond did not indicate a potential SSI.

Based on the evidence provided in this Written Demonstration, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy will continue with a detection monitoring program.

Introduction

CPS Energy owns and operates the Calaveras Power Station that consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under the CCR Rule. Currently, CPS Energy operates three CCR units at the Power Station: Evaporation Pond (EP), Fly Ash Landfill (FAL), and the Sludge Recycle Holding (SRH) Pond. Although the J.T. Deely Power Plant ceased operation at the end of December 2018 and sluiced bottom ash is no longer being received at the Bottom Ash Ponds (BAPs), the BAPs will continue to be monitored until the units have undergone closure. An Annual Groundwater Monitoring and Corrective Action Report (Report) was completed for each of these CCR units. Upper Prediction Limits (UPLs) and Lower Prediction Limits (LPLs) were calculated in each Report for the purpose of determining a potential statistically significant increase (SSI) over background levels. The Reports indicated that a potential SSI over background levels was determined for one or more Appendix III constituents from monitoring wells associated with the EP, FAL, and BAPs. A potential SSI over background levels was not determined from monitoring wells associated with the SRH Pond.

According to the CCR Rule [§257.94(e)], if the owner or operator of a CCR unit determines there is a SSI over background levels for one or more Appendix III constituents, the owner or operator may demonstrate that a source other than the CCR unit caused the SSI over background levels or that the SSI resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality. The CCR Rule also indicates that the owner or operator must complete the written demonstration within 90 days of detecting a SSI over the background levels. If a successful demonstration is completed within the 90-day period, the owner or operator may continue with a detection monitoring program. If a successful demonstration is not completed within the 90-day period, the owner or operator must initiate an assessment monitoring program.

General Comments and Terms

- Several groundwater monitoring wells were installed in the northern portion of the property prior to the construction of the EP and FAL (collectively termed Northern CCR Units). The EP was initially constructed as a landfill in 1990 and later converted to the surface impoundment in 1996 and the FAL was constructed in 1992.
- ‘historical data’ refers to analytical data collected from 1988 through 1992 from monitoring wells that were in existence before the EP and FAL were operated. These monitoring wells are located over one mile north of the BAPs, and although the BAPs were constructed in 1977, the historical data collected from these wells and the current data collected from upgradient wells of the Northern CCR Units is useful in evaluating BAP data.
- ‘background monitoring period’ refers to the period from December 2016 to October 2017 when eight independent samples were collected from each background and downgradient well within the CCR monitoring well network.

Evaporation Pond (EP)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the EP are presented in the following table and are discussed below.

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Boron	JKS-61	--	1.88	2019-10-22	2.90	mg/L
Fluoride	JKS-36	--	0.382	2019-10-22	1.41	mg/L
Fluoride	JKS-61	--	0.382	2019-10-22	0.48	mg/L
pH	JKS-36	4.58	6.47	2019-10-22	3.66	SU

Boron (JKS-61)

Boron concentrations detected in JKS-61 were previously discussed in the February 2019 *Written Demonstration* and no SSI was determined for boron in this well based on the line of evidence provided below. The boron concentrations detected in JKS-61 during the October 2019 monitoring event (2.90 mg/L) and the February 2020 resampling event (2.30 mg/L) are less than or within the range of boron concentrations (between 2.67 to 3.48 mg/L) detected in upgradient monitoring well

JKS-57 and are in the same order of magnitude (up to 2.27 mg/L) detected in upgradient monitoring well JKS-45 for the other Northern CCR Unit during the background monitoring period. The boron concentrations in these upgradient monitoring wells reflect the natural variability in groundwater quality.

Fluoride (JKS-36 and JKS-61)

Fluoride concentrations detected in JKS-36 and JKS-61 were previously discussed in the April 2018 and February 2019 *Written Demonstrations* and no SSI were determined for fluoride in these wells based on the lines of evidence provided below. The fluoride concentrations detected in JKS-36 and JKS-61 during the October 2019 monitoring event (1.41 mg/L and 0.48 mg/L, respectively) are within the range of fluoride concentrations (between <0.036 mg/L and 1.53 mg/L and between <0.036 mg/L and 0.64 mg/L, respectively) detected in these monitoring wells during the background monitoring period. The historical data from JKS-36 indicate naturally occurring fluoride concentrations up to 1.5 mg/L. In addition, historical data from JKS-43 located in the vicinity of the EP indicate naturally occurring fluoride concentrations up to 1.75 mg/L.

pH (JKS-36)

pH values detected in JKS-36 were previously discussed in the April 2018 and February 2019 *Written Demonstrations* and no SSI was determined for pH in this well based on the lines of evidence provided below. The pH value in JKS-36 during the October 2019 monitoring event (3.66 SU) is within the range of pH values (between 3.24 and 6.98 SU) detected during the background monitoring period. In addition, the historical data from JKS-36 indicate naturally occurring pH values ranging between 3.2 and 4.6 SU.

Fly Ash Landfill (FAL)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the FAL are presented in the following table and are discussed below.

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
pH	JKS-31	3.98	6.73	2019-10-22	2.62	SU
pH	JKS-46	3.98	6.73	2019-10-23	2.62	SU

pH (JKS-31 and JKS-46)

pH values detected in JKS-31 and JKS-46 were previously discussed in the April 2018 and February 2019 Written Demonstrations and no SSI was determined for pH in these wells based on the same lines of evidence provided below. The pH value detected in JKS-31 during the October 2019 monitoring event (2.62 SU) is below the range of pH values detected in this well during the background monitoring period (between 3.84 and 6.34 SU); however, the pH value detected in the February 2020 resampling event (4.11 SU) is not a SSI and historical data from JKS-31 indicate naturally occurring pH values ranging between 2.8 and 5.0 SU. The pH values detected in JKS-46 during the October 2019 monitoring event (2.62 SU) and the February 2020 resampling event (3.60 SU) are within the range of pH values detected in this well during the background monitoring period (between 2.1 and 3.6 SU). In addition, historical data from JKS-36, JKS-40, and JKS-43 located in the vicinity of the Northern CCR Units indicate naturally occurring pH values ranging between 2.9 and 4.9 SU.

Note: The FAL is primarily used for storage of fly ash prior to offsite beneficial use and does not store liquid CCR or non-CCR wastestreams.

Bottom Ash Ponds (BAPs)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the BAPs are presented in the following table and are discussed below.

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Boron	JKS-50R	--	2.4	2019-10-22	6.93	mg/L
Boron	JKS-56	--	2.4	2019-10-22	4.47	mg/L
Fluoride	JKS-48	--	0.847	2019-10-22	1.25	mg/L

Boron (JKS-50R and JKS-56)

Boron concentrations detected in JKS-50R and JKS-56 were previously discussed in the February 2019 Written Demonstration and no SSI was determined for boron in these wells based on the lines of evidence provided below. The boron concentrations detected in JKS-50R and JKS-56 during the October 2019 monitoring event (6.93 mg/L and 4.47 mg/L, respectively) and the February 2020 resampling event (6.36 mg/L and 4.04 mg/L, respectively) are in the same order of magnitude detected in upgradient monitoring wells JKS-57 and JKS-45 (up to 3.48 mg/L and 2.27 mg/L, respectively) for the Northern CCR Units during the background monitoring period. The boron concentrations in these upgradient monitoring wells reflect the natural variability in groundwater quality.

For comparison, a study of groundwater contamination from coal power plants across the southeast United States documented a 1 to 2 order of magnitude increase in boron concentrations between background and affected monitoring wells (Harkness et al., 2016). The detections in the wells in the study had boron concentrations of 1 to 6 mg/L, compared to background levels ranging from non-detect to 0.04 mg/L. Another study of affected groundwater from a CCR site in Indiana (Buszka et al., 2007) documented a 2 to 3 order of magnitude increase in boron concentrations between background and affected monitoring wells.

In addition, the statistical analysis shows that no other Appendix III constituents were identified as potential SSIs in JKS-50R or JKS-56. If the elevated boron concentrations were associated with a release, other elevated Appendix III constituent concentrations would also be expected in these wells (Milligan and Ruane, 1980).

Finally, the concentration of boron within the BAPs was considered with respect to concentrations in the surrounding monitoring wells. During two sampling events in February 2018, grab samples of effluent water from the BAPs had reported boron concentrations of 1.03 mg/L and 1.16 mg/L. Because boron is concentrated in coal ash compared to the original coal (Openshaw, 1992), and because boron is one of the more easily leached constituents in coal ash (Izquierdo and Querol, 2012), a low concentration of boron in the effluent indicates that the leachable boron concentration in the bottom ash is relatively low. In February 2018, a grab sample of the bottom ash being sent to the BAPs had a boron concentration of 122 mg/kg, and the toxicity characteristic leaching procedure (TCLP) analysis on this same sample had a boron concentration of 1.1 mg/L. The concentration of boron in the effluent and the leachable concentration of boron in the bottom ash are less than the concentrations in JKS-50R or JKS-56.

Fluoride (JKS-48)

Fluoride concentrations detected in JKS-48 were previously discussed in the February 2019 Written Demonstration and no SSI was determined for fluoride in this well based on the lines of evidence provided below. The fluoride concentration detected in JKS-48 during the October 2019 monitoring event (1.25 mg/L) is within the range of fluoride concentrations (between <0.2 and 1.62 mg/L) detected in this well during the background monitoring period. In addition, historical data from JKS-43 located in the vicinity of the Northern CCR Units indicates naturally occurring fluoride concentrations up to 1.75 mg/L.

Summary

EP – The concentrations of constituents associated with potential SSIs (boron, fluoride and pH) appear to be naturally occurring and reflect natural variability in groundwater quality.

FAL – The concentrations of constituents associated with potential SSIs (pH) appear to be naturally occurring and reflect natural variability in groundwater quality.

BAPs – The concentrations of constituents associated with potential SSIs (boron and fluoride) appear to be naturally occurring and reflect natural variability in groundwater quality. In addition, if the boron concentrations were associated with a release, other elevated Appendix III constituents would be expected and the expectation would be that the detected boron concentrations would be lower based on the effluent water and bottom ash analyses.

Conclusions

Based on the evidence provided in this Written Demonstration, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy should continue with a detection monitoring program.

References

Buszka, P. M., J. Fitzpatrick, L. R. Watson, and R. T. Kay. 2007. Evaluation of Ground-Water and Boron Sources by Use of Boron Stable-Isotope Ratios, Tritium, and Selected Water-Chemistry Constituents near Beverly Shores, Northwestern Indiana, 2004. U.S. Geological Survey Scientific Investigations Report Series 2007-5166.

Harkness, J. S., B. Sulkin, and A. Vengosh. 2016. Evidence for Coal Ash Ponds Leaking in the Southeastern United States. Environmental Science and Technology, v. 50 no. 12, p 6583-6592.

Izquierdo, M. and X. Querol. 2012. Leaching behaviour of elements from coal combustion fly ash: An overview. International Journal of Coal Geology. v. 94. p. 54-66.

Milligan, J. D. and R. J. Ruane. 1980. Effects of Coal-ash Leachate on Ground Water Quality. USEPA Interagency Energy/Environment R&D Program Report, EPA-600/7-80-066.

Openshaw, S. C. 1992. Utilization of Coal Fly Ash. MS Thesis. University of Florida.

Certification

Certification from a qualified professional engineer verifying the accuracy of the information provided in this Written Demonstration is provided in Attachment 1.

We appreciate the opportunity to work with you on this project. Please contact me if you should have any questions.

Yours sincerely,

Walter Zverina

Walter Zverina
Project Manager

ATTACHMENT 1 CERTIFICATION

WRITTEN DEMONSTRATION CERTIFICATION

Calaveras Power Station
San Antonio, Texas
CPS Energy

CERTIFICATION

I hereby verify the accuracy of the information provided in this *Written Demonstration* in accordance with the requirements of 40 CFR §257.94(e)(2).

JEFFERY L. BAUGUSS
86195

4/27/2020

Jeffery L. Bauguss, P.E.
Texas Licensed Professional Engineer No. 86195

Attachment 15-4

ERM

CityCentre Four
840 West Sam Houston Parkway
North, Suite 600
Houston, Texas 77024-3920

Telephone: +281-600-1000
Fax: +281-520-4625

www.erm.com

18 June 2021

Mr. Michael Malone
CPS Energy
145 Navarro Street
San Antonio, Texas 78205

Reference: Project No. 0503422

Dear Mr. Malone:

Subject: *Written Demonstration* – Responses to Potential Statistically Significant Increases
Calaveras Power Station
San Antonio, Texas

Executive Summary

Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the Coal Combustion Residual (CCR) Rule) was published in the Federal Register in April 2015 and became effective in October 2015. The CCR Rule allows for continued beneficial use of all CCR. CPS Energy operates active surface impoundments and a landfill primarily for temporary storage and historically for disposal of fly ash and bottom ash.

One of the many requirements of the CCR Rule was for CPS Energy to determine if there are impacts to groundwater from any of the surface impoundments and landfill at the Calaveras Power Station that contain CCR, and post the evaluation to its website on an annual basis. The evaluation of the October 2020 groundwater sample results indicated a potential statistically significant increase (SSI) for a limited number of constituents from the Evaporation Pond (EP), Fly Ash Landfill (FAL), and Bottom Ash Ponds (BAPs). Groundwater sample results from the Sludge Recycle Holding (SRH) Pond did not indicate a potential SSI.

Based on the evidence provided in this *Written Demonstration*, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy will continue with a detection monitoring program.

Introduction

CPS Energy owns and operates the Calaveras Power Station that consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under the CCR Rule. Currently, CPS Energy operates three CCR units at the Power Station: Evaporation Pond (EP), Fly Ash Landfill (FAL), and the Sludge Recycle Holding (SRH) Pond. Although the J.T. Deely Power Plant ceased operation at the end of December 2018 and sluiced bottom ash is no longer being received at the Bottom Ash Ponds (BAPs), the BAPs will continue to be monitored until the units have undergone closure. An *Annual Groundwater Monitoring and Corrective Action Report* (Report) was completed for each of these CCR units. Upper Prediction Limits (UPLs) and Lower Prediction Limits (LPLs) were calculated in each Report for the purpose of determining a potential statistically significant increase (SSI) over background levels. The Reports indicated that a potential SSI over background levels was determined for one or more Appendix III constituents from monitoring wells associated with the EP, FAL, and BAPs. A potential SSI over background levels was not determined from monitoring wells associated with the SRH Pond.

According to the CCR Rule [§257.94(e)], if the owner or operator of a CCR unit determines there is a SSI over background levels for one or more Appendix III constituents, the owner or operator may demonstrate that a source other than the CCR unit caused the SSI over background levels or that the SSI resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality. The CCR Rule also indicates that the owner or operator must complete the written demonstration within 90 days of detecting a SSI over the background levels. If a successful demonstration is completed within the 90-day period, the owner or operator may continue with a detection monitoring program. If a successful demonstration is not completed within the 90-day period, the owner or operator must initiate an assessment monitoring program.

General Comments and Terms

- Several groundwater monitoring wells were installed in the northern portion of the property prior to the construction of the EP and FAL (collectively termed Northern CCR Units). The EP was initially constructed as a landfill in 1990 and later converted to the surface impoundment in 1996 and the FAL was constructed in 1992.
- ‘Historical data’ refers to analytical data collected from 1988 through 1992 from monitoring wells that were in existence before the EP and FAL were operated. These monitoring wells are located over one mile north of the BAPs, and although the BAPs were constructed in 1977, the historical data collected from these wells and the current data collected from upgradient wells of the Northern CCR Units is useful in evaluating BAP data.
- ‘Background monitoring period’ refers to the period from December 2016 to October 2017 when eight independent samples were collected from each background and downgradient well within the CCR monitoring well network.

Evaporation Pond (EP)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the EP are presented in the following table and are discussed below.

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Fluoride	JKS-36	--	0.382	2020-10-21	1.07	mg/L
pH	JKS-36	4.58	6.21	2020-10-21	3.98	SU
pH	JKS-61	4.58	6.21	2020-10-21	6.57	SU
pH	JKS-62	4.58	6.21	2020-11-17	6.55	SU

Fluoride (JKS-36)

Fluoride concentrations detected in JKS-36 were previously discussed in the April 2018, February 2019, and April 2020 *Written Demonstrations* and no SSI was determined for fluoride in this well based on the lines of evidence provided below. The fluoride concentration detected in JKS-36 during the October 2020 monitoring event (1.07 mg/L) is within the range of fluoride concentrations (between <0.036 mg/L and 1.53 mg/L) detected in this monitoring well during the background monitoring period. The historical data from JKS-36 indicate naturally occurring fluoride concentrations up to 1.5 mg/L. In addition, historical data from JKS-43 located in the vicinity of the EP indicate naturally occurring fluoride concentrations up to 1.75 mg/L.

pH (JKS-36, JKS-61, and JKS-62)
pH values detected in JKS-36 were previously discussed in the April 2018, February 2019, and April 2020 *Written Demonstrations* and no SSI was determined for pH in this well based on the lines of evidence provided below. The pH value in JKS-36 during the October 2020 monitoring event (3.98 SU) is within the range of pH values (between 3.24 and 6.98 SU) detected during the background monitoring period. In addition, the historical data from JKS-36 indicate naturally occurring pH values ranging between 3.2 and 4.6 SU.

pH values detected in JKS-61 and JKS-62 were not previously identified as potential SSIs necessitating discussion. The pH value in JKS-61 during the October 2020 monitoring event (6.57 SU) is within the range of pH values (between 6.48 and 7.40 SU) detected during the background monitoring period. The pH value in JKS-62 during the October 2020 monitoring event (6.55 SU) is below the range of pH values (between 6.63 and 7.51 SU) detected during the background monitoring period. These pH values; however, are essentially neutral (between 6.0 to 8.0 SU) indicative of naturally occurring pH values.

Fly Ash Landfill (FAL)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the FAL are presented in the following table and are discussed below.

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
pH	JKS-31	3.98	6.73	2020-10-20	3.68	SU
pH	JKS-46	3.98	6.73	2020-10-20	3.01	SU

pH (JKS-31 and JKS-46)
pH values detected in JKS-31 and JKS-46 were previously discussed in the April 2018, February 2019, and April 2020 *Written Demonstrations* and no SSI was determined for pH in these wells based on the same lines of evidence provided below. The pH value detected in JKS-31 during the October 2020 monitoring event (3.68 SU) is below the range of pH values (between 3.84 and 6.34 SU) detected in this well during the background monitoring period; however, historical data from JKS-31 indicate naturally occurring pH values ranging between 2.8 and 5.0 SU. The pH values detected in JKS-46 during the October 2020 monitoring event (3.01 SU) is within the range of pH values (between 2.1 and 3.6 SU) detected in this well during the background monitoring period. In addition, historical data from JKS-36, JKS-40, and JKS-43 located in the vicinity of the Northern CCR Units indicate naturally occurring pH values ranging between 2.9 and 4.9 SU.

Note: The FAL is primarily used for storage of fly ash prior to offsite beneficial use and does not store liquid CCR or non-CCR wastestreams.

Bottom Ash Ponds (BAPs)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the BAPs are presented in the following table and are discussed below.

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Boron	JKS-50R	--	2.65	2020-10-21	6.79	mg/L
Boron	JKS-56	--	2.65	2020-10-21	4.00	mg/L
Fluoride	JKS-48	--	0.908	2020-10-21	1.05	mg/L

Boron (JKS-50R and JKS-56)

Boron concentrations detected in JKS-50R and JKS-56 were previously discussed in the February 2019 and April 2020 *Written Demonstrations* and no SSI was determined for boron in these wells based on the lines of evidence provided below. The boron concentrations detected in JKS-50R and JKS-56 during the October 2020 monitoring event (6.79 mg/L and 4.00 mg/L, respectively) and the February 2021 resampling event of JKS-50R (5.62 mg/L) are in the same order of magnitude detected in upgradient monitoring wells JKS-57 and JKS-45 (up to 3.48 mg/L and 2.27 mg/L, respectively) for the Northern CCR Units during the background monitoring period. The boron concentrations in these upgradient monitoring wells reflect the natural variability in groundwater quality.

For comparison, a study of groundwater contamination from coal power plants across the southeast United States documented a 1 to 2 order of magnitude increase in boron concentrations between background and affected monitoring wells (Harkness et al., 2016). The detections in the wells in the study had boron concentrations of 1 to 6 mg/L, compared to background levels ranging from non-detect to 0.04 mg/L. Another study of affected groundwater from a CCR site in Indiana (Buszka et al., 2007) documented a 2 to 3 order of magnitude increase in boron concentrations between background and affected monitoring wells.

In addition, the statistical analysis shows that no other Appendix III constituents were identified as potential SSIs in JKS-50R or JKS-56. If the elevated boron concentrations were associated with a release, other elevated Appendix III constituent concentrations would also be expected in these wells (Milligan and Ruane, 1980).

Finally, the concentration of boron within the BAPs was considered with respect to concentrations in the surrounding monitoring wells. During two sampling events in February 2018, grab samples of effluent water from the BAPs had reported boron concentrations of 1.03 mg/L and 1.16 mg/L. Because boron is concentrated in coal ash compared to the original coal (Openshaw, 1992), and because boron is one of the more easily leached constituents in coal ash (Izquierdo and Querol, 2012), a low concentration of boron in the effluent indicates that the leachable boron concentration in the bottom ash is relatively low. In February 2018, a grab sample of the bottom ash being sent to the BAPs had a boron concentration of 122 mg/kg, and the toxicity characteristic leaching procedure (TCLP) analysis on this same sample had a boron concentration of 1.1 mg/L. The concentration of boron in the effluent and the leachable concentration of boron in the bottom ash are less than the concentrations in JKS-50R or JKS-56.

Fluoride (JKS-48)

Fluoride concentrations detected in JKS-48 were previously discussed in the February 2019 and April 2020 *Written Demonstrations* and no SSI was determined for fluoride in this well based on the lines of evidence provided below. The fluoride concentration detected in JKS-48 during the October 2020 monitoring event (1.05 mg/L) is within the range of fluoride concentrations (between <0.096 and 1.62 mg/L) detected in this well during the background monitoring period. In addition, historical data from JKS-43 located in the vicinity of the Northern CCR Units indicates naturally occurring fluoride concentrations up to 1.75 mg/L.

Summary

EP – The concentrations of constituents associated with potential SSIs (fluoride and pH) appear to be naturally occurring and reflect natural variability in groundwater quality.

FAL – The concentrations of constituents associated with potential SSIs (pH) appear to be naturally occurring and reflect natural variability in groundwater quality.

BAPs – The concentrations of constituents associated with potential SSIs (boron and fluoride) appear to be naturally occurring and reflect natural variability in groundwater quality. In addition, if the boron concentrations were associated with a release, other elevated Appendix III constituents would be expected and the expectation would be that the detected boron concentrations would be lower based on the effluent water and bottom ash analyses.

Conclusions

Based on the evidence provided in this *Written Demonstration*, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy should continue with a detection monitoring program.

References

Buszka, P. M., J. Fitzpatrick, L. R. Watson, and R. T. Kay. 2007. Evaluation of Ground-Water and Boron Sources by Use of Boron Stable-Isotope Ratios, Tritium, and Selected Water-Chemistry Constituents near Beverly Shores, Northwestern Indiana, 2004. U.S. Geological Survey Scientific Investigations Report Series 2007-5166.

Harkness, J. S., B. Sulkin, and A. Vengosh. 2016. Evidence for Coal Ash Ponds Leaking in the Southeastern United States. Environmental Science and Technology, v. 50 no. 12, p 6583-6592.

Izquierdo, M. and X. Querol. 2012. Leaching behaviour of elements from coal combustion fly ash: An overview. International Journal of Coal Geology. v. 94. p. 54-66.

Milligan, J. D. and R. J. Ruane. 1980. Effects of Coal-ash Leachate on Ground Water Quality. USEPA Interagency Energy/Environment R&D Program Report, EPA-600/7-80-066.

Openshaw, S. C. 1992. Utilization of Coal Fly Ash. MS Thesis. University of Florida.

Certification

Certification from a qualified professional engineer verifying the accuracy of the information provided in this *Written Demonstration* is provided in Attachment 1.

We appreciate the opportunity to work with you on this project. Please contact me if you should have any questions.

Yours sincerely,

Environmental Resources Management Southwest, Inc.

Walter Zverina

Walter Zverina
Project Manager

ATTACHMENT 1 CERTIFICATION

WRITTEN DEMONSTRATION CERTIFICATION

Calaveras Power Station
San Antonio, Texas
CPS Energy

CERTIFICATION

I hereby verify the accuracy of the information provided in this *Written Demonstration* in accordance with the requirements of 40 CFR §257.94(e)(2).

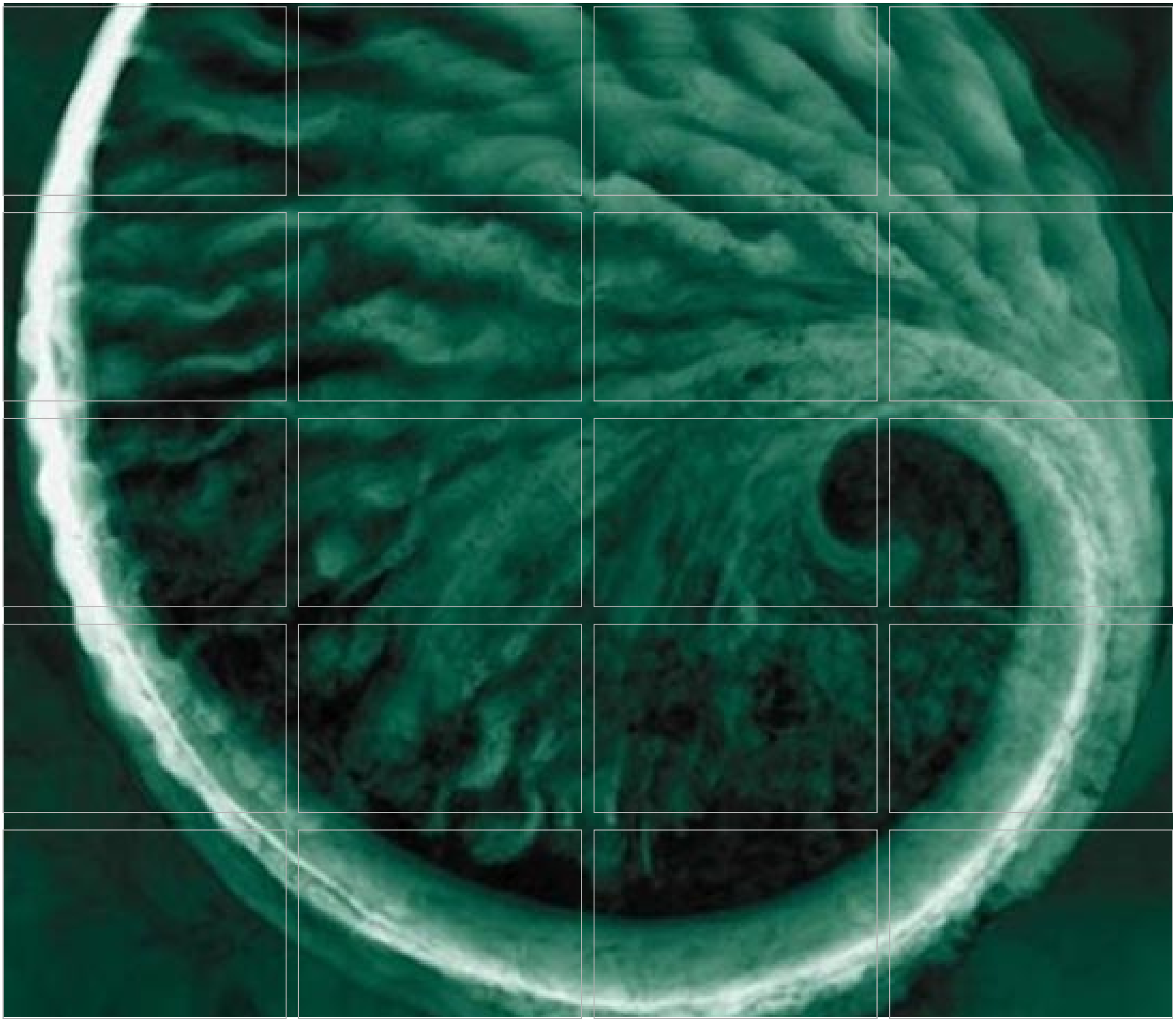
JEFFERY L. BAUGUSS
86195

6/18/21

Jeffery L. Bauguss, P.E.
Texas Licensed Professional Engineer No. 86195

Attachment 16   Annual Groundwater Monitoring and Corrective Action Reports

Attachment 16-1



Annual Groundwater Monitoring and Corrective Action Report

CPS Energy
Calaveras Power Station – Bottom Ash Ponds
San Antonio, Texas

January 2021

www.erm.com

The business of sustainability

ERM

Calaveras Power Station – Bottom Ash Ponds

Annual Groundwater Monitoring and Corrective Action Report

January 2021

Project No. 0503422
San Antonio, Texas

Jeffery L. Bauguss, P.E.
Partner-in-Charge

Walter Zverina

Walter Zverina
Project Manager

Karen Fletcher
Senior Scientist

Nicholas Houtchens, P.G.
Senior Geologist

NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, TX 78701
T: 512-459-4700

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

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1. *CURRENT STATUS SUMMARY*

As required in Title 40, Code of Federal Regulations, §257.90, this section provides an overview of the current status of the groundwater monitoring and corrective action program for the Bottom Ash Ponds (BAPs) located at the CPS Energy Calaveras Power Station:

- At the start of the 2020 annual reporting period, the BAPs were operating under the detection monitoring program, as defined in §257.94;
- At the end of the 2020 annual reporting period, the BAPs were operating under the detection monitoring program, as defined in §257.94;
- At this time, there was no confirmed statistically significant increase over background for one or more constituents listed in Appendix III pursuant to §257.94(e);
- An assessment monitoring program was not required or initiated for the BAPs;
- A remedy was not required or selected pursuant to §257.97 during the 2020 annual reporting period; and
- No remedial activities were initiated or are ongoing pursuant to §257.98 during the 2020 annual reporting period.

2. *INTRODUCTION*

CPS Energy owns and operates the Calaveras Power Station which consists of two power plants (J.T. Deely and J.K. Spruce) that are subject to regulation under Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the CCR Rule). The Power Station is located in unincorporated Bexar County, Texas, approximately 13 miles southeast of San Antonio. Currently, CPS Energy operates three CCR units at the Power Station: Evaporation Pond, Fly Ash Landfill, and the Sludge Recycle Holding (SRH) Pond. Although the J.T. Deely Power Plant ceased operation at the end of December 2018 and sluiced bottom ash is no longer being received at the BAPs, the BAPs will continue to be monitored until the units have undergone closure. This *Annual Groundwater Monitoring and Corrective Action Report* (Report) only addresses the BAPs.

This Report was produced by Environmental Resource Management (ERM), on behalf of CPS Energy, and summarizes the groundwater monitoring activities for the BAPs and provides a statistical summary of the findings for samples collected during the 2020 semi-annual monitoring events. Consistent with the requirements of the CCR Rule, this Report will be posted to the facility's operating records and notification will be made to the State of Texas. Additionally, this Report will be placed on the CPS Energy publically accessible internet site. Unless otherwise mentioned, the analyses in this Report follow the *Groundwater Sampling and Analysis Program* (SAP) (ERM, 2017) posted on the internet site. The table below cross references the reporting requirements under the CCR Rule with the contents of this Report.

Regulatory Requirement Cross-Reference

Regulatory Citation	Requirement (paraphrased)	Where Addressed in this Report
§257.90(e)	Status of the groundwater monitoring and corrective action program	Sections 1 and 3
§257.90(e)	Summarize key actions completed	Section 3
§257.90(e)	Describe any problems encountered and actions to resolve problems	Section 3
§257.90(e)	Key activities for upcoming year	Section 5
§257.90(e)(1)	Map or aerial image of CCR unit and monitoring wells	Figure 1
§257.90(e)(2)	Identification of new monitoring wells installed or decommissioned during the preceding year	Section 3
§257.90(e)(3)	Summary of groundwater data, monitoring wells and dates sampled, and whether sample was required under detection or assessment monitoring	Sections 3 and 4, Tables 1 through 3, Figure 2
§257.90(e)(4)	Narrative discussion of any transition between monitoring programs	Section 5

The BAPs are located east of the Power Station generating units and are adjacent to and immediately east of the SRH Pond. The BAPs consists of two separate, but adjacent, ponds (oriented north and south) containing sluiced bottom ash material. The BAPs were constructed in 1977 as part of the original plant construction. The CCR unit location is shown on Figure 1.

3. PROGRAM STATUS

From December 2016 through October 2017, groundwater samples were collected as part of background sampling. After October 2017, groundwater samples were collected as part of detection monitoring. The samples were collected from the groundwater monitoring well network certified for use in determining compliance with the CCR Rule.

The groundwater monitoring well network consists of two upgradient monitor wells (JKS-49 and JKS-51) and five downgradient monitor wells (JKS-48, JKS-50R, JKS-52, JKS-55, and JKS-56). All monitoring wells are screened within the uppermost groundwater bearing unit (GWBU) in the vicinity of the North and South BAPs. The uppermost GWBU varies in thickness from approximately 9.5 to 21.5 feet thick and is comprised of clayey/silty sand to moderately-sorted sand. The uppermost GWBU is located below semi-confining units (i.e., clay, sandy clay, or silty clay), and above a sandstone bedrock unit.

The monitoring well locations are shown in Figure 1. No problems were encountered in the data collection or in well performance, and no action was required to resolve any issues. No new monitoring wells were installed or decommissioned after the certification of the well network.

Although the J.T. Deely Power Plant ceased operation at the end of December 2018 and sluiced bottom ash is no longer being received at the BAPs, the BAPs will continue to be monitored until the units have undergone closure.

3.1. GROUNDWATER FLOW RATE AND DIRECTION

Depth to groundwater surface measurements were made at each monitoring well prior to sampling. Groundwater elevations were calculated by subtracting the depth to ground-water measurement from the surveyed reference elevation for each well.

Groundwater elevations collected during the monitoring events are summarized in Table 1. Groundwater elevations and the potentiometric surfaces for the April and October 2020 monitoring events are shown on Figure 2A and Figure 2B, respectively. As measured during the April 2020 monitoring event, groundwater in the vicinity of the BAPs appears to flow toward Calaveras Lake and the adjacent channel (south and southeast). The horizontal gradient is less than 0.001 feet/foot.

Groundwater elevations measured during the October 2020 monitoring event appear to display radial flow from Calaveras Lake and adjacent channel towards the BAPs (from the east and south), which is a change in groundwater flow direction not previously observed at the BAPs, including April 2020. Similar to observations made during the October 2019 sampling event, JKS-49 was the lowest recorded potentiometric surface elevation. The horizontal gradient is approximately 0.002 feet/foot. Groundwater monitoring networks that exhibit a substantially flat gradient are more likely to experience differences in groundwater flow direction. With proximity to Calaveras Lake, the slightest lake level fluctuations may influence groundwater flow direction. The potentiometric surface elevations will continue to be monitored and a water level study will be initiated in 2021.

3.2. SAMPLING SUMMARY

A summary of the total number of samples collected from each monitoring well is provided in Table 2. Groundwater analytical results for the sampling events are summarized in Table 3. Laboratory data packages are provided in Appendix A.

The BAPs monitoring wells were sampled by CPS Energy using low flow sampling techniques during the monitoring events. No data gaps were identified during the 2020 semi-annual groundwater monitoring events.

3.3. DATA QUALITY

ERM reviewed field and laboratory documentation to assess the validity, reliability and usability of the analytical results. Samples were sent to San Antonio Testing Laboratory, located in San Antonio, Texas for analysis. Data quality information reviewed for these results included field sampling forms, chain-of-custody documentation, holding times, lab methods, cooler temperatures, laboratory method blanks, laboratory control sample recoveries, field duplicate samples, matrix spikes/matrix spike duplicates, quantitation limits, and equipment blanks. A summary of the data qualifiers are included in Table 3. The data quality review found the results to be valid, reliable, and useable for decision making purposes with the listed qualifiers. No analytical results were rejected.

4. STATISTICAL ANALYSIS AND RESULTS

Consistent with the CCR Rule and the SAP, a prediction limit approach [40 CFR §257.93(f)] was used to identify potential impacts to groundwater. Tables and figures generated as part of the statistical analysis are provided in Appendix B. The steps outlined in the decision framework in the SAP include:

- Interwell versus intrawell comparisons;
- Establishment of upgradient dataset;
- Calculation of prediction limits; and
- Conclusions.

The remaining sections of this Report are focused on evaluation of the October 2020 sampling results. Note the April 2020 sampling results were evaluated as discussed in the *April 2020 Groundwater Sampling Event – Calaveras Power Station CCR Units* (ERM, 2020) provided in Appendix C.

4.1. INTERWELL VERSUS INTRAWELL COMPARISONS

When multiple upgradient wells were available within the same unit, concentrations were compared among these wells to determine if they could be pooled to create a single, interwell, upgradient dataset. For each analyte, Boxplots (Appendix B, Figure 1) and Kruskal-Wallis test results (Appendix B, Table 1) are provided for upgradient wells. The statistical test shows that:

- One Appendix III analyte [chloride] will follow interwell analysis, with no significant differences present in upgradient data; and
- The remaining six Appendix III analytes [boron, calcium, fluoride, pH, sulfate, and total dissolved solids (TDS)] will follow intrawell analysis, with significant differences present in upgradient data.

Interwell analytes will use a pooled upgradient dataset for subsequent report sections. Conversely, intrawell analytes will have each individual upgradient dataset used for subsequent report sections.

4.2. ESTABLISHMENT OF UPGRADIENT DATASET

When evaluating the concentrations of analytes in groundwater, USEPA Unified Guidance (2009) recommends performing a careful quality check of the data to identify any anomalies. In addition to the data validation that was performed, descriptive statistics, outlier testing, and temporal stationarity checks were completed to finalize the upgradient dataset.

4.2.1. Descriptive Statistics

Descriptive statistics were calculated for the upgradient wells and analytes at the BAPs (Appendix B, Table 2). The descriptive statistics highlight a number of relevant characteristics about the upgradient datasets including:

- There are a total of 13 well-analyte combinations for the upgradient dataset;
- 13 well-analyte combinations have detection rates greater than or equal to 50 percent;
- 12 well-analyte combinations have 100 percent detects;

- 11 well-analyte combinations follow a normal distribution (using Shapiro-Wilks Normality Test); and
- Two well-analyte combinations have no discernible distribution.

4.2.2. *Outlier Determination*

Both statistical and visual outlier tests were performed on the upgradient datasets. Data points identified as both a statistical and visual outlier (Appendix B, Table 3 and Appendix B, Figure 2) were reviewed before they were excluded from the dataset. A total of four potential outliers were initially flagged in the upgradient datasets. However, these values were consistent with seasonal fluctuations and concentrations detected in other upgradient wells or in historical groundwater sampling results. No analytical or sampling issues were identified during data review; therefore, the four values were considered valid and were retained for upper prediction limit (UPL) calculations.

4.2.3. *Check for Temporal Stability*

A trend test was performed for all values in the upgradient wells that had at least eight detected data points and at least 50 percent detection rate. Time series figures of upgradient wells are provided in Appendix B, Figure 3. Additionally, the Mann Kendall trend test results are provided in Appendix B, Table 4. The following summarizes the results of the trend analysis:

- There are a total of 13 well-analyte combinations in the upgradient dataset; and
- 13 well-analyte combinations meet the data requirements of the trend test of which:
    - One well-analyte combination had an increasing trend;
    - One well-analyte combination had a decreasing trend; and
    - 11 well-analyte combinations had no trend (i.e., concentrations were stable over time).

4.3. *CALCULATION OF PREDICTION LIMITS*

A multi-part assessment of the monitoring wells was performed to determine what type of UPL to calculate as a compliance point. A decision framework was applied for each upgradient well based on inter/intrawell analysis, data availability, and presence of temporal trends.

A total of two well-analyte combinations were found to have either increasing or decreasing trends. For these well-analyte combinations, a bootstrapped UPL calculated around a Theil Sen trend was used to derive a more accurate UPL. The remaining 11 well-analyte combinations were found to have no significant trend. Sanitas was used to calculate static UPLs using an annual site-wide false positive rate of 0.1 with a 1-of-2 re-testing approach.

A final UPL was selected for each analyte and compared to the October 2020 sampling results in the downgradient wells. A final lower prediction limit (LPL) was also selected for pH. For the one analyte following interwell analysis, the upgradient dataset was pooled prior to UPL calculations, resulting in a single UPL value per analyte. For the six analytes following intrawell analysis, an UPL value was calculated for each of the upgradient wells. For these wells and analytes, the maximum UPL was selected as the representative UPL for each analyte. A similar approach was used to determine the LPL for pH; however, the minimum LPL was selected in the case of intrawell analysis. All final UPL and LPL values are shown in the table below. Full upgradient well prediction limit calculations are provided in Appendix B, Table 5.

Final UPL and LPL Values

Analysis Type	Analyte	LPL	UPL	Unit
Intrawell	Boron	--	2.65	mg/L
Intrawell	Calcium	--	387	mg/L
Interwell	Chloride	--	607	mg/L
Intrawell	Fluoride	--	0.908	mg/L
Intrawell	pH	5.48	7.31	SU
Intrawell	Sulfate	--	462	mg/L
Intrawell	TDS	--	2,380	mg/L

4.4. CONCLUSIONS

The downgradient samples collected during the October 2020 monitoring event were used for compliance comparisons. All downgradient wells were below the UPLs and above the LPLs for pH with the following exceptions shown in the table below. All downgradient wells with initial exceedances were examined for trends to assess the stability of concentrations. A summary of these trend test results are provided in Appendix B, Figure 4.

Downgradient UPL Exceedances

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Boron	JKS-50R	--	2.65	2020-10-21	6.79	mg/L
Boron	JKS-56	--	2.65	2020-10-21	4.00	mg/L
Fluoride	JKS-48	--	0.908	2020-10-21	1.05	mg/L

Additionally, each downgradient well-analyte pair had a Wilcoxon Rank Sum test comparing if their median is greater than the UPL or less than the LPL for pH. This nonparametric, rank-based test was used as an additional line of evidence for downgradient well compliance. Specific well-analyte pairs are of interest if: (1) there is a recent exceedance of the UPL, but historic concentrations place the median less than the UPL, or (2) there is not a recent exceedance of the UPL, but historic concentrations place the median greater than the UPL. All downgradient wells had medians less than the UPLs and greater than the LPLs for pH with the following exceptions shown in the table below. Full downgradient results are provided in Appendix B, Table 6, with boxplots in Appendix B, Figure 5.

Downgradient Median Exceedances

Analyte	Well
Boron	JKS-50R
Boron	JKS-56

All initial exceedances of the UPL may be confirmed with re-testing of the downgradient wells per the 1-of-2 re-testing scheme. If the initial exceedance is confirmed with re-testing results from the same well, and if the well-analyte combination median is greater than the UPL, the well-analyte combination will be declared a statistically significant increase (SSI) above background. Any wells with re-testing results at or less than the UPL will be considered in compliance and will not require further action. Any resampling results will be reported in the subsequent *Written Demonstration*.

5. *RECOMMENDATIONS*

Currently, there are no plans to transition from detection monitoring to assessment monitoring. Consistent with the 1-of-2 re-testing approach described in the Unified Guidance and the SAP, initial exceedances may be re-tested within 90 days. Based on these re-testing results, if an SSI is found, a notification or *Written Demonstration* will be prepared within 90 days. Based on the findings of the *Written Demonstration*, detection monitoring or assessment monitoring will be initiated as appropriate under §257.94 and §257.95.

6. *REFERENCES*

ERM, 2017. *Groundwater Sampling and Analysis Program.*

USEPA, 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities.* Unified Guidance. USEPA/530/R/09/007. Office of Resource Conservation and Recovery. Washington, D.C.

Tables

TABLE 1
Groundwater Elevations Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-49 Upgradient		**JKS-51 Upgradient**		**JKS-48 Downgradient**		**JKS-50R Downgradient**	
		TOC Elevation	**498.63**	**TOC Elevation**	**496.92**	**TOC Elevation**	**497.19**	**TOC Elevation**	**498.48**
Sampling Event	**Sampling Event Dates**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**
1	12/6/16 to 12/8/16	8.81	489.82	10.76	486.16	11.47	485.72	12.50	485.98
2	2/21/17 to 2/23/17	8.56	490.07	10.80	486.12	11.80	485.39	12.70	485.78
3	3/28/17 to 3/30/17	8.90	489.73	10.59	486.33	11.64	485.55	12.32	486.16
4	5/2/17 to 5/4/17	8.85	489.78	10.56	486.36	11.72	485.47	12.49	485.99
5	6/20/17 to 6/21/17	8.75	489.88	10.56	486.36	12.00	485.19	12.81	485.67
6	7/25/17 to 7/26/17	8.46	490.17	10.68	486.24	11.91	485.28	12.78	485.70
7	8/29/17 to 8/30/17	7.21	491.42	10.48	486.44	11.77	485.42	12.53	485.95
8	10/10/17 to 10/11/17	11.17	487.46	10.98	485.94	12.24	484.95	13.44	485.04
9	4/4/18 to 4/5/18	9.00	489.63	10.93	485.99	12.15	485.04	14.03	484.45
10	10/30/18 to 10/31/18	6.88	491.75	10.45	486.47	11.73	485.46	12.08	486.40
11	4/9/19 to 4/10/19	12.52	486.11	11.02	485.90	11.80	485.39	13.10	485.38
12	10/22/19 to 10/23/19	14.84	483.79	12.00	484.92	12.57	484.62	14.10	484.38
13	4/28/20 to 4/29/20	13.58	485.05	11.79	485.13	12.41	484.78	13.66	484.82
14	10/20/20 to 10/21/20	14.42	484.21	12.11	484.81	12.39	484.80	13.98	484.50

		JKS-52 Downgradient		**JKS-55 Downgradient**		**JKS-56 Downgradient**	
		TOC Elevation	**493.15**	**TOC Elevation**	**493.81**	**TOC Elevation**	**496.66**
Sampling Event	**Sampling Event Dates**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**
1	12/6/16 to 12/8/16	7.53	485.62	8.15	485.66	11.12	485.54
2	2/21/17 to 2/23/17	7.43	485.72	8.51	485.30	10.90	485.76
3	3/28/17 to 3/30/17	7.33	485.82	8.25	485.56	10.50	486.16
4	5/2/17 to 5/4/17	7.35	485.80	8.40	485.41	10.65	486.01
5	6/20/17 to 6/21/17	7.46	485.69	8.79	485.02	11.00	485.66
6	7/25/17 to 7/26/17	7.50	485.65	8.77	485.04	10.95	485.71
7	8/29/17 to 8/30/17	7.40	485.75	8.59	485.22	10.72	485.94
8	10/10/17 to 10/11/17	7.53	485.62	8.92	484.89	11.61	485.05
9	4/4/18 to 4/5/18	8.48	484.67	8.90	484.91	11.13	485.53
10	10/30/18 to 10/31/18	8.33	484.82	8.25	485.56	10.27	486.39
11	4/9/19 to 4/10/19	7.65	485.50	8.60	485.21	11.30	485.36
12	10/22/19 to 10/23/19	9.40	483.75	9.64	484.17	12.34	484.32
13	4/28/20 to 4/29/20	8.20	484.95	9.19	484.62	11.78	484.88
14	10/20/20 to 10/21/20	8.07	485.08	9.49	484.32	12.10	484.56

NOTES:
btoc = below top of casing
msl = mean sea level

TABLE 2
Groundwater Sampling Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

CCR Unit	Well ID	Well Function	Number of Samples Collected in 2016 - 2020	2016 - 2020 Sample Dates														Monitoring Program
				12/6/16 to 12/8/16	2/21/17 to 2/23/17	3/28/17 to 3/30/17	5/2/17 to 5/4/17	6/20/17 to 6/21/17	7/25/17 to 7/26/17	8/29/17 to 8/30/17	10/10/17 to 10/11/17	4/4/18 to 4/5/18	10/30/18 to 10/31/18	4/9/19 to 4/10/19	10/22/19 to 10/23/19	4/28/20 to 4/29/20	10/20/20 to 10/21/20	
Bottom Ash Ponds	JKS-48	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-49	Upgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-50R	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-51	Upgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-52	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-55	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-56	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection

NOTES:
X = Indicates that a sample was collected.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-49 Upgradient													
	Sample Date	**12/7/16**	**2/22/17**	**3/28/17**	**5/3/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	3.24	3.28	3.28	3.03 X	3.04 J	2.76	2.85	2.87	2.71	2.70	2.05	2.58	2.47	2.81
Calcium	mg/L	130	146	173	113	127	120	145	147	135	117 D	154 D	127 D	114 J	132
Chloride	mg/L	295 D	383 D	372 D	326	414 D	448 D	459 D	424	446 D	408	449	429	452	435
Fluoride	mg/L	0.715	0.643 JH	0.665 JH	0.809	0.627 JH	0.617 JH	0.525	0.712	0.697	0.719	0.749	0.793	0.894	0.656
Sulfate	mg/L	211 D	232 D	234 D	194	218 D	227	265 D	219 X	237	237	240	205	217	193
pH - Field Collected	SU	7.19	7.12	7.12	7.02	7.06	6.16	7.05	6.89	7.12	7.12	7.31	6.43	7.15	7.14
Total dissolved solids	mg/L	1250	1240	1190	1100	1450	1440	1490	1730	1310	1210	1290	1380	1240	1380
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00173 J	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000676 J	0.000729 J	0.00123 U	0.00123 U	0.000544 J	0.000538 J	0.000478 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0607	0.0575	0.0503	0.0554	0.0783	0.0721	0.0788	0.0735	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000859 J	0.000572 J	0.00262 U	0.00262 U	0.000963 J	0.000997 J	0.00113 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00102 J	0.00109 J	0.00124 J	0.00155 J	0.00133 J	0.00153 J	0.00155 J	0.00146 J	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.715	0.643 JH	0.665 JH	0.809	0.627 JH	0.617 JH	0.525	0.712	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000758 U	0.000155 J	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0137 J	0.0341	0.0295	0.0427	0.0252	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000690 J	0.0000263 U	0.0000490 J	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00779 J	0.00846	0.00875	0.0106	0.00908 J	0.00938	0.0107	0.0111	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00992 J	0.00597	0.00479	0.00521 J	0.00370 J	0.00235	0.00188 J	0.00141 J	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.198 ± 0.197	0.615 ± 0.272	0.747 ± 0.323	0.195 ± 0.167	0.294 ± 0.192	0.241 ± 0.193	0.159 ± 0.191	0.746 ± 0.274	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.1 ± 0.907	-1.37 ± 1.37	0.854 ± 0.724	1.08 ± 1.72	2.23 ± 0.949	0.658 ± 0.636	0.812 ± 0.604	1.43 ± 0.898	NR	NR	NR	NR	NR	NR

NOTES:

mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-51 Upgradient													
	Sample Date	12/8/16	2/22/17	3/28/17	5/3/17	6/21/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/9/19	10/22/19	4/28/20	10/20/20
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.512	0.517	0.473	0.565	0.512	0.525	0.453	0.509	0.465	0.347	0.489	0.648	0.627	0.668
Calcium	mg/L	267	292	322	266	261 X	232	236	256	246	149 D	328	336 D	334 J	298
Chloride	mg/L	403 D	331 D	414 D	447	424 D	455 D	384 D	375	395 D	301	559	574 D	555	493
Fluoride	mg/L	0.247	0.341 JH	0.415 JH	0.534	0.354	0.391	0.0960 U	0.407 JH	0.305 J	0.291 J	0.329 J	0.405 J	0.470	0.018 U
Sulfate	mg/L	293 D	330 D	348 D	359	342 D	330 D	314 D	302	354 D	260	428	405 D	439	376
pH - Field Collected	SU	6.59	6.51	6.48	6.56	6.40	5.48	6.38	6.20	6.44	6.70	6.66	5.73	6.43	6.47
Total dissolved solids	mg/L	1650	1650	1490	1980	1530	1580	1390	1650	1320	916	1890	2150	2010	1930
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.000953 J	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000412 J	0.000390 J	0.00123 U	0.000392 J	0.000344 J	0.000395 J	0.000418 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0655	0.0563	0.0517	0.0512	0.0534	0.0520	0.0520	0.0564	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000212 J	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000941 J	0.000525 U	0.00262 U	0.000657 J	0.000874 J	0.00113 J	0.00133 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000350 U	0.0000770 J	0.0000920 J	0.000350 U	0.000124 J	0.0000940 J	0.0000800 J	0.000108 J	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.247	0.341 JH	0.415 JH	0.534	0.354	0.391	0.0960 U	0.407 JH	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0322	0.0874	0.0790	0.0958 JX	0.0718	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.000199 J	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000255 U	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.09 ± 0.376	0.104 ± 0.122	0.618 ± 0.247	0.197 ± 0.145	0.328 ± 0.195	0.0847 ± 0.186	4.83 ± 0.763	0.682 ± 0.309	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.312 ± 0.688	1.09 ± 1.37	2.32 ± 1.45	-1.26 ± 1.37	-0.799 ± 0.928	1.57 ± 0.786	0.762 ± 0.706	0.963 ± 0.954	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-48 Downgradient													
	Sample Date	**12/7/16**	**2/22/17**	**3/30/17**	**5/2/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	2.21	2.14	--	2.08	2.13	2.15 X	2.02	2.23	2.03	2.13	2.22	2.27	2.36	2.36
Calcium	mg/L	130	139	125	NR	111	136 X	134	147	143	128 D	166 D	135 D	130 J	142
Chloride	mg/L	395 D	408 D	435 D	427	440 D	465 D	166 D	427	433 D	438	467	446	485	446
Fluoride	mg/L	1.43	1.21 JH	1.62	1.41 JH	1.07	1.62	0.0960 U	1.22	1.35	1.31	1.46	1.25	0.051 JH	1.05
Sulfate	mg/L	239 D	251 D	266 D	259	253 D	244	140 D	257	282 D	266	271	213	206	170
pH - Field Collected	SU	7.06	6.92	6.86	6.99	6.88	5.92	6.90	6.74	6.91	6.92	7.06	6.12	6.89	6.83
Total dissolved solids	mg/L	1400	1270	1440	1490	1540	1380 J	850	1470	1400	1410	1420	1520	1400	1300
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	--	0.000240 U	0.00120 U	0.00129 J	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000538 J	--	0.000424 J	0.00123 U	0.000452 J	0.000459 J	0.000475 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0717	0.0699	--	0.0659	0.0686	0.0769	0.0725	0.0761	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	--	0.000131 U	0.000654 U	0.000233 J	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	--	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000608 J	--	0.000525 U	0.00262 U	0.000525 U	0.000863 J	0.00130 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00111 J	0.000844 J	--	0.000920 J	0.000987 J	0.00137 J	0.000917 J	0.00106 J	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	1.43	1.21 JH	1.62	1.41	1.07	1.62	0.0960 U	1.22	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	--	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000203 J	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	NR	0.0536	0.0501	0.0700	0.0551	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000310 JX	0.0000263 U	0.0000263 UX	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000422 J	--	0.000263 J	0.00128 U	0.000344 J	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	--	0.000454 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	--	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.139 ± 0.250	0.251 ± 0.149	0.0232 ± 0.136	0.357 ± 0.174	0.46 ± 0.235	0.544 ± 0.259	0.562 ± 0.283	0.26 ± 0.241	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.847 ± 1.14	0.317 ± 1.15	1.1 ± 0.737	-0.109 ± 1.35	0.284 ± 0.662	0.273 ± 0.867	0.459 ± 0.649	0.772 ± 0.931	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-50R Downgradient													
	Sample Date	**12/7/16**	**2/22/17**	**3/28/17**	**5/3/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	4.70	5.18	5.87	5.92	4.87	4.38	4.18	4.54	3.52	5.17	5.85	6.93	5.52	6.79
Calcium	mg/L	126	134	189	120	125	108	130	132	127	116 D	159 D	135 D	126 J	140
Chloride	mg/L	47.7 X	49.0 J	63.9	81.3	111	123	141 D	100	170	87.9	70.0	60.3	102	69.8
Fluoride	mg/L	0.316	0.331 JH	0.447 JH	0.528	0.387 JH	0.390 JH	0.0960 U	0.427 JH	0.335 J	0.392 J	0.319 J	0.380 J	0.510	0.332
Sulfate	mg/L	137 X	146	156	160	146	148	195 D	144	131	141	168	172	194	171
pH - Field Collected	SU	6.83	6.77	NR	6.80	6.63	5.69	6.62	6.43	6.67	6.61	6.80	5.85	6.65	6.63
Total dissolved solids	mg/L	737	808	789	902	914	856	992	947	883	688	842	899	918	863
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.00111 J	0.000735 J	0.00123 U	0.00123 U	0.000520 J	0.000545 J	0.000596 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.133	0.128	0.113	0.117	0.125	0.117	0.123	0.118	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000147 J	0.000187 J	0.000654 U	0.000654 U	0.000131 U	0.000131 U	0.000174 J	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000189 J	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.00251 J	0.00169 J	0.00262 U	0.00262 U	0.000788 J	0.000759 J	0.00108 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00305 J	0.00345	0.00251	0.00215 J	0.00191 J	0.00216	0.00233	0.00285	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.316	0.331 JH	0.447 JH	0.528	0.387 JH	0.390 JH	0.0960 U	0.427 JH	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000796 J	0.000988 J	0.000627 J	0.000758 U	0.000758 U	0.000178 J	0.000152 U	0.000168 J	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.000476 U	0.00209 J	0.000476 U	0.00621 J	0.000476 U	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00150 J	0.00153 J	0.00125 J	0.00128 U	0.00128 U	0.00102 J	0.00104 J	0.00108 J	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000514 J	0.000454 U	0.00227 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.102 ± 0.173	0.479 ± 0.216	-0.0714 ± 0.168	0.197 ± 0.183 U	0.245 ± 0.204	0.408 ± 0.226	0 ± 0.176	0.815 ± 0.292	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.99 ± 1.31	-0.428 ± 1.24	0.665 ± 1.14	0.00273 ± 1.33 U	0.783 ± 0.638	1.08 ± 0.832	0.0172 ± 1.12	1.5 ± 0.842	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-52 Downgradient													
	Sample Date	**12/7/16**	**2/21/17**	**3/28/17**	**5/2/17**	**6/21/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	1.66	2.11	1.63	1.51	1.33	1.43	1.46	1.71 X	1.95	1.54	1.46 X	1.65	2.05	2.21
Calcium	mg/L	169	181	189	--	145	140	162	168	175	153 D	195 DX	171 D	174 J	199
Chloride	mg/L	331 D	377 D	323 DX	320	326 D	343 D	417 D	355	360 D	326	336	320	433	408
Fluoride	mg/L	0.796	0.665	0.718 JH	0.915 JH	0.705	0.996 JH	0.0960 U	0.740	0.720	0.710	0.831	0.808	0.908	0.659
Sulfate	mg/L	277 D	318 D	299 DX	290	287 D	292 D	171 D	289	278 D	292	268	288 D	315	282
pH - Field Collected	SU	7.01	6.47	6.91	6.94	6.87	5.87	6.81	6.63	6.79	6.76	6.91	6.00	6.83	6.78
Total dissolved solids	mg/L	1290	1380	1100	1250	1280	1250	1250	1220	1240	1210	1170	1270	1470	1430
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000565 J	0.000398 J	0.000425 J	0.000427 J	0.000392 J	0.000412 J	0.000448 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0646	0.0583	0.0519	0.0483	0.0527	0.0558	0.0565	0.0616	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000153 J	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000525 U	0.000525 U	0.000525 U	0.000841 J	0.000860 J	0.00123 J	0.00108 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00188 J	0.00233	0.00112 J	0.00119 J	0.00211	0.00183 J	0.00159 J	0.00189 J	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.796	0.665	0.718 JH	0.915 JH	0.705	0.996 JH	0.0960 U	0.740	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000292 J	0.000152 U	0.000152 U	0.000163 J	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0471	0.000476 U	--	0.0616	0.0605	0.0827	0.0588	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.000234	0.0000263 U	0.0000263 U	0.0000263 U	0.0000810 J	0.0000263 U	0.0000263 UX	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.00128 J	0.00115 J	0.00102 J	0.000911 J	0.000865 J	0.000843 J	0.000914 J	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.71 ± 0.465	0.608 ± 0.289	0.296 ± 0.169	0 ± 0.150	0.435 ± 0.241	0.449 ± 0.196	0.194 ± 0.194	0.704 ± 0.319	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.65 ± 1.12	0.744 ± 0.833	0.0645 ± 0.649	0.53 ± 1.10	0.928 ± 0.784	1.16 ± 0.867	0.716 ± 0.767	1.54 ± 1.22	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-55 Downgradient													
	Sample Date	**12/7/16**	**2/22/17**	**3/28/17**	**5/3/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.716	0.716	0.785	0.710	0.787	0.651	0.687	0.759	0.645	0.611	0.740	0.771	0.779	0.815
Calcium	mg/L	143	153	181	133	133	118	136	146	134	119 D	165 D	145 D	137 J	154
Chloride	mg/L	384 DX	50.5	403 D	388	395 D	400 D	168 D	386	387 D	429	438	432	452	431
Fluoride	mg/L	0.857	0.352 JH	0.746 JH	0.891	1.14	1.08 JH	0.0960 U	0.864	0.791	0.820	0.822	0.832	1.01	0.727
Sulfate	mg/L	164 X	147	172	173	164	166	139 D	157	168	155	168	159	177	164
pH - Field Collected	SU	6.85	6.80	6.81	6.82	6.72	5.77	6.72	6.53	6.75	6.70	6.90	5.96	6.81	6.77
Total dissolved solids	mg/L	1430	1380	1290	1310	1500	1270	826	1470	1300	1190	1420	1370	1350	1380
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000650 J	0.000520 J	0.00123 U	0.00123 U	0.000507 J	0.000582 J	0.000599 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.103	0.0876	0.0823	0.0758	0.0828	0.0780	0.0801	0.0816	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000134 J	0.000654 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000625 J	0.000525 U	0.00262 U	0.00262 U	0.000525 U	0.000797 J	0.000903 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00702 J	0.00516	0.00579	0.00750 J	0.00642 J	0.00562	0.00565	0.00565	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.857	0.352 JH	0.746 JH	0.891	1.14	1.08 JH	0.0960 U	0.864	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0136 J	0.0425	0.0354	0.0495	0.0338	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 UX	0.0000263 U	0.0000263 UX	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00130 J	0.00123 J	0.00108 J	0.00128 U	0.00128 U	0.000804 J	0.000898 J	0.000837 J	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.00227 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.694 ± 0.358	0.721 ± 0.320	0.745 ± 0.258	0.576 ± 0.261	0.305 ± 0.190	0.0212 ± 0.171	0.327 ± 0.233	0.588 ± 0.314	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	3.76 ± 1.33	1.87 ± 1.01	-0.0356 ± 1.09	1.01 ± 1.02	0.591 ± 0.843	0.532 ± 0.795	0.234 ± 0.821	1.24 ± 0.848	NR	NR	NR	NR	NR	NR

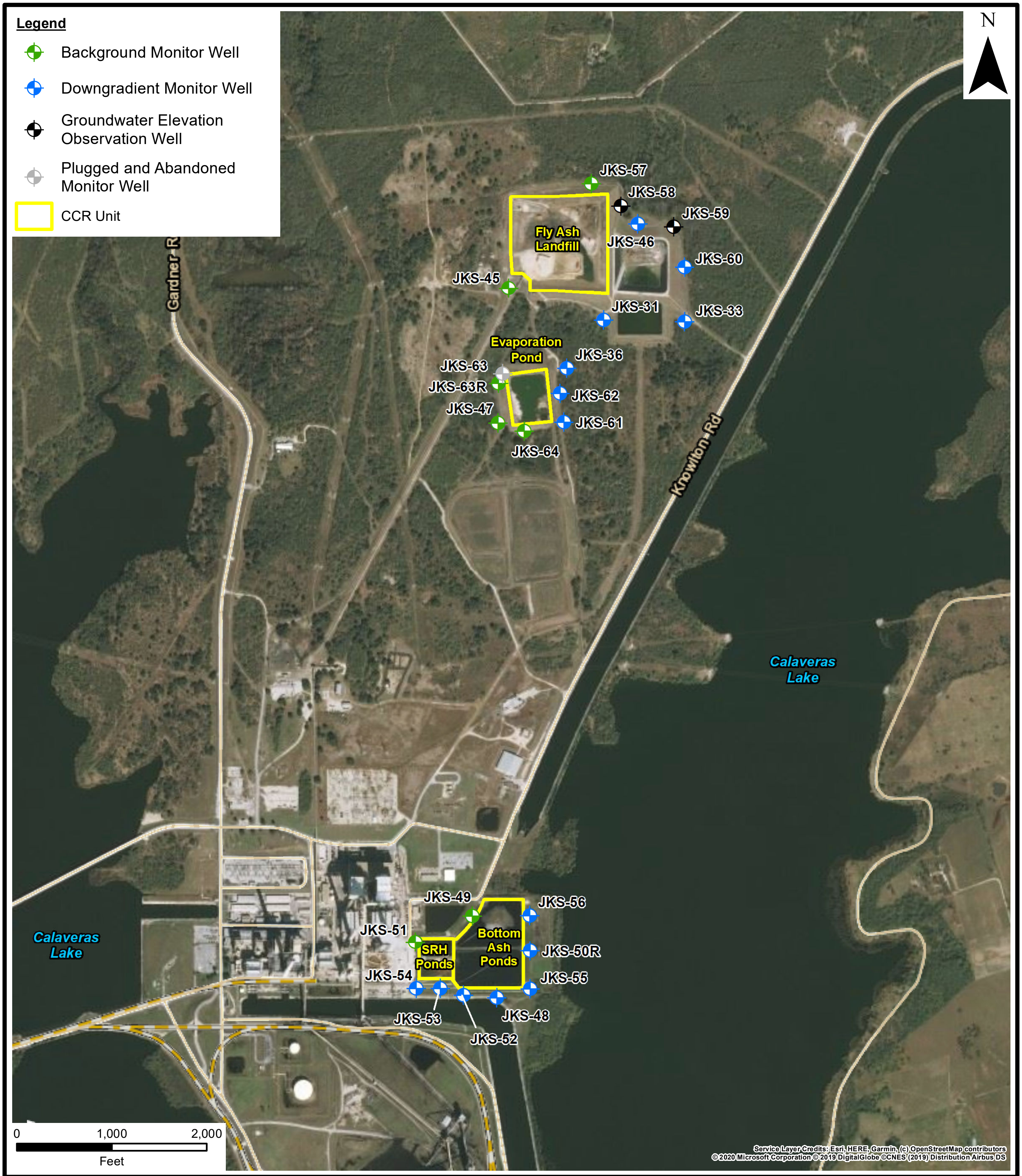
NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-56 Downgradient													
	Sample Date	**12/7/16**	**2/22/17**	**3/30/17**	**5/3/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	3.97	4.13	--	4.60	3.98	3.60	3.60 X	3.48	3.95	3.95	3.85	4.47	3.55	4.00
Calcium	mg/L	137	143	127	124	136	116	137	146	126	121 D	150 D	131 D	103 J	120
Chloride	mg/L	131	95.7	96.3	95.6	114	126	146 D	150	121	108 JL	81.0	81.2	101	77.2
Fluoride	mg/L	0.344	0.354 JH	0.333	0.564	0.407 JH	0.401 JH	0.0960 U	0.448 JH	0.37 J	0.428 J	0.372 J	0.452 J	0.552	0.418
Sulfate	mg/L	193	190	188	183	186	194	201 D	200	193	192	193	194	138	140
pH - Field Collected	SU	6.73	6.63	6.56	6.71	6.56	5.63	6.57	6.38	6.64	6.55	6.76	5.84	6.72	6.63
Total dissolved solids	mg/L	1100	969	1020	997	1060	1060	986	1240	992	976	918	968	904	847
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	--	0.00120 U	0.00120 U	0.000240 U	0.00104 J	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00527 J	0.00425	--	0.00350 J	0.00435 J	0.00373	0.00517	0.00451	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.126	0.0974	--	0.0890	0.0921	0.0897	0.103	0.0909	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	--	0.000654 U	0.000654 U	0.000131 U	0.000136 J	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	--	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000654 J	--	0.00276 J	0.00262 U	0.000525 U	0.00498	0.00141 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00560 J	0.00564	--	0.00641 J	0.00687 J	0.00668	0.00771	0.00746	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.344	0.354 JH	0.333	0.564	0.407 JH	0.401 JH	0.0960 U	0.448 JH	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	--	0.000758 U	0.000758 U	0.000152 U	0.000211 J	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.000476 U	0.000476 U	0.00156 J	0.000476 U	0.00598 J	0.000476 U	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000700 J	0.0000263 UX	0.0000263 U	0.0000263 UX	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00360 J	0.00190 J	--	0.00168 J	0.00152 J	0.00156 J	0.00160 J	0.00155 J	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	--	0.00227 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	--	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.23 ± 0.430	0.254 ± 0.175	0.372 ± 0.215	0.138 ± 0.166	0.273 ± 0.253	0.177 ± 0.213	0.441 ± 0.225	0.397 ± 0.252	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.949 ± 1.38	3.07 ± 1.28	1.09 ± 0.897	1.97 ± 1.35	1.27 ± 0.994	1.16 ± 0.862	1.45 ± 0.895	3.36 ± 1.42	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

Figures



Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
© 2020 Microsoft Corporation © 2019 DigitalGlobe ©CNES (2019) Distribution Airbus DS

Environmental Resources Management

DESIGN:	WZ	DRAWN:	EFC	CHKD.:	WZ
DATE:	1/17/2020	SCALE:	AS SHOWN	REVISION:	0

\\ushoufs01\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2019gwmon\fig1_0503422_CPSCalv_WellLocs.mxd

FIGURE 1
CCR WELL NETWORK LOCATION MAP
CPS Energy - Calaveras Power Station
San Antonio, Texas

NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Environmental Resources Management

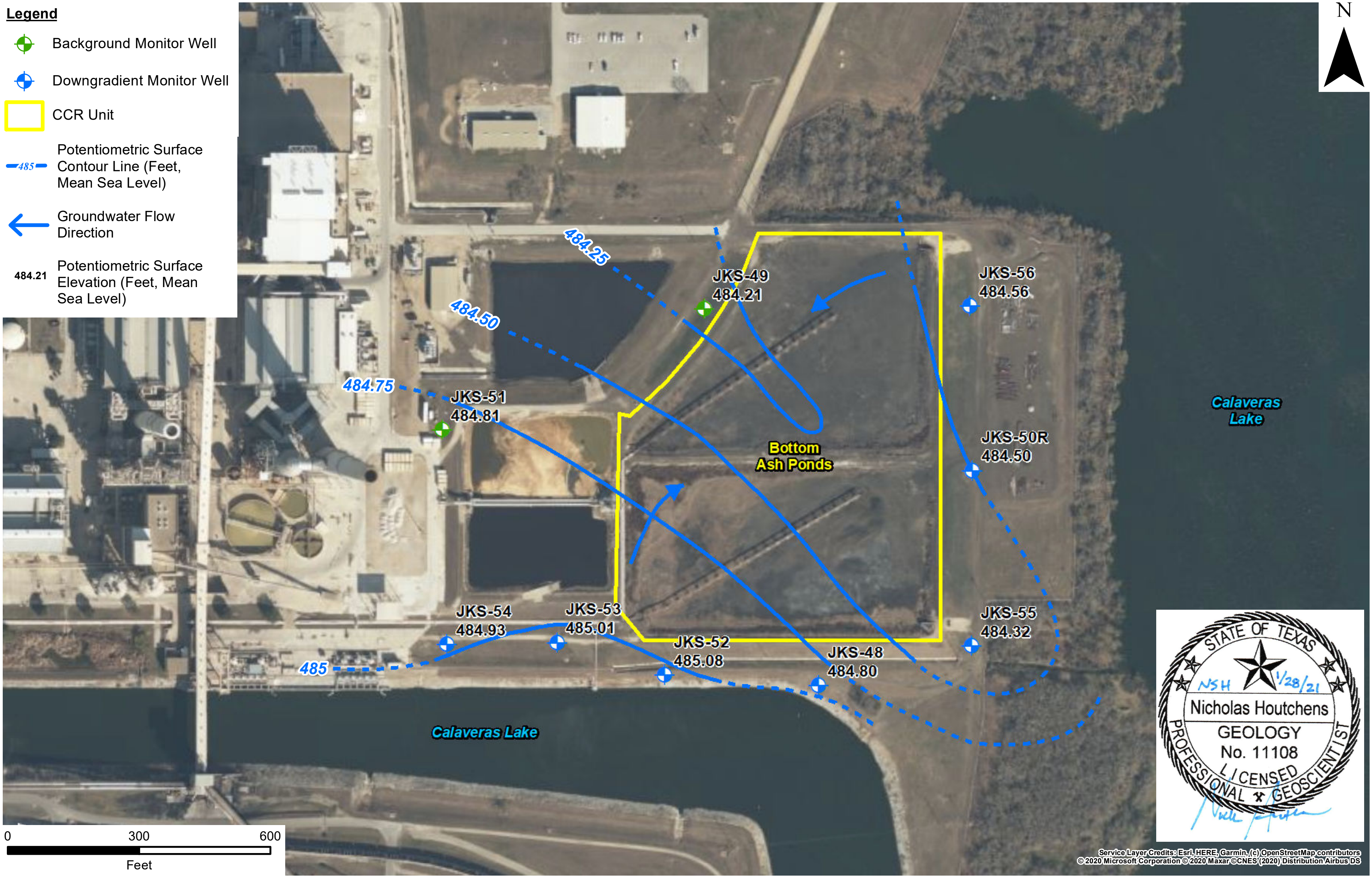
DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/19/2021	SCALE:	AS SHOWN	REVISION:	2

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2020gwmon\fig2A_0503422_CPSCalv_BotAshPond_apr2020pmap.mxd

FIGURE 2A
POTENTIOMETRIC SURFACE MAP -
APRIL 2020
Bottom Ash Ponds CCR Unit
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM



NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Environmental Resources Management

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/19/2021	SCALE:	AS SHOWN	REVISION:	1

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2020gwmon\fig2B_0503422_CPSCalv_BotAshPond_oct2020pmap.mxd

FIGURE 2B
POTENTIOMETRIC SURFACE MAP - OCTOBER 2020
Bottom Ash Ponds CCR Unit
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM

Laboratory Data Packages

Appendix A

(*Data Packages Available Upon Request*)

Statistical Analysis Tables and Figures

Appendix B

APPENDIX B - TABLE 1
Kruskal-Wallis Test Comparisons of Upgradient Wells
Calaveras Power Station
Bottom Ash Ponds

Analyte	**N**	**Num Detects**	**Percent Detect**	**DF**	**KW Statistic**	**p-value**	**Conclusion**	**UPL Type**
Boron	28	28	100.00%	1	20.3	<0.001	Significant Difference	Intrawell
Calcium	28	28	100.00%	1	19.5	<0.001	Significant Difference	Intrawell
Chloride	28	28	100.00%	1	0.256	0.613	No Significant Difference	Interwell
Fluoride	28	26	92.86%	1	19.9	<0.001	Significant Difference	Intrawell
pH	28	28	100.00%	1	12.7	<0.001	Significant Difference	Intrawell
Sulfate	28	28	100.00%	1	19.9	<0.001	Significant Difference	Intrawell
Total dissolved solids	28	28	100.00%	1	9.64	0.00191	Significant Difference	Intrawell

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations
N: number of data points
DF: degrees of freedom
statistic: Kruskal Wallis test statistic

p-value: P-values below 0.05 indicate that the median concentrations in the upgradient wells are significantly different from each other and the upgradient wells should not be pooled.

p-value: P-values equal or above 0.05 indicate that the median concentrations in the upgradient wells are not significantly different from each other and the upgradient wells can be pooled.

APPENDIX B - TABLE 2
Descriptive Statistics for Upgradient Wells
Calaveras Power Station
Bottom Ash Ponds

Analyte	Well	Units	N	Num Detect	Percent Detect	Min ND	Max ND	Min Detect	Median	Mean	Max Detect	SD	CV	Distribution
Boron	JKS-49	mg/L	14	14	100.00%			2.05	2.83	2.83	3.28	0.339	0.119722997	Normal
Boron	JKS-51	mg/L	14	14	100.00%			0.347	0.512	0.522	0.668	0.0844	0.161632889	Normal
Calcium	JKS-49	mg/L	14	14	100.00%			113	131	134	173	17.1	0.127299	Normal
Calcium	JKS-51	mg/L	14	14	100.00%			149	266	273	336	51	0.186659149	Normal
Chloride	Pooled	mg/L	28	28	100.00%			295	424	423	574	68.9	0.162758525	Normal
Fluoride	JKS-49	mg/L	14	14	100.00%			0.525	0.704	0.702	0.894	0.0922	0.131442503	Normal
Fluoride	JKS-51	mg/L	14	12	85.71%	0.009	0.048	0.247	0.348	0.325	0.534	0.146	0.448419555	Normal
pH	JKS-49	SU	14	14	100.00%			6.16	7.12	6.99	7.31	0.314	0.044881001	NDD
pH	JKS-51	SU	14	14	100.00%			5.48	6.46	6.36	6.7	0.346	0.054432828	NDD
Sulfate	JKS-49	mg/L	14	14	100.00%			193	223	224	265	19.5	0.087268176	Normal
Sulfate	JKS-51	mg/L	14	14	100.00%			260	345	349	439	50.8	0.145831309	Normal
Total dissolved solids	JKS-49	mg/L	14	14	100.00%			1100	1300	1340	1730	159	0.118945011	Normal
Total dissolved solids	JKS-51	mg/L	14	14	100.00%			916	1650	1650	2150	326	0.197480634	Normal

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations
Well = Pooled, indicates that the summary statistics were produced for the pooled upgradient wells based on the Kruskal-Wallis test (Table 1).
SU: Standard units
N: number of data points
ND: Non-detect
SD: Standard Deviation
CV: Coefficient of Variation (standard deviation divided by the mean)
NDD: Non Discernible Distribution

APPENDIX B - TABLE 3
Potential Outliers in Upgradient Wells
Calaveras Power Station
Bottom Ash Ponds

Well	Sample	Date	Analyte	Units	Detect	Concentration	UPL type	Distribution	Statistical Outlier	Visual Outlier	Normal Outlier	Log Statistical Outlier	Log Visual Outlier	Lognormal Outlier	Statistical and Visual Outlier
JKS-51	JKS-51004	10/22/2019	Boron	mg/L	TRUE	0.648	Intrawell	Normal		X					
JKS-51	JKS-51-20200428-CCR	4/28/2020	Boron	mg/L	TRUE	0.627	Intrawell	Normal		X			X		
JKS-51	JKS51620699-001	4/10/2019	Chloride	mg/L	TRUE	559	Interwell	Normal		X			X		
JKS-51	JKS-51-20200428-CCR	4/28/2020	Chloride	mg/L	TRUE	555	Interwell	Normal		X			X		
JKS-49	JKS-49-WG-20170725	7/25/2017	pH	SU	TRUE	6.16	Intrawell	NDD	X	X	X	X	X	X	0
JKS-49	JKS-49-WG-20171010	10/10/2017	pH	SU	TRUE	6.89	Intrawell	NDD		X			X		
JKS-49	JKS-49-WG-20191022-02	10/22/2019	pH	SU	TRUE	6.43	Intrawell	NDD	X	X	X	X	X	X	0
JKS-51	JKS-51-WG-20170725	7/25/2017	pH	SU	TRUE	5.48	Intrawell	NDD	X	X	X	X	X	X	0
JKS-51	JKS-51-WG-20171010	10/10/2017	pH	SU	TRUE	6.2	Intrawell	NDD		X			X		
JKS-51	JKS-51-WG-20191022-02	10/22/2019	pH	SU	TRUE	5.73	Intrawell	NDD	X	X	X	X	X	X	0

NOTES:

NDD: No Discernible Distribution
SU: Standard units
Outlier tests were performed on detected data only.
Statistical outliers were determined using a Dixon's test for N < 25 and with Rosner's test for N > 25.
Visual outliers were identified if they fall above the confidence envelope on the QQ plot.
Data points were considered potential outliers if they were both statistical and visual outliers.
NDD wells had data points considered as potential outliers if they were either a normal or lognormal outlier.
[Blank] data distribution indicates that the well data did not have enough detected data points for outlier analysis.
Lognormally distributed data was first log-transformed before visual and statistical outlier tests were performed.
Normal data distribution indicates that the well data was directly used for statistical and visual outlier tests.
NDD indicates that both the untransformed and transformed data were examined with statistical and visual outlier tests.
'0' indicates that the data point was a statistical and visual outlier but was retained after review by the hydrogeologist.

APPENDIX B - TABLE 4
Mann Kendall Test for Trends in Upgradient Wells
Calaveras Power Station
Bottom Ash Ponds

Analyte	**UPL Type**	**Well**	**N**	**Num Detects**	**Percent Detect**	**p-value**	**tau**	**Conclusion**
Boron	Intrawell	JKS-49	14	14	100.00%	<0.001	-0.685	Decreasing Trend
Boron	Intrawell	JKS-51	14	14	100.00%	0.511	0.133	Stable, No Trend
Calcium	Intrawell	JKS-49	14	14	100.00%	0.584	-0.11	Stable, No Trend
Calcium	Intrawell	JKS-51	14	14	100.00%	0.747	0.0769	Stable, No Trend
Chloride	Interwell	JKS-49, JKS-51	28	28	100.00%	0.00137	0.43	Increasing Trend
Fluoride	Intrawell	JKS-49	14	14	100.00%	0.233	0.253	Stable, No Trend
Fluoride	Intrawell	JKS-51	14	12	85.71%	0.826	-0.0442	Stable, No Trend
pH	Intrawell	JKS-49	14	14	100.00%	0.782	0.0569	Stable, No Trend
pH	Intrawell	JKS-51	14	14	100.00%	0.518	-0.143	Stable, No Trend
Sulfate	Intrawell	JKS-49	14	14	100.00%	0.913	-0.0221	Stable, No Trend
Sulfate	Intrawell	JKS-51	14	14	100.00%	0.1	0.331	Stable, No Trend
Total dissolved solids	Intrawell	JKS-49	14	14	100.00%	0.546	0.122	Stable, No Trend
Total dissolved solids	Intrawell	JKS-51	14	14	100.00%	0.441	0.156	Stable, No Trend

NOTES:

Non-detects were substituted with a value of zero for trend calculations
N: number of data points
tau: Kendall's tau statistic
p-value: A two-sided p-value describing the probability of the H0 being true (a=0.05)
Trend tests were performed on all upgradient data, only if the dataset met the minimum data quality criteria (ERM 2017).

APPENDIX B - TABLE 5
Calculated UPLs for Upgradient Datasets
Calaveras Power Station
Bottom Ash Ponds

Analyte	UPL Type	Trend	Well	N	Num Detects	Percent Detects	LPL	UPL	Units	ND Adjustment	Transformation	Alpha	Method	Final LPL	Final UPL
Boron	Intrawell	Decreasing Trend	JKS-49	14	14	100.00%		2.65	mg/L	None	No	0.0015	NP Detrended UPL		X
Boron	Intrawell	Stable, No Trend	JKS-51	14	14	100.00%		0.711	mg/L	None	No	0.0015	Param Intra 1 of 2		
Calcium	Intrawell	Stable, No Trend	JKS-49	14	14	100.00%		172	mg/L	None	No	0.0015	Param Intra 1 of 2		
Calcium	Intrawell	Stable, No Trend	JKS-51	14	14	100.00%		387	mg/L	None	No	0.0015	Param Intra 1 of 2		X
Chloride	Interwell	Increasing Trend	JKS-49, JKS-51	28	28	100.00%		607	mg/L	None	No	0.0015	NP Detrended UPL		X
Fluoride	Intrawell	Stable, No Trend	JKS-49	14	14	100.00%		0.908	mg/L	None	No	0.0015	Param Intra 1 of 2		X
Fluoride	Intrawell	Stable, No Trend	JKS-51	14	12	85.71%		0.65	mg/L	None	No	0.0015	Param Intra 1 of 2		
pH	Intrawell	Stable, No Trend	JKS-49	14	14	100.00%	6.16	7.31	SU	None	No	0.0172	NP Intra (normality) 1 of 2		X
pH	Intrawell	Stable, No Trend	JKS-51	14	14	100.00%	5.48	6.7	SU	None	No	0.0172	NP Intra (normality) 1 of 2	X	
Sulfate	Intrawell	Stable, No Trend	JKS-49	14	14	100.00%		267	mg/L	None	No	0.0015	Param Intra 1 of 2		
Sulfate	Intrawell	Stable, No Trend	JKS-51	14	14	100.00%		462	mg/L	None	No	0.0015	Param Intra 1 of 2		X
Total dissolved solids	Intrawell	Stable, No Trend	JKS-49	14	14	100.00%		1690	mg/L	None	No	0.0015	Param Intra 1 of 2		
Total dissolved solids	Intrawell	Stable, No Trend	JKS-51	14	14	100.00%		2380	mg/L	None	No	0.0015	Param Intra 1 of 2		X

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations
UPL: upper prediction limit
LPL: Lower prediction limit. These were only calculated for pH
UPLs were constructed with a site wide false positive rate of 0.1 and a 1 of 2 retesting.
UPLs were calculated using Sanitas Software.
SU: Standard units
NP: non parametric
RL: Reporting Limit
Intra: indicates an intrawell UPL was used
Inter: indicates an interwell UPL was used
In the case where multiple UPLs were calculated for an analyte, the maximum UPL was used as the final UPL.
In the case where multiple LPLs were calculated for an pH the minimum LPL was used as the final LPL.

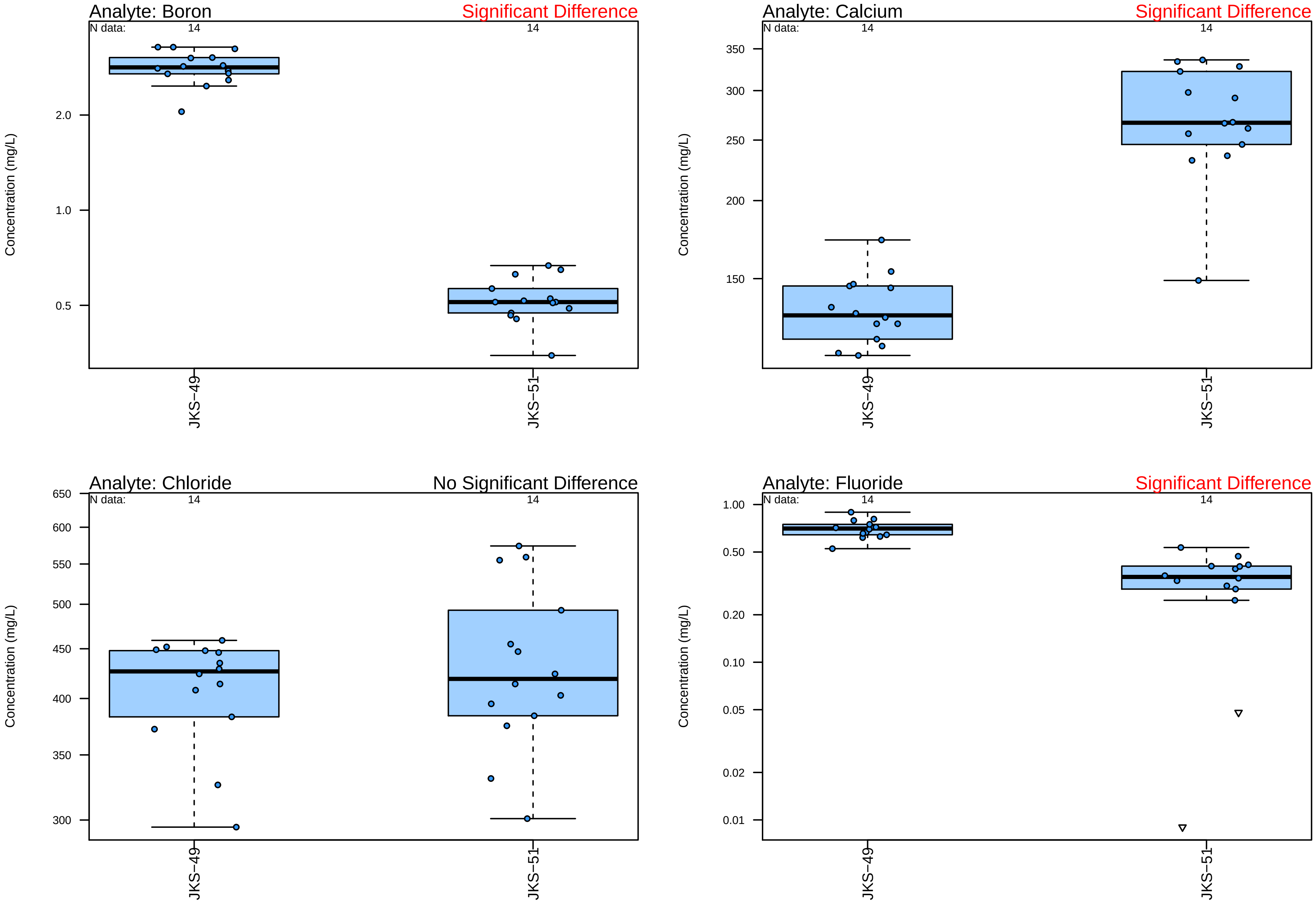
APPENDIX B - TABLE 6
Comparisons of Downgradient Wells to UPLs
Calaveras Power Station
Bottom Ash Ponds

Analyte	Well	LPL	UPL	Units	Recent Date	Observation	Obs > UPL	Notes	Mann Kendall p-value	Mann Kendall tau	WRS p-value	WRS Conclusion	Exceed Median	Overall Conclusion
Boron	JKS-48		2.65	mg/L	10/21/2020	2.36					0.999	NS		No Exceedance
Boron	JKS-50R		2.65	mg/L	10/21/2020	6.79	X	Trend Test: Stable, No Trend	0.388	0.187	<0.001	***	X	Both Exceedance
Boron	JKS-52		2.65	mg/L	10/21/2020	2.21					1	NS		No Exceedance
Boron	JKS-55		2.65	mg/L	10/21/2020	0.815					1	NS		No Exceedance
Boron	JKS-56		2.65	mg/L	10/21/2020	4	X	Trend Test: Stable, No Trend	0.462	-0.156	<0.001	***	X	Both Exceedance
Calcium	JKS-48		387	mg/L	10/21/2020	142					0.999	NS		No Exceedance
Calcium	JKS-50R		387	mg/L	10/21/2020	140					1	NS		No Exceedance
Calcium	JKS-52		387	mg/L	10/21/2020	199					1	NS		No Exceedance
Calcium	JKS-55		387	mg/L	10/21/2020	154					1	NS		No Exceedance
Calcium	JKS-56		387	mg/L	10/21/2020	120					1	NS		No Exceedance
Chloride	JKS-48		607	mg/L	10/21/2020	446					1	NS		No Exceedance
Chloride	JKS-50R		607	mg/L	10/21/2020	69.8					1	NS		No Exceedance
Chloride	JKS-52		607	mg/L	10/21/2020	408					1	NS		No Exceedance
Chloride	JKS-55		607	mg/L	10/21/2020	431					1	NS		No Exceedance
Chloride	JKS-56		607	mg/L	10/21/2020	77.2					1	NS		No Exceedance
Fluoride	JKS-48		0.908	mg/L	10/21/2020	1.05	X	Trend Test: Stable, No Trend	0.188	-0.265	0.0582	NS		UPL Exceedance
Fluoride	JKS-50R		0.908	mg/L	10/21/2020	0.332					1	NS		No Exceedance
Fluoride	JKS-52		0.908	mg/L	10/21/2020	0.659					0.998	NS		No Exceedance
Fluoride	JKS-55		0.908	mg/L	10/21/2020	0.727					0.932	NS		No Exceedance
Fluoride	JKS-56		0.908	mg/L	10/21/2020	0.418					1	NS		No Exceedance
pH	JKS-48	5.48	7.31	SU	10/21/2020	6.83					1	NS		No Exceedance
pH	JKS-50R	5.48	7.31	SU	10/21/2020	6.63					0.999	NS		No Exceedance
pH	JKS-52	5.48	7.31	SU	10/21/2020	6.78					1	NS		No Exceedance
pH	JKS-55	5.48	7.31	SU	10/21/2020	6.77					1	NS		No Exceedance
pH	JKS-56	5.48	7.31	SU	10/21/2020	6.63					1	NS		No Exceedance
Sulfate	JKS-48		462	mg/L	10/21/2020	170					1	NS		No Exceedance
Sulfate	JKS-50R		462	mg/L	10/21/2020	171					1	NS		No Exceedance
Sulfate	JKS-52		462	mg/L	10/21/2020	282					1	NS		No Exceedance
Sulfate	JKS-55		462	mg/L	10/21/2020	164					1	NS		No Exceedance
Sulfate	JKS-56		462	mg/L	10/21/2020	140					1	NS		No Exceedance
Total dissolved solids	JKS-48		2380	mg/L	10/21/2020	1300					1	NS		No Exceedance
Total dissolved solids	JKS-50R		2380	mg/L	10/21/2020	863					1	NS		No Exceedance
Total dissolved solids	JKS-52		2380	mg/L	10/21/2020	1430					1	NS		No Exceedance
Total dissolved solids	JKS-55		2380	mg/L	10/21/2020	1380					1	NS		No Exceedance
Total dissolved solids	JKS-56		2380	mg/L	10/21/2020	847					1	NS		No Exceedance

NOTES:

Non-detects were substituted with a value of zero for trend calculations
UPL: Upper Prediction Limit
ND: Not detected
SU: Standard units
tau: Kendall's tau statistic
Obs > UPL: Exceed 'X' indicates that the most recent observed value is higher than the UPL (or out of range of the LPL and UPL in the case of pH.)
Obs > UPL: Exceed 'X0' indicates that the two most recent values are higher than the UPL, but the upgradient well is 100% ND.
Obs > UPL: Exceed '0' indicated that the most recent observed value is higher than the UPL, but is not scored as an SSI due to Double Quantification Rule (ERM 2017).
WRS: Wilcoxon Rank Sum test comparing if median of downgradient well is larger than the UPL (for pH, also checks if median is less than LPL)
WRS p-value: A one-sided p-value describing the probability of the H0 (UPL/LPL) being true (a=0.05)
Overall: UPL Exceedance - most recent sampling event exceeds the UPL, but median of the well is not greater than UPL
Overall: WRS Exceedance - most recent sampling event does not exceed the UPL, but median of the well is greater than UPL
Overall: Both Exceedance - most recent sampling event exceeds the UPL and median of the well is larger than the UPL

Appendix B – Figure 1
Unit: Bottom Ash Ponds
Boxplots of Upgradient Wells



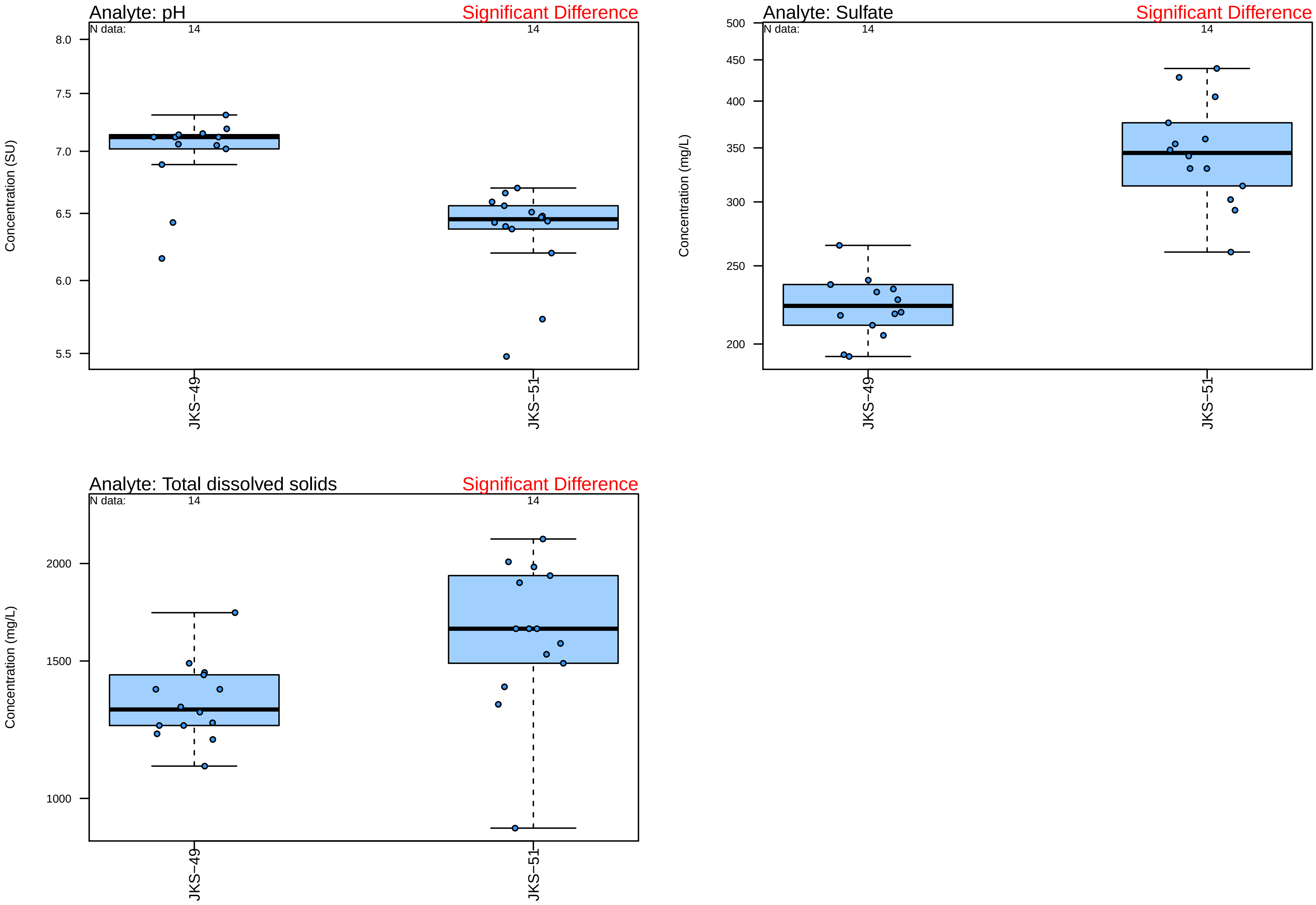
Analyte: Boron — Significant Difference

Analyte: Calcium — Significant Difference

Analyte: Chloride — No Significant Difference

Analyte: Fluoride — Significant Difference

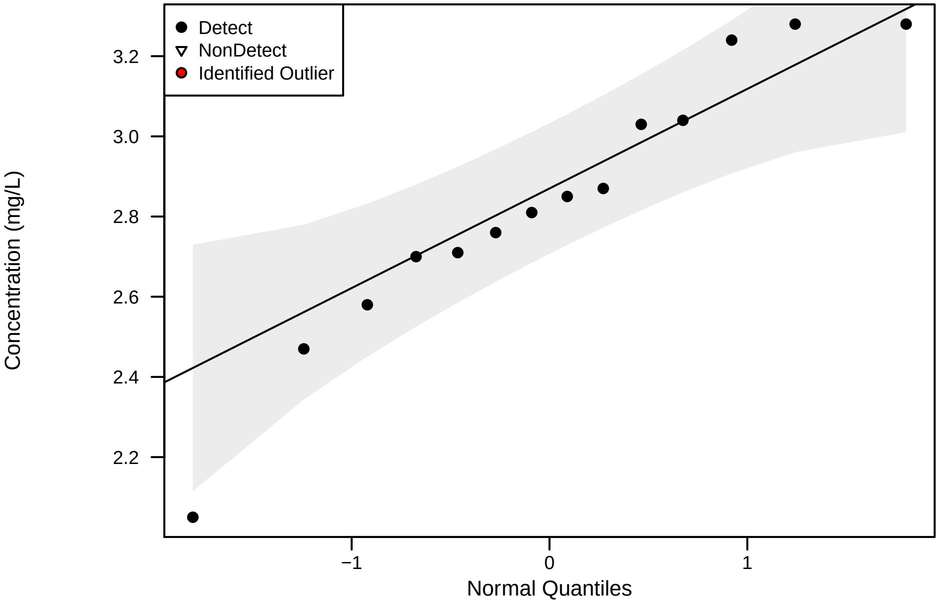
Appendix B – Figure 1
Unit: Bottom Ash Ponds
Boxplots of Upgradient Wells



Appendix B − Figure 2
Unit: Bottom Ash Ponds
QQ Plots of Upgradient Wells

Analyte: Boron
Wells: JKS−49

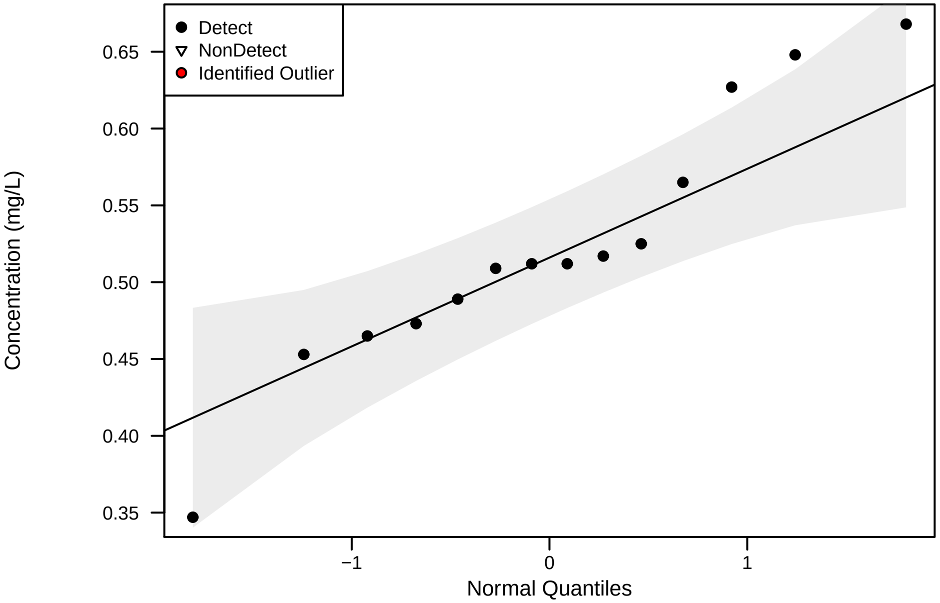
Intrawell Analysis
Normal Distribution



Intentionally left blank,
not Lognormal/NDD distribution.

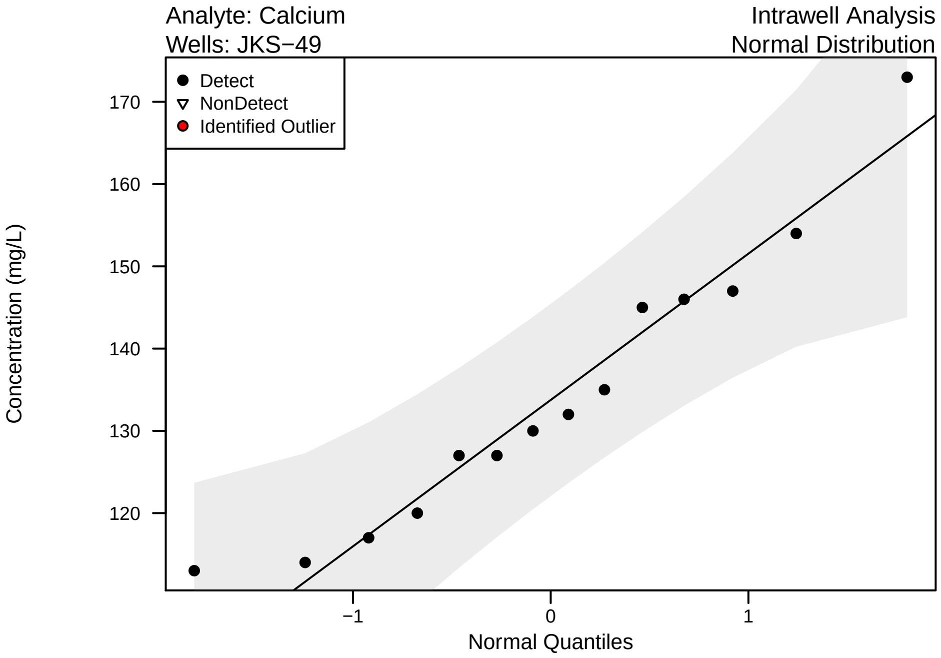
Analyte: Boron
Wells: JKS−51

Intrawell Analysis
Normal Distribution

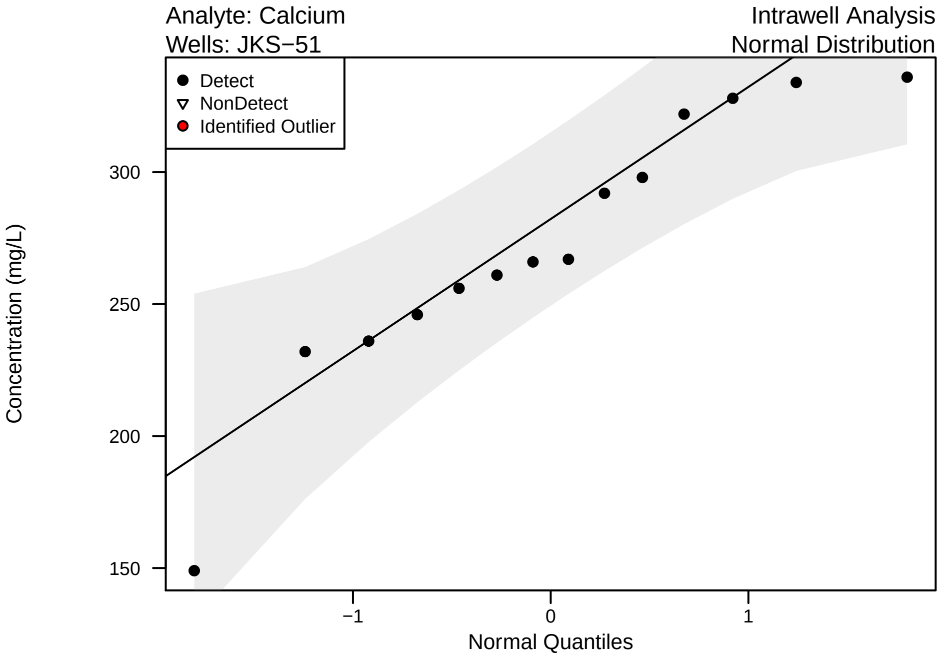


Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 2
Unit: Bottom Ash Ponds
QQ Plots of Upgradient Wells

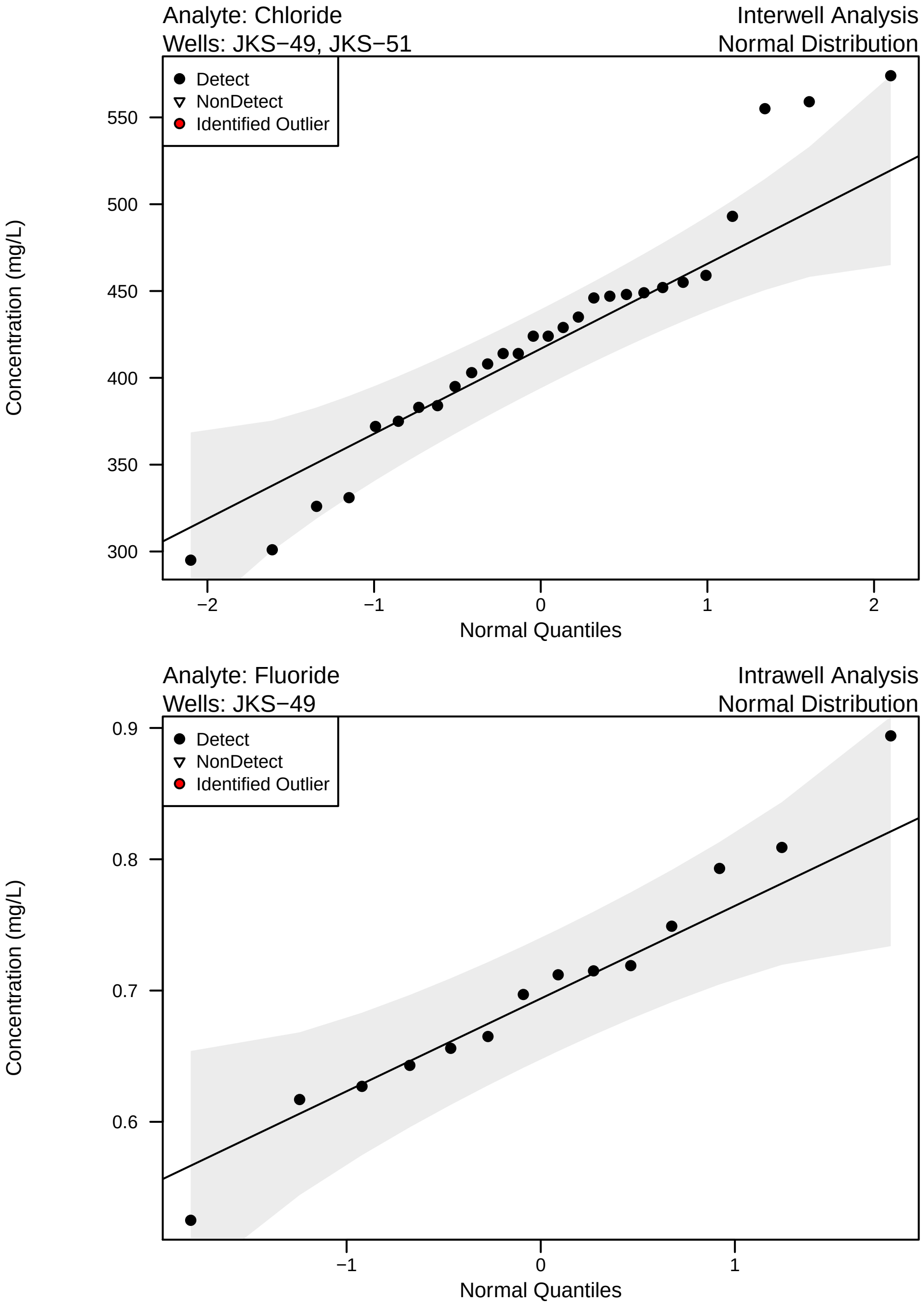


Intentionally left blank,
not Lognormal/NDD distribution.



Intentionally left blank,
not Lognormal/NDD distribution.

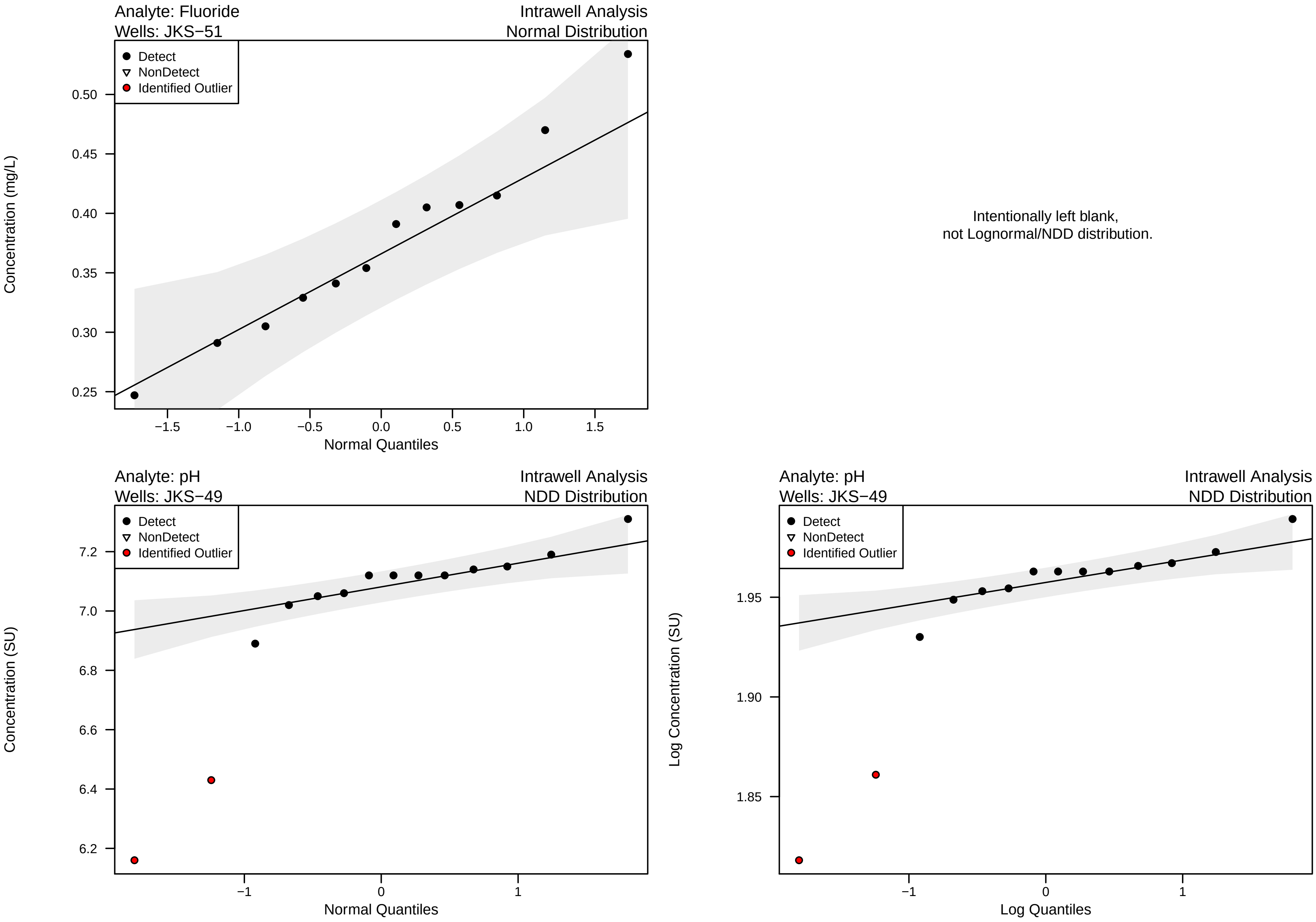
Appendix B − Figure 2
Unit: Bottom Ash Ponds
QQ Plots of Upgradient Wells



Intentionally left blank,
not Lognormal/NDD distribution.

Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 2
Unit: Bottom Ash Ponds
QQ Plots of Upgradient Wells

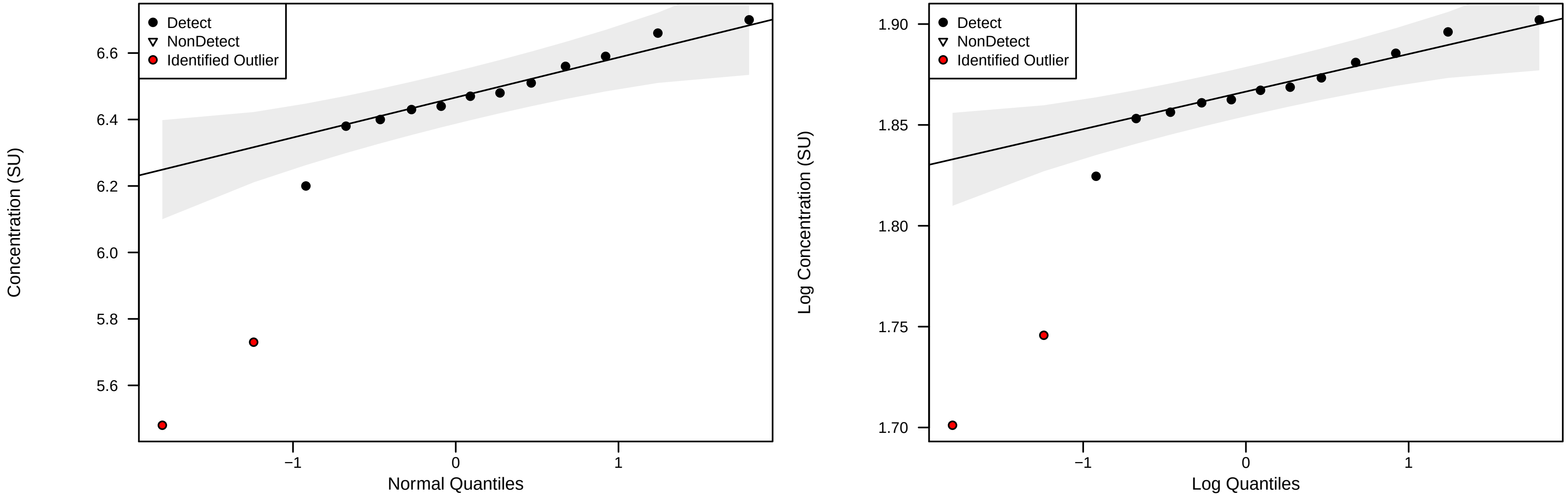


Intentionally left blank,
not Lognormal/NDD distribution.

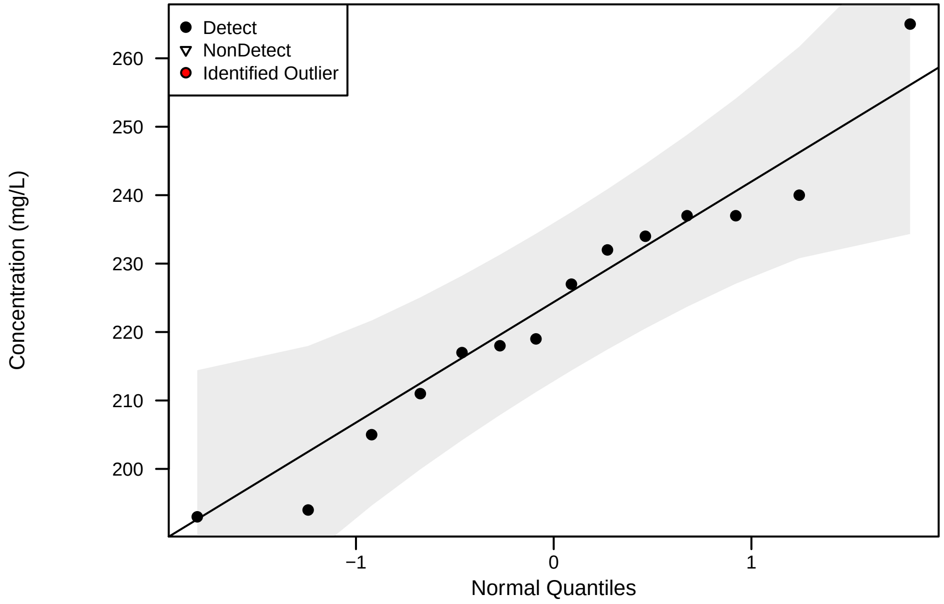
Appendix B − Figure 2
Unit: Bottom Ash Ponds
QQ Plots of Upgradient Wells

Analyte: pH
Wells: JKS−51
Intrawell Analysis
NDD Distribution

Analyte: pH
Wells: JKS−51
Intrawell Analysis
NDD Distribution



Analyte: Sulfate
Wells: JKS−49
Intrawell Analysis
Normal Distribution

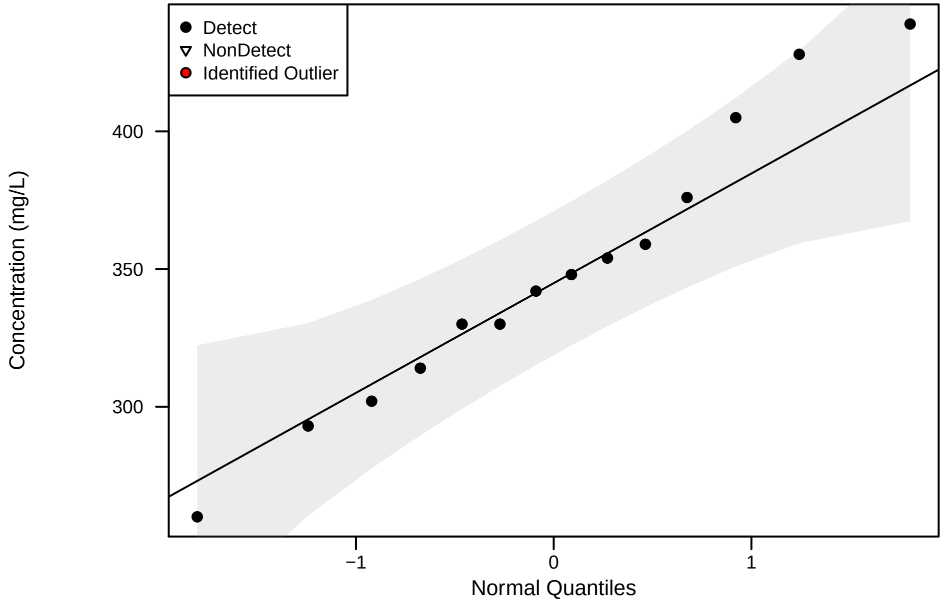


Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 2
Unit: Bottom Ash Ponds
QQ Plots of Upgradient Wells

Analyte: Sulfate
Wells: JKS−51

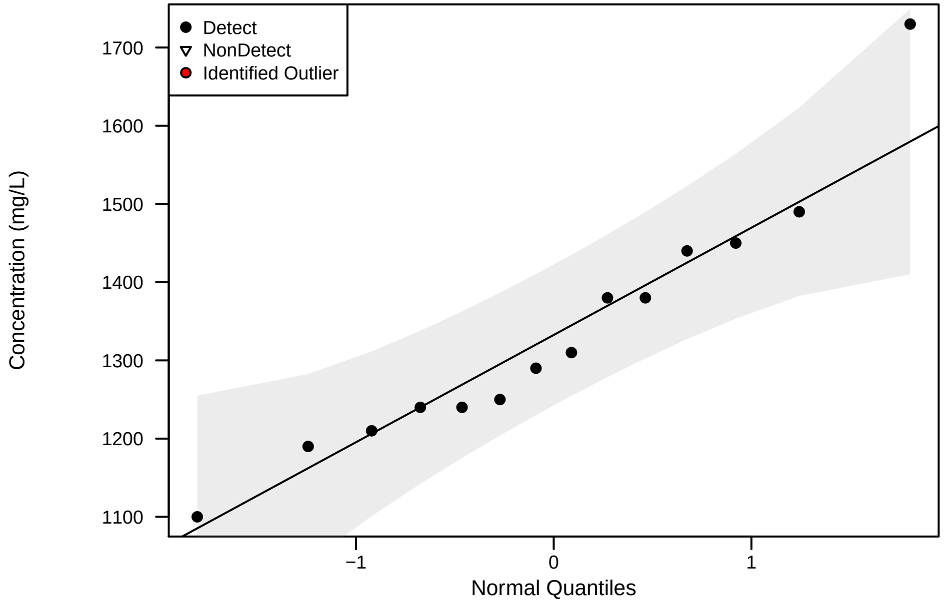
Intrawell Analysis
Normal Distribution



Intentionally left blank,
not Lognormal/NDD distribution.

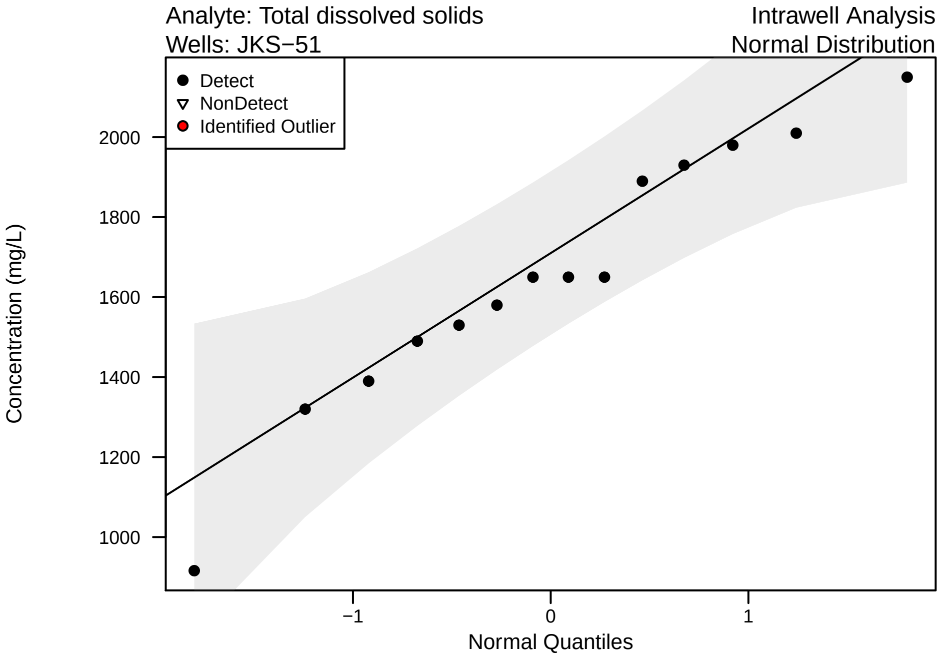
Analyte: Total dissolved solids
Wells: JKS−49

Intrawell Analysis
Normal Distribution



Intentionally left blank,
not Lognormal/NDD distribution.

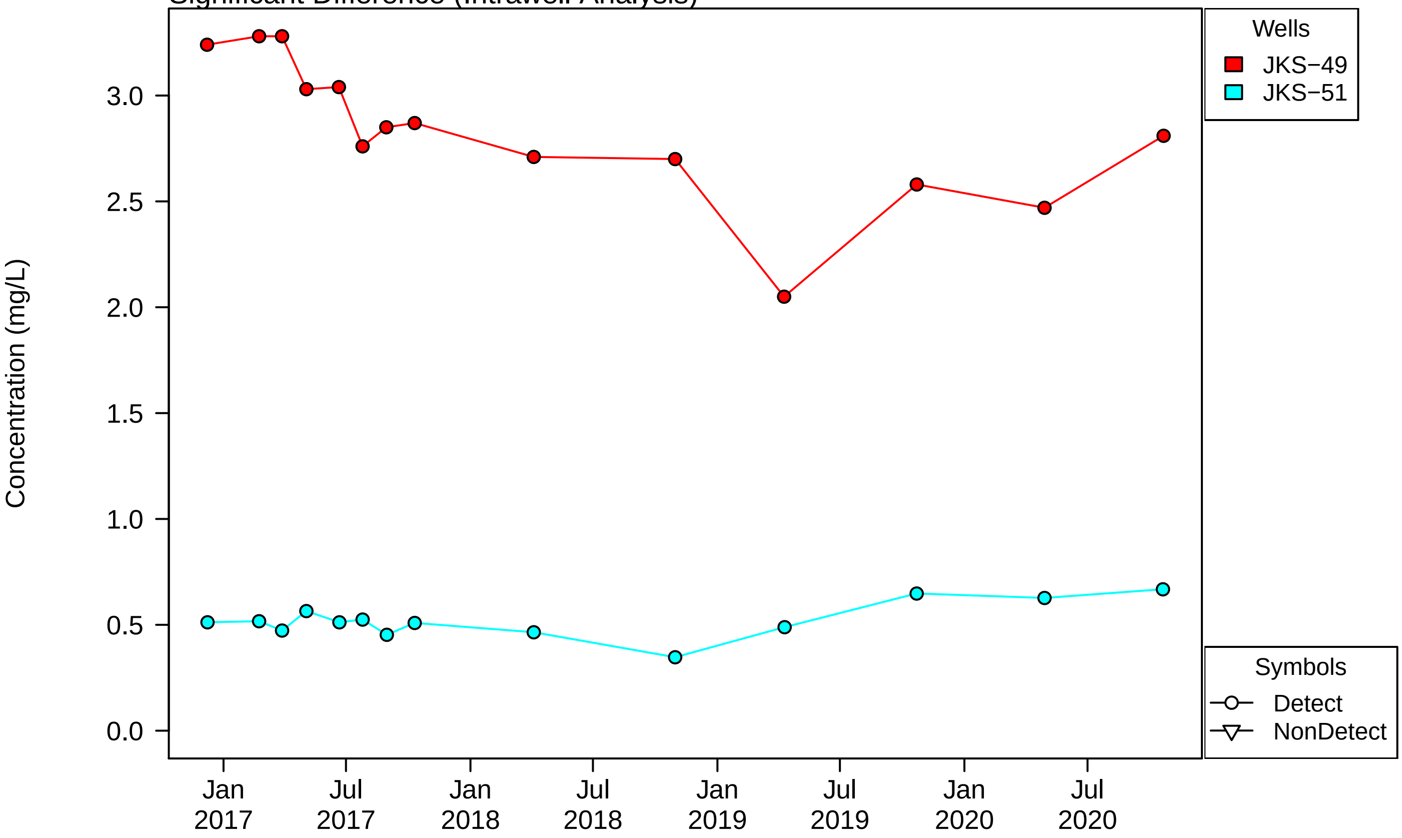
Appendix B − Figure 2
Unit: Bottom Ash Ponds
QQ Plots of Upgradient Wells



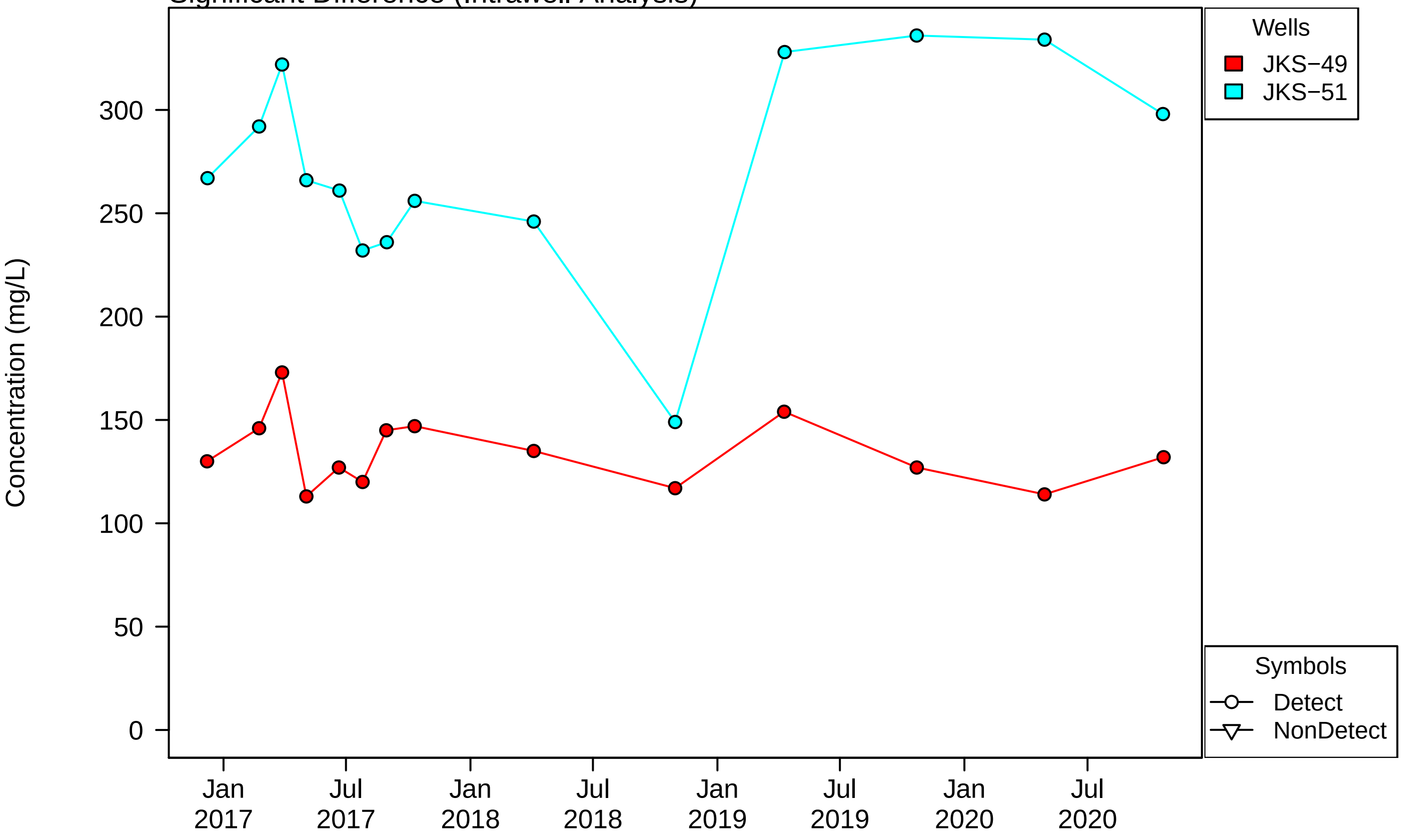
Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 3
Unit: Bottom Ash Ponds
Timeseries of Upgradient Wells

Chemical: Boron
Significant Difference (Intrawell Analysis)

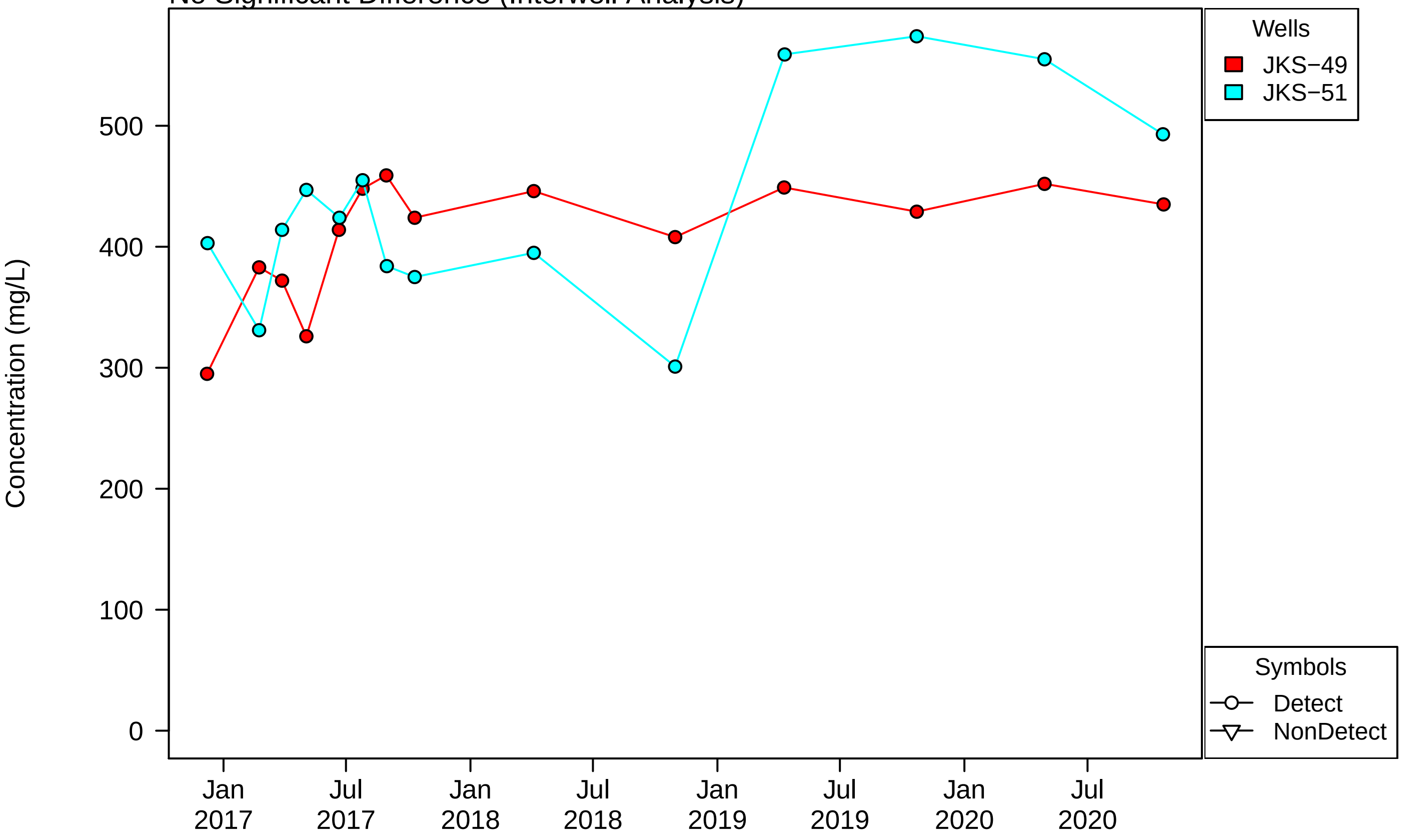


Chemical: Calcium
Significant Difference (Intrawell Analysis)

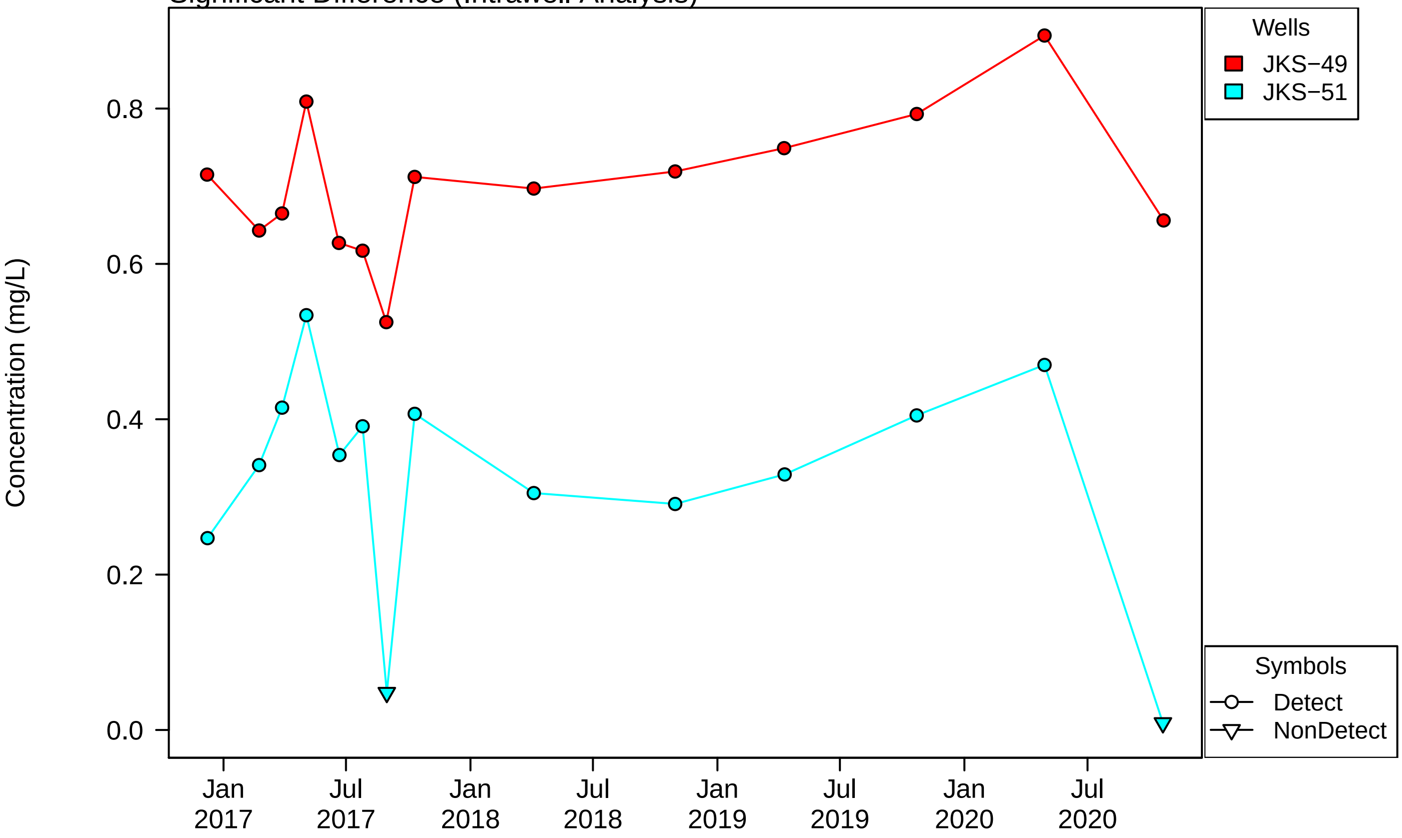


Appendix B – Figure 3
Unit: Bottom Ash Ponds
Timeseries of Upgradient Wells

Chemical: Chloride
No Significant Difference (Interwell Analysis)

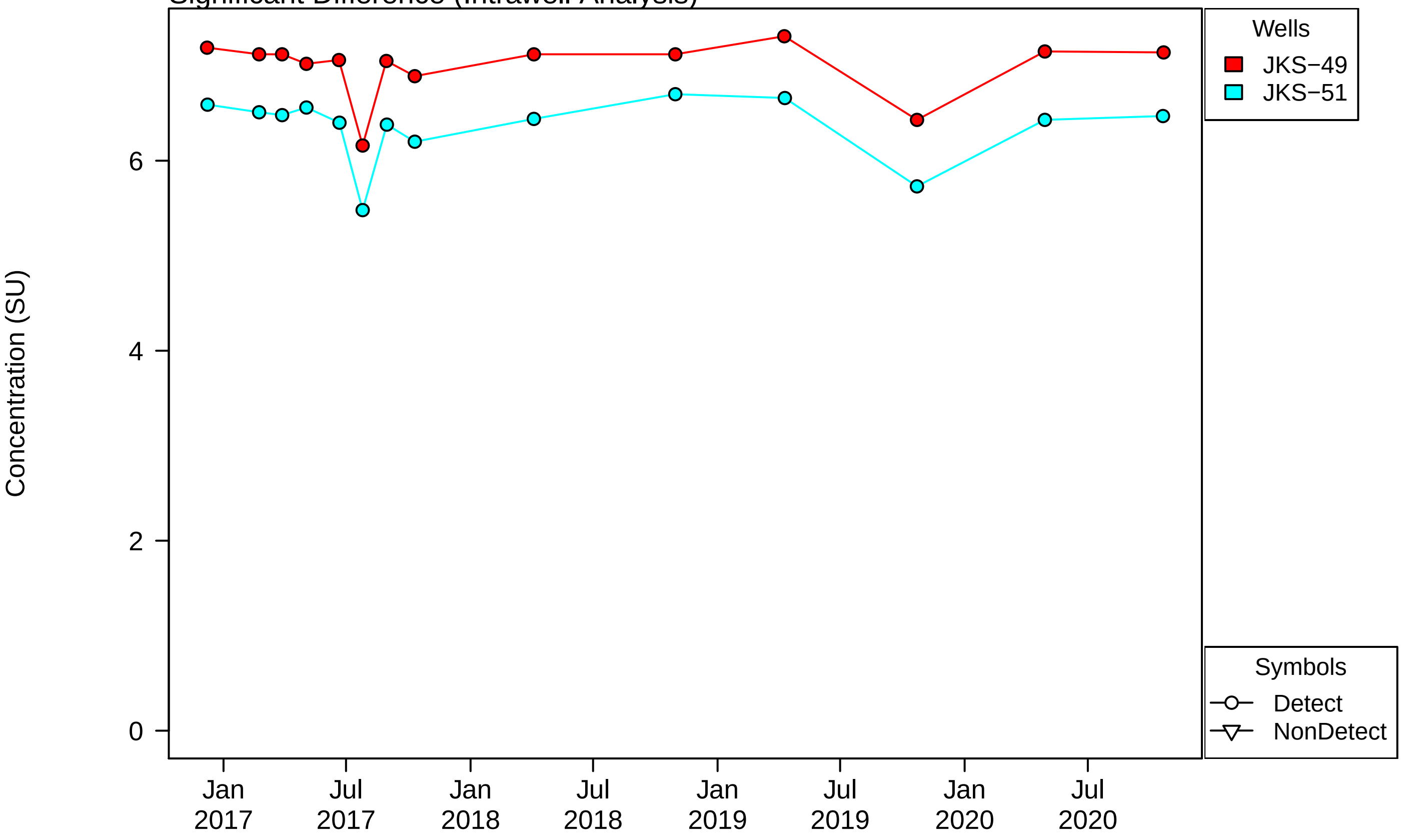


Chemical: Fluoride
Significant Difference (Intrawell Analysis)

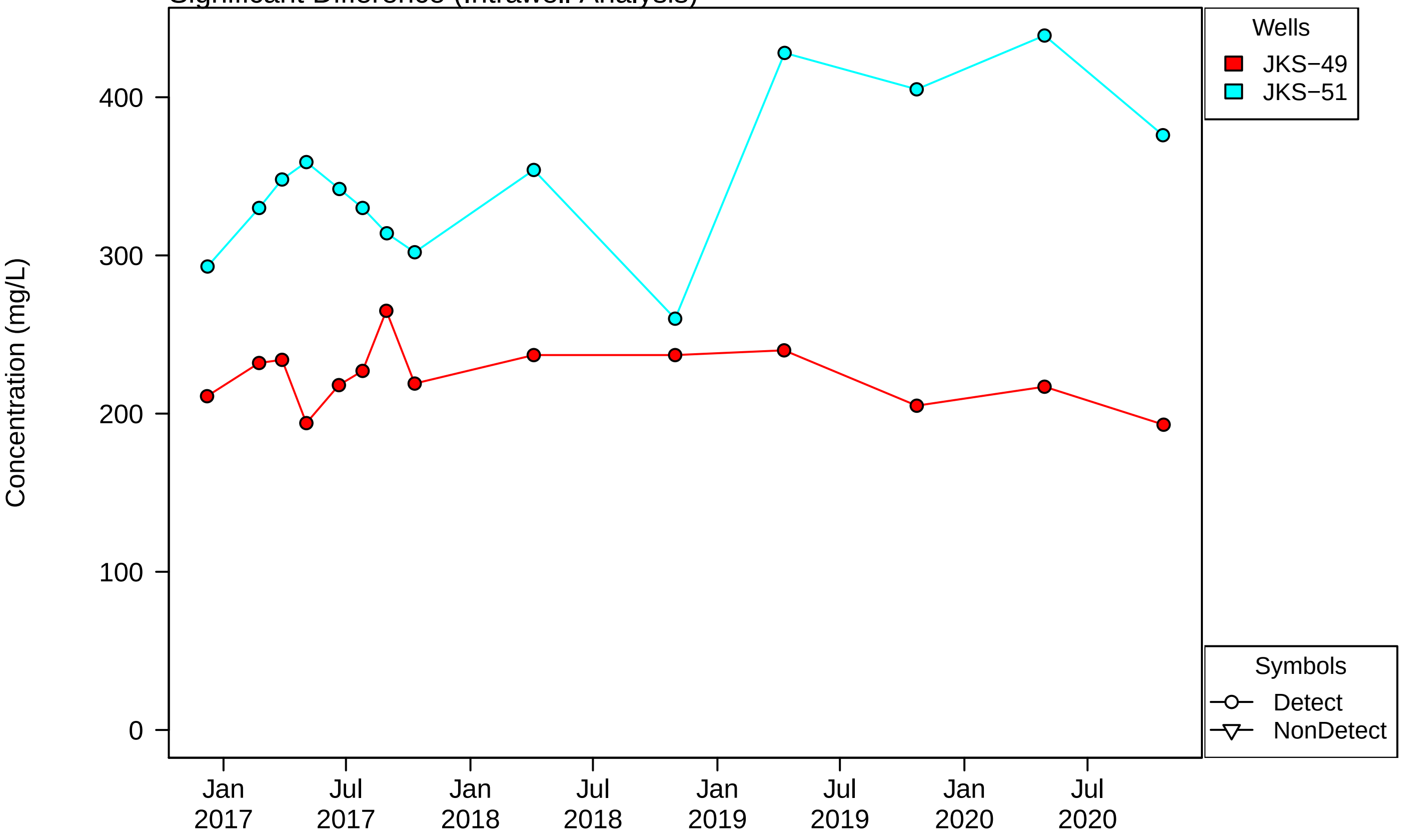


Appendix B − Figure 3
Unit: Bottom Ash Ponds
Timeseries of Upgradient Wells

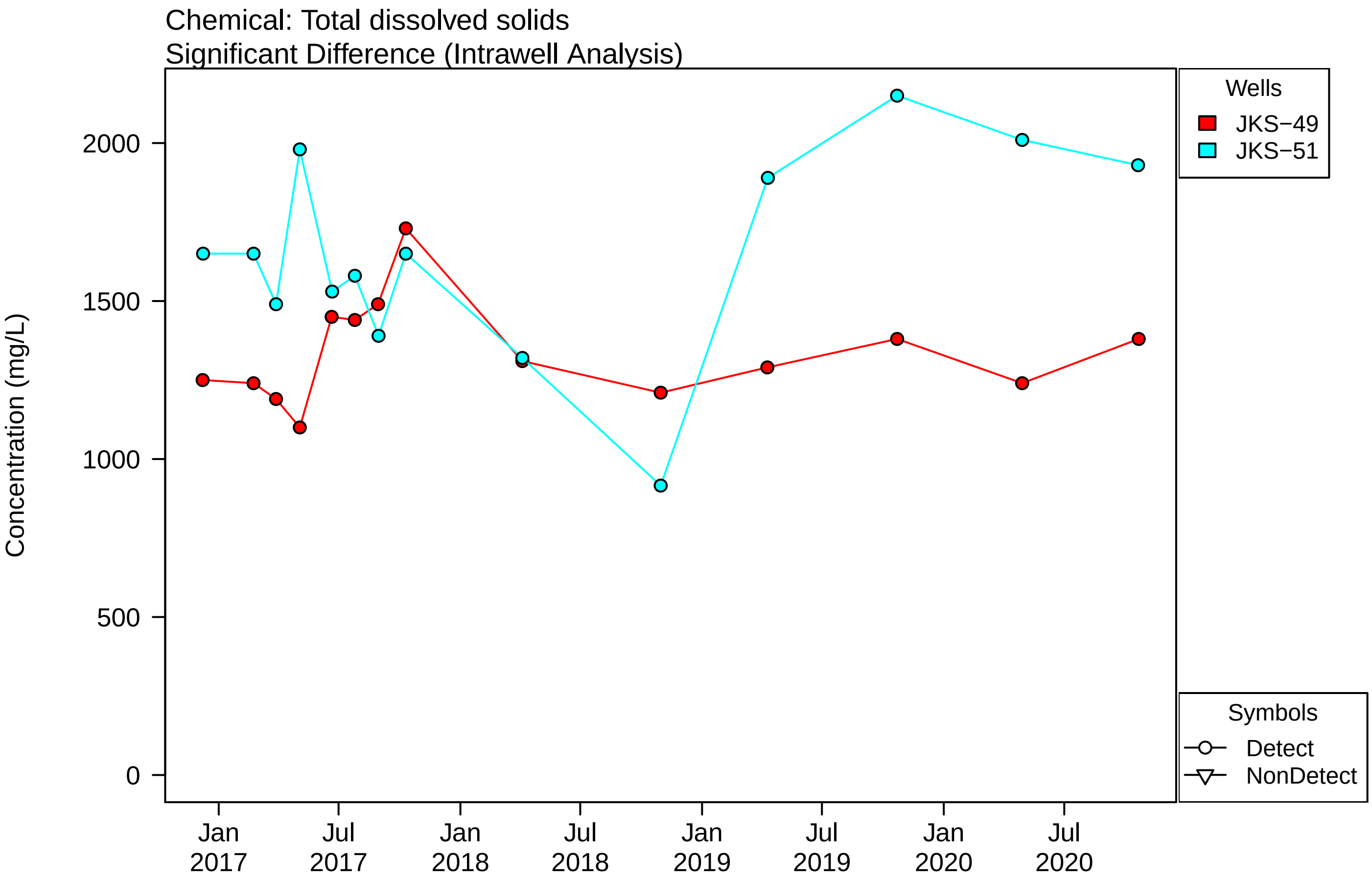
Chemical: pH
Significant Difference (Intrawell Analysis)



Chemical: Sulfate
Significant Difference (Intrawell Analysis)

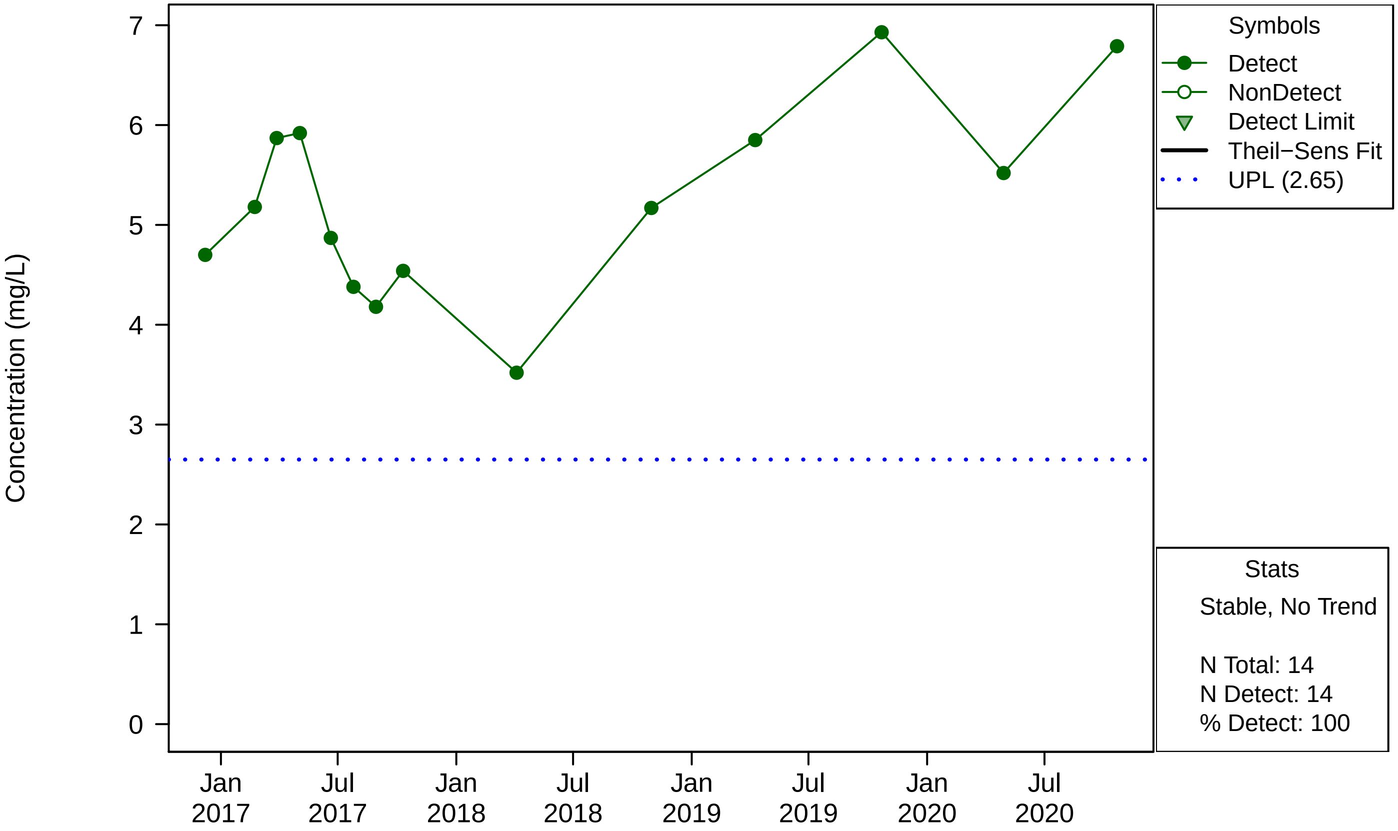


Appendix B − Figure 3
Unit: Bottom Ash Ponds
Timeseries of Upgradient Wells

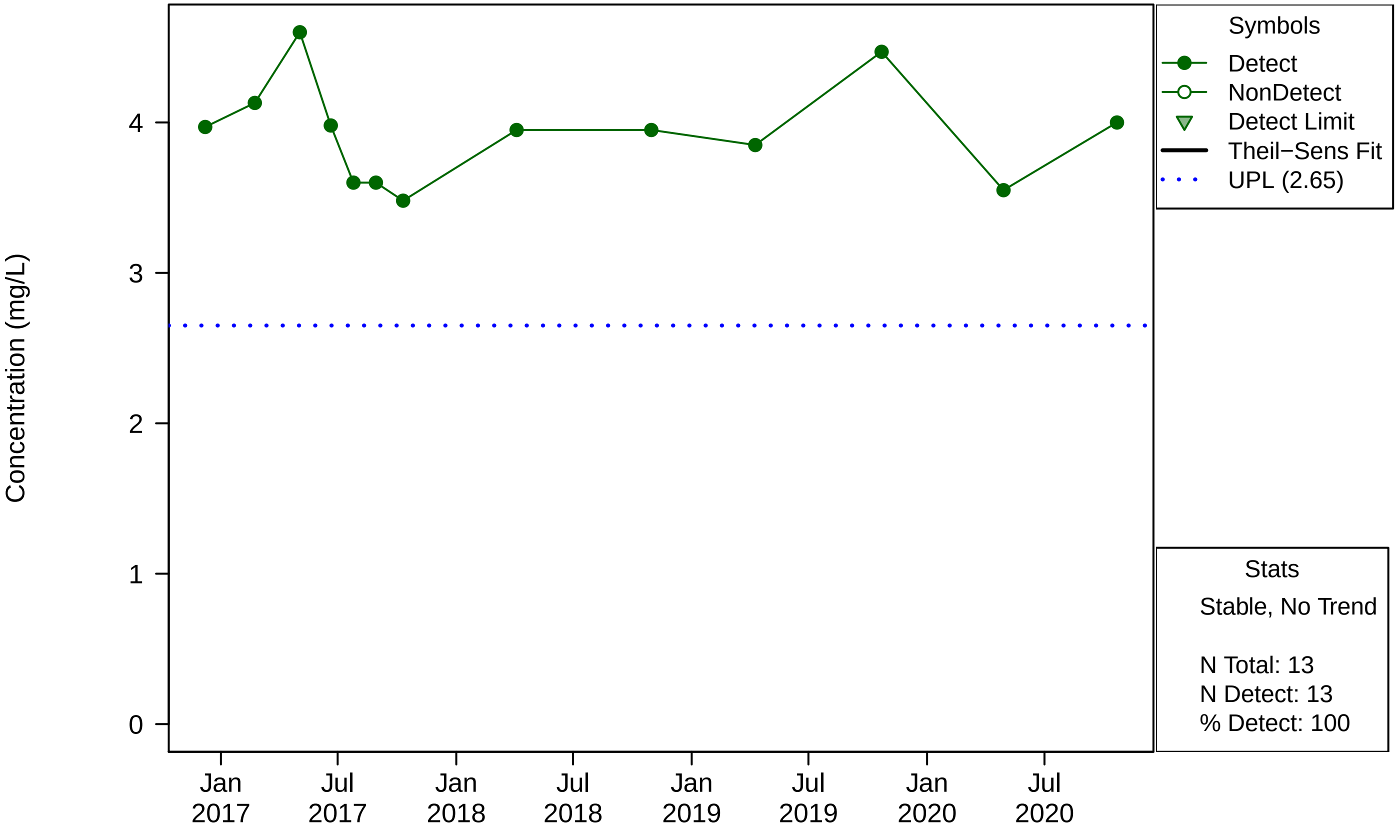


Appendix B − Figure 4
Unit: Bottom Ash Ponds
Trend Analysis of Downgradient Wells with Exceedances

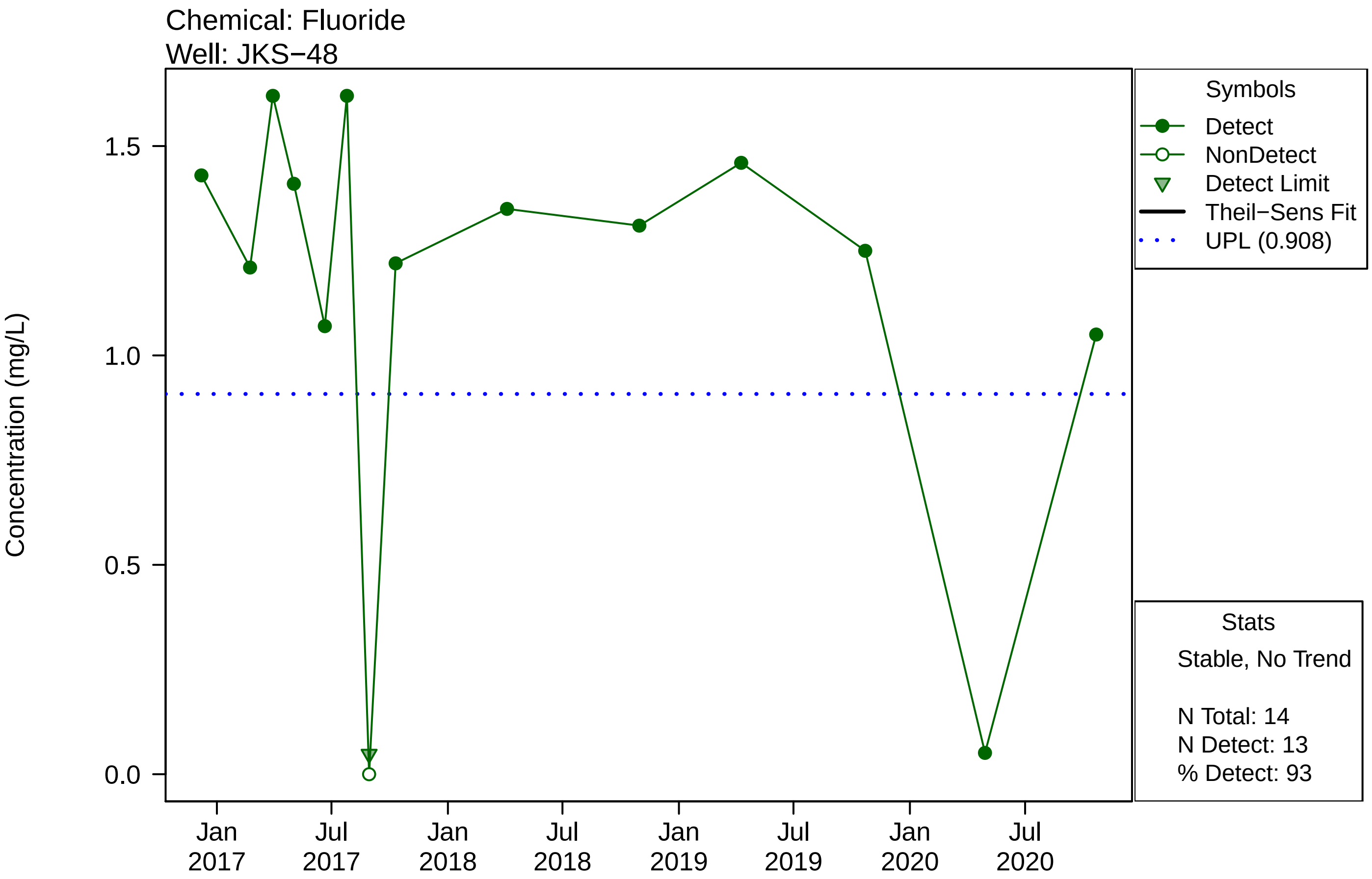
Chemical: Boron
Well: JKS−50R



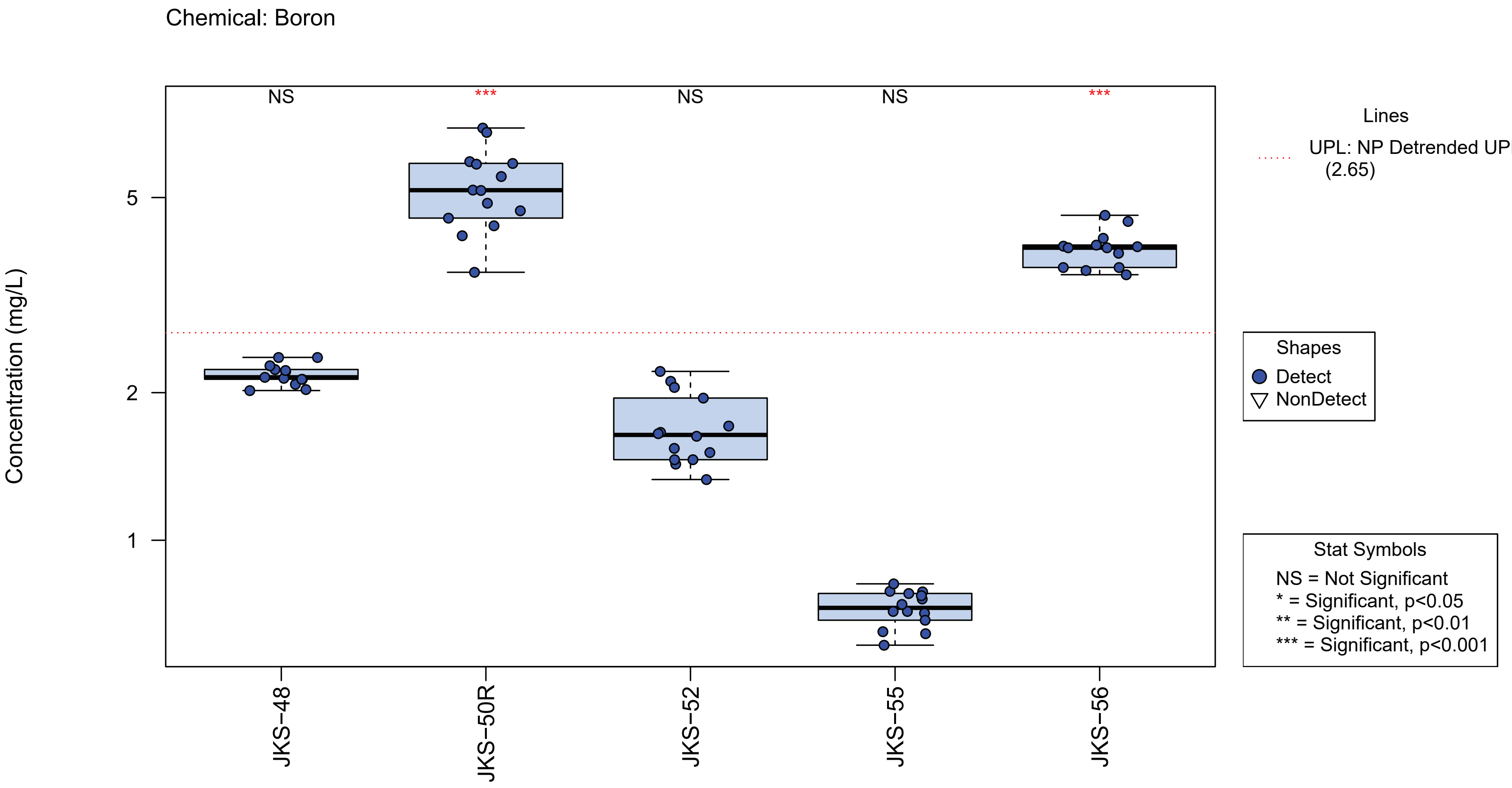
Chemical: Boron
Well: JKS−56



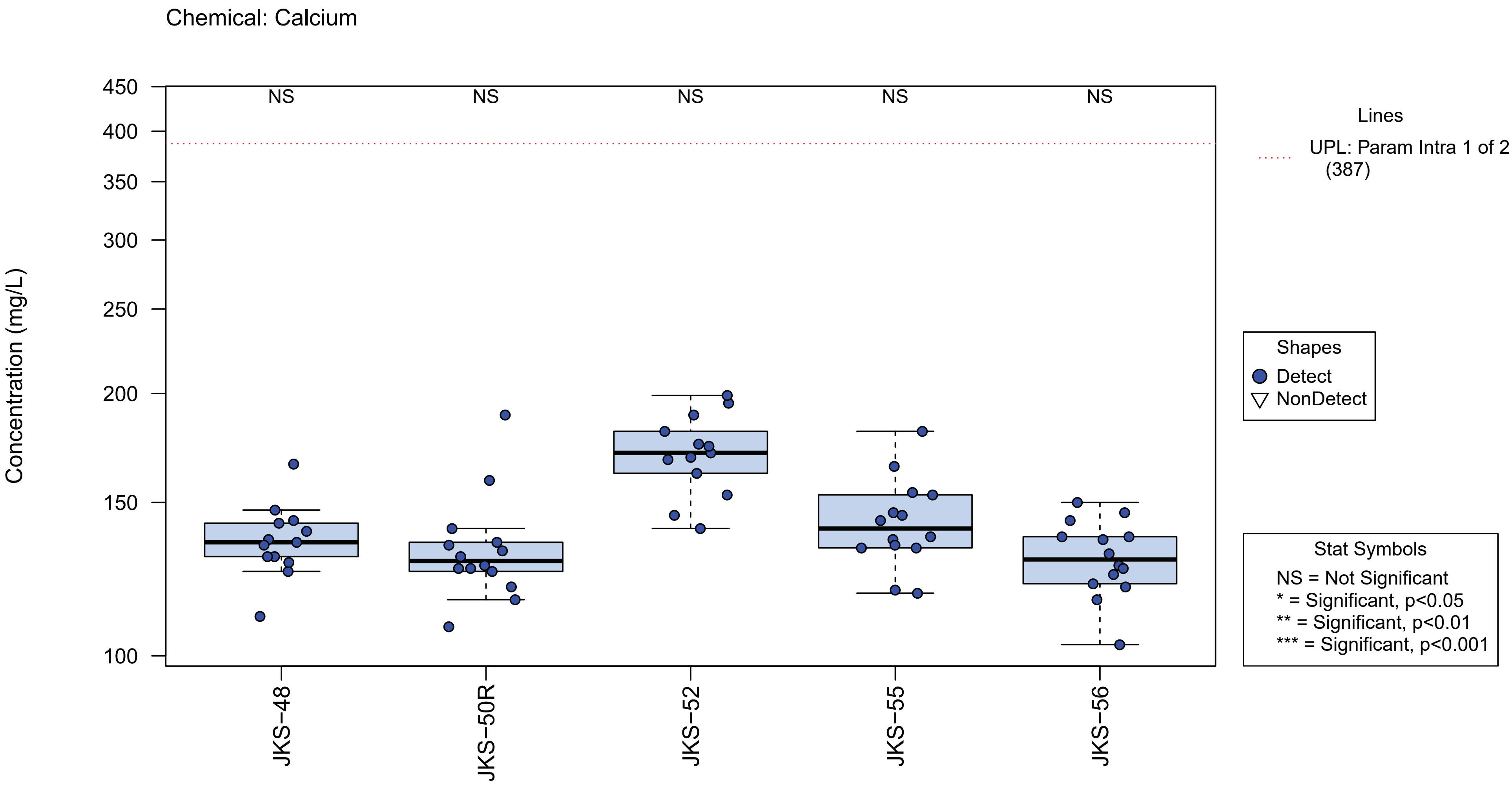
Appendix B − Figure 4
Unit: Bottom Ash Ponds
Trend Analysis of Downgradient Wells with Exceedances



Appendix B - Figure 5
Unit: Bottom Ash Ponds
Boxplots of Downgradient Wells

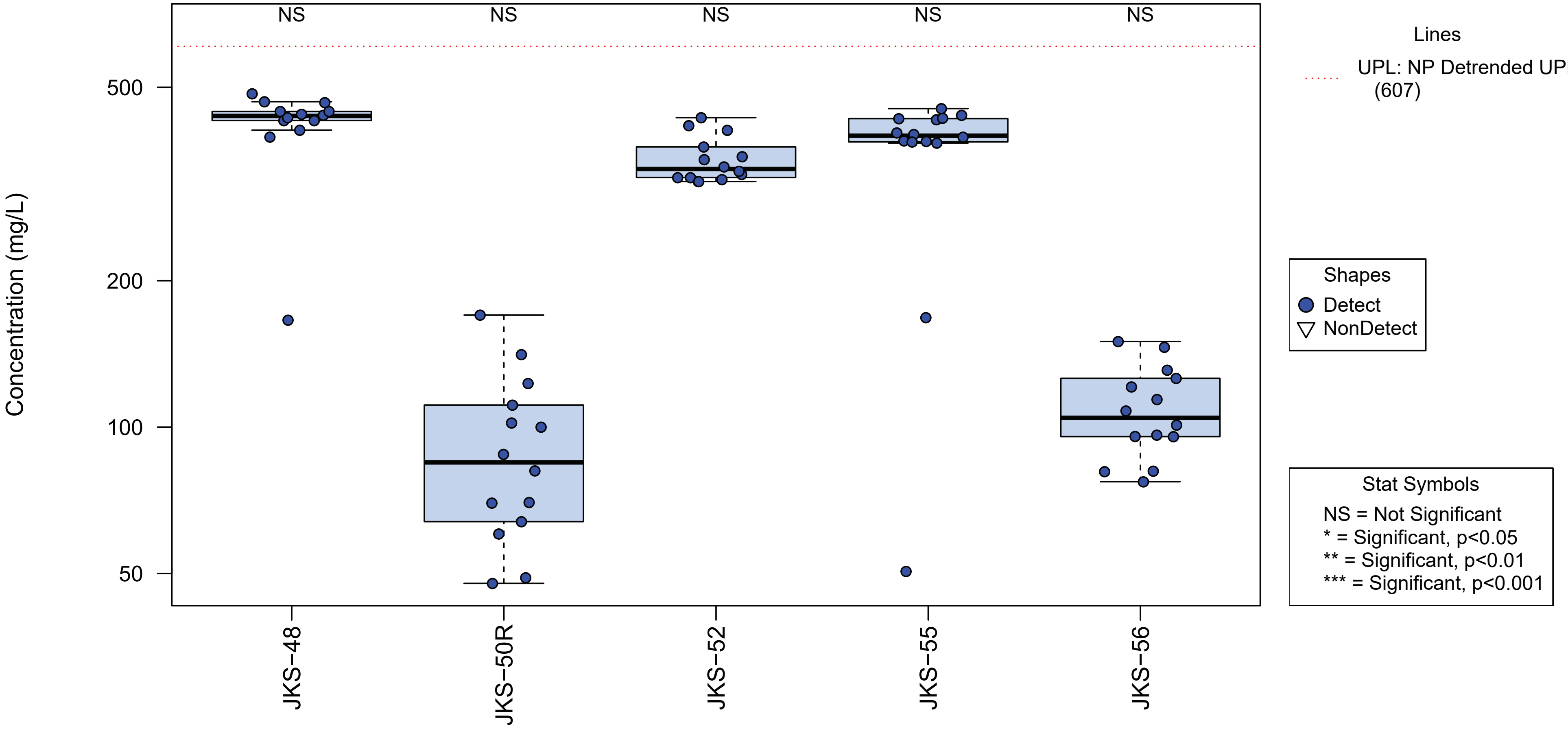


Appendix B - Figure 5
Unit: Bottom Ash Ponds
Boxplots of Downgradient Wells

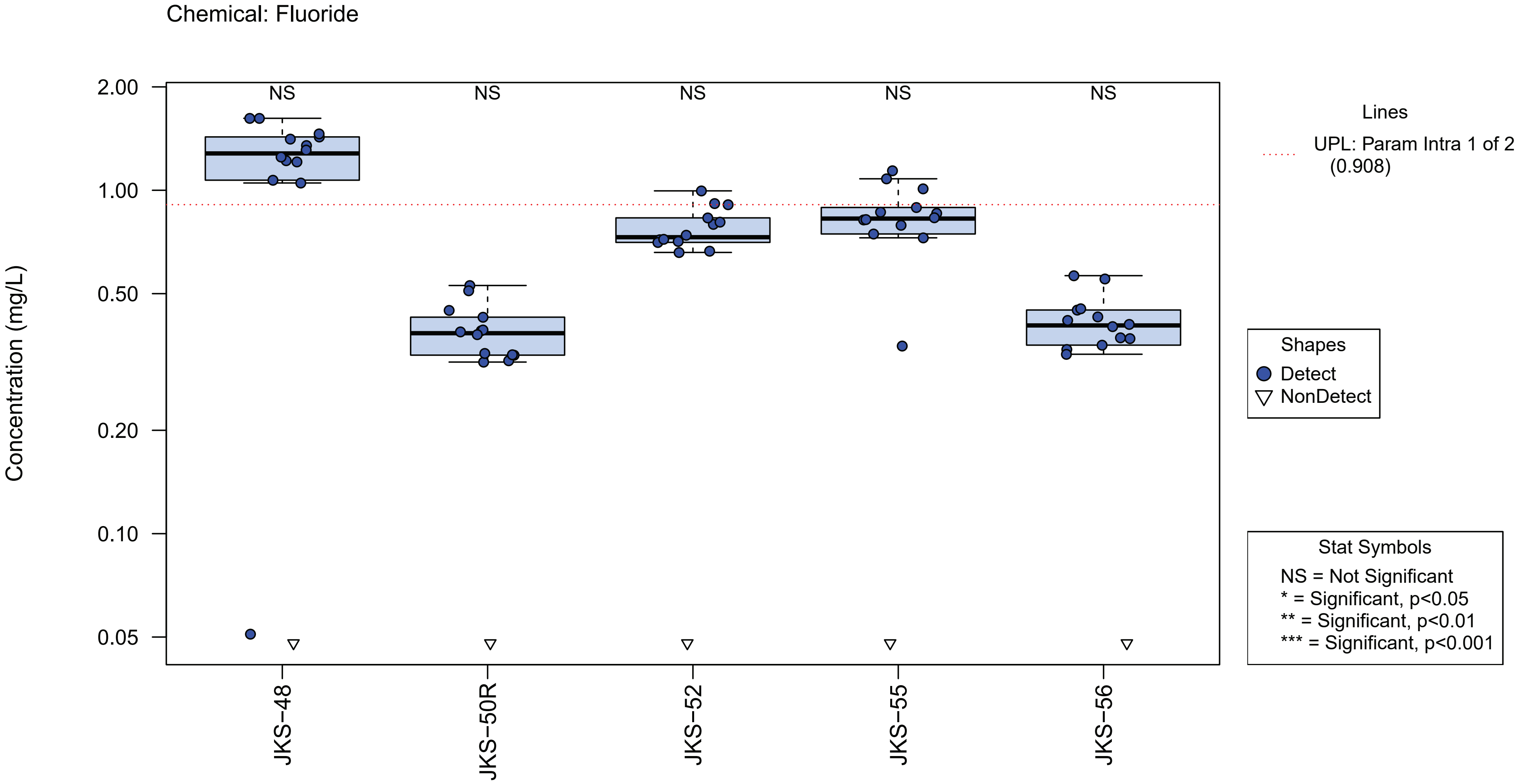


Appendix B - Figure 5
Unit: Bottom Ash Ponds
Boxplots of Downgradient Wells

Chemical: Chloride

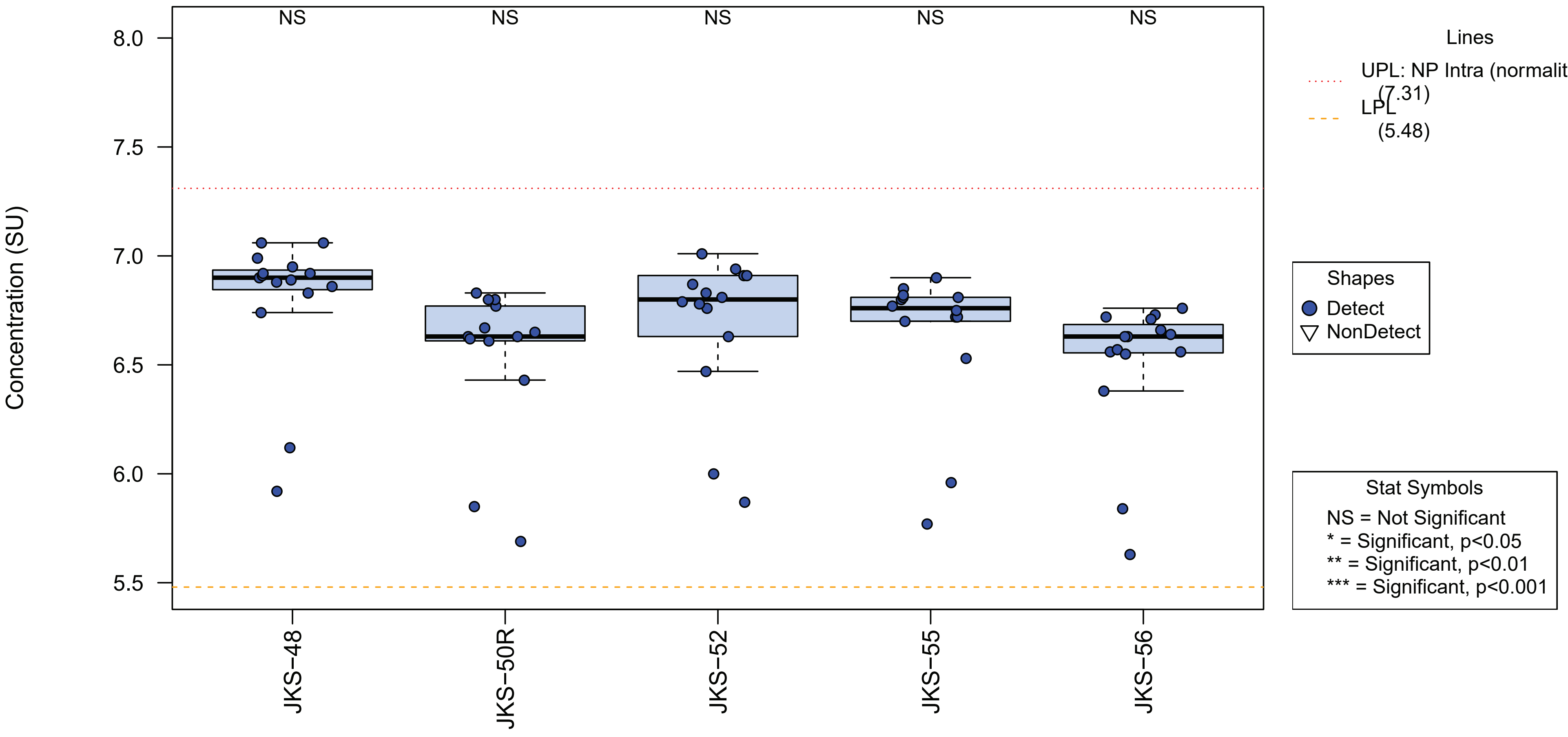


Appendix B - Figure 5
Unit: Bottom Ash Ponds
Boxplots of Downgradient Wells

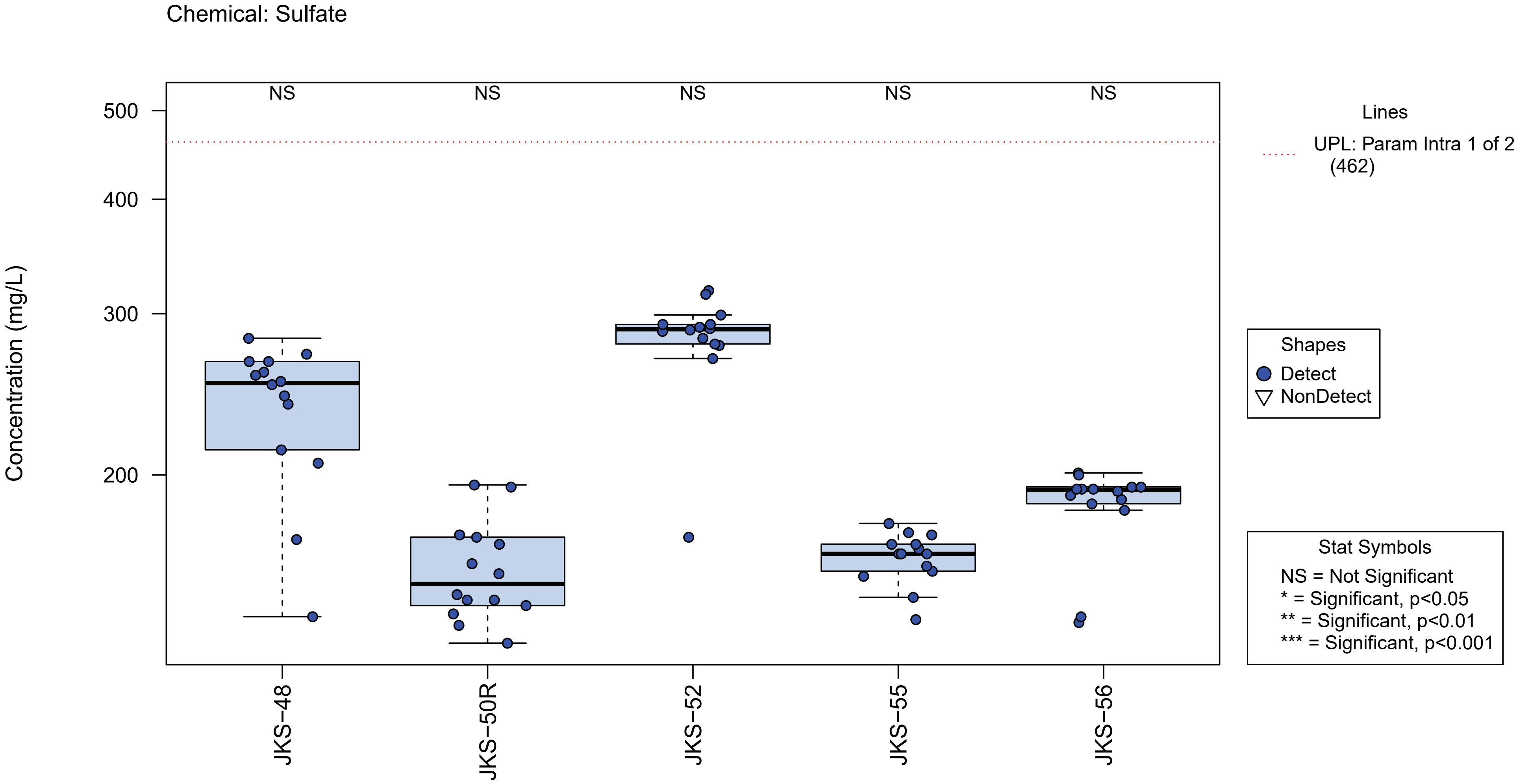


Appendix B - Figure 5
Unit: Bottom Ash Ponds
Boxplots of Downgradient Wells

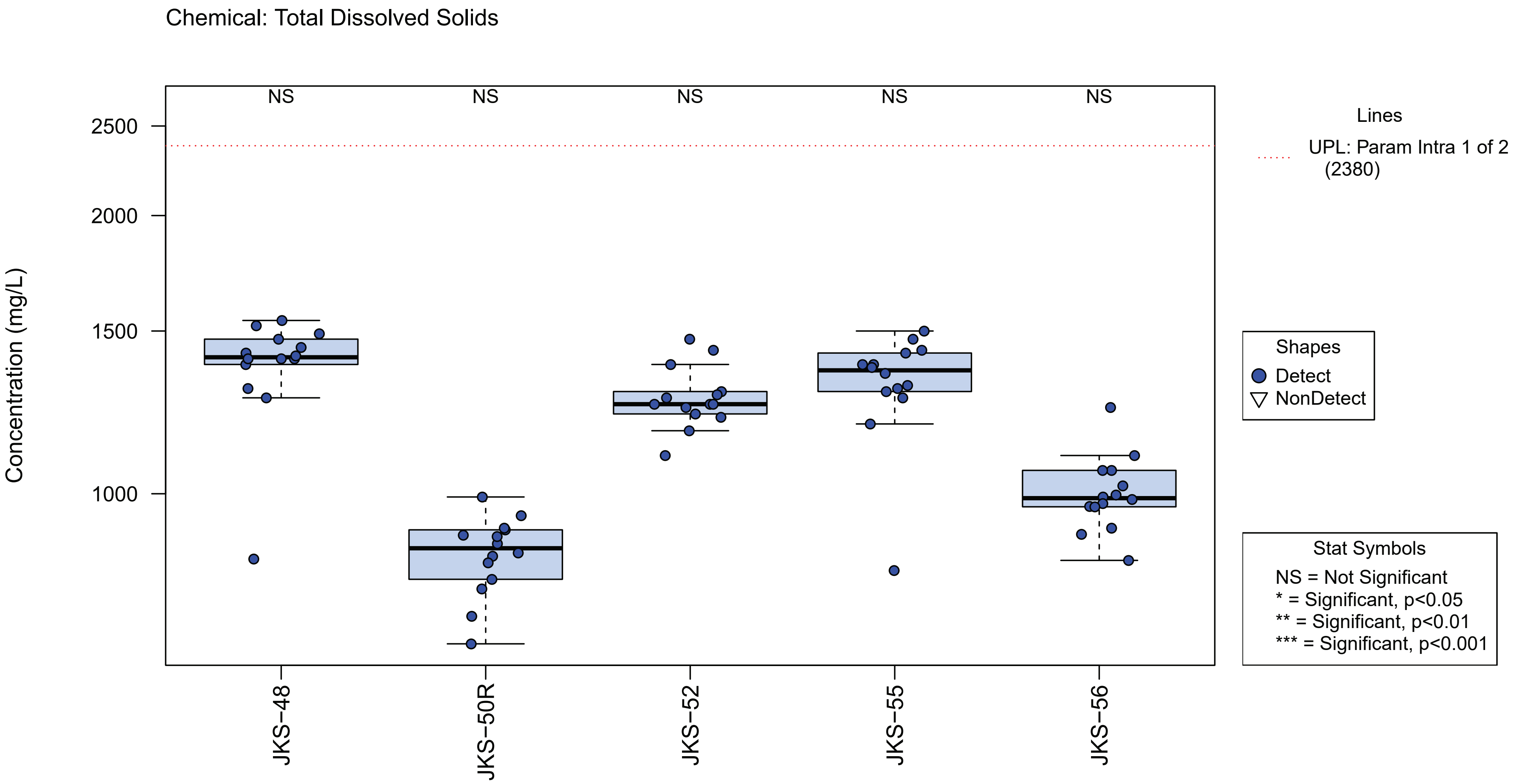
Chemical: pH



Appendix B - Figure 5
Unit: Bottom Ash Ponds
Boxplots of Downgradient Wells



Appendix B - Figure 5
Unit: Bottom Ash Ponds
Boxplots of Downgradient Wells



April 2020 Groundwater Sampling Event – Calaveras Power Station CCR Units

Appendix C

ERM

CityCentre Four
840 West Sam Houston Parkway
North, Suite 600
Houston, Texas 77024-3920

Telephone: +281 600 1000
Fax: +281 520 4625

www.erm.com

ERM

September 25, 2020

Mr. Michael Malone
CPS Energy
145 Navarro Street
San Antonio, Texas 78205

Reference: Project No. 0503422\A10320

Subject: April 2020 Groundwater Sampling Event and August 2020 Resampling Event
Calaveras Power Station CCR Units
San Antonio, Texas

Dear Mr. Malone:

Introduction

Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the Coal Combustion Residual (CCR) Rule) was published in the Federal Register in April 2015 and became effective in October 2015. One of the many requirements of the CCR Rule was for CPS Energy to determine if there are impacts to groundwater from the surface impoundments [Evaporation Pond (EP), Bottom Ash Ponds (BAPs), and Sludge Recycling Holding (SRH) Pond] and the landfill [Fly Ash Landfill (FAL)] that contain CCR at the Calaveras Power Station.

In the initial *2017 Annual Groundwater Monitoring and Corrective Action Report* for each CCR unit, the downgradient monitoring well results from the October 2016 sampling event were compared to Upper Prediction Limits (UPLs) and Lower Prediction Limits (LPLs). UPLs and LPLs were calculated in the *Annual Groundwater Monitoring and Corrective Action Reports* for the purpose of determining a potential statistically significant increase (SSI) over background levels. In the subsequent *2018* and *2019 Annual Groundwater Monitoring and Corrective Action Reports* for each CCR unit, the downgradient monitoring well results from the October 2017 and October 2018 sampling events were compared to updated UPLs and LPLs. These updated UPLs and LPLs were recalculated in the respective *Annual Groundwater Monitoring and Corrective Action Reports* using the additional data collected from the previous year. The evaluations of the April and August 2020 groundwater sample results indicated a potential SSI for a limited number of constituents from the EP, FAL, BAPs, and SRH Pond.

According to the CCR Rule [§257.94(e)], if the owner or operator of a CCR unit determines there is a SSI over background levels for one or more Appendix III constituents, the owner or operator may demonstrate that a source other than the CCR unit caused the SSI over background levels or that the SSI resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality. The CCR Rule also indicates that the owner or operator must complete the written demonstration within 90 days of detecting a SSI over the background levels. If a successful demonstration is completed within the 90-day period, the owner or operator may continue with a detection monitoring program.

To address the potential SSIs identified in the previous three *Annual Groundwater Monitoring and Corrective Action Reports*, CPS Energy prepared three *Written Demonstrations – Responses to Potential Statistically Significant Increases* (dated April 4, 2018; February 27, 2019; and April 27, 2020; respectively). Based on the evidence provided in the *Written Demonstrations*, no SSIs over background levels were determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy continued with a detection monitoring program that would include semiannual sampling.

Sampling Events Summary

The first semiannual groundwater sampling event for 2020 was conducted on April 28 through April 29, 2020. The sampling event included the collection of water level measurements and groundwater samples from all the background and downgradient monitoring wells in the CCR monitoring program. Monitoring wells were gauged and then sampled by CPS Energy using low flow sampling techniques during the sampling event. The groundwater samples were analyzed for Appendix III constituents. A resampling event of JKS-54 only was conducted on August 24, 2020.

For each CCR unit, the downgradient monitoring well results from the April and August 2020 sampling events were compared to the updated UPLs and LPLs recalculated in their respective *2019 Annual Groundwater Monitoring and Corrective Action Report*. The April and August 2020 groundwater sample results for the downgradient monitoring wells in each CCR unit are summarized in Attachment 1.

Although the evaluations of the April and August 2020 groundwater sample results indicate a potential SSI for a limited number of constituents, with the exception of sulfate in JKS-54 associated with the SRH Pond, the constituents associated with the potential SSIs are the same constituents, detected at similar concentrations, which were previously identified in one or all of the *Written Demonstrations*. The evaluations of the April and August 2020 groundwater sample results with potential SSIs are summarized below.

EP – The constituents associated with potential SSIs include fluoride in JKS-36 and JKS-61; and pH in JKS-36 and JKS-62. As previously presented in the *Written Demonstrations*, the concentrations of fluoride and pH appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

FAL – The constituent associated with a potential SSI is pH in JKS-31 and JKS-46. As previously presented in the *Written Demonstrations*, the concentrations of pH appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

BAPs – The constituents associated with potential SSIs include boron in JKS-50R and JKS-56; and fluoride in JKS-52 and JKS-55. As previously presented in the *Written Demonstrations*, the concentrations of boron and fluoride appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

SRH Pond – The constituents associated with potential SSIs include fluoride in JKS-52 and JKS-54; and sulfate in JKS-54. As previously noted in the *April 2019 Groundwater Sampling Report*, the concentrations of fluoride appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit and the reported April 2020 concentrations are within the range of naturally occurring concentrations identified in the *Annual Groundwater Monitoring and Corrective Action Reports*. Although a potential SSI of sulfate was not previously presented in the *Written Demonstrations*, the concentrations of sulfate in JKS-54 appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. While the concentration reported in the April 2020 sampling event (443 mg/L) was the highest concentration reported in JKS-54, the concentration reported in the August 2020 resampling event (425 mg/L) is within the range of concentrations reported in upgradient monitoring well JKS-51 over the previous three sampling events (405 to 439 mg/L).

Conclusions

Based on the April and August 2020 groundwater sample results and the evidence provided in one or all of the *Written Demonstrations*, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy should continue with a detection monitoring program. The second semiannual sampling event should be performed in October 2020.

We appreciate the opportunity to work with you on this project. Please contact me if you should have any questions.

Sincerely,

Environmental Resources Management

Walter Zverina

Walter Zverina
Principal Consultant

ATTACHMENT 1 APRIL AND AUGUST 2020 GROUNDWATER SAMPLE RESULTS

September 2020
Project No. 0503422

April 2020 Groundwater Sample Results
CCR Unit: Evaporation Pond
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	EP	EP	EP	EP
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-36	JKS-61	JKS-61	JKS-62
			Sample Date	4/29/2020	4/29/2020	4/29/2020	4/29/2020
			Sample Type Code	N	N	FD	N
Constituent	Units	2019 LPL - EP	2019 UPL - EP				
Boron	mg/L	--	1.88	0.459	1.82	1.85	0.484
Calcium	mg/L	--	1,300	175	154	157	122
Chloride	mg/L	--	2,780	63.3	312	317	284
Fluoride	mg/L	--	0.382	1.18	0.494	0.549	0.331
pH, Field	SU	4.58	6.47	3.42	6.27	6.27	6.54
Sulfate	mg/L	--	2,110	189	604	608	190
Total dissolved solids	mg/L	--	6,660	1,790	1,870	1,870	1,100

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

April 2020 Groundwater Sample Results
CCR Unit: Fly Ash Landfill
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	FAL	FAL	FAL	FAL	FAL
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-31	JKS-33	JKS-46	JKS-46	JKS-60
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020
			Sample Type Code	N	N	N	FD	N
Constituent	Units	2019 LPL - FAL	2019 UPL - FAL					
Boron	mg/L	--	4.29	0.429	1.18	0.864	0.806	0.325
Calcium	mg/L	--	583	171 J	573 J	143 J	133 J	530 J
Chloride	mg/L	--	841	272	756	17.9	19.2	168
Fluoride	mg/L	--	4.86	1.00	1.68	1.61 J	2.44 J	0.188
pH, Field	SU	3.98	6.73	3.70	6.30	3.10	3.10	6.61
Sulfate	mg/L	--	7,630	877	1,620	1,180	1,240	1,280
Total dissolved solids	mg/L	--	11,900	1,890	4,370	1,970	1,780	3,180

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

April 2020 Groundwater Sample Results
CCR Unit: Bottom Ash Ponds
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	BAP	BAP	BAP	BAP	BAP	BAP
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-48	JKS-50R	JKS-52	JKS-52	JKS-55	JKS-56
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020
			Sample Type Code	N	N	N	FD	N	N
Constituent	Units	2019 LPL - BAP	2019 UPL - BAP						
Boron	mg/L	--	2.40	2.36	5.52	2.05	2.16	0.779	3.55
Calcium	mg/L	--	368	130 J	126 J	174 J	180 J	137 J	103 J
Chloride	mg/L	--	608	485	102	433	430	452	101
Fluoride	mg/L	--	0.847	0.051 JH	0.510	0.908	0.952	1.01	0.552
pH, Field	SU	5.48	7.31	6.89	6.65	6.83	6.83	6.81	6.72
Sulfate	mg/L	--	431	206	194	315	313	177	138
Total dissolved solids	mg/L	--	2,240	1,400	918	1,470	1,420	1,350	904

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

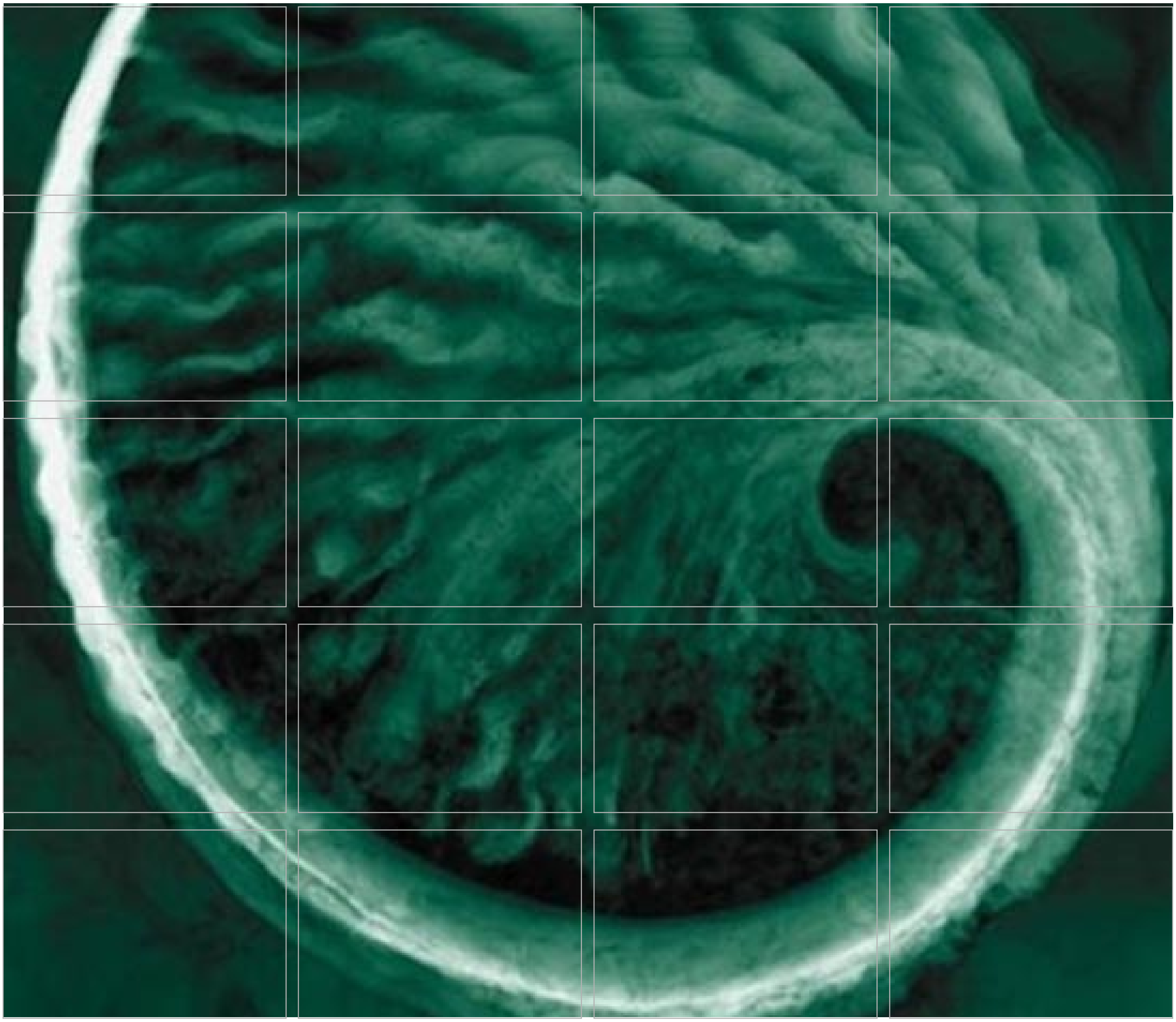
April and August 2020 Groundwater Sample Results
CCR Unit: SRH Pond
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	SRH Pond	SRH Pond	SRH Pond	SRH Pond	SRH Pond
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-52	JKS-52	JKS-53	JKS-54	JKS-54
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	8/24/2020
			Sample Type Code	N	FD	N	N	R
Constituent	Units	2019 LPL - SRH	2019 UPL - SRH					
Boron	mg/L	--	2.40	2.05	2.16	1.43	1.23	NA
Calcium	mg/L	--	357	174 J	180 J	114 J	118 J	NA
Chloride	mg/L	--	608	433	430	381	380	NA
Fluoride	mg/L	--	0.831	0.908	0.952	0.428	0.861	0.579
pH, Field	SU	5.48	7.31	6.83	6.83	6.67	6.76	NA
Sulfate	mg/L	--	421	315	313	244	443	425
Total dissolved solids	mg/L	--	2,180	1,470	1,420	1,160	1,570	NA

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate; R - Resample
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NA: Not analyzed for this constituent

Attachment 16-2



Annual Groundwater Monitoring and Corrective Action Report

CPS Energy
Calaveras Power Station – Evaporation Pond
San Antonio, Texas

January 2021

www.erm.com

The business of sustainability

ERM

Calaveras Power Station – Evaporation Pond

Annual Groundwater Monitoring and Corrective Action Report

January 2021

Project No. 0503422
San Antonio, Texas

Jeffery L. Bauguss, P.E.
Partner-in-Charge

Walter Zverina

Walter Zverina
Project Manager

Karen Fletcher
Senior Scientist

Nicholas Houtchens, P.G.
Senior Geologist

NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, TX 78701
T: 512-459-4700

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

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1. *CURRENT STATUS SUMMARY*

As required in Title 40, Code of Federal Regulations, §257.90, this section provides an overview of the current status of the groundwater monitoring and corrective action program for the Evaporation Pond located at the CPS Energy Calaveras Power Station:

- At the start of the 2020 annual reporting period, the Evaporation Pond was operating under the detection monitoring program, as defined in §257.94;
- At the end of the 2020 annual reporting period, the Evaporation Pond was operating under the detection monitoring program, as defined in §257.94;
- At this time, there was no confirmed statistically significant increase over background for one or more constituents listed in Appendix III pursuant to §257.94(e);
- An assessment monitoring program was not required or initiated for the Evaporation Pond;
- A remedy was not required or selected pursuant to §257.97 during the 2020 annual reporting period; and
- No remedial activities were initiated or are ongoing pursuant to §257.98 during the 2020 annual reporting period.

2. *INTRODUCTION*

CPS Energy owns and operates the Calaveras Power Station which consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the CCR Rule). The Power Station is located in unincorporated Bexar County, Texas, approximately 13 miles southeast of San Antonio. Currently, CPS Energy operates three CCR units at the Power Station: Evaporation Pond, Fly Ash Landfill, and the Sludge Recycle Holding (SRH) Pond. This *Annual Groundwater Monitoring and Corrective Action Report* (Report) only addresses the Evaporation Pond.

This Report was produced by Environmental Resource Management (ERM), on behalf of CPS Energy, and summarizes the groundwater monitoring activities for the Evaporation Pond and provides a statistical summary of the findings for samples collected during the 2020 semi-annual monitoring events. Consistent with the requirements of the CCR Rule, this Report will be posted to the facility's operating record and notification will be made to the State of Texas. Additionally, this Report will be placed on the CPS Energy publically accessible internet site. Unless otherwise mentioned, the analyses in this Report follow the *Groundwater Sampling and Analysis Program* (SAP) (ERM, 2017) posted on the internet site. The table below cross references the reporting requirements under the CCR Rule with the contents of this Report.

Regulatory Requirement Cross-Reference

Regulatory Citation	Requirement (paraphrased)	Where Addressed in this Report
§257.90(e)	Status of the groundwater monitoring and corrective action program	Sections 1 and 3
§257.90(e)	Summarize key actions completed	Section 3
§257.90(e)	Describe any problems encountered and actions to resolve problems	Section 3
§257.90(e)	Key activities for upcoming year	Section 5
§257.90(e)(1)	Map or aerial image of CCR unit and monitoring wells	Figure 1
§257.90(e)(2)	Identification of new monitoring wells installed or decommissioned during the preceding year	Section 3
§257.90(e)(3)	Summary of groundwater data, monitoring wells and dates sampled, and whether sample was required under detection or assessment monitoring	Sections 3 and 4, Tables 1 through 3, and Figure 2
§257.90(e)(4)	Narrative discussion of any transition between monitoring programs	Section 5

The Evaporation Pond is located northeast of the Power Station generating units and is south of the Fly Ash Landfill. The Evaporation Pond currently receives boiler chemical cleaning waste and other authorized liquid wastes. The Evaporation Pond was originally constructed as a fly ash landfill, but was converted from a landfill to an impoundment in 1996. The CCR unit location is shown on Figure 1.

3. *PROGRAM STATUS*

From December 2016 to October 2017, groundwater samples were collected as part of background sampling. After October 2017, groundwater samples were collected as part of detection monitoring. The samples were collected from the groundwater monitoring well network certified for use in determining compliance with the CCR Rule.

The groundwater monitoring well network consists of three upgradient monitoring wells (JKS-47, JKS-63R, and JKS-64) and three downgradient monitoring wells (JKS-36, JKS-61, and JKS-62). As previously reported in the *2019 Groundwater Monitoring and Corrective Action Report*, monitoring well JKS-63R was installed in May 2019 to replace upgradient monitoring well JKS-63, which had become blocked with tree roots in the well casing. All monitoring wells are screened within the uppermost groundwater bearing unit (GWBU). The uppermost GWBU is approximately 20 feet thick and is comprised of clayey/silty sand to well-sorted sand. The uppermost GWBU is located below unconfining units (i.e., sands, silts, and low to medium plasticity clays), and above a high plasticity clay (lower confining unit).

The monitoring well locations are shown in Figure 1. No problems were encountered in the data collection or in well performance with the exception of monitoring wells JKS-62 and JKS-63R. Groundwater samples were not collected from JKS-62 or JKS-63R during the October 2020 monitoring event due to blockages in the well casings. Upon further inspection of both wells, it was discovered that tree rootlets had entered both well casings which prevented sample collection. The tree rootlets were cleared from each well casing and a groundwater sample was collected from JKS-62 and JKS-63R in November 2020.

3.1. GROUNDWATER FLOW RATE AND DIRECTION

Depth to groundwater surface measurements were made at each monitoring well prior to sampling. Groundwater elevations were calculated by subtracting the depth to groundwater from the surveyed reference elevation for each well.

Groundwater elevations collected during the monitoring events are summarized in Table 1. Groundwater elevations and the potentiometric surfaces for the April and October 2020 monitoring events are shown on Figure 2A and Figure 2B, respectively. For both sampling events, groundwater upgradient of the Evaporation Pond appears to flow southeast from a potential groundwater divide (generally located west of the CCR unit) and northeast from the Closed Landfills (located south of the CCR unit) towards the CCR unit. Downgradient of the Evaporation Pond, groundwater appears to flow generally east towards Calaveras Lake. The horizontal gradient for both the April and October 2020 events was approximately 0.003 feet/foot. A non-proportional change in water levels was observed at JKS-36 during the 2020 monitoring events. Groundwater monitoring networks that exhibit a substantially flat gradient are more likely to experience differences in groundwater flow direction. The potentiometric surface elevations will continue to be monitored and a water level study will be initiated in 2021.

3.2. SAMPLING SUMMARY

A summary of the total number of samples collected from each monitoring well is provided in Table 2. Groundwater analytical results from the monitoring events are summarized in Table 3. Laboratory data packages are provided in Appendix A.

The Evaporation Pond monitoring wells were sampled by CPS Energy using low flow sampling techniques during the monitoring events. No data gaps were identified during the 2020 semi-annual groundwater monitoring events.

3.3. DATA QUALITY

ERM reviewed field and laboratory documentation to assess the validity, reliability and usability of the analytical results. Samples were sent to San Antonio Testing Laboratory, located in San Antonio, Texas for analysis. Data quality information reviewed for these results included field sampling forms, chain-of-custody documentation, holding times, lab methods, cooler temperatures, laboratory method blanks, laboratory control sample recoveries, field duplicate samples, matrix spikes/matrix spike duplicates, quantitation limits, and equipment blanks. A summary of the data qualifiers are included in Table 3. The data quality review found the results to be valid, reliable, and useable for decision making purposes with the listed qualifiers. No analytical results were rejected.

4. STATISTICAL ANALYSIS AND RESULTS

Consistent with the CCR Rule and the SAP, a prediction limit approach [40 CFR §257.93(f)] was used to identify potential impacts to groundwater. Tables and figures generated as part of the statistical analysis are provided in Appendix B. The steps outlined in the decision framework in the SAP include:

- Interwell versus intrawell comparisons;
- Establishment of upgradient dataset;
- Calculation of prediction limits; and
- Conclusions.

The remaining sections of this Report are focused on evaluation of the October 2020 sampling results. Note the April 2020 sampling results were evaluated as discussed in the *April 2020 Groundwater Sampling Event – Calaveras Power Station CCR Units* (ERM, 2020) provided in Appendix C.

4.1. INTERWELL VS INTRAWELL COMPARISONS

When multiple upgradient wells were available within the same unit, concentrations were compared among these wells to determine if they could be pooled to create a single, interwell, upgradient dataset. For each analyte, Boxplots (Appendix B, Figure 1) and Kruskal-Wallis test results (Appendix B, Table 1) are provided for upgradient wells. The statistical test shows that:

- One Appendix III analyte [fluoride] will follow interwell analysis, with no significant differences present in upgradient data; and
- The remaining six Appendix III analytes [boron, calcium, chloride, pH, sulfate, and total dissolved solids (TDS)] will follow intrawell analysis, with significant differences present in upgradient data.

Interwell analytes will use a pooled upgradient dataset for subsequent report sections. Conversely, intrawell analytes will have each individual upgradient dataset used for subsequent report sections.

4.2. ESTABLISHMENT OF UPGRADIENT DATASET

When evaluating the concentrations of analytes in groundwater, USEPA Unified Guidance (2009) recommends performing a careful quality check of the data to identify any anomalies. In addition to the data validation that was performed, descriptive statistics, outlier testing, and temporal stationarity checks were completed to finalize the upgradient dataset.

4.2.1. Descriptive Statistics

Descriptive statistics were calculated for the upgradient wells and analytes at the Evaporation Pond (Appendix B, Table 2). The descriptive statistics highlight a number of relevant characteristics about the upgradient datasets including:

- There are a total of 19 well-analyte combinations for the upgradient dataset;
- 19 well-analyte combinations have detection rates greater than or equal to 50 percent;
- 17 well-analyte combinations have 100 percent detects;

- Nine well-analyte combinations follow a normal distribution (using Shapiro-Wilks Normality Test);
- Three well-analyte combinations follow a log-normal distribution; and
- Seven well-analyte combinations have no discernible distribution.

4.2.2. *Outlier Determination*

Both statistical and visual outlier tests were performed on the upgradient datasets. Data points identified as both a statistical and visual outlier (Appendix B, Table 3 and Appendix B, Figure 2) were reviewed before they were excluded from the dataset. A total of six potential outliers were initially flagged in the upgradient datasets. However, these values were consistent with seasonal fluctuations and concentrations detected in other upgradient wells or in historical groundwater sampling results. No analytical or sampling issues were identified during data review; therefore, the six values were considered valid and were retained for upper prediction limit (UPL) calculations.

4.2.3. *Check for Temporal Stability*

A trend test was performed for all values in the upgradient wells that had at least eight detected data points and at least 50 percent detection rate. Time series figures of upgradient wells are provided in Appendix B, Figure 3. Additionally, the Mann Kendall trend test results are provided in Appendix B, Table 4. The following summarizes the results of the trend analysis:

- There are a total of 19 well-analyte combinations in the upgradient dataset;
- 19 well-analyte combinations meet the data requirements of the trend test of which:
    - Four well-analyte combinations had an increasing trend;
    - Two well-analyte combinations had a decreasing trend; and
    - 13 well-analyte combinations had no trend (i.e., concentrations were stable over time).

4.3. *CALCULATION OF PREDICTION LIMITS*

A multi-part assessment of the monitoring wells was performed to determine what type of UPL to calculate as a compliance point. A decision framework was applied for each upgradient well based on inter/intrawell analysis, data availability, and presence of temporal trends.

A total of six well-analyte combinations were found to have either increasing or decreasing trends. For these well-analyte combinations, a bootstrapped UPL calculated around a Theil Sen trend was used to derive a more accurate UPL. The remaining 13 well-analyte combinations were found to have no trend. Sanitas was used to calculate static UPLs using an annual site-wide false positive rate of 0.1 with a 1-of-2 re-testing approach.

A final UPL was selected for each analyte and compared to the October 2020 sampling results in the downgradient wells. A final lower prediction limit (LPL) was also selected for pH. For the one analyte following interwell analysis, the upgradient dataset was pooled prior to UPL calculations, resulting in a single UPL value per analyte. For the six analytes following intrawell analysis, a UPL value was calculated for each of the upgradient wells. For these wells and analytes, the maximum UPL was selected as the representative UPL for each analyte. A similar approach was used to determine the LPL for pH; however, the minimum LPL was selected in the case of intrawell analysis. All final UPL and LPL values are shown in the table below. Full upgradient well calculations are provided in Appendix B, Table 5.

Final UPL and LPL Values

Analysis Type	Analyte	LPL	UPL	Unit
Intrawell	Boron	--	1.90	mg/L
Intrawell	Calcium	--	1,060	mg/L
Intrawell	Chloride	--	3,200	mg/L
Interwell	Fluoride	--	0.382	mg/L
Intrawell	pH	4.58	6.21	SU
Intrawell	Sulfate	--	2,120	mg/L
Intrawell	TDS	--	8,330	mg/L

4.4. CONCLUSIONS

The downgradient samples collected during the October 2020 monitoring event were used for compliance comparisons. All downgradient wells were less than the UPLs and greater than the LPLs for pH with the following exceptions shown in the table below. All downgradient wells with initial exceedances were examined for trends to assess the stability of concentrations. A summary of these trend test results are provided in Appendix B, Figure 4.

Downgradient UPL Exceedances

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Fluoride	JKS-36	--	0.382	2020-10-21	1.07	mg/L
pH	JKS-36	4.58	6.21	2020-10-21	3.98	SU
pH	JKS-61	4.58	6.21	2020-10-21	6.57	SU
pH	JKS-62	4.58	6.21	2020-11-17	6.55	SU

Additionally, each downgradient well-analyte pair had a Wilcoxon Rank Sum test comparing if their median is greater than the UPL or less than the LPL for pH. This nonparametric, rank-based test was used as an additional line of evidence for downgradient well compliance. Specific well-analyte pairs are of interest if: (1) there is a recent exceedance of the UPL, but historic concentrations place the median less than the UPL, or (2) there is not a recent exceedance of the UPL, but historic concentrations place the median greater than the UPL. All downgradient wells had medians less than the UPLs and greater than the LPLs for pH with the following exceptions shown in the table below. Full downgradient results are provided in Appendix B, Table 6, with boxplots in Appendix B, Figure 5.

Downgradient Median Exceedances

Analyte	Well
Fluoride	JKS-36
pH	JKS-61
pH	JKS-62

All initial exceedances of the UPL may be confirmed with re-testing of the downgradient wells per the 1-of-2 re-testing scheme. If the initial exceedance is confirmed with re-testing results from the same well, and if the well-analyte combination median is greater than the UPL, the well-analyte combination will be declared a statistically significant increase (SSI) above background. Any wells with re-testing results at or less than the UPL will be considered in compliance and will not require further action. Any resampling results will be reported in the subsequent *Written Demonstration*.

5. RECOMMENDATIONS

Currently, there are no plans to transition from detection monitoring to assessment monitoring. Consistent with the 1-of-2 re-testing approach described in the Unified Guidance and the SAP, initial exceedances may be re-tested within 90 days. Based on these re-testing results, if an SSI is found, a notification or *Written Demonstration* will be prepared within 90 days. Based on the findings of the *Written Demonstration*, detection monitoring or assessment monitoring will be initiated as appropriate under §257.94 and §257.95.

6. REFERENCES

ERM, 2017. *Groundwater Sampling and Analysis Program.*

USEPA, 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities.* Unified Guidance. USEPA/530/R/09/007. Office of Resource Conservation and Recovery. Washington, D.C.

Tables

TABLE 1
Groundwater Elevations Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-47 Upgradient (1)		**JKS-63 Upgradient**		**JKS-63R Upgradient**		**JKS-64 Upgradient**	
		TOC Elevation	**513.63**	**TOC Elevation**	**526.86**	**TOC Elevation**	**522.27**	**TOC Elevation**	**507.84**
Sampling Event	**Sampling Event Dates**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**
1	12/6/16 to 12/8/16	30.98	482.65	44.45	482.41	(4)	(4)	24.98	482.86
2	2/21/17 to 2/23/17	30.64	482.99	44.25	482.61	(4)	(4)	24.24	483.60
3	3/28/17 to 3/30/17	30.47	483.16	44.12	482.74	(4)	(4)	24.21	483.63
4	5/2/17 to 5/4/17	30.29	483.34	43.89	482.97	(4)	(4)	24.46	483.38
5	6/20/17 to 6/21/17	30.40	483.23	43.85	483.01	(4)	(4)	24.40	483.44
6	7/25/17 to 7/26/17	30.62	483.01	44.00	482.86	(4)	(4)	24.78	483.06
7	8/29/17 to 8/30/17	30.50	483.13	43.90	482.96	(4)	(4)	25.70	482.14
8	10/10/17 to 10/11/17	30.71	482.92	44.05	482.81	(4)	(4)	24.95	482.89
9	4/4/18 to 4/5/18	30.42	483.21	43.81	483.05	(4)	(4)	24.67	483.17
10	10/30/18 to 10/31/18	30.90	482.73	(2)	(2)	(4)	(4)	25.46	482.38
11	4/9/19 to 4/10/19	30.17	483.46	(2)	(2)	39.27 (5)	483.00	24.50	483.34
12	10/22/19 to 10/23/19	30.87	482.76	(3)	(3)	39.48	482.79	25.30	482.54
13	4/28/20 to 4/29/20	30.60	483.03	(3)	(3)	39.36	482.91	25.15	482.69
14	10/20/20 to 10/21/20	31.28	482.35	(3)	(3)	40.25 (6)	482.02	25.88	481.96

		JKS-36 Downgradient		**JKS-61 Downgradient**		**JKS-62 Downgradient**	
		TOC Elevation	**508.41**	**TOC Elevation**	**505.51**	**TOC Elevation**	**509.84**
Sampling Event	**Sampling Event Dates**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**
1	12/6/16 to 12/8/16	25.99	482.42	23.95	481.56	28.63	481.21
2	2/21/17 to 2/23/17	25.78	482.63	23.31	482.20	28.30	481.54
3	3/28/17 to 3/30/17	25.37	483.04	23.10	482.41	28.42	481.42
4	5/2/17 to 5/4/17	43.89	464.52	22.85	482.66	28.00	481.84
5	6/20/17 to 6/21/17	25.40	483.01	22.05	483.46	28.05	481.79
6	7/25/17 to 7/26/17	25.62	482.79	23.50	482.01	28.12	481.72
7	8/29/17 to 8/30/17	25.70	482.71	23.60	481.91	28.12	481.72
8	10/10/17 to 10/11/17	25.91	482.50	23.97	481.54	28.00	481.84
9	4/4/18 to 4/5/18	25.46	482.95	23.08	482.43	27.66	482.18
10	10/30/18 to 10/31/18	25.90	482.51	23.94	481.57	28.33	481.51
11	4/9/19 to 4/10/19	25.23	483.18	22.97	482.54	27.52	482.32
12	10/22/19 to 10/23/19	25.90	482.51	24.20	481.31	27.85	481.99
13	4/28/20 to 4/29/20	25.45	482.96	23.74	481.77	27.78	482.06
14	10/20/20 to 10/21/20	26.03	482.38	24.60	480.91	29.10 (6)	480.74

NOTES:
btoc = below top of casing
msl = mean sea level
(1) JKS-47 was re-sampled on 2/28/17.
(2) Blockage in JKS-63 well casing.
(3) JKS-63 was plugged and abandoned on 5/2/19.
(4) JKS-63R was installed on 5/2/19.
(5) JKS-63R water level was initially measured on 8/20/19.
(6) JKS-62 and JKS-63R were gauged on 11/17/20, due to a blockage encountered in the well casing during Event 14 (October 2020).

TABLE 2
Groundwater Sampling Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

CCR Unit	Well ID	Well Function	Number of Samples Collected in 2016 - 2020	2016 - 2020 Sample Dates														Monitoring Program
				12/6/16 to 12/8/16	2/21/17 to 2/23/17	3/28/17 to 3/30/17	5/2/17 to 5/4/17	6/20/17 to 6/21/17	7/25/17 to 7/26/17	8/29/17 to 8/30/17	10/10/17 to 10/11/17	4/4/18 to 4/5/18	10/30/18 to 10/31/18	4/9/19 to 4/10/19	10/22/19 to 10/23/19	4/28/20 to 4/29/20	10/20/2020 to 10/21/20	
Evaporation Pond	JKS-36	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-47	Upgradient Monitoring	14	X	(1)	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-61	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-62	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X (6)	Detection
	JKS-63	Upgradient Monitoring	8	X	X	X	X	(2)	X	X	X	X	(3)	(3)	(3)	(3)	(3)	Detection
	JKS-63R	Upgradient Monitoring	4	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4) (5)	X	X	X (6)	Detection
	JKS-64	Upgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection

NOTES:
X = Indicates that a sample was collected.
(1) JKS-47 was re-sampled on 2/28/2017.
(2) A sample was not collected at JKS-63 during Event 5 (June 2017), due to the well going dry during sampling activities.
(3) A sample was not collected at JKS-63 during Event 10 (October 2018) and Event 11 (April 2019), due to blockage in the well casing. JKS-63 was plugged and abandoned on 5/2/19.
(4) JKS-63R was installed on 5/2/19.
(5) JKS-63R was initially sampled on 8/20/19.
(6) JKS-62 and JKS-63R were sampled on 11/17/20. Samples were not collected during the October 2020 sampling event due to blockages in the well casings.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-47 Upgradient													
	Sample Date	12/8/16	2/28/17	3/29/17	5/3/17	6/21/17	7/26/17	8/30/17	10/11/17	4/5/18	10/30/18	4/10/19	10/23/19	4/29/20	10/21/20
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.824	0.838	0.696	0.817	0.804	0.828 JH	0.760	1.02	0.844	0.806	0.590	1.05	0.800	0.904
Calcium	mg/L	54.0	62.1	168	26.2	71.1	62.7 JH	66.7	36.1	53.5	83.2 D	128	36.5	43.1	28.4
Chloride	mg/L	107	150	232 D	193	168	148 JH	210 D	68.5	151	186	279	53.9 X	107	60.9
Fluoride	mg/L	0.0360 U	0.0360 U	0.315	0.382 JH	0.213 JH	0.360 U	0.0960 U	0.0360 U	0.0360 U	0.0998 J	0.0985 J	0.154 JH	0.163	0.161
Sulfate	mg/L	213 D	267 D	369 D	299	266 D	248 JH	284 D	171	236	262	347	210 X	257	195
pH - Field Collected	SU	5.82	5.83	5.75	6.00	5.75	5.85	5.90	5.93	5.91	5.72	5.92	4.58	5.87	5.88
Total dissolved solids	mg/L	811	922	1170	1060	979	806 JH	904	677	787	727	1240	665	772	782
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000294 J	0.00120 U	0.000275 J	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00442 J	0.00130 J	0.00136 J	0.00123 U	0.00185 J	0.00105 J	0.00124 J	0.000246 U	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0475	0.0132	0.0180	0.0118 J	0.0154	0.00981	0.0104	0.00785	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000813 J	0.000255 J	0.000131 U	0.000654 U	0.000352 J	0.000131 U	0.000172 J	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000637 J	0.000977 J	0.000797 J	0.000735 J	0.000611 J	0.000814 J	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.234	0.00430	0.000988 J	0.00262 U	0.00262 J	0.000855 J	0.00130 J	0.000525 U	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00915 J	0.00102 J	0.00153 J	0.00113 J	0.00227	0.000976 J	0.00107 J	0.0000699 U	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.0360 U	0.315	0.382 JH	0.213 JH	0.360 U	0.0960 U	0.0360 U	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.00586 J	0.000950 J	0.000448 J	0.000758 U	0.00157 J	0.000202 J	0.000449 J	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0615	0.0478	0.00238 U	0.0207	0.0720	0.0644	0.0799	0.0521	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000600 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.0317	0.00126 J	0.00173 J	0.00128 J	0.000788 J	0.000581 J	0.000653 J	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0493	0.0697	0.0518	0.0564	0.0613	0.0577	0.0525	0.0854	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.2 ± 0.342	0.578 ± 0.275	0.630 ± 0.237	0.538 ± 0.192	0.729 ± 0.278	0.304 ± 0.233	1.06 ± 0.361	0.246 ± 0.180	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.66 ± 1.15	1.34 ± 1.05	1.27 ± 0.960 U	2.17 ± 1.01	0.664 ± 0.929	0.771 ± 1.48	1.65 ± 1.05	0.463 ± 0.886	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-63 / JKS-63R Upgradient (A)													
	Sample Date	**12/8/16**	**2/22/17**	**3/29/17**	**5/3/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/5/18**	**10/30/18**	**8/20/19**	**10/23/19**	**4/29/20**	**11/17/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Nov 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.800	0.866	NR	0.981	(1)	1.33 JH	1.23	1.06	1.13	(2)	2.03	1.03	0.950	1.12
Calcium	mg/L	783	914	713	1060	(1)	835	174	872	836	(2)	221	953 D	952	1050
Chloride	mg/L	1230 D	1160 D	1220 D	1340	(1)	1960 JHD	1890 D	1420	1670	(2)	2360 D	2240	2530	2830
Fluoride	mg/L	0.0573 J	0.320	0.297	0.364 JH	(1)	0.0971 JH	0.182 JH	0.0360 U	0.0360 U	(2)	0.206 J	0.352 JH	0.018 U	0.018 U
Sulfate	mg/L	0.0460 U	1860 D	1890 D	1860	(1)	1970 D	1920 D	1820	2110	(2)	1810 D	1750 D	1810	2120
pH - Field Collected	SU	5.61	5.35	5.60	5.85	(1)	5.88	5.82	5.63	5.64	(2)	--	4.76	5.83	5.79
Total dissolved solids	mg/L	5750	4760	4870	5560	(1)	6410	5000	5080	5220	(2)	6660	5200	7240	8190
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000459 J	0.000695 J	0.00120 U	(1)	0.000240 U	0.000424 J	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00332 J	0.00294	0.00128 J	0.00123 U	(1)	0.000893 J	0.000992 J	0.000246 U	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0626	0.0540	0.0336	0.0316	(1)	0.0294	0.0258	0.0222	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000930 J	0.000442 J	0.000654 U	(1)	0.000196 J	0.000223 J	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.00339 J	0.00405	0.00394	0.00316 J	(1)	0.00282	0.00263	0.00285	NR	NR	NR	NR	NR	NR
Chromium	mg/L	1.49	0.735	0.371	0.114	(1)	0.0742	0.0584	0.0130	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.0802	0.0762	0.0546	0.0331	(1)	0.0137	0.0119	0.0119	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0573 J	0.320	0.297	0.364 JH	(1)	0.0971 JH	0.182 JH	0.0360 U	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.00441 J	0.00599	0.00108 J	0.000758 U	(1)	0.000238 J	0.000551 J	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.116	0.00238 U	0.654	(1)	0.946	1.15	0.791	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.000236	0.000237	0.000206	0.0000400 J	(1)	0.000260	0.000441	0.000376	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.186	0.00789	0.00966	0.00419 J	(1)	0.00281	0.00180 J	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0188	0.0210	0.0257	0.0188	(1)	0.0288	0.0318	0.0244	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	(1)	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	3.42 ± 0.573	2.76 ± 0.476	5.79 ± 0.790	4.57 ± 0.577	(1)	6.7 ± 0.744	7.36 ± 0.874	5.04 ± 0.711	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.44 ± 1.44	4.13 ± 1.21	2.04 ± 1.61 U	3.41 ± 0.968	(1)	10.9 ± 2.31	1.79 ± 1.27	6.77 ± 1.48	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-64 Upgradient													
	Sample Date	**12/8/16**	**2/23/17**	**3/29/17**	**5/4/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/5/18**	**10/30/18**	**4/10/19**	**10/23/19**	**4/29/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.839	0.837	1.14	0.962	0.816	0.904 JH	0.835	0.901	0.837	0.805	0.804	0.747	0.711	0.735
Calcium	mg/L	24.0	24.0	31.4	23.8	20.6	21.7 JH	21.6	25.2	23.6	24.4	23.0	24.4	20.3	20.4
Chloride	mg/L	12.7	12.4	11.8	11.0	11.4	11.5	11.5	9.63	14.2	15.5	16.6	17.7	18.2	16.0
Fluoride	mg/L	0.0360 U	0.294 JH	0.332	0.188	0.231 JH	0.157 JH	0.224 JH	0.0360 U	0.0360 U	0.106 J	0.121 J	0.176 JH	0.143	0.101
Sulfate	mg/L	171	182	184	174	172	170 JH	172	164	189	196	193	192 X	209	212
pH - Field Collected	SU	6.46	5.50	6.30	6.33	6.21	6.09	6.20	6.21	6.13	5.97	6.14	4.82	5.86	5.96
Total dissolved solids	mg/L	594	585	611	581	572	555 JH	463	576	549	525	551	588	569	664
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.000911 J	0.000730 J	0.000556 J	0.00123 U	0.000476 J	0.000490 J	0.000519 J	0.000246 U	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.00768	0.00451	0.00392 J	0.00410 J	0.00320 J	0.00324 J	0.00275 BJ	0.000484 U	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000131 U	0.000131 U	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000147 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.000525 U	0.000905 J	0.000525 U	0.00262 U	0.000867 J	0.000637 J	0.000961 J	0.000525 U	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000998 J	0.000952 J	0.000851 J	0.000859 J	0.000745 J	0.000856 J	0.000889 J	0.0000699 U	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.294 JH	0.332	0.188	0.231 JH	0.157 JH	0.224 JH	0.0360 U	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000186 J	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0173 J	0.0146 J	0.00238 U	0.0152 J	0.0173 J	0.0181 J	0.0252	0.0208	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 UX	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000540 J	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.000398 J	0.000317 J	0.000255 U	0.00128 U	0.000265 J	0.000255 U	0.000273 J	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.000512 J	0.000550 J	0.000495 J	0.00227 U	0.000468 J	0.000468 J	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.000332 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.981 ± 0.400	1.16 ± 0.408	0.530 ± 0.284	0.231 ± 0.174	0.258 ± 0.175	0.286 ± 0.247	1.05 ± 0.361	0.531 ± 0.276	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.429 ± 1.56	2.07 ± 1.22	-0.102 ± 1.07 U	0.408 ± 0.764	0.699 ± 0.761	2.49 ± 1.54	0.26 ± 0.639	1 ± 0.834	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-36 Downgradient													
	Sample Date	**12/8/16**	**2/23/17**	**3/29/17**	**5/4/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/5/18**	**10/30/18**	**4/10/19**	**10/22/19**	**4/29/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.308	0.671	0.748	0.731	0.581	0.625 JH	0.663	0.637	0.625	0.686	0.663	0.632	0.459	0.456
Calcium	mg/L	69.7	165	147	282	247	255 JHX	241	289	281	311 D	315 D	265 D	175	259
Chloride	mg/L	14.5	199 D	37.0	355	364 D	379 JHD	319 D	328	347 X	313	285	274	63.3	319
Fluoride	mg/L	0.0360 U	0.439 JH	0.330	1.53	1.26	1.37 JH	1.30	1.32	1.95 X	1.47	1.45	1.41	1.18	1.07
Sulfate	mg/L	49.2	409 D	271 D	726	731 D	775 JHD	707 D	741	816 X	946	697	756 D	189	890
pH - Field Collected	SU	6.71	4.96	6.98	4.04	3.72	3.80	5.20	3.24	3.48	3.61	3.71	3.66	3.42	3.98
Total dissolved solids	mg/L	368	1010	591	1610	1820	1700 JH	1220	1770	1650	1630	1520	1600	1790	1930
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.00123 J	0.00120 U	0.000240 U	0.00121 J	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000588 J	0.00134 J	0.00324 J	0.00276	0.00369	0.00341	0.00372	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0988	0.0967	0.139	0.0270	0.0187	0.0207	0.0372	0.0225	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.00198 J	0.000131 U	0.0259	0.0226	0.0261	0.0212	0.0259	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.00257 J	0.00510	0.000548 J	0.0118	0.0102	0.0117	0.0101	0.0113	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.00608	0.0409	0.0100 J	0.00968	0.0156	0.00792	0.0132	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000579 J	0.0871	0.00751	0.220	0.186	0.216	0.195	0.215	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.439 JH	0.330	1.53	1.26	1.37 JH	1.30	1.32	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000164 J	0.000220 J	0.000261 J	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0123 J	0.119	0.00238 U	0.326	0.340	0.371	0.372	0.379	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.000834	0.000289	0.00143	0.00240	0.00244	0.00160	0.00113	0.00226	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00397 J	0.00261	0.0686	0.00183 J	0.000704 J	0.000791 J	0.00151 J	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0334	0.0448	0.0313	0.0673	0.0616	0.0697	0.0633	0.0663	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000487 J	0.000332 U	0.00166 U	0.000876 J	0.00114 J	0.000889 J	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.0888 ± 0.151	1.12 ± 0.342	0.453 ± 0.276	4.85 ± 0.656	4.02 ± 0.608	4.32 ± 0.667	6.28 ± 0.845	3.6 ± 0.600	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.14 ± 1.02	2.17 ± 0.979	0.166 ± 0.861 U	4.28 ± 1.19	3.44 ± 1.04	3.95 ± 1.79	2.63 ± 0.928	3.3 ± 1.33	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-61 Downgradient													
	Sample Date	**12/7/16**	**2/23/17**	**3/29/17**	**5/3/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/5/18**	**10/31/18**	**4/10/19**	**10/22/19**	**4/29/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	1.07	1.29	1.15	1.18	0.960	1.01 JH	0.994	0.997	1.09	3.25	2.72	2.90	1.82	1.82
Calcium	mg/L	134	95.9	155	113	115	107 JH	105	135	171	197 D	176	168 D	154	172
Chloride	mg/L	198	158	162	168	193	190 JH	218 D	210	285	213	253	248	312	281
Fluoride	mg/L	0.393	0.503	0.522	0.643 JH	0.459 JH	0.479 JH	0.0960 U	0.0360 U	0.406 J	0.430 J	0.403 J	0.480 J	0.494	0.366
Sulfate	mg/L	401 D	377 JD	382 D	388	408 D	390 JHD	385 D	401	562	548	619	548 D	604	533
pH - Field Collected	SU	6.72	6.51	6.48	6.68	6.53	6.55	7.40	6.27	6.42	6.38	6.52	5.61	6.27	6.57
Total dissolved solids	mg/L	1400	1180	1190	1260	1430	1290 JH	1170	1280	1620	514	1650	1790	1870	2000
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000768 J	0.000709 J	0.00123 U	0.000563 J	0.000622 J	0.000569 J	0.000246 U	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0364	0.0186	0.0173	0.0178 J	0.0148	0.0167	0.0153	0.0162	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000911 J	0.000525 U	0.00262 U	0.000525 U	0.000604 J	0.000808 J	0.000525 U	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000719 J	0.000725 J	0.000769 J	0.000779 J	0.000805 J	0.000765 J	0.000855 J	0.0000699 U	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.393	0.503	0.522	0.643 JH	0.459 JH	0.479 JH	0.0960 U	0.0360 U	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0158 J	0.00238 U	0.0120 J	0.0342	0.0336	0.0443	0.0335	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00165 J	0.00129 J	0.000984 J	0.00128 U	0.000776 J	0.000742 J	0.000712 J	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.00123 J	0.00123 J	0.00227 U	0.00185 J	0.00154 J	0.00172 J	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.15 ± 0.429	0.723 ± 0.306	0.256 ± 0.237 U	0.237 ± 0.193	0.398 ± 0.239	0.511 ± 0.223	0.821 ± 0.324	0.485 ± 0.212	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.79 ± 1.44	0.358 ± 1.06	0.761 ± 0.688 U	-0.064 ± 0.607	2.03 ± 0.997	0.491 ± 0.813	0.247 ± 0.710	1.64 ± 1.08	NR	NR	NR	NR	NR	NR

NOTES:
(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.
(1) Sample not collected due to the well going dry during sampling activities.
(2) Sample not collected due to blockage in the well casing.
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
B: Target analyte or common lab contaminant was identified in the method blank.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
H: Bias in sample result likely to be high.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3

Groundwater Analytical Results Summary

CPS Energy - Calaveras Power Station

Evaporation Pond

		JKS-62 Downgradient													
	Sample Date	12/8/16	2/23/17	3/29/17	5/4/17	6/21/17	7/26/17	8/30/17	10/11/17	4/5/18	10/30/18	4/10/19	10/23/19	4/29/20	11/17/20
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Nov 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.549	0.481	0.597	0.601	0.501	0.485 JH	0.485	0.549	0.522	0.559	0.612	0.528	0.484	0.537
Calcium	mg/L	155	152	220	156	150	134 JH	150	158	160	161 D	205 D	151 D	122	144
Chloride	mg/L	257 D	279 DX	279 D	278	291 D	260 JHD	281 D	241	312	279	336	276	284	284
Fluoride	mg/L	0.246	0.362 JH	0.418	0.388	0.366 JH	0.342 JH	0.233 JH	0.0360 U	0.353 J	0.309 J	0.356 J	0.380 J	0.331	0.295
Sulfate	mg/L	190	187	193	188	184	181 JH	188 D	175	200	183	191	183	190	212
pH - Field Collected	SU	6.79	6.67	6.63	6.71	6.68	6.82	7.51	6.52	6.72	6.58	6.29	5.43	6.54	6.55
Total dissolved solids	mg/L	1120	1170	1140	1100	1080	976 JH	1080	1080	1110	956	1190	1160	1100	1040
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.000684 J	0.000293 J	0.000246 U	0.00123 U	0.000254 J	0.000246 U	0.000246 U	0.000246 U	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0825	0.0786	0.0813	0.0747	0.0734	0.0737	0.0708	0.0793	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000131 U	0.000131 U	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000147 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00186 J	0.00109 J	0.000525 U	0.00262 U	0.000551 J	0.000691 J	0.00107 J	0.000525 U	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00110 J	0.000198 J	0.000744 J	0.000350 U	0.000278 J	0.000211 J	0.0000699 U	0.0000699 U	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.246	0.362 JH	0.418	0.388	0.366 JH	0.342 JH	0.233 JH	0.0360 U	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000588 J	0.000152 U	0.000152 U	0.000758 U	0.000154 J	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0129 J	0.00238 U	0.00134 J	0.0353	0.0305	0.0457	0.0263	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000540 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.000414 J	0.000259 J	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.222	0.192	0.196	0.195	0.185	0.181	0.191	0.208	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.000332 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.485 ± 0.229	0.402 ± 0.220	0.665 ± 0.321	0.0997 ± 0.153	0.425 ± 0.233	0.399 ± 0.220	2.02 ± 0.489	0.669 ± 0.279	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.15 ± 1.38	1.53 ± 1.28 U	0.305 ± 1.10 U	-0.138 ± 0.656	0.66 ± 0.760	1.07 ± 0.949	0.673 ± 0.821	0.371 ± 0.631	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

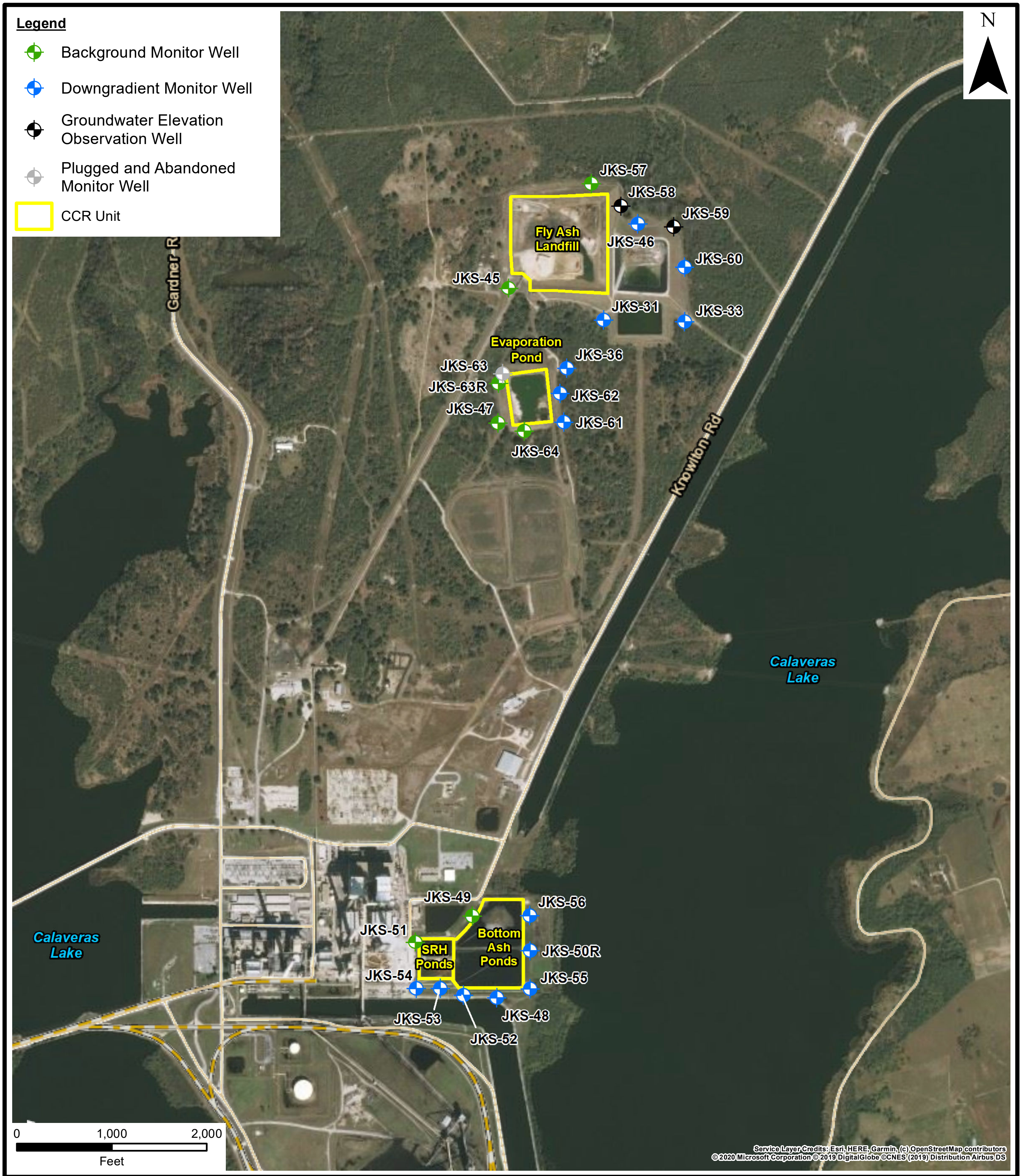
H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

Figures



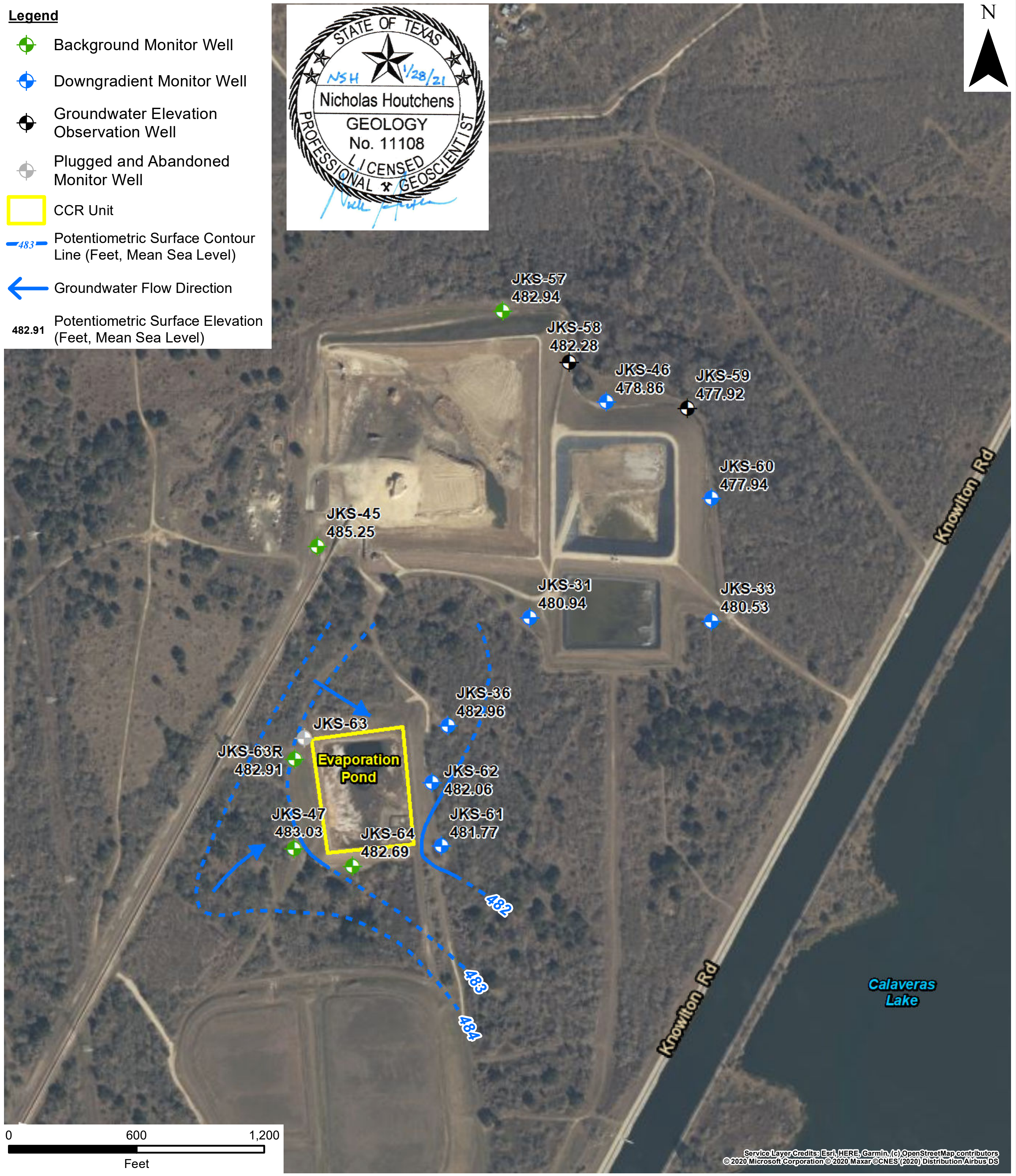
Environmental Resources Management

DESIGN:	WZ	DRAWN:	EFC	CHKD.:	WZ
DATE:	1/17/2020	SCALE:	AS SHOWN	REVISION:	0

\\ushoufs01\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2019gwmon\fig1_0503422_CPSCalv_WellLocs.mxd

FIGURE 1
CCR WELL NETWORK LOCATION MAP
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM



NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Environmental Resources Management

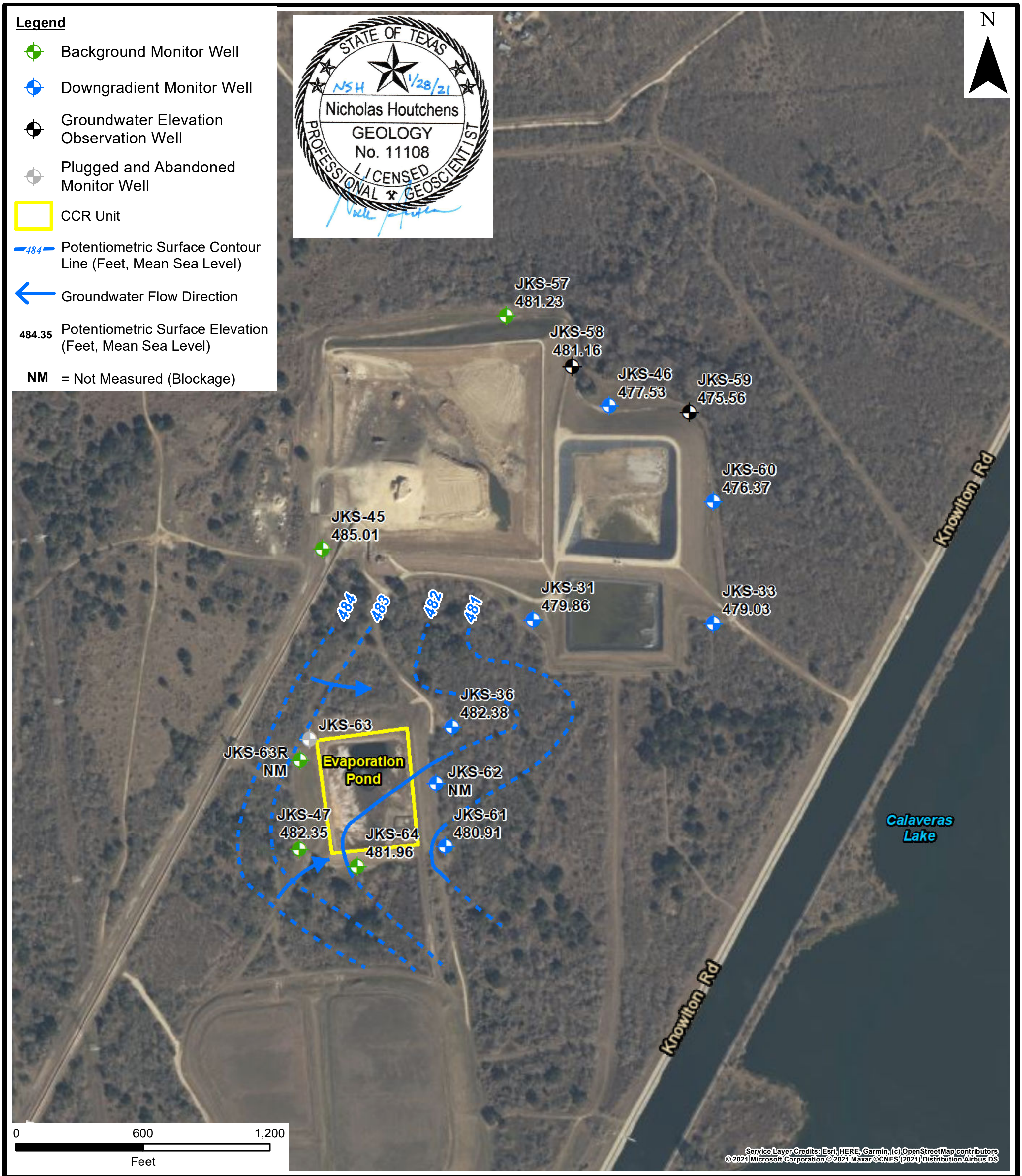
DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/22/2021	SCALE:	AS SHOWN	REVISION:	1

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2020gwmon\fig2A_0503422_CPSCalv_EvapPond_apr2020pmapRev.mxd

FIGURE 2A
POTENTIOMETRIC SURFACE MAP -
APRIL 2020
Evaporation Pond CCR Unit
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM



NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Environmental Resources Management

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/22/2021	SCALE:	AS SHOWN	REVISION:	3

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2020gwmon\fig2B_0503422_CPSCalv_EvapPond_oct2020pmapRev.mxd

FIGURE 2B
POTENTIOMETRIC SURFACE MAP -
OCTOBER 2020
Evaporation Pond CCR Unit
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM

Laboratory Data Packages

Appendix A

(*Data Packages Available Upon Request*)

Statistical Analysis Tables and Figures

Appendix B

APPENDIX B - TABLE 1
Kruskal-Wallis Test Comparisons of Upgradient Wells
Calaveras Power Station
Evaporation Pond

Analyte	N	Num Detects	Percent Detect	DF	KW Statistic	p-value	Conclusion	UPL Type
Boron	39	39	100.00%	2	12.7	0.00176	Significant Difference	Intrawell
Calcium	40	40	100.00%	2	34.2	<0.001	Significant Difference	Intrawell
Chloride	40	40	100.00%	2	34.6	<0.001	Significant Difference	Intrawell
Fluoride	40	27	67.50%	2	0.289	0.866	No Significant Difference	Interwell
pH	41	41	100.00%	2	15.3	<0.001	Significant Difference	Intrawell
Sulfate	40	39	97.50%	2	24.2	<0.001	Significant Difference	Intrawell
Total dissolved solids	40	40	100.00%	2	34.6	<0.001	Significant Difference	Intrawell

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations
N: number of data points
DF: degrees of freedom
statistic: Kruskal Wallis test statistic

p-value: P-values below 0.05 indicate that the median concentrations in the upgradient wells are significantly different from each other and the upgradient wells should not be pooled.

p-value: P-values equal or above 0.05 indicate that the median concentrations in the upgradient wells are not significantly different from each other and the upgradient wells can be pooled.

APPENDIX B - TABLE 2
Descriptive Statistics for Upgradient Wells
Calaveras Power Station
Evaporation Pond

Analyte	Well	Units	N	Num Detects	Percent Detect	Min ND	Max ND	Min Detect	Median	Mean	Max Detect	SD	CV	Distribution
Boron	JKS-47	mg/L	14	14	100.00%			0.59	0.82	0.827	1.05	0.115	0.13943233	Normal
Boron	JKS-63	mg/L	11	11	100.00%			0.8	1.06	1.14	2.03	0.333	0.29220418	Lognormal
Boron	JKS-64	mg/L	14	14	100.00%			0.711	0.836	0.848	1.14	0.108	0.12718512	Lognormal
Calcium	JKS-47	mg/L	14	14	100.00%			26.2	58	65.7	168	39.4	0.59984232	Lognormal
Calcium	JKS-63	mg/L	12	12	100.00%			174	854	780	1060	290	0.37217927	NDD
Calcium	JKS-64	mg/L	14	14	100.00%			20.3	23.7	23.5	31.4	2.81	0.11991249	NDD
Chloride	JKS-47	mg/L	14	14	100.00%			53.9	150	151	279	66.8	0.44205264	Normal
Chloride	JKS-63	mg/L	12	12	100.00%			1160	1780	1820	2830	570	0.31301683	Normal
Chloride	JKS-64	mg/L	14	14	100.00%			9.63	12.6	13.6	18.2	2.75	0.2025478	Normal
Fluoride	Pooled	mg/L	40	27	67.50%	0.009	0.18	0.0573	0.148	0.149	0.382	0.116	0.78039246	NDD
pH	JKS-47	SU	15	15	100.00%			4.58	5.85	5.74	6	0.349	0.06072719	NDD
pH	JKS-63	SU	12	12	100.00%			4.76	5.68	5.62	5.88	0.31	0.05516597	NDD
pH	JKS-64	SU	14	14	100.00%			4.82	6.14	6.01	6.46	0.416	0.06911982	NDD
Sulfate	JKS-47	mg/L	14	14	100.00%			171	260	259	369	54.9	0.21213909	Normal
Sulfate	JKS-63	mg/L	12	11	91.67%	0.023	0.023	1750	1860	1740	2120	561	0.32178096	NDD
Sulfate	JKS-64	mg/L	14	14	100.00%			164	183	184	212	14.9	0.08075078	Normal
Total dissolved solids	JKS-47	mg/L	14	14	100.00%			665	808	879	1240	177	0.2019093	Normal
Total dissolved solids	JKS-63	mg/L	12	12	100.00%			4760	5390	5830	8190	1080	0.18471415	Normal
Total dissolved solids	JKS-64	mg/L	14	14	100.00%			463	574	570	664	45	0.07888675	Normal

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations
Well = Pooled, indicates that the summary statistics were produced for the pooled upgradient wells based on the Kruskal-Wallis test (Table 1).
SU: Standard units
N: number of data points
ND: Non-detect
SD: Standard Deviation
CV: Coefficient of Variation (standard deviation divided by the mean)
NDD: No Discernible Distribution

APPENDIX B - TABLE 3
Potential Outliers in Upgradient Wells
Calaveras Power Station
Evaporation Pond

Well	Sample	Date	Analyte	Units	Detect	Concentration	UPL type	Distribution	Statistical Outlier	Visual Outlier	Normal Outlier	Log Statistical Outlier	Log Visual Outlier	Lognormal Outlier	Statistical and Visual Outlier
JKS-47	JKS 47565343-007	10/11/2017	Boron	mg/L	TRUE	1.02	Intrawell	Normal		X			X		
JKS-47	JKS-47002	10/23/2019	Boron	mg/L	TRUE	1.05	Intrawell	Normal		X			X		
JKS-47	JKS-47-20201021-CCR	10/21/2020	Boron	mg/L	TRUE	0.904	Intrawell	Normal		X			X		
JKS-63	63R001	8/20/2019	Boron	mg/L	TRUE	2.03	Intrawell	Lognormal	X	X	X		X		
JKS-64	JKS-64549681-009	3/29/2017	Boron	mg/L	TRUE	1.14	Intrawell	Lognormal	X	X	X		X		
JKS-47	JKS-47549681-004	3/29/2017	Calcium	mg/L	TRUE	168	Intrawell	Lognormal	X	X	X				
JKS-47	JKS47620699-005	4/10/2019	Calcium	mg/L	TRUE	128	Intrawell	Lognormal	X	X	X				
JKS-64	JKS-64549681-009	3/29/2017	Calcium	mg/L	TRUE	31.4	Intrawell	NDD	X	X	X	X	X	X	0
JKS-47	JKS-47549681-004	3/29/2017	Fluoride	mg/L	TRUE	0.315	Interwell	NDD	X						
JKS-47	JKS-47552352-008	5/3/2017	Fluoride	mg/L	TRUE	0.382	Interwell	NDD	X						
JKS-47	JKS 47555913-009	6/21/2017	Fluoride	mg/L	TRUE	0.213	Interwell	NDD	X						
JKS-63	JKS-63547064-005	2/22/2017	Fluoride	mg/L	TRUE	0.32	Interwell	NDD	X						
JKS-63	JKS-63549681-007	3/29/2017	Fluoride	mg/L	TRUE	0.297	Interwell	NDD	X						
JKS-63	JKS-63552352-009	5/3/2017	Fluoride	mg/L	TRUE	0.364	Interwell	NDD	X						
JKS-63	JKS-63561592-006	8/30/2017	Fluoride	mg/L	TRUE	0.182	Interwell	NDD	X						
JKS-63	63R001	8/20/2019	Fluoride	mg/L	TRUE	0.206	Interwell	NDD	X						
JKS-63	JKS-63R005	10/23/2019	Fluoride	mg/L	TRUE	0.352	Interwell	NDD	X						
JKS-64	JKS-64547201-002	2/23/2017	Fluoride	mg/L	TRUE	0.294	Interwell	NDD	X						
JKS-64	JKS-64549681-009	3/29/2017	Fluoride	mg/L	TRUE	0.332	Interwell	NDD	X						
JKS-64	JKS-64552439-003	5/4/2017	Fluoride	mg/L	TRUE	0.188	Interwell	NDD	X						
JKS-64	JKS 64555913-007	6/21/2017	Fluoride	mg/L	TRUE	0.231	Interwell	NDD	X						
JKS-64	JKS-64561592-005	8/30/2017	Fluoride	mg/L	TRUE	0.224	Interwell	NDD	X						
JKS-47	JKS-47-WG-20170223	2/23/2017	pH	SU	TRUE	5.42	Intrawell	NDD	X	X	X	X	X	X	0
JKS-47	JKS-47-WG-20191023-02	10/23/2019	pH	SU	TRUE	4.58	Intrawell	NDD	X	X	X	X	X	X	0
JKS-63	JKS-63-WG-20170222	2/22/2017	pH	SU	TRUE	5.35	Intrawell	NDD		X			X		
JKS-63	JKS-63R-WG-20191023-02	10/23/2019	pH	SU	TRUE	4.76	Intrawell	NDD	X	X	X	X	X	X	0
JKS-64	JKS-64-WG-20170223	2/23/2017	pH	SU	TRUE	5.5	Intrawell	NDD		X		X	X	X	0
JKS-64	JKS-64-WG-20191023-02	10/23/2019	pH	SU	TRUE	4.82	Intrawell	NDD	X	X	X	X	X	X	0
JKS-47	JKS47620699-005	4/10/2019	Sulfate	mg/L	TRUE	347	Intrawell	Normal		X					
JKS-63	WELL 63581537-002	4/5/2018	Sulfate	mg/L	TRUE	2110	Intrawell	NDD		X			X		
JKS-47	JKS-47549681-004	3/29/2017	Total dissolved solids	mg/L	TRUE	1170	Intrawell	Normal		X					
JKS-64	JKS-64-20201021-CCR	10/21/2020	Total dissolved solids	mg/L	TRUE	664	Intrawell	Normal	X	X	X	X	X	X	0

NOTES:

NDD: No Discernible Distribution
SU: Standard units
Outlier tests were performed on detected data only.
Statistical outliers were determined using a Dixon's test for N < 25 and with Rosner's test for N > 25.
Visual outliers were identified if they fall above the confidence envelope on the QQ plot.
Data points were considered potential outliers if they were both statistical and visual outliers.
NDD wells had data points considered as potential outliers if they were either a normal or lognormal outlier.
[Blank] data distribution indicates that the well data did not have enough detected data points for outlier analysis.
Lognormally distributed data was first log-transformed before visual and statistical outlier tests were performed.
Normal data distribution indicates that the well data was directly used for statistical and visual outlier tests.
NDD indicates that both the untransformed and transformed data were examined with statistical and visual outlier tests.
'0' indicates that the data point was a statistical and visual outlier but was retained after review by the hydrogeologist.

APPENDIX B - TABLE 4
Mann Kendall Test for Trends in Upgradient Wells
Calaveras Power Station
Evaporation Pond

Analyte	UPL Type	Well	N	Num Detects	Percent Detect	p-value	tau	Conclusion
Boron	Intrawell	JKS-47	14	14	100.00%	0.667	0.0989	Stable, No Trend
Boron	Intrawell	JKS-63	11	11	100.00%	0.359	0.236	Stable, No Trend
Boron	Intrawell	JKS-64	14	14	100.00%	0.001	-0.663	Decreasing Trend
Calcium	Intrawell	JKS-47	14	14	100.00%	0.518	-0.143	Stable, No Trend
Calcium	Intrawell	JKS-63	12	12	100.00%	0.311	0.242	Stable, No Trend
Calcium	Intrawell	JKS-64	14	14	100.00%	0.17	-0.278	Stable, No Trend
Chloride	Intrawell	JKS-47	14	14	100.00%	0.324	-0.199	Stable, No Trend
Chloride	Intrawell	JKS-63	12	12	100.00%	<0.001	0.758	Increasing Trend
Chloride	Intrawell	JKS-64	14	14	100.00%	0.0283	0.442	Increasing Trend
Fluoride	Interwell	JKS-47, JKS-63, JKS-64	40	27	67.50%	0.217	-0.141	Stable, No Trend
pH	Intrawell	JKS-47	15	15	100.00%	0.428	0.153	Stable, No Trend
pH	Intrawell	JKS-63	12	12	100.00%	0.545	0.152	Stable, No Trend
pH	Intrawell	JKS-64	14	14	100.00%	0.0117	-0.508	Decreasing Trend
Sulfate	Intrawell	JKS-47	14	14	100.00%	0.193	-0.275	Stable, No Trend
Sulfate	Intrawell	JKS-63	12	11	91.67%	0.679	0.0923	Stable, No Trend
Sulfate	Intrawell	JKS-64	14	14	100.00%	0.0158	0.486	Increasing Trend
Total dissolved solids	Intrawell	JKS-47	14	14	100.00%	0.0617	-0.385	Stable, No Trend
Total dissolved solids	Intrawell	JKS-63	12	12	100.00%	0.0311	0.485	Increasing Trend
Total dissolved solids	Intrawell	JKS-64	14	14	100.00%	0.388	-0.187	Stable, No Trend

NOTES:

Non-detects were substituted with a value of zero for trend calculations
N: number of data points
tau: Kendall's tau statistic
p-value: A two-sided p-value describing the probability of the H0 being true (a=0.05)
Trend tests were performed on all upgradient data, only if the dataset met the minimum data quality criteria (ERM 2017).

APPENDIX B - TABLE 5
Calculated UPLs for Upgradient Datasets
Calaveras Power Station
Evaporation Pond

Analyte	UPL Type	Trend	Well	N	Num Detects	Percent Detects	LPL	UPL	Units	ND Adjustment	Transformation	Alpha	Method	Final LPL	Final UPL
Boron	Intrawell	Stable, No Trend	JKS-47	14	14	100.00%		1.06	mg/L	None	No	0.0025	Param Intra 1 of 2		
Boron	Intrawell	Stable, No Trend	JKS-63	11	11	100.00%		1.9	mg/L	None	ln(x)	0.0025	Param Intra 1 of 2		X
Boron	Intrawell	Decreasing Trend	JKS-64	14	14	100.00%		0.937	mg/L	None	No	0.0025	NP Detrended UPL		
Calcium	Intrawell	Stable, No Trend	JKS-47	14	14	100.00%		168	mg/L	None	ln(x)	0.0025	Param Intra 1 of 2		
Calcium	Intrawell	Stable, No Trend	JKS-63	12	12	100.00%		1060	mg/L	None	No	0.0108	NP Intra (normality) 1 of 2		X
Calcium	Intrawell	Stable, No Trend	JKS-64	14	14	100.00%		31.4	mg/L	None	No	0.00861	NP Intra (normality) 1 of 2		
Chloride	Intrawell	Stable, No Trend	JKS-47	14	14	100.00%		287	mg/L	None	No	0.0025	Param Intra 1 of 2		
Chloride	Intrawell	Increasing Trend	JKS-63	12	12	100.00%		3200	mg/L	None	No	0.0025	NP Detrended UPL		X
Chloride	Intrawell	Increasing Trend	JKS-64	14	14	100.00%		20.9	mg/L	None	No	0.0025	NP Detrended UPL		
Fluoride	Interwell	Stable, No Trend	JKS-47, JKS-63, JKS-64	40	27	67.50%		0.382	mg/L	None	No	0.00115	NP Inter (normality) 1 of 2		X
pH	Intrawell	Stable, No Trend	JKS-47	15	15	100.00%	4.58	6	SU	None	No	0.0151	NP Intra (normality) 1 of 2	X	
pH	Intrawell	Stable, No Trend	JKS-63	12	12	100.00%	4.76	5.88	SU	None	No	0.0216	NP Intra (normality) 1 of 2		
pH	Intrawell	Decreasing Trend	JKS-64	14	14	100.00%	4.84	6.21	SU	None	No	0.0172	NP Detrended UPL		X
Sulfate	Intrawell	Stable, No Trend	JKS-47	14	14	100.00%		371	mg/L	None	No	0.0025	Param Intra 1 of 2		
Sulfate	Intrawell	Stable, No Trend	JKS-63	12	11	91.67%		2120	mg/L	None	No	0.0108	NP Intra (normality) 1 of 2		X
Sulfate	Intrawell	Increasing Trend	JKS-64	14	14	100.00%		219	mg/L	None	No	0.0025	NP Detrended UPL		
Total dissolved solids	Intrawell	Stable, No Trend	JKS-47	14	14	100.00%		1240	mg/L	None	No	0.0025	Param Intra 1 of 2		
Total dissolved solids	Intrawell	Increasing Trend	JKS-63	12	12	100.00%		8330	mg/L	None	No	0.0025	NP Detrended UPL		X
Total dissolved solids	Intrawell	Stable, No Trend	JKS-64	14	14	100.00%		662	mg/L	None	No	0.0025	Param Intra 1 of 2		

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations
UPL: upper prediction limit
LPL: Lower prediction limit. These were only calculated for pH
UPLs were constructed with a site wide false positive rate of 0.1 and a 1 of 2 retesting.
UPLs were calculated using Sanitas Software.
SU: Standard units
NP: non parametric
RL: Reporting Limit
Intra: indicates an intrawell UPL was used
Inter: indicates an interwell UPL was used
In the case where multiple UPLs were calculated for an analyte, the maximum UPL was used as the final UPL.
In the case where multiple LPLs were calculated for an pH the minimum LPL was used as the final LPL.

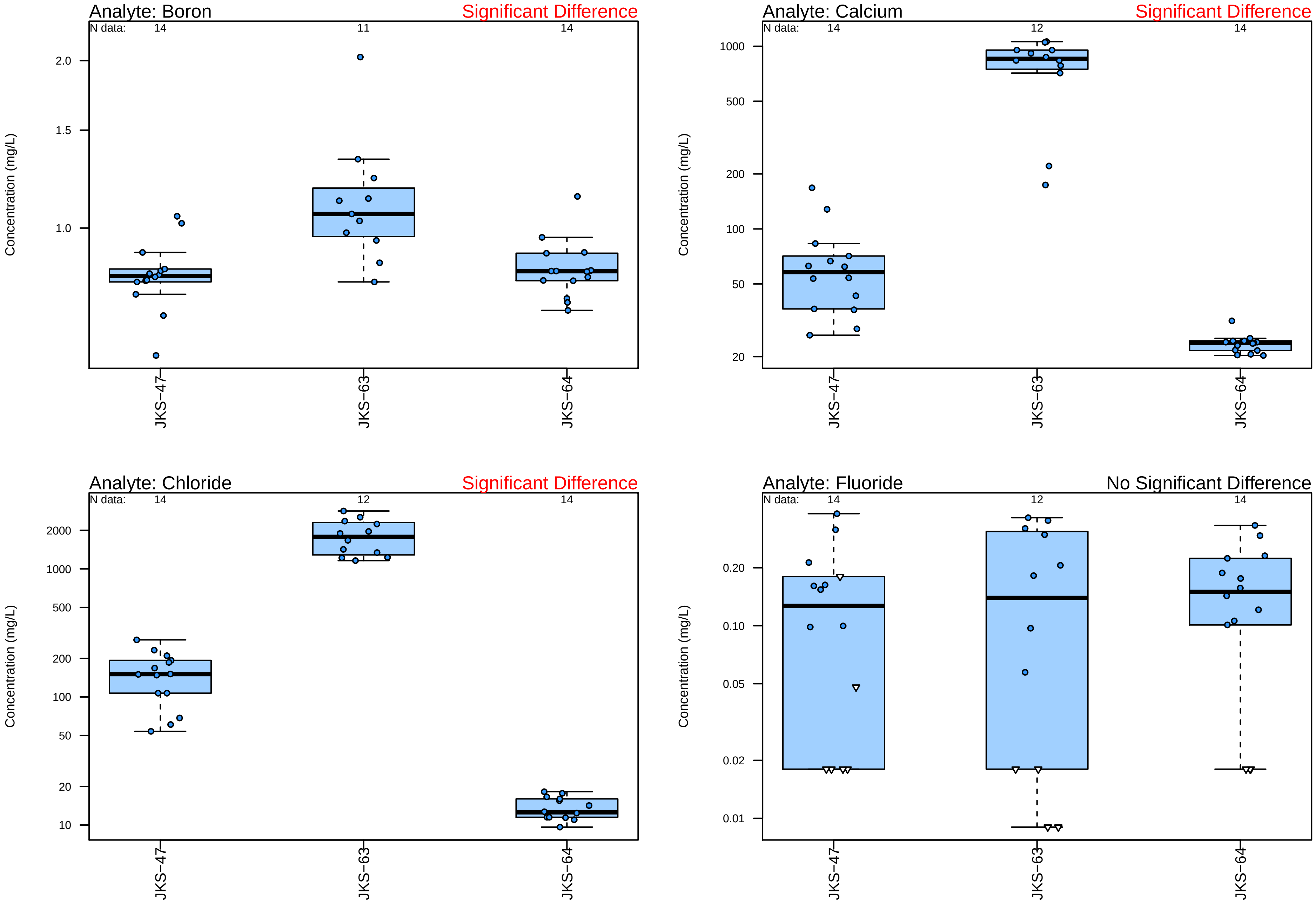
APPENDIX B - TABLE 6
Comparisons of Downgradient Wells to UPLs
Calaveras Power Station
Evaporation Pond

Analyte	Well	LPL	UPL	Units	Recent Date	Observation	Obs > UPL	Notes	Mann Kendall p-value	Mann Kendall tau	WRS p-value	WRS Conclusion	Exceed Median	Overall Conclusion
Boron	JKS-36		1.9	mg/L	10/21/2020	0.456					1	NS		No Exceedance
Boron	JKS-61		1.9	mg/L	10/21/2020	1.82					0.884	NS		No Exceedance
Boron	JKS-62		1.9	mg/L	11/17/2020	0.537					1	NS		No Exceedance
Calcium	JKS-36		1060	mg/L	10/21/2020	259					1	NS		No Exceedance
Calcium	JKS-61		1060	mg/L	10/21/2020	172					1	NS		No Exceedance
Calcium	JKS-62		1060	mg/L	11/17/2020	144					1	NS		No Exceedance
Chloride	JKS-36		3200	mg/L	10/21/2020	319					1	NS		No Exceedance
Chloride	JKS-61		3200	mg/L	10/21/2020	281					1	NS		No Exceedance
Chloride	JKS-62		3200	mg/L	11/17/2020	284					1	NS		No Exceedance
Fluoride	JKS-36		0.382	mg/L	10/21/2020	1.07	X	Trend Test: Stable, No Trend	0.279	0.231	<0.001	***	X	Both Exceedance
Fluoride	JKS-61		0.382	mg/L	10/21/2020	0.366					0.0765	NS		No Exceedance
Fluoride	JKS-62		0.382	mg/L	11/17/2020	0.295					0.998	NS		No Exceedance
pH	JKS-36	4.58	6.21	SU	10/21/2020	3.98	X	Trend Test: Decreasing Trend	0.0264	-0.451	0.108	NS		UPL Exceedance
pH	JKS-61	4.58	6.21	SU	10/21/2020	6.57	X	Trend Test: Stable, No Trend	0.125	-0.309	0.00716	**	X	Both Exceedance
pH	JKS-62	4.58	6.21	SU	11/17/2020	6.55	X	Trend Test: Stable, No Trend	0.0617	-0.385	0.00537	**	X	Both Exceedance
Sulfate	JKS-36		2120	mg/L	10/21/2020	890					1	NS		No Exceedance
Sulfate	JKS-61		2120	mg/L	10/21/2020	553					1	NS		No Exceedance
Sulfate	JKS-62		2120	mg/L	11/17/2020	212					1	NS		No Exceedance
Total dissolved solids	JKS-36		8330	mg/L	10/21/2020	1930					1	NS		No Exceedance
Total dissolved solids	JKS-61		8330	mg/L	10/21/2020	2000					1	NS		No Exceedance
Total dissolved solids	JKS-62		8330	mg/L	11/17/2020	1040					1	NS		No Exceedance

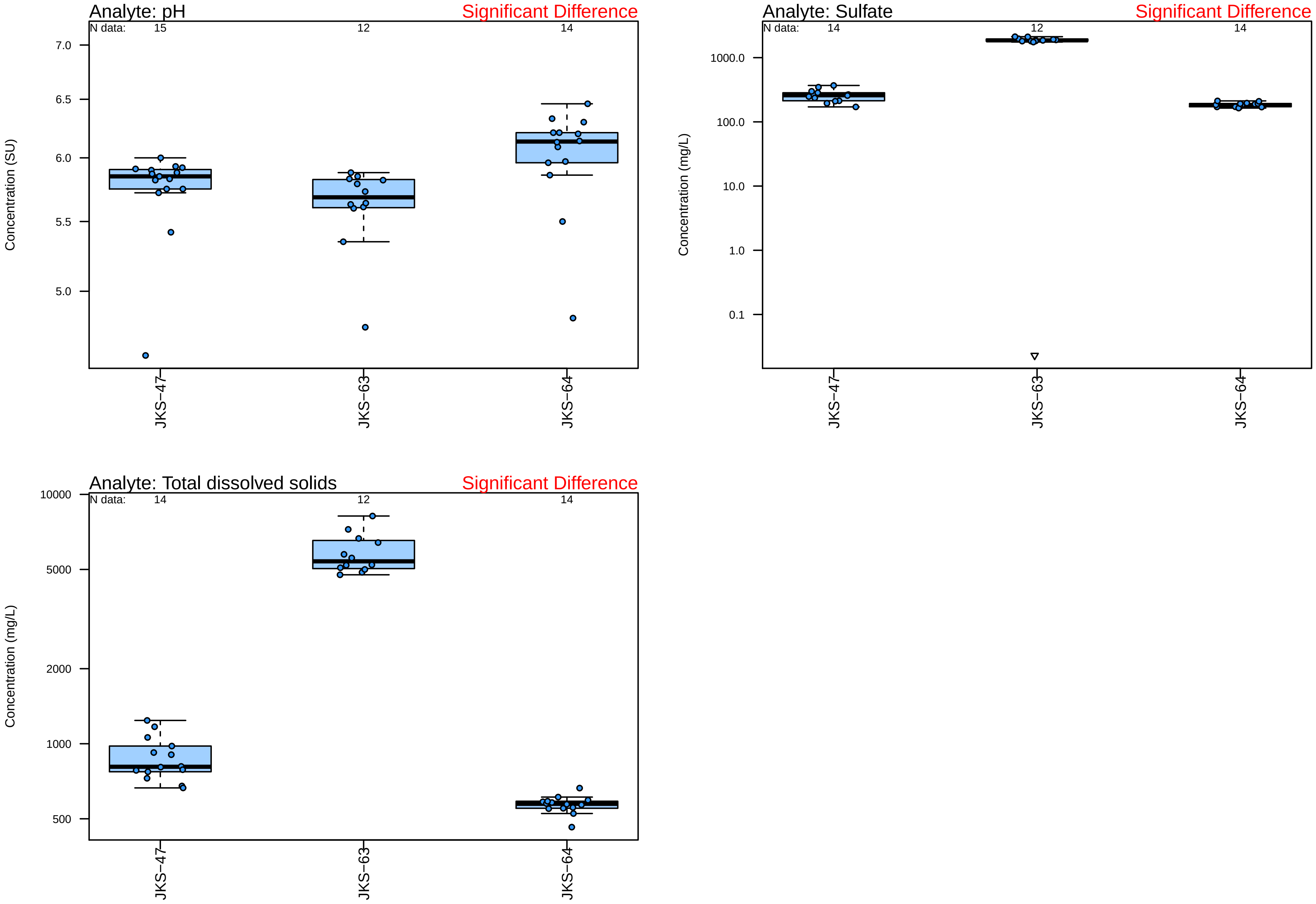
NOTES:

Non-detects were substituted with a value of zero for trend calculations
UPL: Upper Prediction Limit
ND: Not detected
SU: Standard units
tau: Kendall's tau statistic
Obs > UPL: Exceed 'X' indicates that the most recent observed value is higher than the UPL (or out of range of the LPL and UPL in the case of pH.)
Obs > UPL: Exceed 'X0' indicates that the two most recent values are higher than the UPL, but the upgradient well is 100% ND.
Obs > UPL: Exceed '0' indicated that the most recent observed value is higher than the UPL, but is not scored as an SSI due to Double Quantification Rule (ERM 2017).
WRS: Wilcoxon Rank Sum test comparing if median of downgradient well is larger than the UPL (for pH, also checks if median is less than LPL)
WRS p-value: A one-sided p-value describing the probability of the H0 (UPL/LPL) being true (a=0.05)
Overall: UPL Exceedance - most recent sampling event exceeds the UPL, but median of the well is not greater than UPL
Overall: WRS Exceedance - most recent sampling event does not exceed the UPL, but median of the well is greater than UPL
Overall: Both Exceedance - most recent sampling event exceeds the UPL and median of the well is larger than the UPL

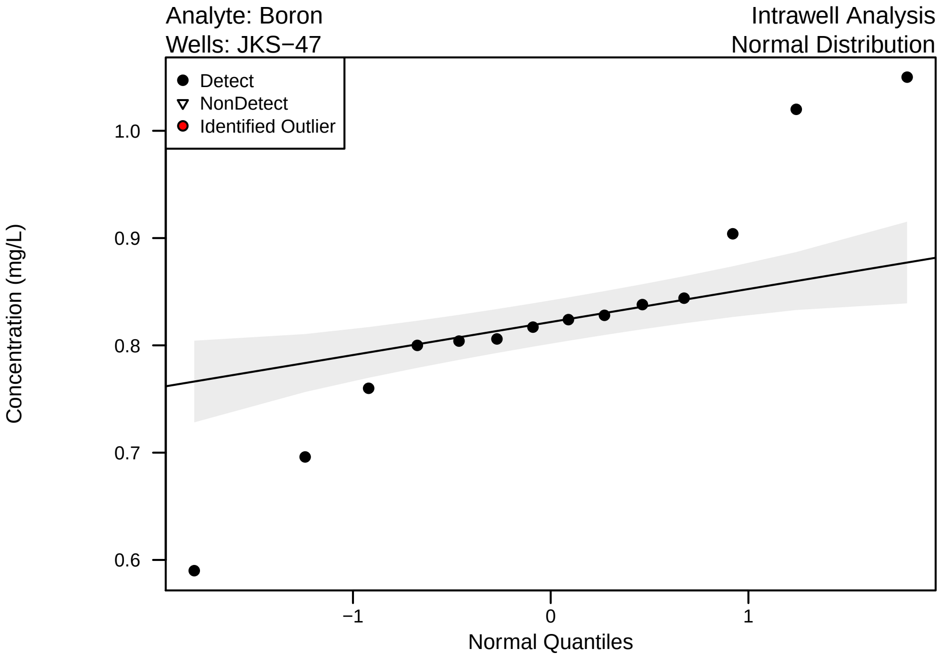
Appendix B – Figure 1
Unit: Evaporation Pond
Boxplots of Upgradient Wells



Appendix B – Figure 1
Unit: Evaporation Pond
Boxplots of Upgradient Wells

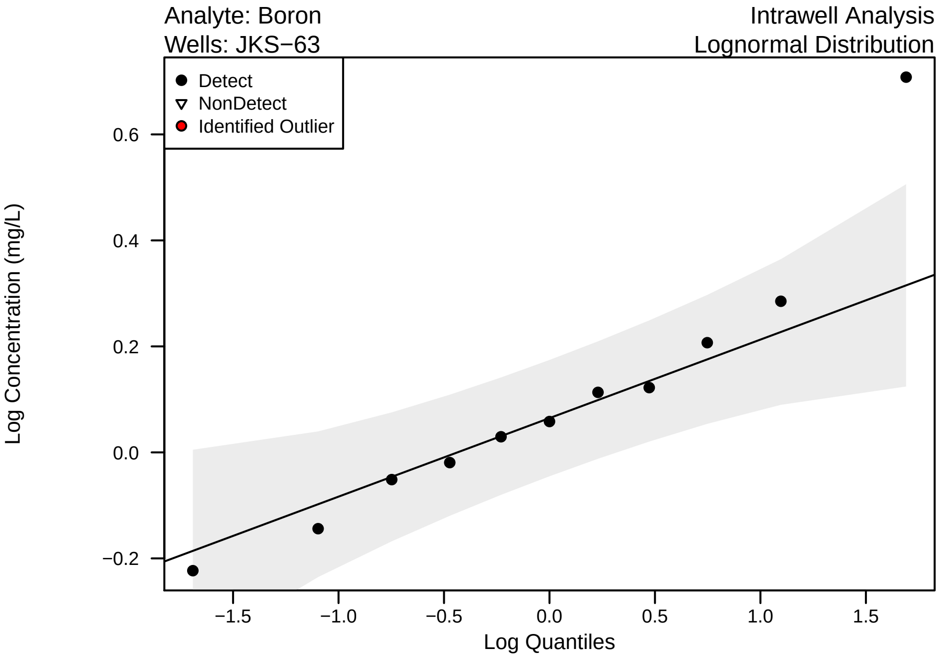


Appendix B − Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells



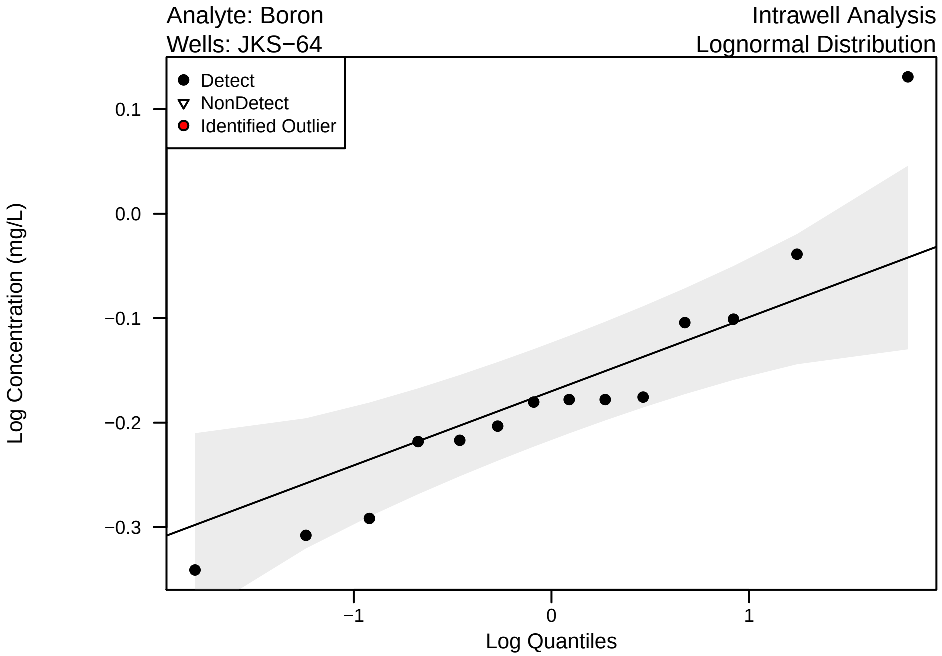
Intentionally left blank,
not Lognormal/NDD distribution.

Intentionally left blank,
not Normal/NDD distribution.

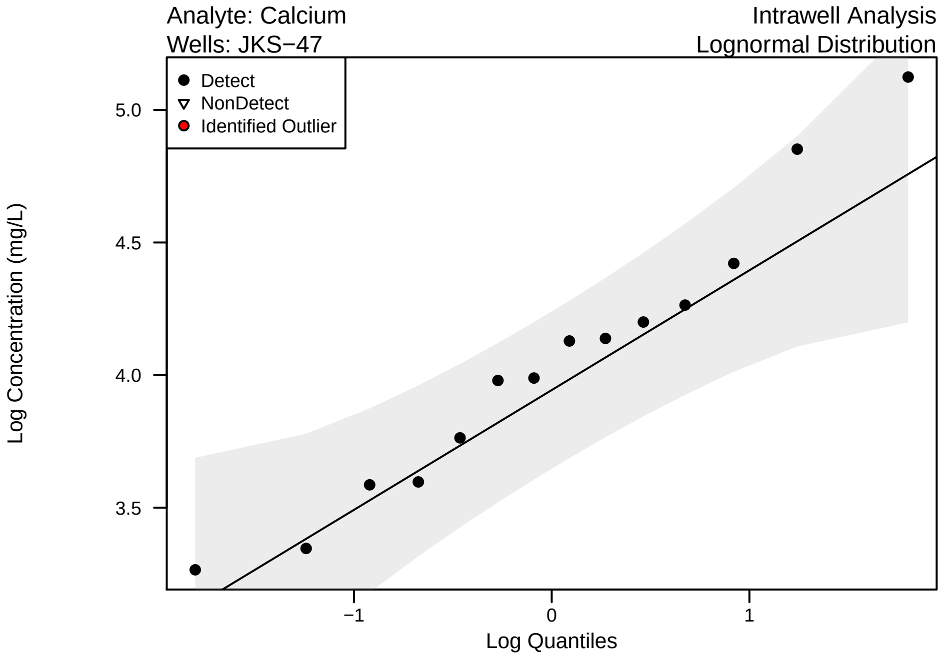


Appendix B − Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells

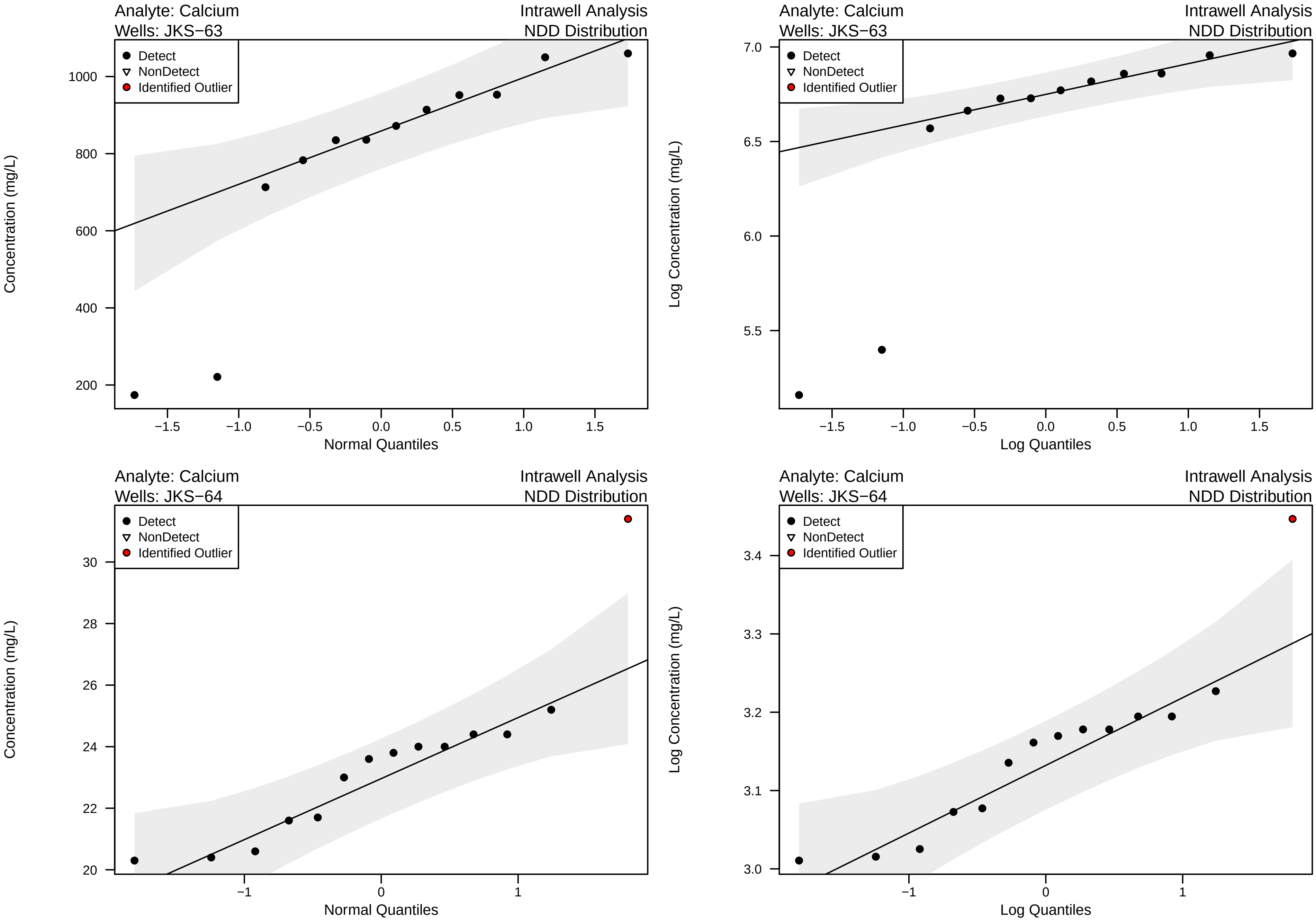
Intentionally left blank,
not Normal/NDD distribution.



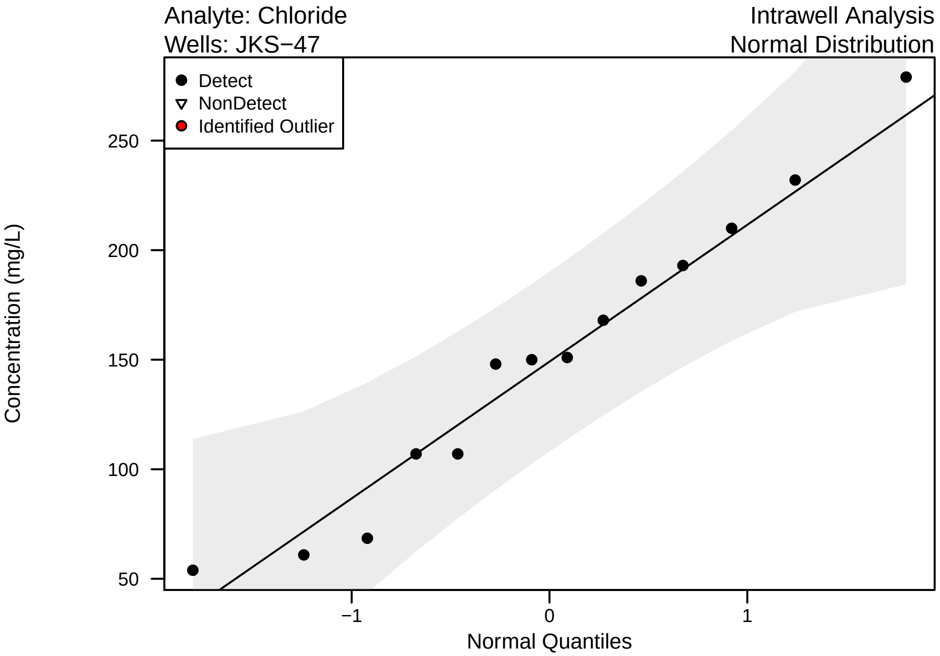
Intentionally left blank,
not Normal/NDD distribution.



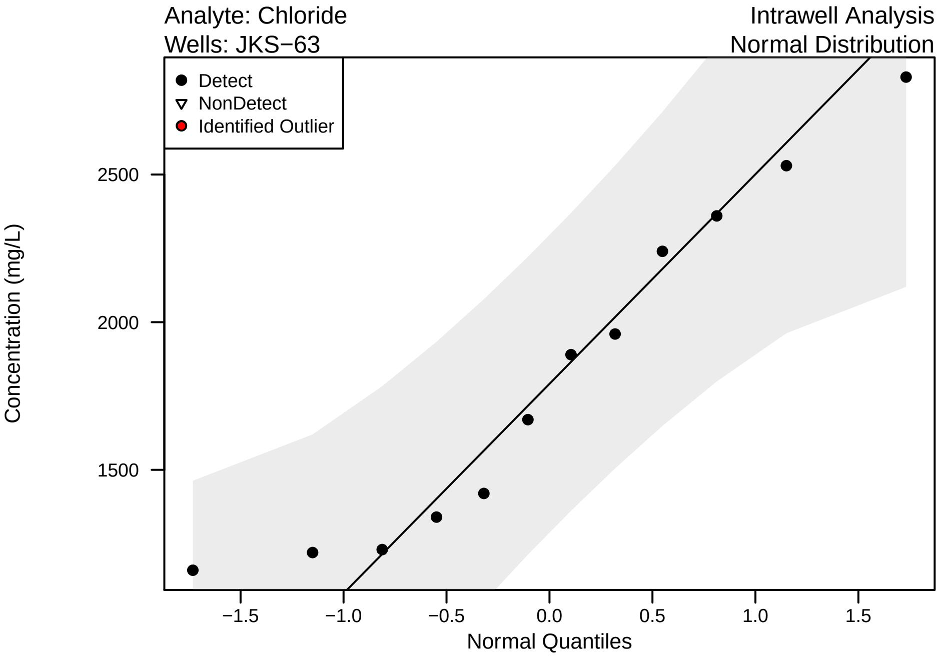
Appendix B – Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells



Appendix B − Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells

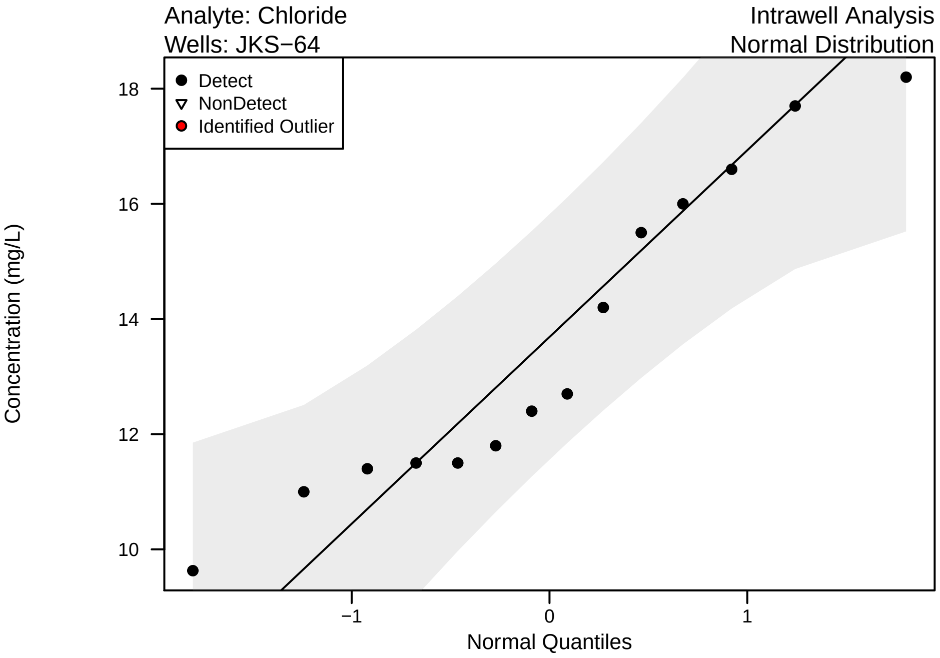

Analyte: Chloride
Wells: JKS−47
Intrawell Analysis
Normal Distribution

Intentionally left blank,
not Lognormal/NDD distribution.


Analyte: Chloride
Wells: JKS−63
Intrawell Analysis
Normal Distribution

Intentionally left blank,
not Lognormal/NDD distribution.

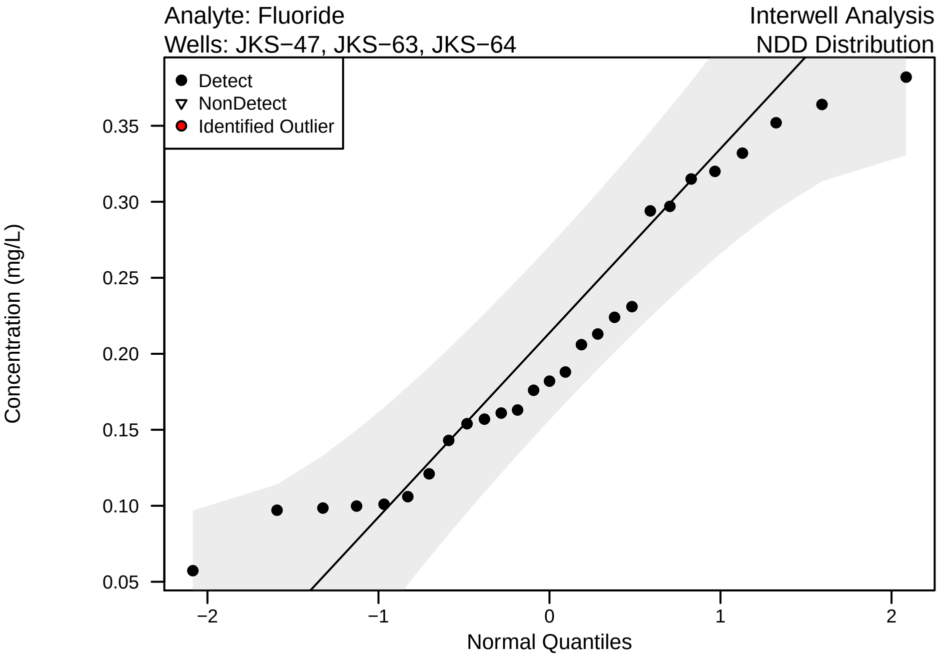
Appendix B − Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells



Analyte: Chloride
Wells: JKS−64

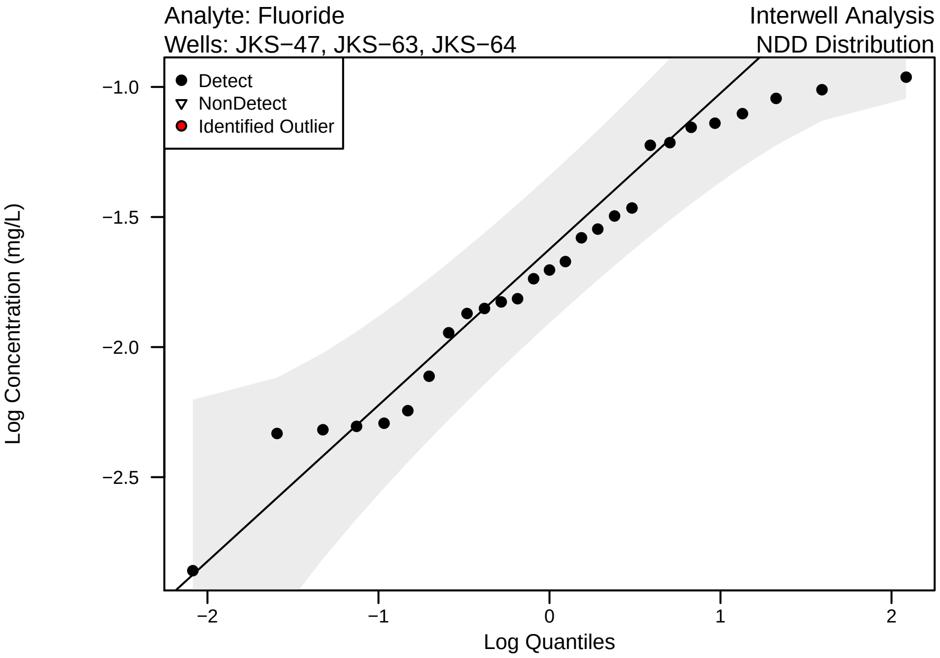
Intrawell Analysis
Normal Distribution

Intentionally left blank,
not Lognormal/NDD distribution.



Analyte: Fluoride
Wells: JKS−47, JKS−63, JKS−64

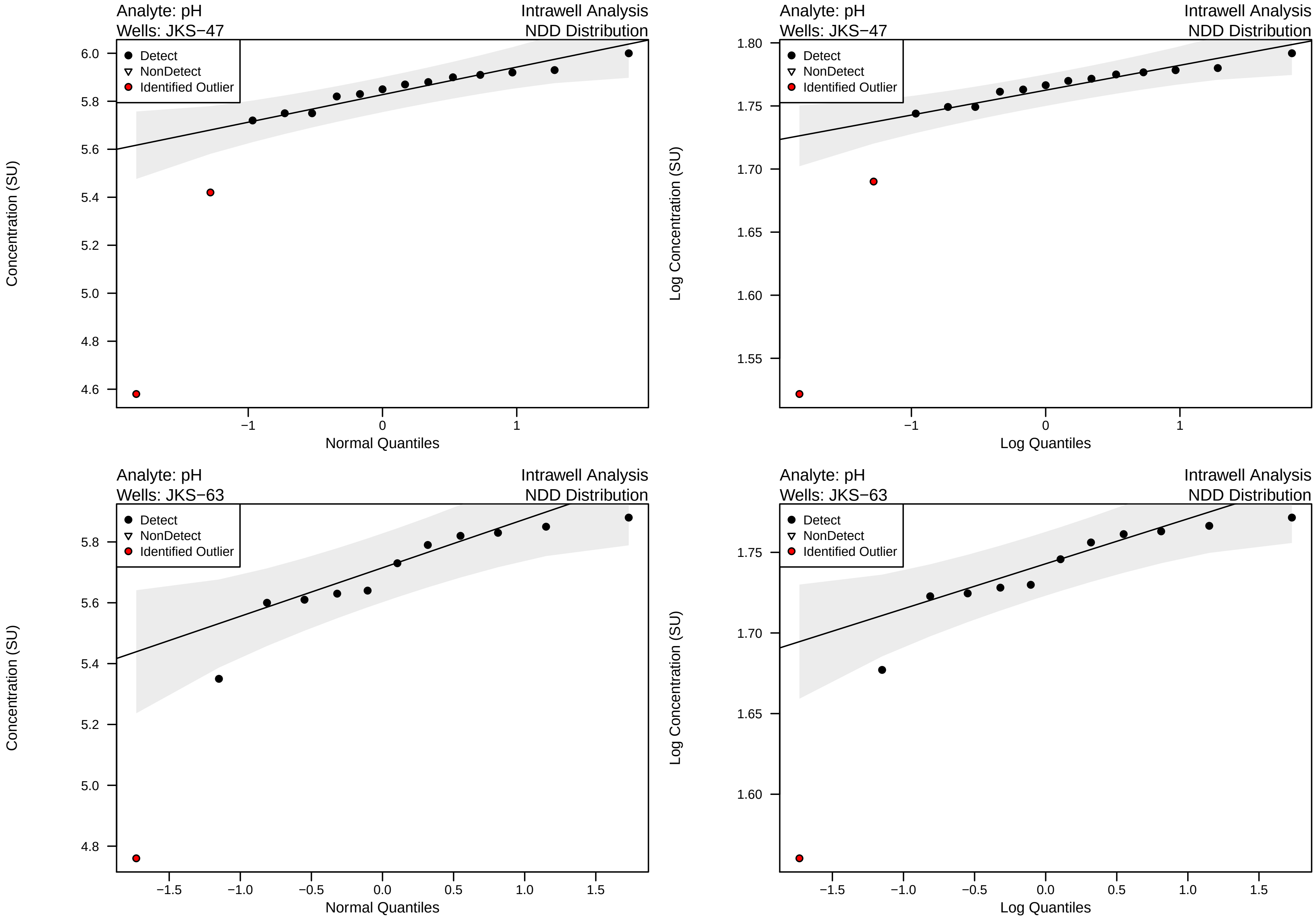
Interwell Analysis
NDD Distribution



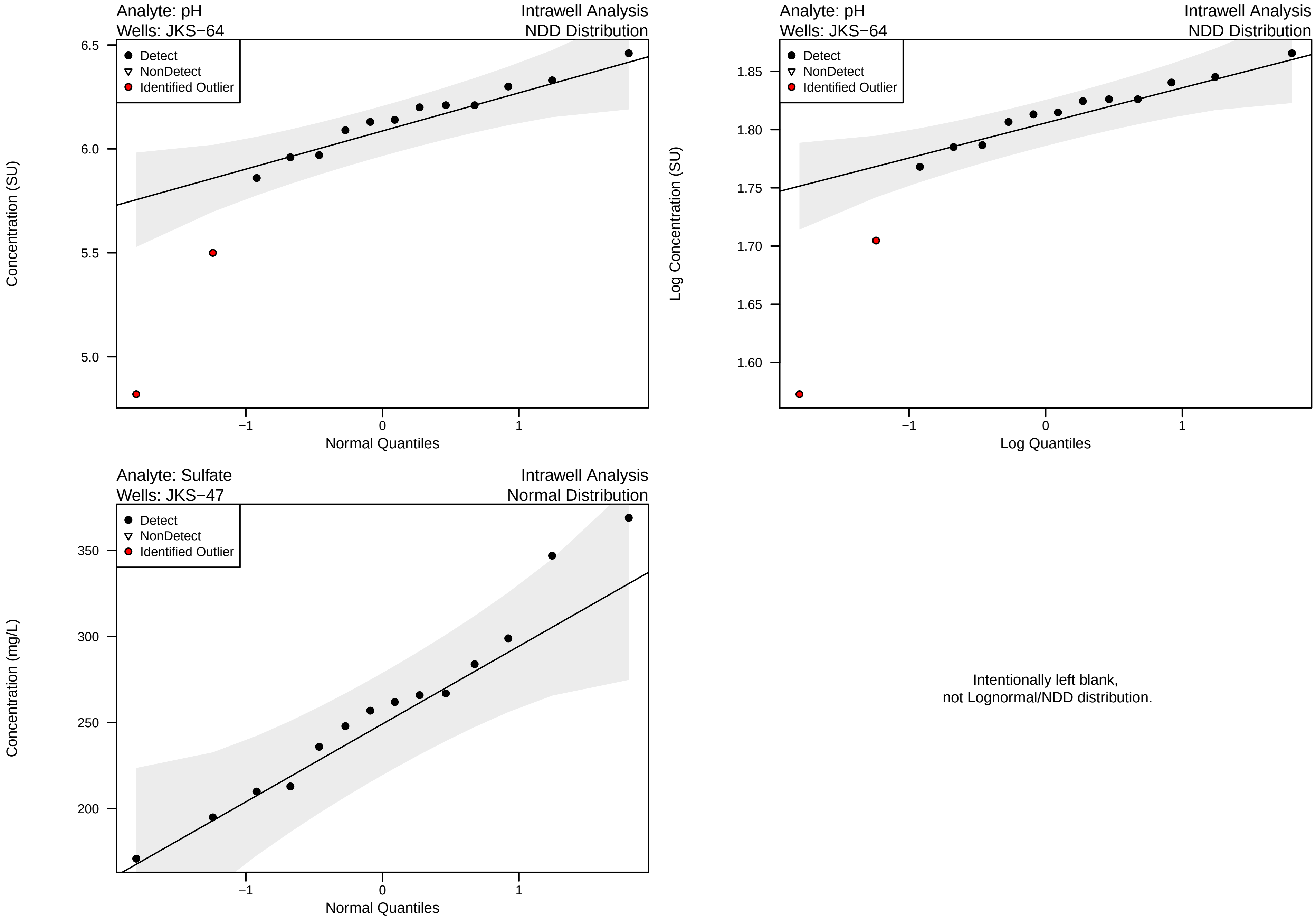
Analyte: Fluoride
Wells: JKS−47, JKS−63, JKS−64

Interwell Analysis
NDD Distribution

Appendix B − Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells

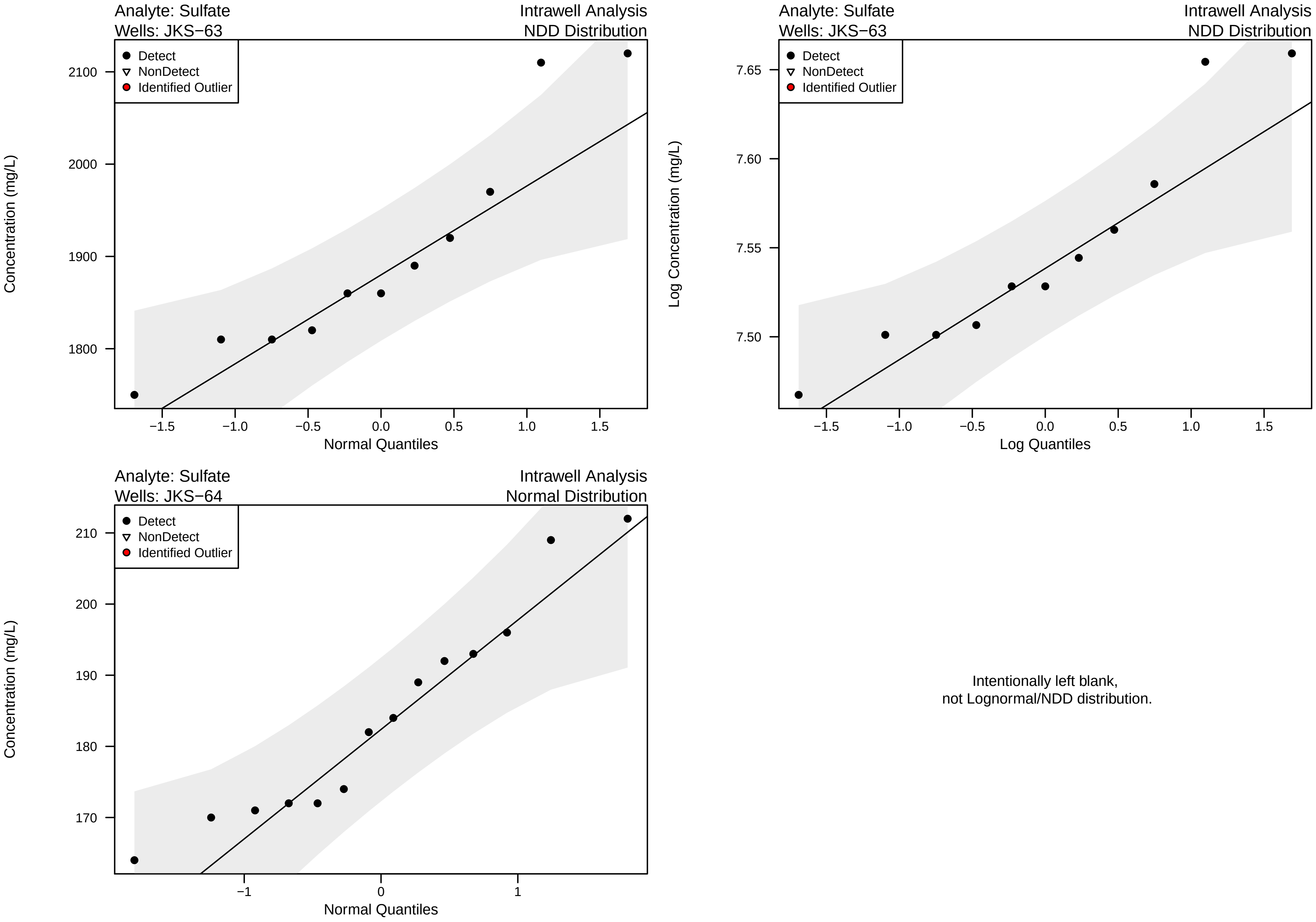


Appendix B − Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells



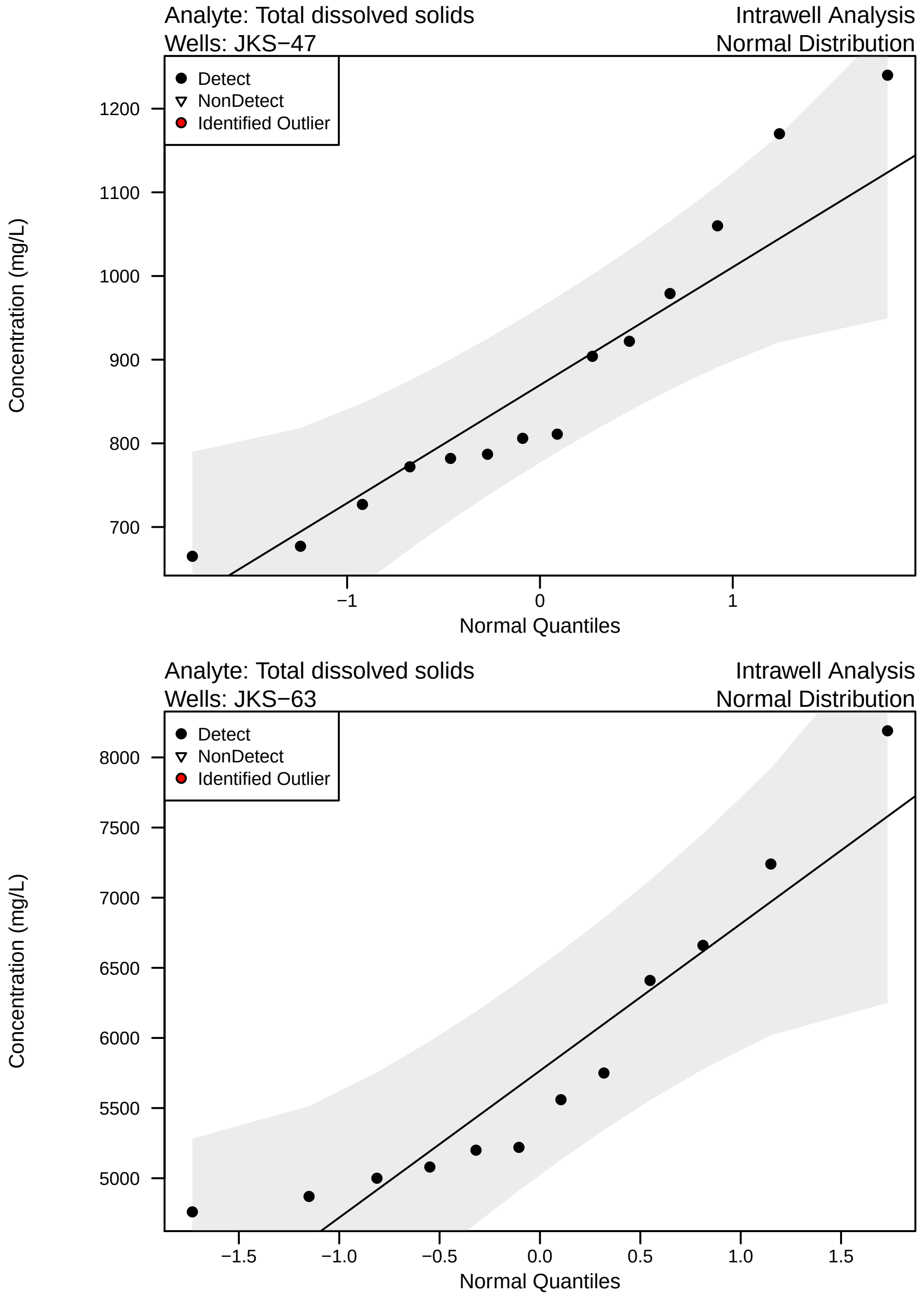
Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells



Intentionally left blank,
not Lognormal/NDD distribution.

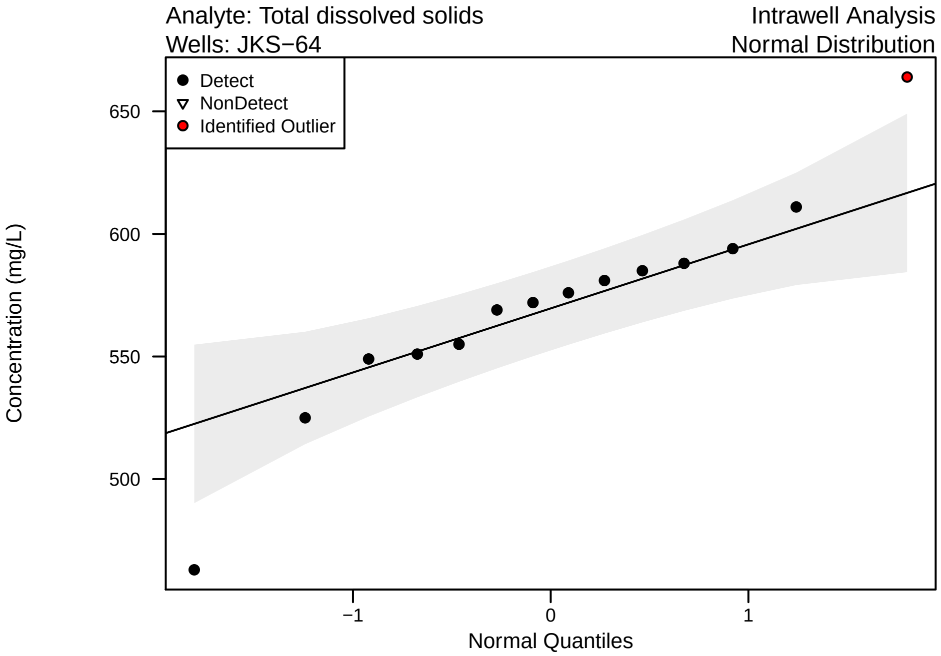
Appendix B − Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells



Intentionally left blank,
not Lognormal/NDD distribution.

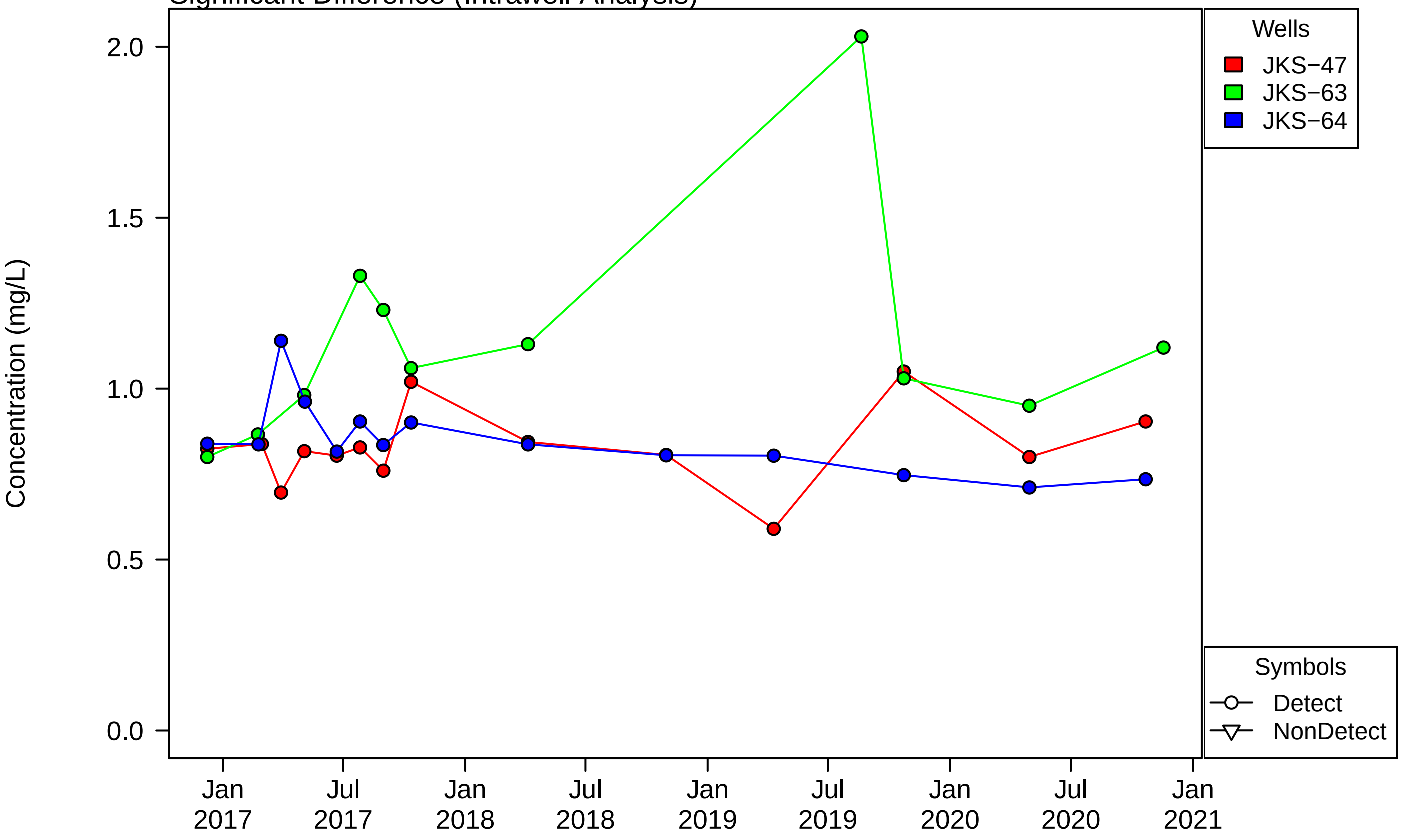
Intentionally left blank,
not Lognormal/NDD distribution.

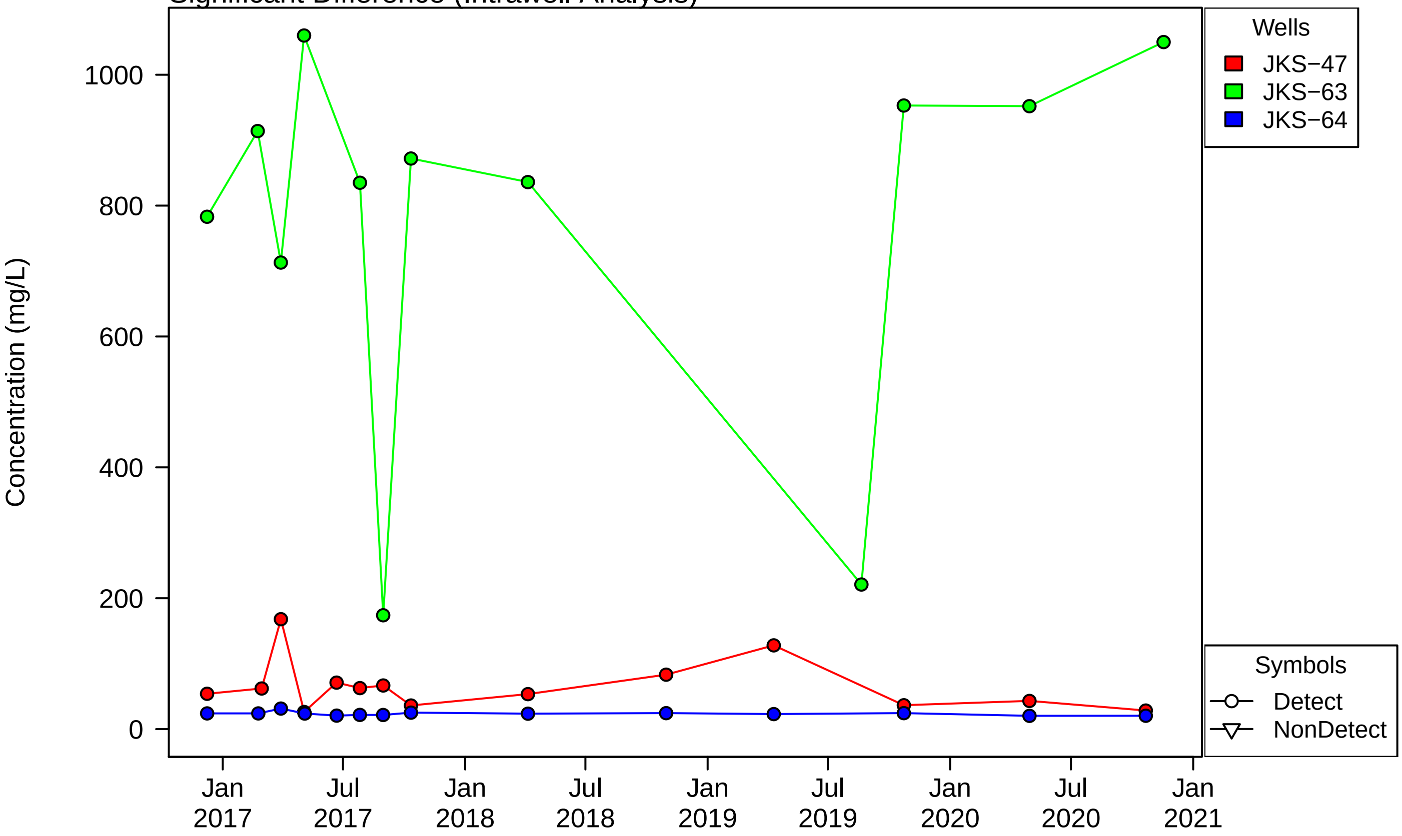
Appendix B − Figure 2
Unit: Evaporation Pond
QQ Plots of Upgradient Wells



Intentionally left blank,
not Lognormal/NDD distribution.

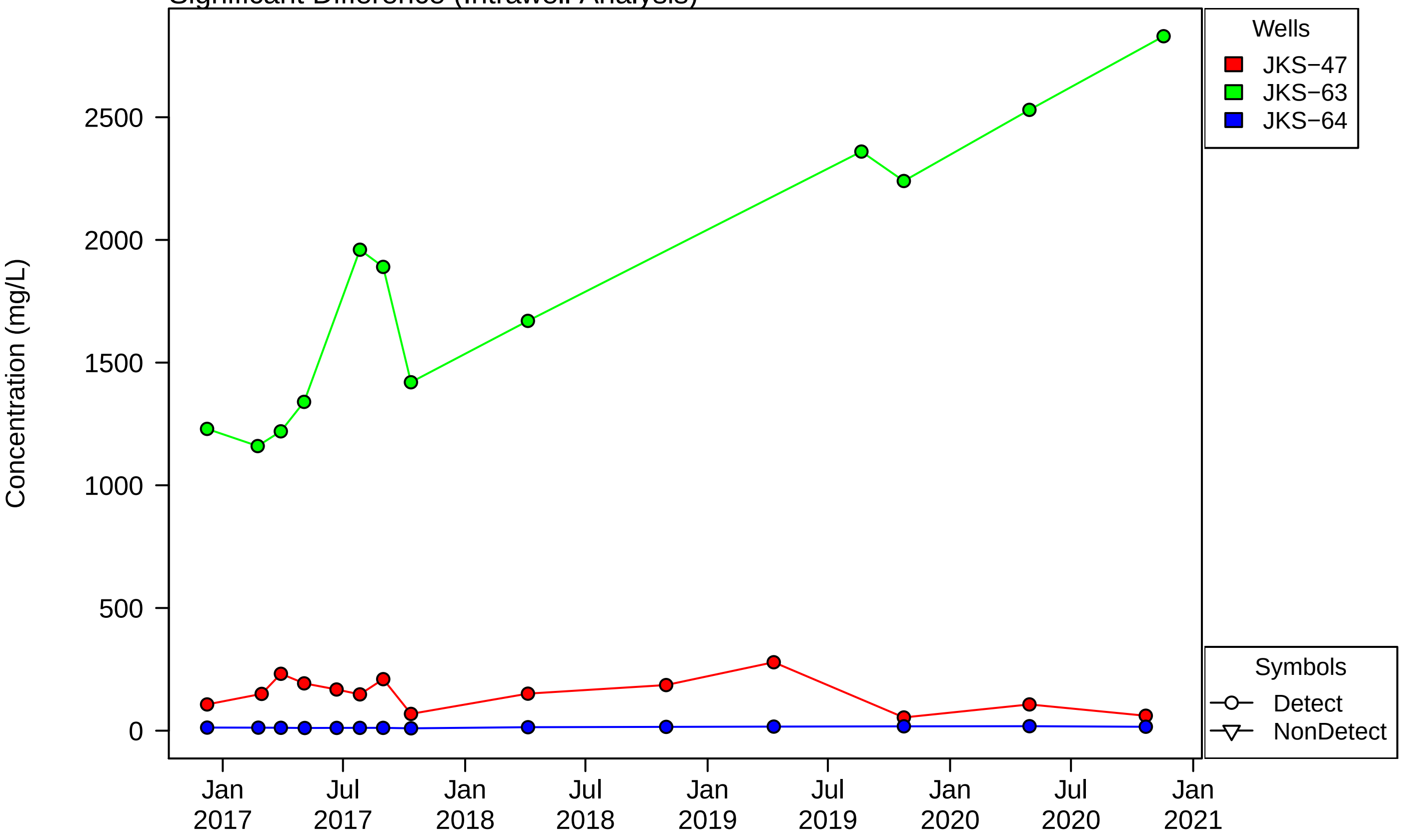
Appendix B − Figure 3
Unit: Evaporation Pond
Timeseries of Upgradient Wells


Chemical: Boron
Significant Difference (Intrawell Analysis)

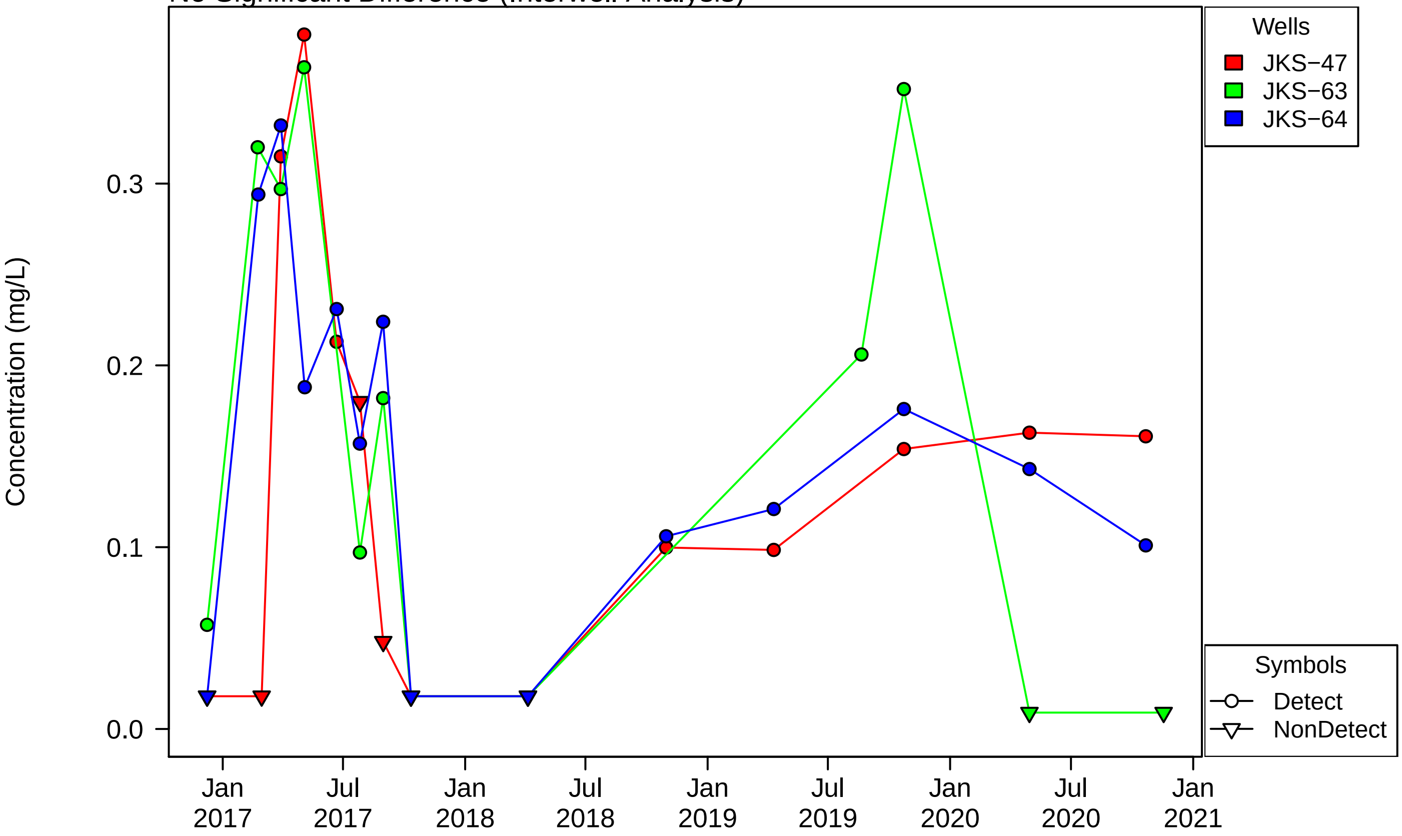

Chemical: Calcium
Significant Difference (Intrawell Analysis)

Appendix B − Figure 3
Unit: Evaporation Pond
Timeseries of Upgradient Wells

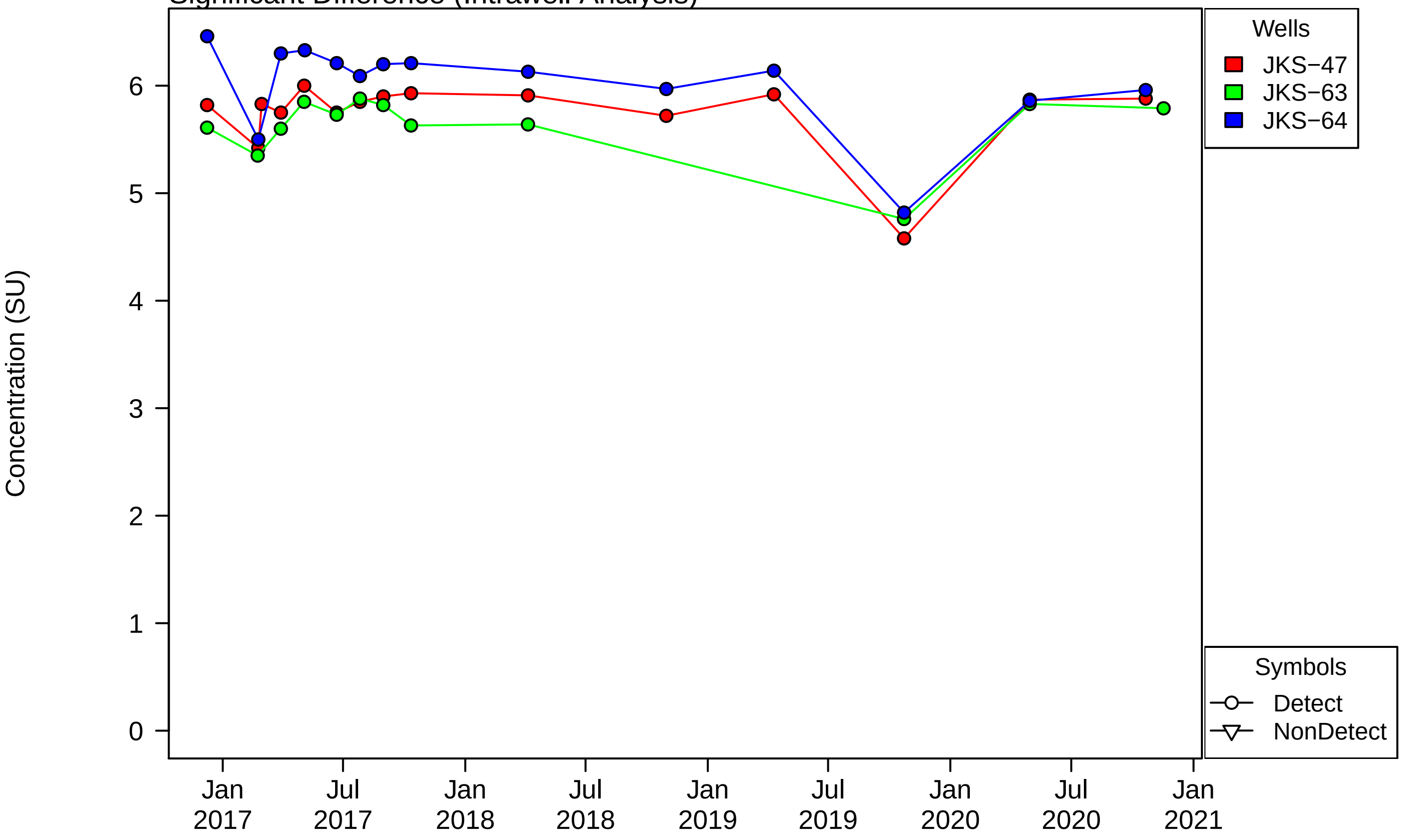
Chemical: Chloride
Significant Difference (Intrawell Analysis)

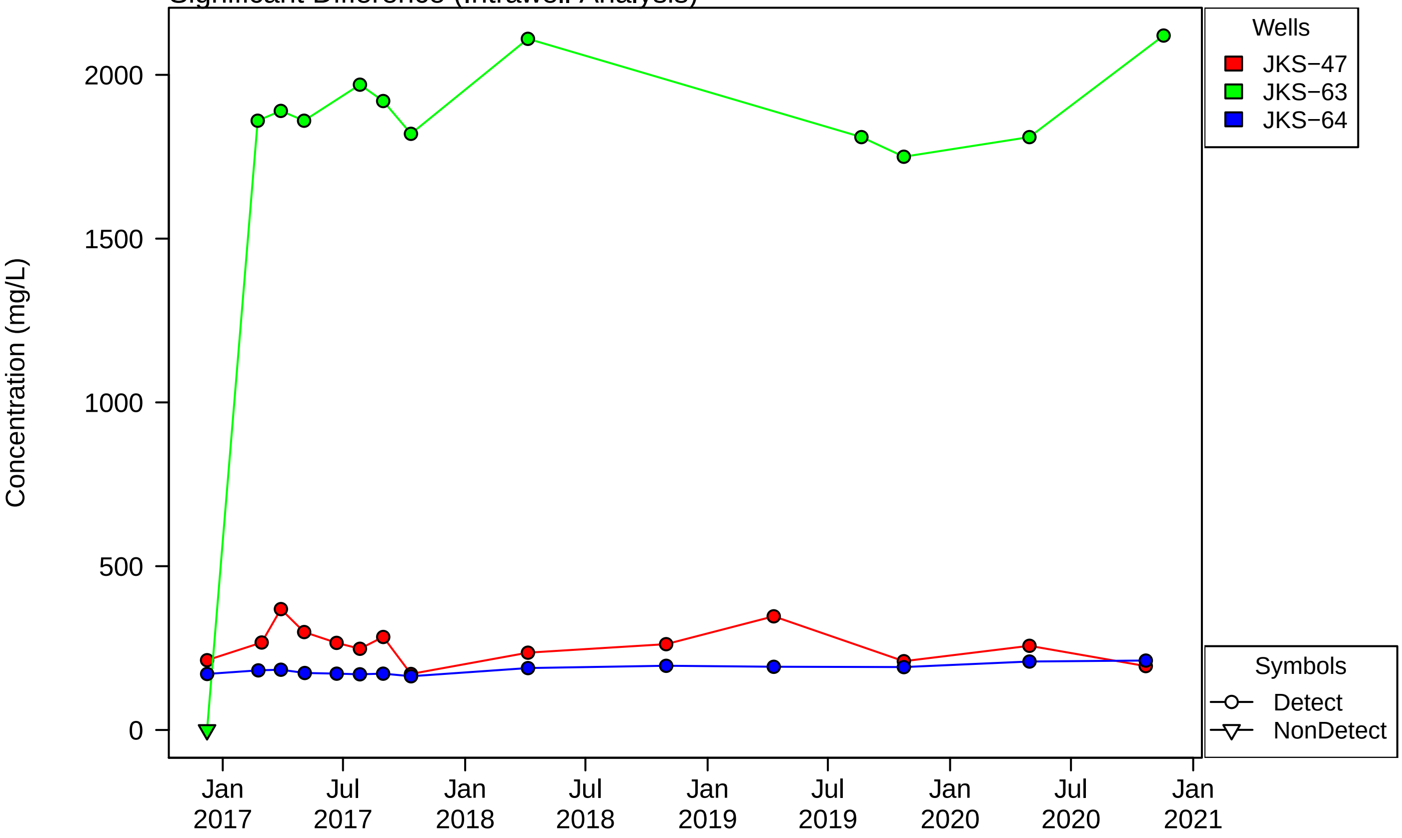


Chemical: Fluoride
No Significant Difference (Interwell Analysis)



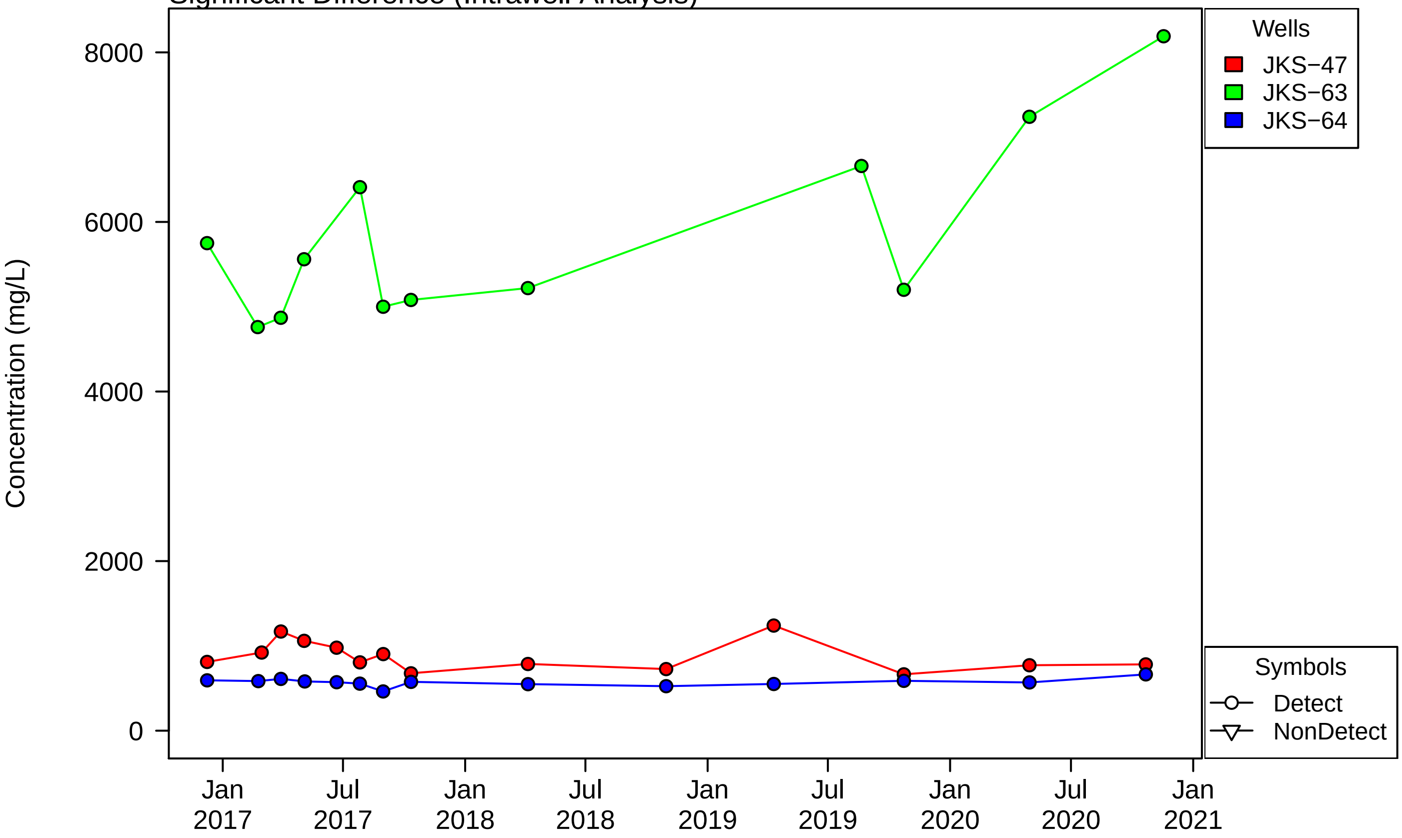
Appendix B − Figure 3
Unit: Evaporation Pond
Timeseries of Upgradient Wells


Chemical: pH
Significant Difference (Intrawell Analysis)

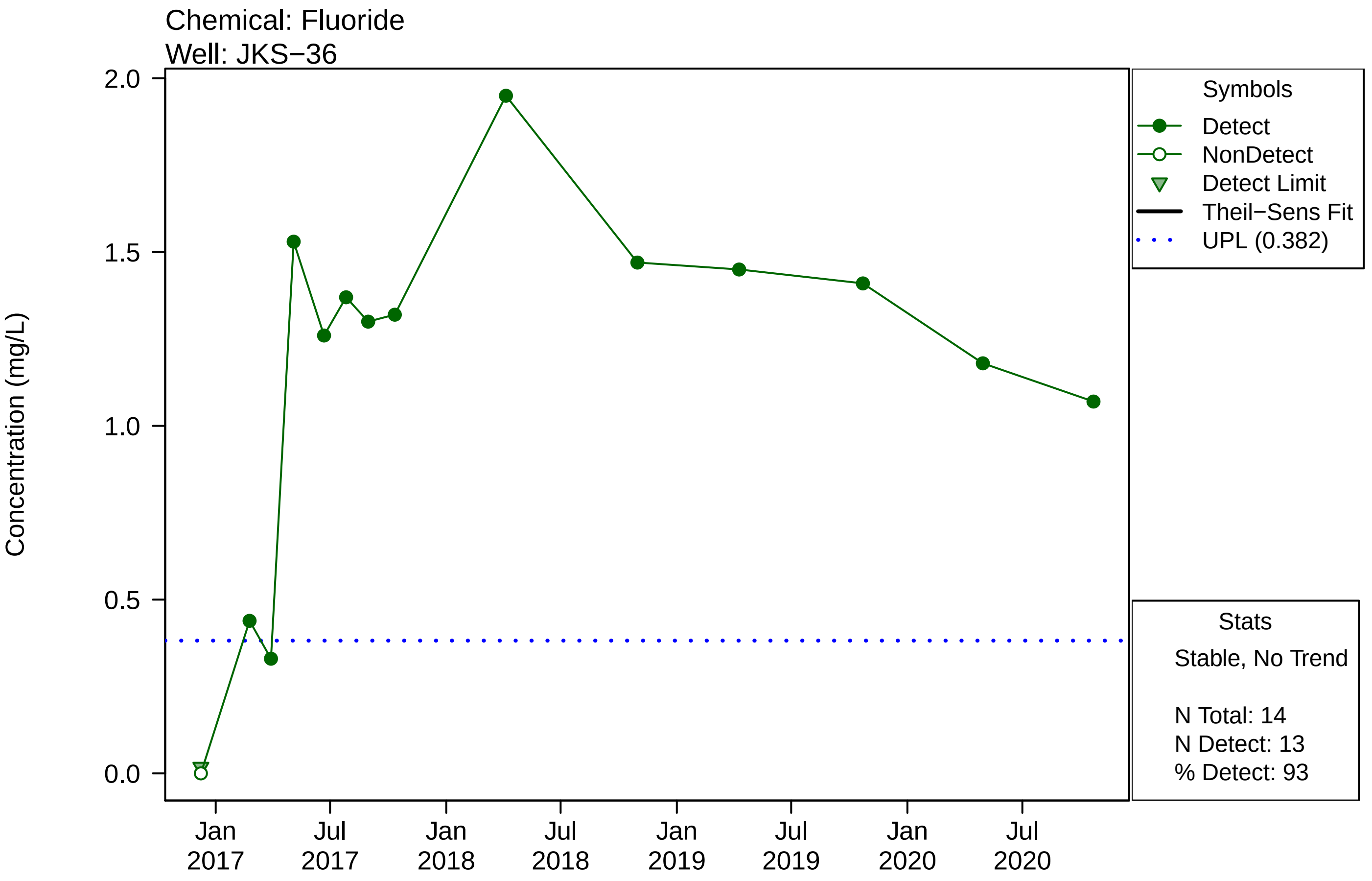

Chemical: Sulfate
Significant Difference (Intrawell Analysis)

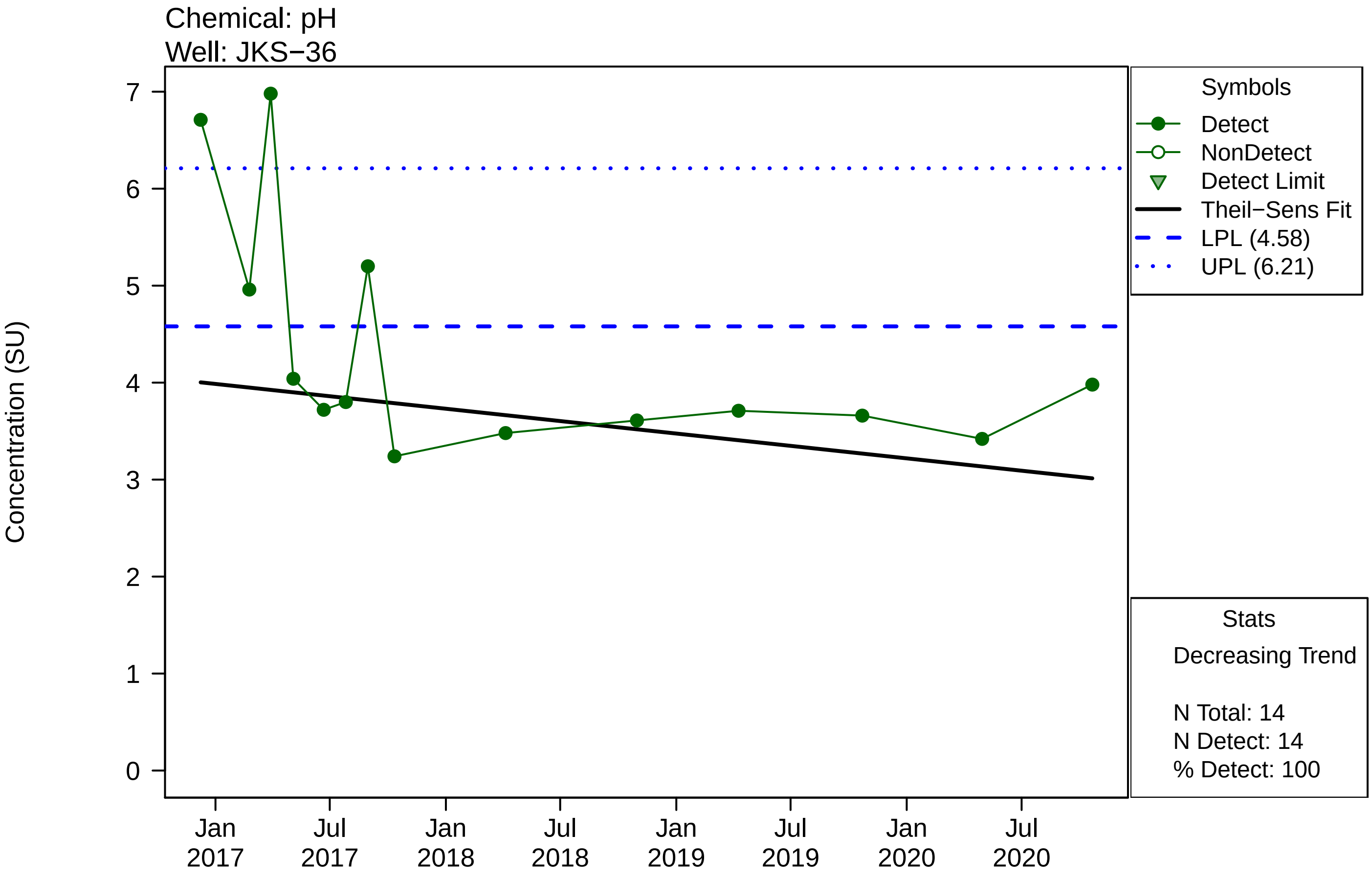
Appendix B − Figure 3
Unit: Evaporation Pond
Timeseries of Upgradient Wells

Chemical: Total dissolved solids
Significant Difference (Intrawell Analysis)

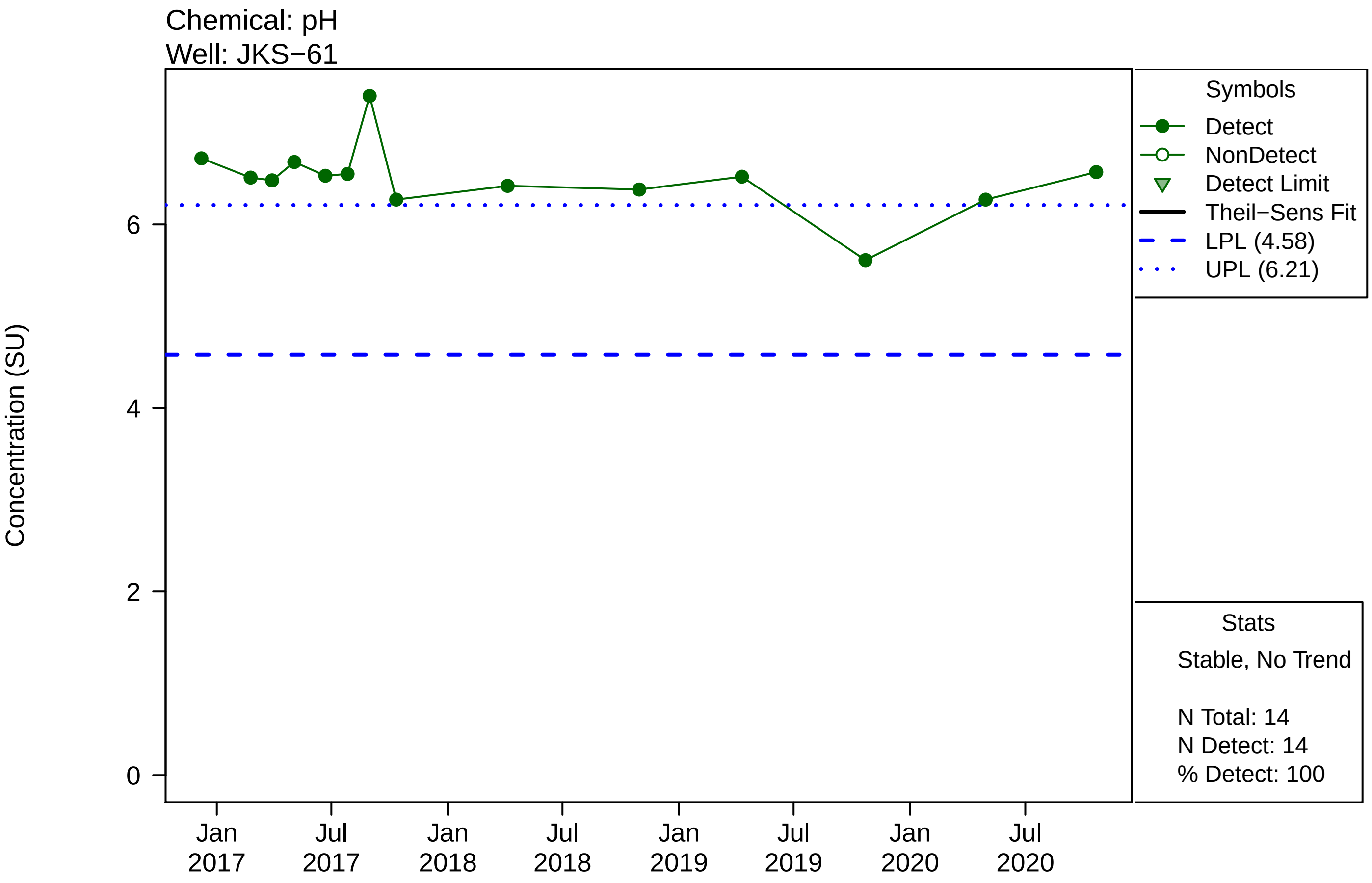


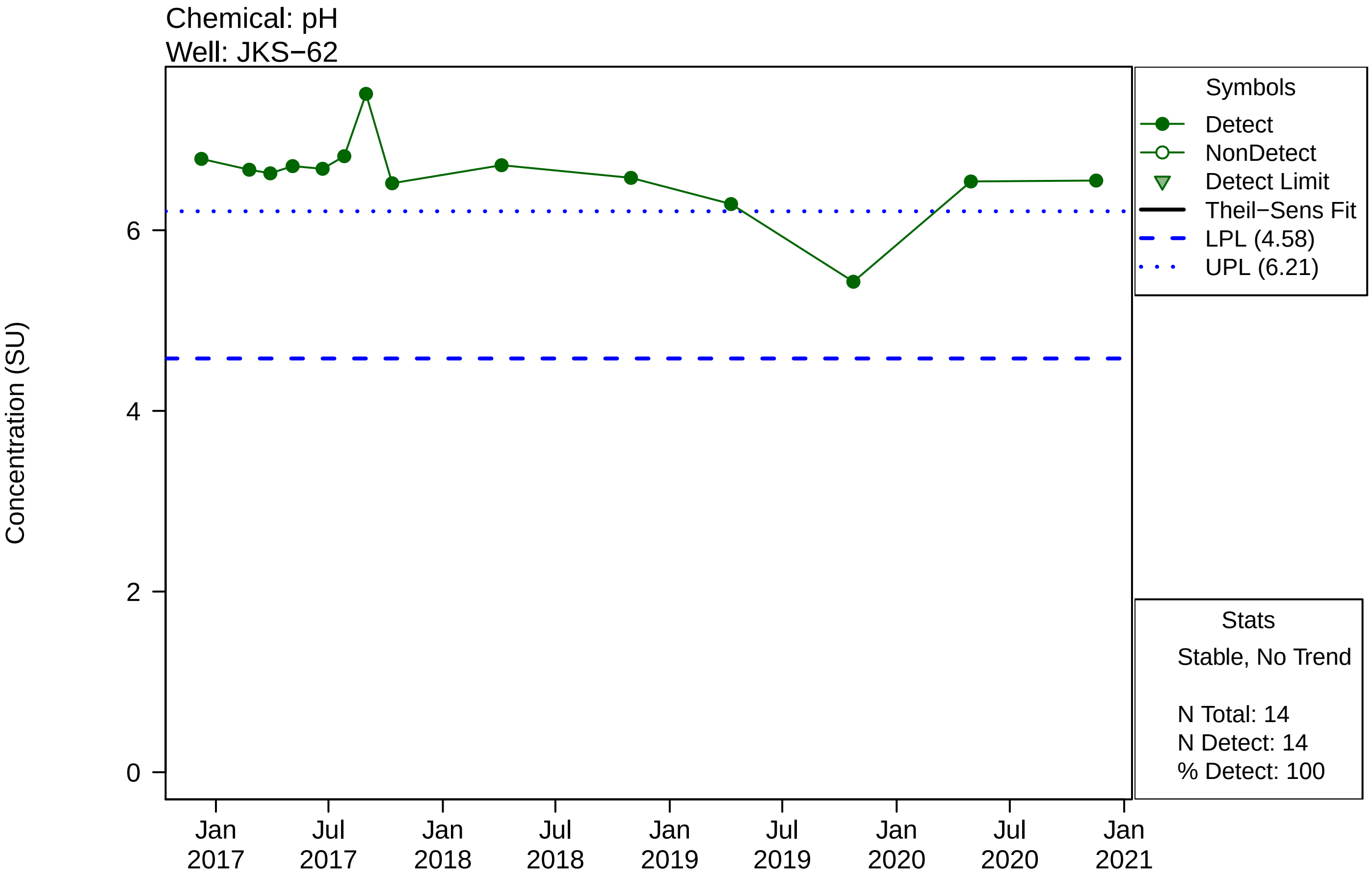
Appendix B − Figure 4
Unit: Evaporation Pond
Trend Analysis of Downgradient Wells with Exceedances


Chemical: Fluoride
Well: JKS−36

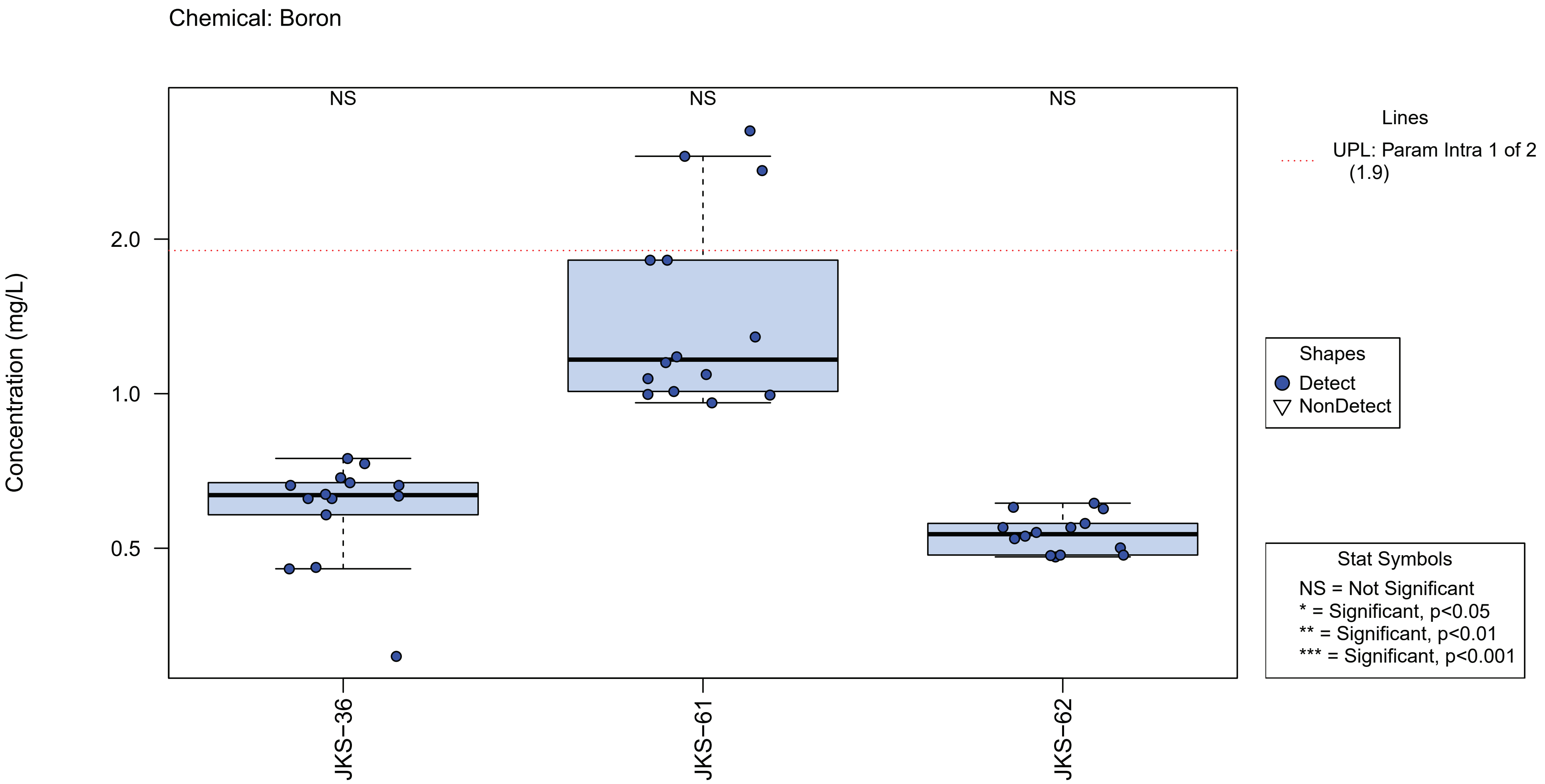

Chemical: pH
Well: JKS−36

Appendix B − Figure 4
Unit: Evaporation Pond
Trend Analysis of Downgradient Wells with Exceedances

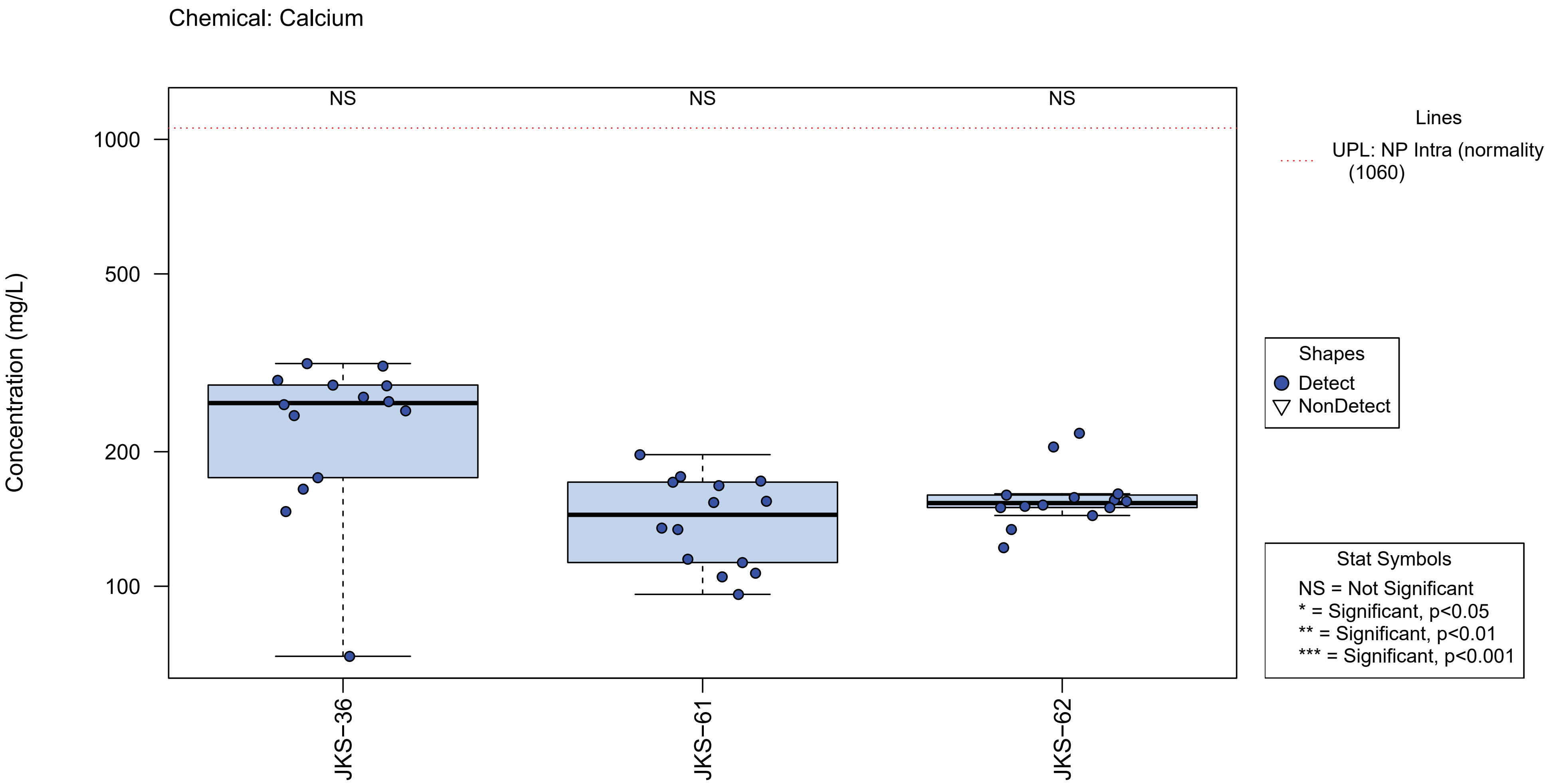




Appendix B - Figure 5
Unit: Evaporation Pond
Boxplots of Downgradient Wells

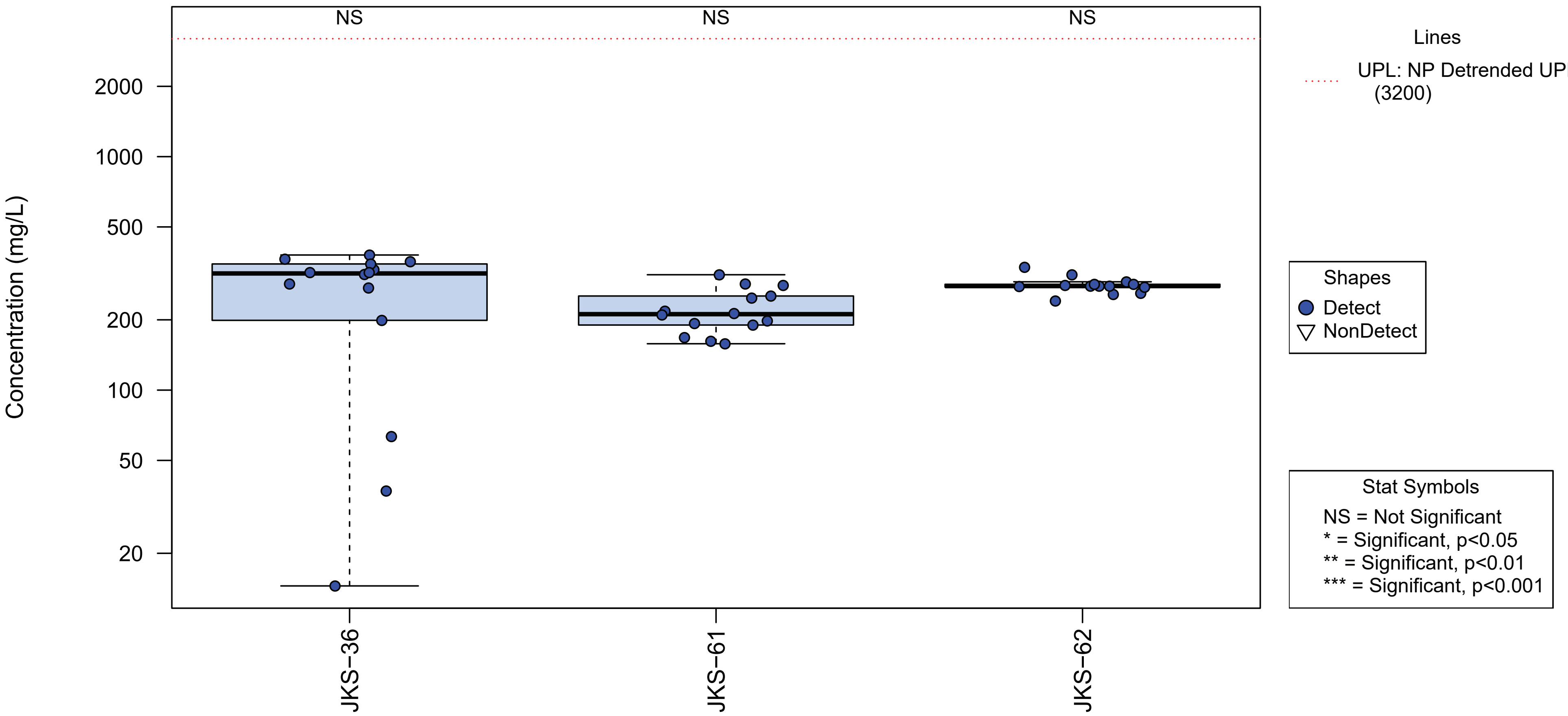


Appendix B - Figure 5
Unit: Evaporation Pond
Boxplots of Downgradient Wells

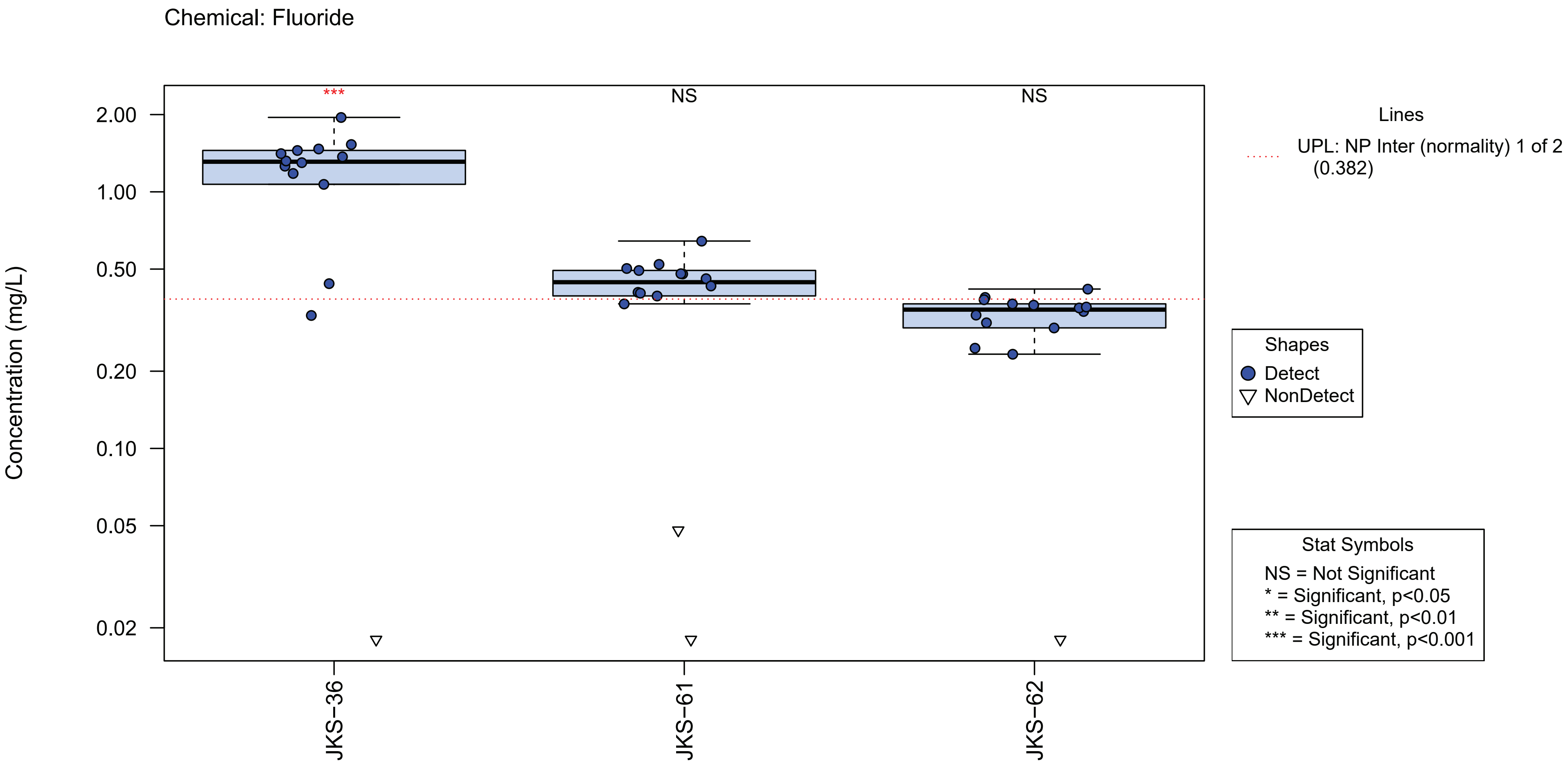


Appendix B - Figure 5
Unit: Evaporation Pond
Boxplots of Downgradient Wells

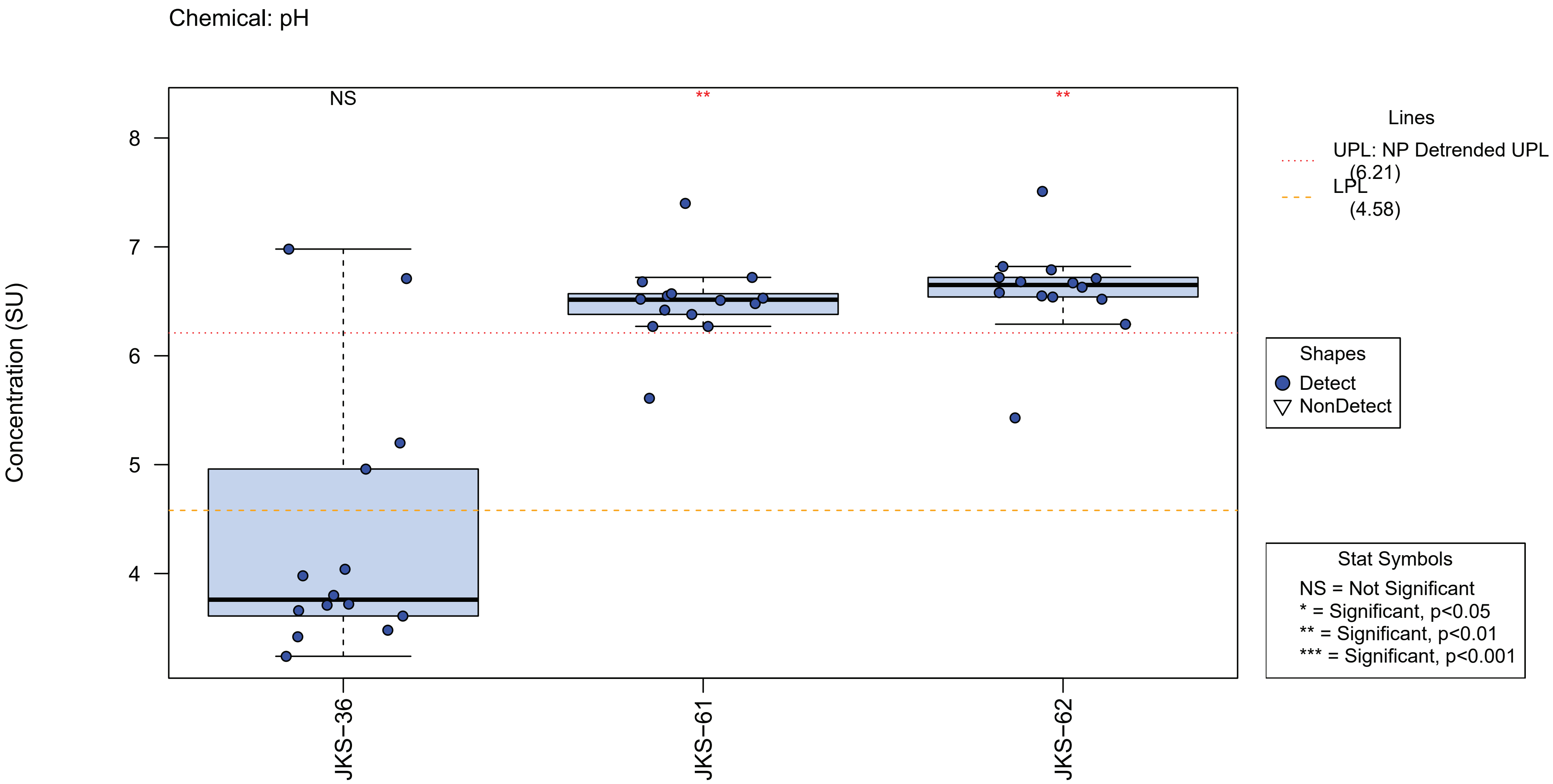
Chemical: Chloride



Appendix B - Figure 5
Unit: Evaporation Pond
Boxplots of Downgradient Wells

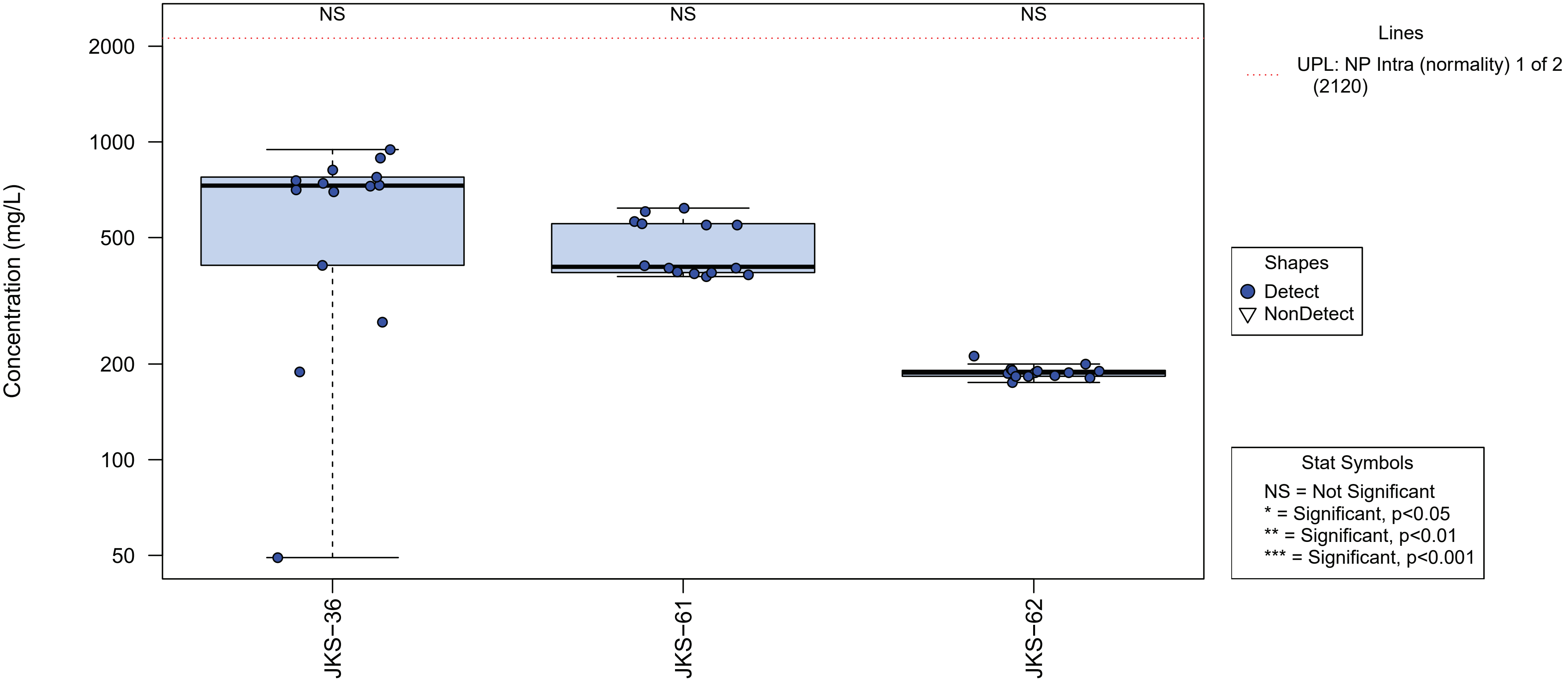


Appendix B - Figure 5
Unit: Evaporation Pond
Boxplots of Downgradient Wells

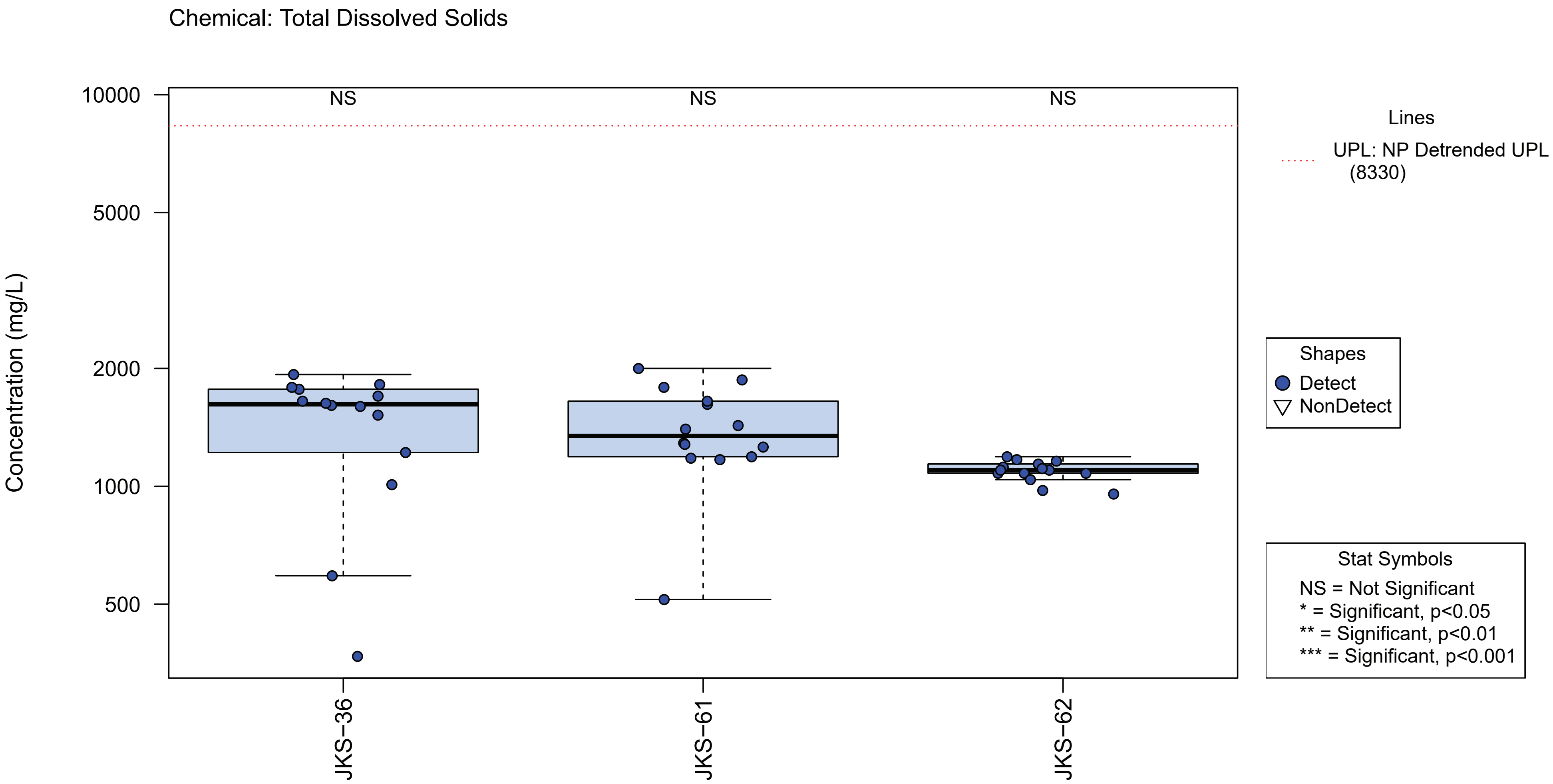


Appendix B - Figure 5
Unit: Evaporation Pond
Boxplots of Downgradient Wells

Chemical: Sulfate



Appendix B - Figure 5
Unit: Evaporation Pond
Boxplots of Downgradient Wells



April 2020 Groundwater Sampling Event – Calaveras Power Station CCR Units

Appendix C

ERM

CityCentre Four
840 West Sam Houston Parkway
North, Suite 600
Houston, Texas 77024-3920

Telephone: +281 600 1000
Fax: +281 520 4625

www.erm.com

September 25, 2020

Mr. Michael Malone
CPS Energy
145 Navarro Street
San Antonio, Texas 78205

Reference: Project No. 0503422\A10320

Subject: April 2020 Groundwater Sampling Event and August 2020 Resampling Event
Calaveras Power Station CCR Units
San Antonio, Texas

Dear Mr. Malone:

Introduction

Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the Coal Combustion Residual (CCR) Rule) was published in the Federal Register in April 2015 and became effective in October 2015. One of the many requirements of the CCR Rule was for CPS Energy to determine if there are impacts to groundwater from the surface impoundments [Evaporation Pond (EP), Bottom Ash Ponds (BAPs), and Sludge Recycling Holding (SRH) Pond] and the landfill [Fly Ash Landfill (FAL)] that contain CCR at the Calaveras Power Station.

In the initial *2017 Annual Groundwater Monitoring and Corrective Action Report* for each CCR unit, the downgradient monitoring well results from the October 2016 sampling event were compared to Upper Prediction Limits (UPLs) and Lower Prediction Limits (LPLs). UPLs and LPLs were calculated in the *Annual Groundwater Monitoring and Corrective Action Reports* for the purpose of determining a potential statistically significant increase (SSI) over background levels. In the subsequent *2018* and *2019 Annual Groundwater Monitoring and Corrective Action Reports* for each CCR unit, the downgradient monitoring well results from the October 2017 and October 2018 sampling events were compared to updated UPLs and LPLs. These updated UPLs and LPLs were recalculated in the respective *Annual Groundwater Monitoring and Corrective Action Reports* using the additional data collected from the previous year. The evaluations of the April and August 2020 groundwater sample results indicated a potential SSI for a limited number of constituents from the EP, FAL, BAPs, and SRH Pond.

According to the CCR Rule [§257.94(e)], if the owner or operator of a CCR unit determines there is a SSI over background levels for one or more Appendix III constituents, the owner or operator may demonstrate that a source other than the CCR unit caused the SSI over background levels or that the SSI resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality. The CCR Rule also indicates that the owner or operator must complete the written demonstration within 90 days of detecting a SSI over the background levels. If a successful demonstration is completed within the 90-day period, the owner or operator may continue with a detection monitoring program.

To address the potential SSIs identified in the previous three *Annual Groundwater Monitoring and Corrective Action Reports*, CPS Energy prepared three *Written Demonstrations – Responses to Potential Statistically Significant Increases* (dated April 4, 2018; February 27, 2019; and April 27, 2020; respectively). Based on the evidence provided in the *Written Demonstrations*, no SSIs over background levels were determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy continued with a detection monitoring program that would include semiannual sampling.

Sampling Events Summary

The first semiannual groundwater sampling event for 2020 was conducted on April 28 through April 29, 2020. The sampling event included the collection of water level measurements and groundwater samples from all the background and downgradient monitoring wells in the CCR monitoring program. Monitoring wells were gauged and then sampled by CPS Energy using low flow sampling techniques during the sampling event. The groundwater samples were analyzed for Appendix III constituents. A resampling event of JKS-54 only was conducted on August 24, 2020.

For each CCR unit, the downgradient monitoring well results from the April and August 2020 sampling events were compared to the updated UPLs and LPLs recalculated in their respective *2019 Annual Groundwater Monitoring and Corrective Action Report*. The April and August 2020 groundwater sample results for the downgradient monitoring wells in each CCR unit are summarized in Attachment 1.

Although the evaluations of the April and August 2020 groundwater sample results indicate a potential SSI for a limited number of constituents, with the exception of sulfate in JKS-54 associated with the SRH Pond, the constituents associated with the potential SSIs are the same constituents, detected at similar concentrations, which were previously identified in one or all of the *Written Demonstrations*. The evaluations of the April and August 2020 groundwater sample results with potential SSIs are summarized below.

EP – The constituents associated with potential SSIs include fluoride in JKS-36 and JKS-61; and pH in JKS-36 and JKS-62. As previously presented in the *Written Demonstrations*, the concentrations of fluoride and pH appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

FAL – The constituent associated with a potential SSI is pH in JKS-31 and JKS-46. As previously presented in the *Written Demonstrations*, the concentrations of pH appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

BAPs – The constituents associated with potential SSIs include boron in JKS-50R and JKS-56; and fluoride in JKS-52 and JKS-55. As previously presented in the *Written Demonstrations*, the concentrations of boron and fluoride appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

SRH Pond – The constituents associated with potential SSIs include fluoride in JKS-52 and JKS-54; and sulfate in JKS-54. As previously noted in the *April 2019 Groundwater Sampling Report*, the concentrations of fluoride appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit and the reported April 2020 concentrations are within the range of naturally occurring concentrations identified in the *Annual Groundwater Monitoring and Corrective Action Reports*. Although a potential SSI of sulfate was not previously presented in the *Written Demonstrations*, the concentrations of sulfate in JKS-54 appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. While the concentration reported in the April 2020 sampling event (443 mg/L) was the highest concentration reported in JKS-54, the concentration reported in the August 2020 resampling event (425 mg/L) is within the range of concentrations reported in upgradient monitoring well JKS-51 over the previous three sampling events (405 to 439 mg/L).

Conclusions

Based on the April and August 2020 groundwater sample results and the evidence provided in one or all of the *Written Demonstrations*, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy should continue with a detection monitoring program. The second semiannual sampling event should be performed in October 2020.

We appreciate the opportunity to work with you on this project. Please contact me if you should have any questions.

Sincerely,

Environmental Resources Management

Walter Zverina

Walter Zverina
Principal Consultant

ATTACHMENT 1 APRIL AND AUGUST 2020 GROUNDWATER SAMPLE RESULTS

September 2020
Project No. 0503422

April 2020 Groundwater Sample Results
CCR Unit: Evaporation Pond
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	EP	EP	EP	EP
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-36	JKS-61	JKS-61	JKS-62
			Sample Date	4/29/2020	4/29/2020	4/29/2020	4/29/2020
			Sample Type Code	N	N	FD	N
Constituent	Units	2019 LPL - EP	2019 UPL - EP				
Boron	mg/L	--	1.88	0.459	1.82	1.85	0.484
Calcium	mg/L	--	1,300	175	154	157	122
Chloride	mg/L	--	2,780	63.3	312	317	284
Fluoride	mg/L	--	0.382	1.18	0.494	0.549	0.331
pH, Field	SU	4.58	6.47	3.42	6.27	6.27	6.54
Sulfate	mg/L	--	2,110	189	604	608	190
Total dissolved solids	mg/L	--	6,660	1,790	1,870	1,870	1,100

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

April 2020 Groundwater Sample Results
CCR Unit: Fly Ash Landfill
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	FAL	FAL	FAL	FAL	FAL
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-31	JKS-33	JKS-46	JKS-46	JKS-60
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020
			Sample Type Code	N	N	N	FD	N
Constituent	Units	2019 LPL - FAL	2019 UPL - FAL					
Boron	mg/L	--	4.29	0.429	1.18	0.864	0.806	0.325
Calcium	mg/L	--	583	171 J	573 J	143 J	133 J	530 J
Chloride	mg/L	--	841	272	756	17.9	19.2	168
Fluoride	mg/L	--	4.86	1.00	1.68	1.61 J	2.44 J	0.188
pH, Field	SU	3.98	6.73	3.70	6.30	3.10	3.10	6.61
Sulfate	mg/L	--	7,630	877	1,620	1,180	1,240	1,280
Total dissolved solids	mg/L	--	11,900	1,890	4,370	1,970	1,780	3,180

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

April 2020 Groundwater Sample Results
CCR Unit: Bottom Ash Ponds
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	BAP	BAP	BAP	BAP	BAP	BAP
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-48	JKS-50R	JKS-52	JKS-52	JKS-55	JKS-56
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020
			Sample Type Code	N	N	N	FD	N	N
Constituent	Units	2019 LPL - BAP	2019 UPL - BAP						
Boron	mg/L	--	2.40	2.36	5.52	2.05	2.16	0.779	3.55
Calcium	mg/L	--	368	130 J	126 J	174 J	180 J	137 J	103 J
Chloride	mg/L	--	608	485	102	433	430	452	101
Fluoride	mg/L	--	0.847	0.051 JH	0.510	0.908	0.952	1.01	0.552
pH, Field	SU	5.48	7.31	6.89	6.65	6.83	6.83	6.81	6.72
Sulfate	mg/L	--	431	206	194	315	313	177	138
Total dissolved solids	mg/L	--	2,240	1,400	918	1,470	1,420	1,350	904

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

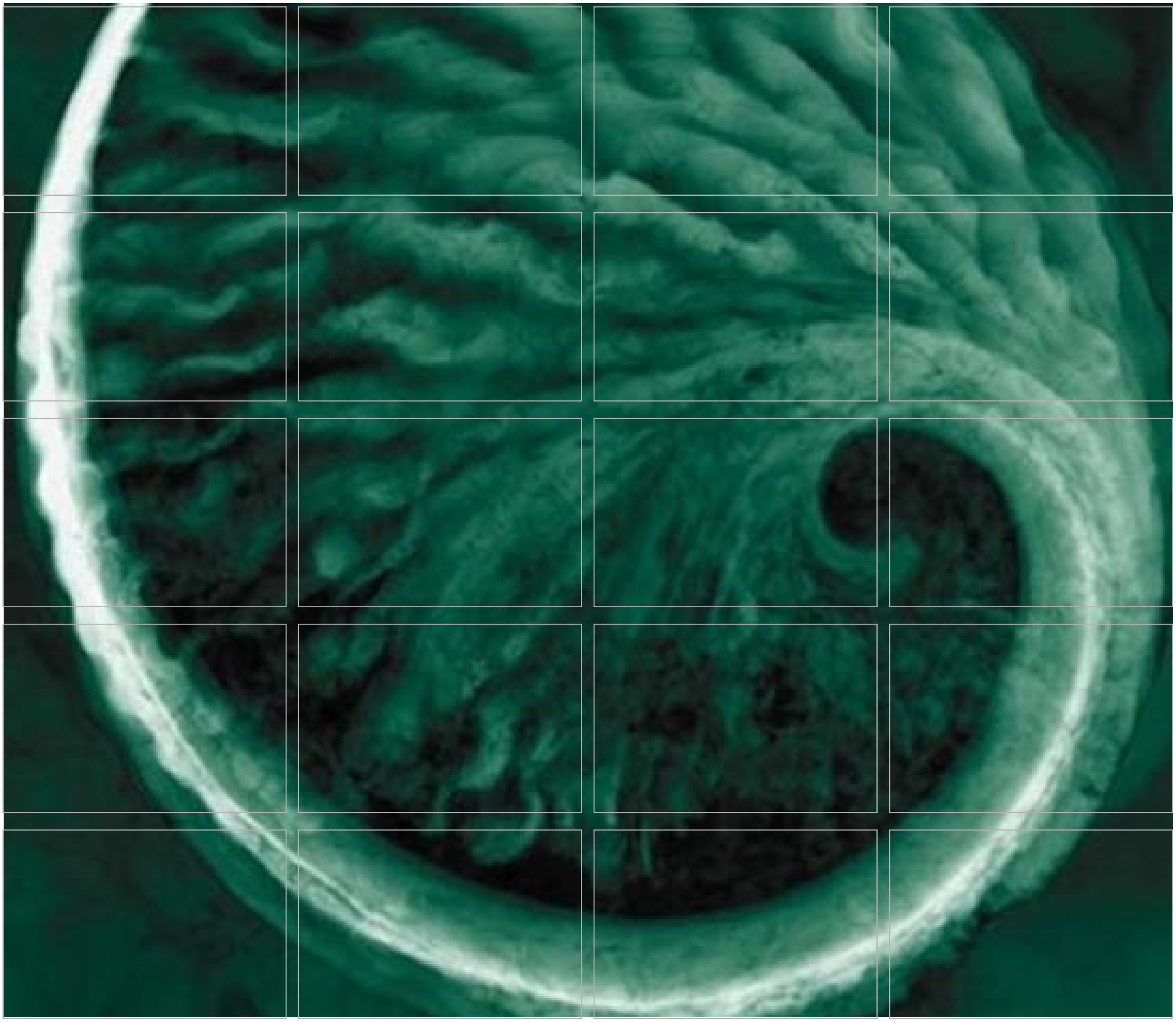
April and August 2020 Groundwater Sample Results
CCR Unit: SRH Pond
CPS Energy Calaveras Power Station
San Antonio, TX

CCR Unit				SRH Pond	SRH Pond	SRH Pond	SRH Pond	SRH Pond
Well Designation				Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Well ID				JKS-52	JKS-52	JKS-53	JKS-54	JKS-54
Sample Date				4/28/2020	4/28/2020	4/28/2020	4/28/2020	8/24/2020
Sample Type Code				N	FD	N	N	R
Constituent	Units	2019 LPL - SRH	2019 UPL - SRH					
Boron	mg/L	--	2.40	2.05	2.16	1.43	1.23	NA
Calcium	mg/L	--	357	174 J	180 J	114 J	118 J	NA
Chloride	mg/L	--	608	433	430	381	380	NA
Fluoride	mg/L	--	0.831	0.908	0.952	0.428	0.861	0.579
pH, Field	SU	5.48	7.31	6.83	6.83	6.67	6.76	NA
Sulfate	mg/L	--	421	315	313	244	443	425
Total dissolved solids	mg/L	--	2,180	1,470	1,420	1,160	1,570	NA

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate; R - Resample
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NA: Not analyzed for this constituent

Attachment 16-3



Annual Groundwater Monitoring and Corrective Action Report

CPS Energy
Calaveras Power Station – Fly Ash Landfill
San Antonio, Texas

January 2021

www.erm.com

ERM

The business of sustainability

Calaveras Power Station – Fly Ash Landfill

Annual Groundwater Monitoring and Corrective Action Report

January 2021

Project No. 0503422
San Antonio, Texas

Jeffery L. Bauguss, P.E.
Partner-in-Charge

Walter Zverina

Walter Zverina
Project Manager

Karen Fletcher
Senior Scientist

NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Nicholas Houtchens, P.G.
Senior Geologist

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, TX 78701
T: 512-459-4700

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

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1. *CURRENT STATUS SUMMARY*

As required in Title 40, Code of Federal Regulations, §257.90, this section provides an overview of the current status of the groundwater monitoring and corrective action program for the Fly Ash Landfill located at the CPS Energy Calaveras Power Station:

- At the start of the 2020 annual reporting period, the Fly Ash Landfill was operating under the detection monitoring program, as defined in §257.94;
- At the end of the 2020 annual reporting period, the Fly Ash Landfill was operating under the detection monitoring program, as defined in §257.94;
- At this time, there was no confirmed statistically significant increase over background for one or more constituents listed in Appendix III pursuant to §257.94(e);
- An assessment monitoring program was not required or initiated for the Fly Ash Landfill;
- A remedy was not required or selected pursuant to §257.97 during the 2020 annual reporting period; and
- No remedial activities were initiated or are ongoing pursuant to §257.98 during the 2020 annual reporting period.

2. *INTRODUCTION*

CPS Energy owns and operates the Calaveras Power Station which consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the CCR Rule). The Power Station is located in unincorporated Bexar County, Texas, approximately 13 miles southeast of San Antonio. Currently, CPS Energy operates three CCR units at the Power Station: Evaporation Pond, Fly Ash Landfill, and the Sludge Recycle Holding (SRH) Pond. This *Annual Groundwater Monitoring and Corrective Action Report* (Report) only addresses the Fly Ash Landfill.

This Report was produced by Environmental Resource Management (ERM), on behalf of CPS Energy, and summarizes the groundwater monitoring activities for the Fly Ash Landfill and provides a statistical summary of the findings for samples collected during the 2020 semi-annual monitoring events. Consistent with the requirements of the CCR Rule, this Report will be posted to the facility's operating record and notification will be made to the State of Texas. Additionally, this Report will be placed on the CPS Energy publically accessible internet site. Unless otherwise mentioned, the analyses in this Report follow the *Groundwater Sampling and Analysis Program* (SAP) (ERM, 2017) posted on the internet site. The table below cross references the reporting requirements under the CCR Rule with the contents of this Report.

Regulatory Requirement Cross-Reference

Regulatory Citation	Requirement (paraphrased)	Where Addressed in this Report
§257.90(e)	Status of the groundwater monitoring and corrective action program	Sections 1 and 3
§257.90(e)	Summarize key actions completed	Section 3
§257.90(e)	Describe any problems encountered and actions to resolve problems	Section 3
§257.90(e)	Key activities for upcoming year	Section 5
§257.90(e)(1)	Map or aerial image of CCR unit and monitoring wells	Figure 1
§257.90(e)(2)	Identification of new monitoring wells installed or decommissioned during the preceding year	Section 3
§257.90(e)(3)	Summary of groundwater data, monitoring wells and dates sampled, and whether sample was required under detection or assessment monitoring	Sections 3 and 4, Tables 1 through 3, and Figure 2
§257.90(e)(4)	Narrative discussion of any transition between monitoring programs	Section 5

The Fly Ash Landfill is located northeast of the Power Station generating units and is north of the Evaporation Pond. The Fly Ash Landfill currently receives fly ash, bottom ash, economizer ash, scrubber sludge from flue gas desulphurization ponds, and flue gas desulphurization gypsum. The Fly Ash Landfill was constructed in 1992. The CCR unit location is shown on Figure 1.

3. PROGRAM STATUS

From December 2016 to October 2017, groundwater samples were collected as part of background sampling. After October 2017, groundwater samples were collected as part of detection monitoring. The samples were collected from the groundwater monitoring well network certified for use in determining compliance with the CCR Rule.

The groundwater monitoring well network consists of two upgradient monitoring wells (JKS-45 and JKS-57) and four downgradient monitoring wells (JKS-31, JKS-33, JKS-46, and JKS-60). All monitoring wells are screened within the uppermost groundwater bearing unit (GWBU). The uppermost GWBU is approximately 5 to over 25 feet thick and is comprised of clayey/silty sand to well-sorted sand. The uppermost GWBU is located below unconsolidated material (i.e., sands, silts, and low to medium plasticity clays), and above a high plasticity clay (lower confining unit).

The monitoring well locations are shown in Figure 1. No problems were encountered in the data collection or in well performance, and no action was required to resolve any issues. No new monitoring wells were installed or decommissioned after the certification of the well network.

3.1. GROUNDWATER FLOW RATE AND DIRECTION

Depth to groundwater surface measurements were made at each monitoring well prior to sampling. Groundwater elevations were calculated by subtracting the depth to groundwater measurement from the surveyed reference elevation for each well.

Groundwater elevations collected during the monitoring events are summarized in Table 1. Groundwater elevations and the potentiometric surface for the April and October 2020 monitoring events are shown on Figure 2A and Figure 2B, respectively. For both sampling events, groundwater in the vicinity of the Fly Ash Landfill appears to flow radially to the northwest, northeast, and east from a potentiometric high located at JKS-45. The horizontal gradient is approximately 0.009 feet/foot and 0.013 feet/foot for the April and October 2020 monitoring events, respectively. A non-proportional change in water levels was observed at JKS-57 during the 2020 monitoring events. The potentiometric surface elevations will continue to be monitored and a water level study will be initiated in 2021.

3.2. SAMPLING SUMMARY

A summary of the total number of samples collected from each monitoring well is provided in Table 2. Groundwater analytical results from the monitoring events are summarized in Table 3. Laboratory data packages are provided in Appendix A.

The Fly Ash Landfill monitoring wells were sampled by CPS Energy using low flow sampling techniques during the monitoring events. No data gaps were identified during the 2020 semi-annual groundwater monitoring events.

3.3. DATA QUALITY

ERM reviewed field and laboratory documentation to assess the validity, reliability and usability of the analytical results. Samples were sent to San Antonio Testing Laboratory, located in San Antonio, Texas for analysis. Data quality information reviewed for these results included field sampling forms, chain-of-custody documentation, holding times, lab methods, cooler temperatures, laboratory method blanks, laboratory control sample recoveries, field duplicate samples, matrix spikes/matrix spike duplicates, quantitation limits, and equipment blanks. A summary of the data qualifiers are included in Table 3. The data quality review found the results to be valid, reliable, and useable for decision making purposes with the listed qualifiers. No analytical results were rejected.

4. STATISTICAL ANALYSIS AND RESULTS

Consistent with the CCR Rule and the SAP, a prediction limit approach [40 CFR §257.93(f)] was used to identify potential impacts to groundwater. Tables and figures generated as part of the statistical analysis are provided in Appendix B. The steps outlined in the decision framework in the SAP include:

- Interwell versus intrawell comparisons;
- Establishment of upgradient dataset;
- Calculation of prediction limits; and
- Conclusions.

The remaining sections of this Report are focused on evaluation of the October 2020 sampling results. Note the April 2020 sampling results were evaluated as discussed in the *April 2020 Groundwater Sampling Event – Calaveras Power Station CCR Units* (ERM, 2020) provided in Appendix C.

4.1. INTERWELL VERSUS INTRAWELL COMPARISONS

When multiple upgradient wells were available within the same unit, concentrations were compared among these wells to determine if they could be pooled to create a single, interwell, upgradient dataset. For each analyte, Boxplots (Appendix B, Figure 1) and Kruskal-Wallis test results (Appendix B, Table 1) are provided for upgradient wells. The statistical test shows that:

- One Appendix III analyte [chloride] will follow interwell analysis, with no significant differences present in upgradient data; and
- The remaining six Appendix III analytes [boron, calcium, fluoride, pH, sulfate, and total dissolved solids (TDS)] will follow intrawell analysis, with significant differences present in upgradient data.

Interwell analytes will use a pooled upgradient dataset for subsequent report sections. Conversely, intrawell analytes will have each individual upgradient dataset used for subsequent report sections.

4.2. ESTABLISHMENT OF UPGRADIENT DATASET

When evaluating the concentrations of analytes in groundwater, USEPA Unified Guidance (2009) recommends performing a careful quality check of the data to identify any anomalies. In addition to the data validation that was performed, descriptive statistics, outlier testing, and temporal stationarity checks were completed to finalize the upgradient dataset.

4.2.1. Descriptive Statistics

Descriptive statistics were calculated for the upgradient wells and analytes at the Fly Ash Landfill (Appendix B, Table 2). The descriptive statistics highlight a number of relevant characteristics about the upgradient datasets including:

- There are a total of 13 well-analyte combinations for the upgradient dataset;
- 13 well-analyte combinations have detection rates greater than or equal to 50 percent;
- 11 well-analyte combinations have 100 percent detects;
- Five well-analyte combinations follow a normal distribution (using Shapiro-Wilks Normality Test);
- One well-analyte combination follows a log-normal distribution; and
- Seven well-analyte combinations have no discernible distribution.

4.2.2. Outlier Determination

Both statistical and visual outlier tests were performed on the upgradient datasets. Data points identified as both a statistical and visual outliers (Appendix B, Table 3 and Appendix B, Figure 2) were reviewed before they were excluded from the dataset. A total of eleven potential outliers were initially flagged in the upgradient datasets. After review, it was determined that eight of the eleven values were consistent with seasonal fluctuations and concentrations detected in other upgradient wells or in historical groundwater sampling results. No analytical or sampling issues were identified for eight potential outliers during data review; therefore, the eight values were considered valid and were retained for upper prediction limit (UPL) calculations.

The three values excluded as outliers were chloride samples at JKS-57 with concentrations exceeding 3,000 mg/L. Historically, samples both at JKS-57 and the other pooled upgradient well were consistently less than 1,000 mg/L. These elevated chloride concentrations in JKS-57 have been noted and will be closely monitored in 2021.

4.2.3. *Check for Temporal Stability*

A trend test was performed for all values in the upgradient wells that had at least eight detected data points and at least 50 percent detection rate. Time series figures of upgradient wells are provided in Appendix B, Figure 3. Additionally, the Mann Kendall trend test results are provided in Appendix B, Table 4. The following summarize the results of the trend analysis:

- There are a total of 13 well-analyte combinations in the upgradient dataset;
- 13 well-analyte combinations meet the data requirements of the trend test of which:
    - Four well-analyte combinations had an increasing trend; and
    - Nine well-analyte combinations had no trend (i.e., concentrations were stable over time).

4.3. CALCULATION OF PREDICTION LIMITS

A multi-part assessment of the monitoring wells was performed to determine what type of UPL to calculate as a compliance point. A decision framework was applied for each upgradient well based on inter/intrawell analysis, data availability, and presence of temporal trends.

A total of four well-analyte combinations were found to have either increasing or decreasing trends. For these well-analyte combinations, a bootstrapped UPL calculated around a Theil Sen trend was used to derive a more accurate UPL. The remaining nine well-analyte combinations were found to have no trend. Sanitas was used to calculate static UPLs using an annual site-wide false positive rate of 0.1 with a 1-of-2 re-testing approach.

A final UPL was selected for each analyte and compared to the October 2020 sampling results in the downgradient wells. A final lower prediction limit (LPL) was also selected for pH. For the one analyte following interwell analysis, the upgradient dataset was pooled prior to UPL calculations, resulting in a single UPL value per analyte. For the six analytes following intrawell analysis, a UPL value was calculated for each of the upgradient wells. For these wells and analytes, the maximum UPL was selected as the representative UPL for each analyte. A similar approach was used to determine the LPL for pH; however, the minimum LPL was selected in the case of intrawell analysis. All final UPL and LPL values are shown in the table below. Full upgradient well calculations are provided in Appendix B, Table 5.

Final UPL and LPL Values

Analysis Type	Analyte	LPL	UPL	Unit
Intrawell	Boron	--	5.97	mg/L
Intrawell	Calcium	--	673	mg/L
Interwell	Chloride	--	841	mg/L
Intrawell	Fluoride	--	4.29	mg/L
Intrawell	pH	3.98	6.73	SU
Intrawell	Sulfate	--	9,320	mg/L
Intrawell	TDS	--	15,900	mg/L

4.4. CONCLUSIONS

The downgradient samples collected during the October 2020 monitoring event were used for compliance comparisons. All downgradient wells were less than the UPLs and greater than the LPLs for pH with the following exceptions shown in the table below. All downgradient wells with initial exceedances were examined for trends to assess the stability of concentrations. A summary of these trend test results are provided in Appendix B, Figure 4.

Downgradient UPL Exceedances

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
pH	JKS-31	3.98	6.73	2020-10-20	3.68	SU
pH	JKS-46	3.98	6.73	2020-10-20	3.01	SU

Additionally, each downgradient well-analyte pair had a Wilcoxon Rank Sum test comparing if their median is greater than the UPL or less than the LPL for pH. This nonparametric, rank-based test was used as an additional line of evidence for downgradient well compliance. Specific well-analyte pairs are of interest if: (1) there is a recent exceedance of the UPL, but historic concentrations place the median less than the UPL, or (2) there is not a recent exceedance of the UPL, but historic concentrations place the median greater than the UPL. All downgradient wells had medians less than the UPLs and greater than the LPLs for pH with the following exceptions shown in the table below. Full downgradient results are provided in Appendix B, Table 6, with boxplots in Appendix B, Figure 5.

Downgradient Median Exceedances

Analyte	Well
pH	JKS-46

All initial exceedances of the UPL may be confirmed with re-testing of the downgradient wells per the 1-of-2 re-testing scheme. If the initial exceedance is confirmed with re-testing results from the same well, and if the well-analyte combination median is greater than the UPL, the well-analyte combination will be declared a statistically significant increase (SSI) above background. Any wells with re-testing results at or less than the UPL will be considered in compliance and will not require further action. Any resampling results will be reported in the subsequent *Written Demonstration.*

5. RECOMMENDATIONS

Currently, there are no plans to transition from detection monitoring to assessment monitoring. Consistent with the 1-of-2 re-testing approach described in the Unified Guidance and the SAP, initial exceedances may be re-tested within 90 days. Based on these re-testing results, if an SSI is found, a notification or *Written Demonstration* will be prepared within 90 days. Based on the findings of the *Written Demonstration*, detection monitoring or assessment monitoring will be initiated as appropriate under §257.94 and §257.95.

6. REFERENCES

ERM, 2017. *Groundwater Sampling and Analysis Program.*

USEPA, 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities.* Unified Guidance. USEPA/530/R/09/007. Office of Resource Conservation and Recovery. Washington, D.C.

Tables

TABLE 1
Groundwater Elevations Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-45 Upgradient		JKS-57 Upgradient		JKS-58 Water Level Only		JKS-59 Water Level Only	
		TOC Elevation	**531.46**	**TOC Elevation**	**506.91**	**TOC Elevation**	**504.45**	**TOC Elevation**	**496.45**
Sampling Event	**Sampling Event Dates**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**
1	12/6/16 to 12/8/16	46.83	484.63	19.89	487.02	18.85	485.60	15.67	480.78
2	2/21/17 to 2/23/17	46.64	484.82	18.95	487.96	15.95	488.50	14.12	482.33
3	3/28/17 to 3/30/17	46.52	484.94	18.20	488.71	15.10	489.35	14.12	482.33
4	5/2/17 to 5/4/17	46.35	485.11	18.80	488.11	16.50	487.95	14.94	481.51
5	6/20/17 to 6/21/17	46.64	484.82	20.23	486.68	18.38	486.07	16.46	479.99
6	7/25/17 to 7/26/17	46.38	485.08	21.16	485.75	15.63	488.82	17.80	478.65
7	8/29/17 to 8/30/17	46.73	484.73	19.44	487.47	19.90	484.55	17.77	478.68
8	10/10/17 to 10/11/17	46.50	484.96	21.67	485.24	20.67	483.78	18.00	478.45
9	4/4/18 to 4/5/18	46.59	484.87	23.22	483.69	21.86	482.59	17.36	479.09
10	10/30/18 to 10/31/18	46.55	484.91	24.65	482.26	21.63	482.82	19.00	477.45
11	4/9/19 to 4/10/19	46.21	485.25	21.09	485.82	17.79	486.66	17.08	479.37
12	10/22/19 to 10/23/19	46.63	484.83	22.61	484.30	20.90	483.55	19.55	476.90
13	4/28/20 to 4/29/20	46.21	485.25	23.97	482.94	22.17	482.28	18.53	477.92
14	10/20/20 to 10/21/20	46.45	485.01	25.68	481.23	23.29	481.16	20.89	475.56

		JKS-31 Downgradient		JKS-33 Downgradient		JKS-46 Downgradient		JKS-60 Downgradient	
		TOC Elevation	**507.45**	**TOC Elevation**	**498.71**	**TOC Elevation**	**499.08**	**TOC Elevation**	**495.70**
Sampling Event	**Sampling Event Dates**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**
1	12/6/16 to 12/8/16	27.01	480.44	18.03	480.68	17.61	481.47	17.15	478.55
2	2/21/17 to 2/23/17	26.50	480.95	17.32	481.39	16.30	482.78	16.34	479.36
3	3/28/17 to 3/30/17	25.98	481.47	16.99	481.72	16.10	482.98	15.93	479.77
4	5/2/17 to 5/4/17	26.60	480.85	17.27	481.44	16.70	482.38	15.96	479.74
5	6/20/17 to 6/21/17	26.70	480.75	18.08	480.63	17.98	481.10	16.43	479.27
6	7/25/17 to 7/26/17	26.77	480.68	18.50	480.21	18.80	480.28	17.00	478.70
7	8/29/17 to 8/30/17	26.58	480.87	18.23	480.48	18.91	480.17	17.52	478.18
8	10/10/17 to 10/11/17	26.73	480.72	18.10	480.61	19.37	479.71	17.20	478.50
9	4/4/18 to 4/5/18	26.86	480.59	17.28	481.43	19.65	479.43	16.95	478.75
10	10/30/18 to 10/31/18	26.70	480.75	18.25	480.46	20.54	478.54	17.75	477.95
11	4/9/19 to 4/10/19	25.10	482.35	17.10	481.61	18.90	480.18	16.53	479.17
12	10/22/19 to 10/23/19	27.04	480.41	18.80	479.91	20.45	478.63	18.03	477.67
13	4/28/20 to 4/29/20	26.51	480.94	18.18	480.53	20.22	478.86	17.76	477.94
14	10/20/20 to 10/21/20	27.59	479.86	19.68	479.03	21.55	477.53	19.33	476.37

NOTES:
btoc = below top of casing
msl = mean sea level

TABLE 2
Groundwater Sampling Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

CCR Unit	Well ID	Well Function	Number of Samples Collected in 2016 - 2020	2016 - 2020 Sample Dates														Monitoring Program
				12/6/16 to 12/8/16	2/21/17 to 2/23/17	3/28/17 to 3/30/17	5/2/17 to 5/4/17	6/20/17 to 6/21/17	7/25/17 to 7/26/17	8/29/17 to 8/30/17	10/10/17 to 10/11/17	4/4/18 to 4/5/18	10/30/18 to 10/31/18	4/9/19 to 4/10/19	10/22/19 to 10/23/19	4/28/20 to 4/29/20	10/20/20 to 10/21/20	
Fly Ash Landfill	JKS-31	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-33	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-45	Upgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-46	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-57	Upgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-60	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection

NOTES:
X = Indicates that a sample was collected.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-45 Upgradient													
	Sample Date	**12/6/16**	**2/23/17**	**3/28/17**	**5/3/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/10/19**	**10/23/19**	**4/28/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	1.65	1.51	2.27	1.11	2.03	1.91	2.02	2.21	2.28	3.24	2.78	2.98	3.01	2.81
Calcium	mg/L	144	122	184	105	101	103	120	130	128	161 D	195	161 D	141 J	132
Chloride	mg/L	196	187	181 J	160	152	0.803	345 JHD	24.8	118	137	167	144	113	98.7
Fluoride	mg/L	0.0360 U	0.207	0.334	0.337 JH	0.174 J	0.274 JH	0.0960 U	0.131 JH	0.0360 U	0.0360 U	0.0621 UJ	0.101 J	0.100	0.018 U
Sulfate	mg/L	623 D	639 D	661	613 X	602 D	2.95 JH	770 JHD	120	662 D	707	874	698	619	564
pH - Field Collected	SU	5.41	5.17	3.98	5.62	5.13	5.66	5.82	5.60	5.59	5.70	5.03	5.59	5.85	5.94
Total dissolved solids	mg/L	1270	1300	1330	1350	1270	1250	1680 JH	1100	1190	741	1350	1320	1590	1260
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.000240 U	0.000310 J	0.000400 J	0.00120 U	0.00120 U	0.000240 U	0.000348 J	0.000490 J	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.000534 J	0.00216	0.00595	0.00123 U	0.00123 U	0.000346 J	0.00283	0.000618 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0185	0.0436	0.103	0.0128 J	0.0176 J	0.0114	0.0480	0.0142	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.00261 U	0.000383 J	0.000921 J	0.000654 U	0.000654 U	0.000149 J	0.000408 J	0.000229 J	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000147 U	0.000147 U	0.000189 J	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00743	0.0152	0.0320	0.00403 J	0.00262 U	0.00313 J	0.0135	0.00272 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00506	0.00465	0.00828	0.00346 J	0.00351 J	0.00277	0.00376	0.00358	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.207	0.334	0.337 JH	0.174 J	0.274 JH	0.0960 U	0.131 JH	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000571 J	0.00419	0.0117	0.000758 U	0.000758 U	0.000479 J	0.00482	0.000968 J	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0329	0.0601	0.00238 U	0.0600	0.0639	0.0694	0.0935	0.0781	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000320 JX	0.0000263 U	0.0000263 U	0.0000300 J	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00105 J	0.00245	0.00372	0.00128 U	0.00128 U	0.000255 U	0.00115 J	0.000271 J	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0147	0.0144	0.0174	0.0121	0.0123	0.00990	0.0136	0.0118	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.000332 U	0.000332 U	0.000460 J	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	4.78 ± 0.890	4.29 ± 0.612	7.63 ± 0.795	3.29 ± 0.485	4.24 ± 0.671	4.34 ± 0.607	3.65 ± 0.553	5.07 ± 0.718	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.92 ± 1.19	4.59 ± 1.34	2.27 ± 1.19	1.42 ± 0.908	2.84 ± 1.15	1.83 ± 0.868	1.86 ± 0.827	1.66 ± 0.847	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-57 Upgradient													
	Sample Date	12/7/16	2/22/17	3/28/17	5/2/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/10/19	10/23/19	4/28/20	10/20/20
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	3.19	3.24	3.17	2.67	3.09	3.08	2.98	3.48	4.49	2.81	3.23	4.14	5.97	3.82
Calcium	mg/L	349	362	413	--	290	327	337	393	409	401 D	477 D	479 D	622 J	592
Chloride	mg/L	70.6	76.2	89.6	130	158	311 D	12.5 JH	185	534 D	3770	119	841	3460	3150
Fluoride	mg/L	3.62	3.32	2.84	2.27	3.42	3.43	0.0960 U	3.28	4.29	2.31	3.03	2.72	4.17	2.99
Sulfate	mg/L	2780 D	1980 DX	2090	2470 D	3080	3410 D	450 JH	3610	4260 D	5000	3570	4240	6510	3890
pH - Field Collected	SU	6.73	6.08	5.13	6.63	6.37	6.72	6.60	6.70	6.63	6.35	6.20	6.19	6.49	6.33
Total dissolved solids	mg/L	4770	3780	3320	4060	5800	5920	850 JH	5850	7390	9750	6000	6700	15100	12200
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00138 J	0.000630 J	0.000654 J	0.000561 J	0.00123 U	0.000480 J	0.000519 J	0.000486 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0311	0.0211	0.0208	0.0174	0.0164 J	0.0149	0.0128	0.0145	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000161 J	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000687 J	0.000525 U	0.000525 U	0.00262 U	0.000739 J	0.000816 J	0.00104 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000520 J	0.00232	0.000297 J	0.000449 J	0.000407 J	0.000748 J	0.000195 J	0.000322 J	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	3.62	3.32	2.84	2.27	3.42	3.43	0.0960 U	3.28	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000256 J	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.545	0.287 X	0.00238 U	--	0.533	0.649	0.671	0.733	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000300 J	0.0000263 U	0.0000580 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000385 J	0.000278 J	0.000255 U	0.00128 U	0.000329 J	0.000283 J	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00237 J	0.000664 J	0.000594 J	0.000561 J	0.00227 U	0.000612 J	0.000858 J	0.000697 J	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.592 ± 0.325	0.322 ± 0.157	0.519 ± 0.219	0.356 ± 0.176	0.273 ± 0.273	0.338 ± 0.221	0.255 ± 0.176	0.0986 ± 0.153	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.15 ± 0.895	2.31 ± 1.03	0.794 ± 0.818	2.86 ± 1.27	0.903 ± 0.843	0.786 ± 0.900	1.9 ± 0.894	1.73 ± 1.00	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-31 Downgradient													
	Sample Date	**12/8/16**	**2/21/17**	**3/29/17**	**5/2/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/10/19**	**10/22/19**	**4/28/20**	**10/20/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.446	0.580	0.642	0.499	0.573	0.510	0.494	0.553	0.485	0.514	0.557	0.483	0.429	0.379
Calcium	mg/L	188	384 X	317	--	216	171	230	228	187	208 D	295 D	200 D	171 J	216
Chloride	mg/L	223 D	477 D	303 D	317	285 D	0.280 UDXF	0.347 U	288	253 D	256	322	267	272	319
Fluoride	mg/L	0.801	0.186 J	0.548	0.865	0.661	0.979 JHXF	0.0960 U	0.735 JH	0.839	0.694	0.791 U	0.784	1.00	0.786
Sulfate	mg/L	697 D	1130 D	768 D	875	782 D	1.17 JHDXF	0.160 JH	803	771 D	774	852	819	877	914
pH - Field Collected	SU	3.94	4.04	6.34	4.29	3.84	5.14	3.99	3.98	3.74	3.07	3.56	2.62	3.70	3.68
Total dissolved solids	mg/L	1470	2290	2430	1850	1730	1500	25.0 U	1890	1420	1390	1660	1620	1890	1700
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000295 J	0.000301 J	0.00120 U	0.000527 J	0.000240 U	0.000559 J	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00151 J	0.0110	0.00834	0.00501	0.00363 J	0.00134 J	0.00556	0.00279	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0167 J	0.0141	0.0198	0.0136	0.0127 J	0.0229	0.0129	0.0122	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.00793 J	0.00851	0.00885	0.00814	0.00865 J	0.00593	0.00827	0.00857	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.0200 J	0.000663 J	0.000596 J	0.000525 U	0.00262 U	0.000890 J	0.000849 J	0.000760 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000440 J	0.0399	0.0623	0.0227	0.0173	0.0113	0.0302	0.0192	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.801	0.186 J	0.548	0.865	0.661	0.979 JHXF	0.0960 U	0.735 JH	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000415 J	0.000223 J	0.000344 J	0.000758 U	0.000348 J	0.00233	0.000580 J	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.533	0.510	0.00238 U	--	0.572	0.484	0.615	0.590	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000360 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000255 U	0.000255 U	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.00163 J	0.00175 J	0.00125 J	0.00227 U	0.00162 J	0.00177 J	0.00155 J	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	2.46 ± 0.574	2.60 ± 0.473	1.44 ± 0.425	1.40 ± 0.338	1.40 ± 0.403	1.28 ± 0.341	1.36 ± 0.399	1.01 ± 0.323	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	7.35 ± 1.59	8.16 ± 2.15	5.33 ± 1.47	5.85 ± 1.79	4.63 ± 1.23	4.44 ± 1.37	3.58 ± 1.22	4.96 ± 1.43	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-33 Downgradient													
	Sample Date	12/7/16	2/22/17	3/28/17	5/2/17	6/20/17	7/26/17	8/29/17	10/10/17	4/5/18	10/30/18	4/10/19	10/22/19	4/28/20	10/20/20
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.940	1.02	1.05	0.987	1.09	1.01	1.03	1.11	0.990	0.791	1.13	1.18	1.18	1.09
Calcium	mg/L	564	600	553	--	563	558	567	531	552	385 D	631	553 D	573 J	493
Chloride	mg/L	735 D	679 D	731 D	690	692 D	693 D	125 JH	666	786	758	806	773 JLKD	756	751
Fluoride	mg/L	1.86	1.08	1.77	1.36	1.81	1.34	0.480 U	1.69	1.85	1.21	1.23	1.24 JLK	1.68	0.864
Sulfate	mg/L	1850 D	1670 D	1780 D	1710	1690 D	1710 D	3170 D	1640	1810	1740	1640	1690 JLKD	1620	1650
pH - Field Collected	SU	6.51	5.90	4.91	6.52	6.15	5.71	6.49	6.49	6.33	6.26	5.98	5.18	6.30	6.23
Total dissolved solids	mg/L	4000	3990	4310	4410	3750	4070	3580	4320	3970	3320	2650 JLK	4040 JLK	4370	4060
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.00120 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000246 U	0.00123 U	0.000257 J	0.00123 U	0.000279 J	0.000316 J	0.000246 U	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0326	0.0318	0.0297	0.0268	0.0279	0.0274	0.0263	0.0264	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000709 J	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000734 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000611 J	0.00262 U	0.000525 U	0.00262 U	0.000525 U	0.00113 J	0.00108 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000690 J	0.000433 J	0.000487 J	0.000435 J	0.000512 J	0.000731 J	0.000902 J	0.000554 J	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	1.86	1.08	1.77	1.36	1.81	1.34	0.480 U	1.69	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000758 U	0.000152 U	0.000758 U	0.000152 U	0.000157 J	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	--	0.194	0.181	0.255	0.176	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000720 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000255 U	0.00128 U	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0314	0.0356	0.0389	0.0368	0.0451	0.0495	0.0546	0.0342	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.00166 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	2.04 ± 0.439	1.14 ± 0.328	2.36 ± 0.522	1.81 ± 0.365	1.73 ± 0.428	1.55 ± 0.422	1.37 ± 0.394	2.23 ± 0.491	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.95 ± 1.16	3.52 ± 1.07	4.69 ± 1.33	3.24 ± 1.26	1.73 ± 0.902	4.11 ± 1.19	1.98 ± 1.01	2.99 ± 1.26	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-46 Downgradient													
	Sample Date	**12/6/16**	**2/22/17**	**3/28/17**	**5/3/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/10/19**	**10/23/19**	**4/28/20**	**10/20/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.902	0.837	0.645	0.799	0.920	0.801	0.788	1.01	0.828	0.702	0.997	1.01	0.864	0.530
Calcium	mg/L	120	132	145	115	126	117	137	145	140	126 D	212 D	172 D	143 J	107
Chloride	mg/L	11.6	11.8	12.2	10.5	12.6	11.8	327 JHD	11.7	11.6	11.6	13.2	13.0	17.9	23.4
Fluoride	mg/L	1.51	1.38	1.03	1.59	2.25	2.34	0.460 JH	1.83	2.16	1.68	2.52	2.22	1.61 J	0.764
Sulfate	mg/L	700 D	692 D	608 D	677	0.0460 U	780 D	288 JHD	800	864 D	855	1030	1020	1180	734
pH - Field Collected	SU	3.60	3.55	2.10	3.57	2.96	3.54	3.21	3.20	3.15	3.00	2.85	2.62	3.10	3.01
Total dissolved solids	mg/L	1160	1040	926	1030	1270	1180	1170 JH	1390	1300	1220	1550	1500	1970	1160
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00190 J	0.00227	0.00144 J	0.00196 J	0.00277 J	0.00253	0.00295	0.00290	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0429	0.0356	0.0308	0.0307	0.0364	0.0317	0.0323	0.0331	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.00381 J	0.00362	0.00340	0.00399 J	0.00459 J	0.00415	0.00462	0.00479	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.00110 J	0.000988 J	0.00121 J	0.00120 J	0.00101 J	0.00133 J	0.00141 J	0.00136 J	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.000942 J	0.00140 J	0.00104 J	0.00262 U	0.00262 U	0.00156 J	0.00191 J	0.00202 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.0303	0.0324	0.0329	0.0367	0.0387	0.0383	0.0412	0.0414	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	1.51	1.38	1.03	1.59	2.25	2.34	0.460 JH	1.83	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.0162	0.0134	0.0109	0.0144	0.0192	0.0201	0.0236	0.0257	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0646	0.000476 U	0.00238 U	0.0673	0.0749	0.0799	0.107	0.0863	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.000255 U	0.000255 U	0.000255 U	0.00128 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0255	0.0266	0.0205	0.0247	0.0296	0.0257	0.0298	0.0283	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00293	0.00292	0.00235	0.00263 J	0.00314 J	0.00300	0.00335	0.00345	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	3.16 ± 0.701	1.69 ± 0.387	1.80 ± 0.448	1.2 0± 0.315	1.82 ± 0.420	1.40 ± 0.353	1.52 ± 0.375	1.99 ± 0.459	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	4.98 ± 1.41	2.17 ± 1.48	2.96 ± 1.24	1.98 ± 0.957	4.39 ± 1.13	2.80 ± 1.05	2.28 ± 1.13	3.82 ± 1.15	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

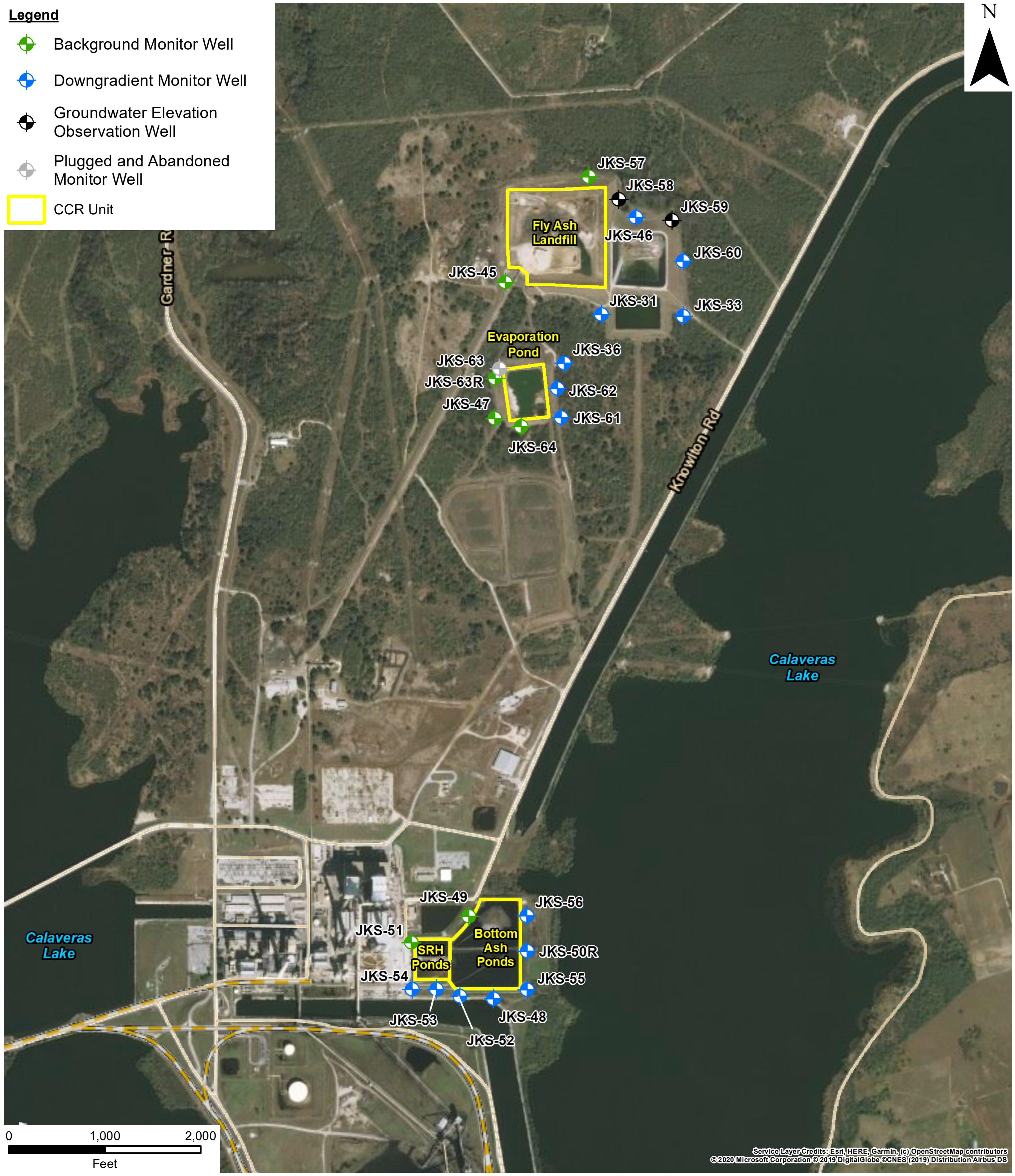
TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-60 Downgradient													
	Sample Date	12/7/16	2/22/17	3/28/17	5/2/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/10/19	10/23/19	4/28/20	10/20/20
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.655	0.504	0.449	0.456	0.442	0.394	0.436	0.479	0.399	0.334	0.405	0.377	0.325	0.433
Calcium	mg/L	433	375	290	--	379	336	350	383	363	382 D	501 D	524 D	530 J	380
Chloride	mg/L	411 D	311 D	311 D	285	300 D	319 D	287 JHD	352	366 D	202	149 X	183	168	235
Fluoride	mg/L	0.0360 U	0.319	0.324	0.421	0.306	0.338 JH	0.0960 U	0.284 JH	0.22 J	0.239 J	0.187 UJ	0.231 J	0.188	0.018 U
Sulfate	mg/L	1480 D	999 D	1010 D	976 X	1020 D	818 D	760 JHDX	759	801 D	906	968	1320	1280	963
pH - Field Collected	SU	5.82	5.38	4.21	5.75	6.07	6.44	5.93	5.97	6.09	6.42	5.93	6.23	6.61	6.16
Total dissolved solids	mg/L	2790	2340	2020	2110	2510	2120	1450 JH	2300	1860	1910	2010	2820	3180	2520
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000861 J	0.000592 J	0.000366 J	0.00123 U	0.000367 J	0.000381 J	0.000266 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0702	0.0491	0.0465	0.0450	0.0469	0.0454	0.0490	0.0503	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000774 J	0.000778 J	0.000786 J	0.000695 J	0.000734 U	0.000359 J	0.000608 J	0.000699 J	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000743 J	0.000525 U	0.000525 U	0.00262 U	0.000690 J	0.00204 J	0.00100 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.115	0.0542	0.0423	0.0389	0.0210	0.00896	0.0166	0.0183	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.319	0.324	0.421	0.306	0.338 JH	0.0960 U	0.284 JH	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000216 J	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	--	0.0305	0.0179 J	0.0635	0.0314	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000370 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000726 J	0.000622 J	0.000715 J	0.00148 J	0.00162 J	0.00124 J	0.00103 J	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.00168 J	0.00132 J	0.00981	0.0390	0.0244	0.00761	0.00745	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000425 J	0.000412 J	0.000403 J	0.00166 U	0.000332 U	0.000372 J	0.000387 J	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	3.01 ± 0.578	2.29 ± 0.421	2.74 ± 0.572	1.71 ± 0.378	0.914 ± 0.341	1.57 ± 0.381	1.34 ± 0.378	4.61 ± 0.650	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.57 ± 1.15	2.62 ± 1.04	0.838 ± 0.826	0.269 ± 0.713	2.24 ± 1.02	0.701 ± 0.850	1.72 ± 0.940	2.48 ± 1.60	NR	NR	NR	NR	NR	NR

NOTES:

mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

Figures



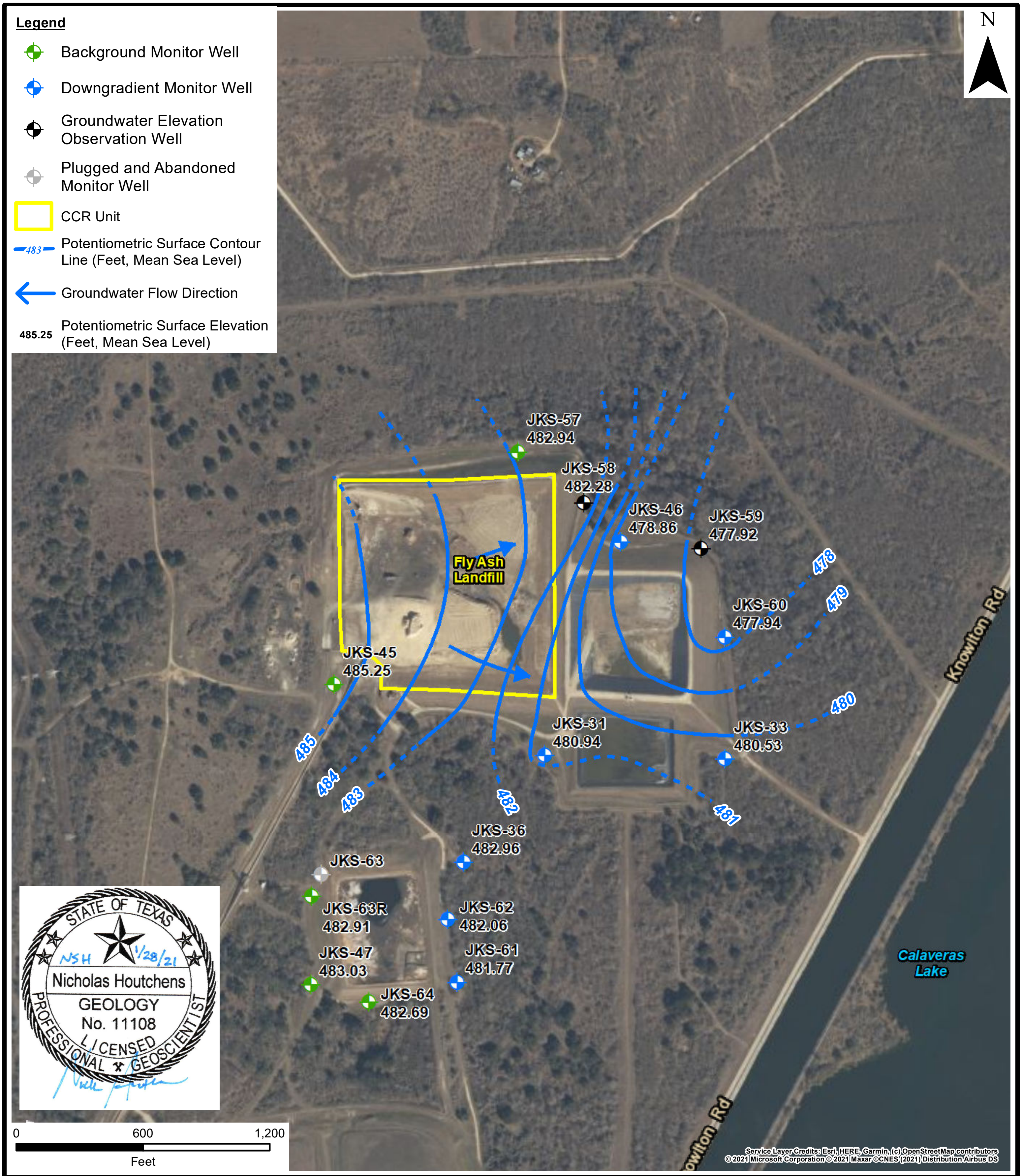
Environmental Resources Management

DESIGN:	WZ	DRAWN:	EFC	CHKD.:	WZ
DATE:	1/17/2020	SCALE:	AS SHOWN	REVISION:	0

\\ushoufs01\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2019gwmon\fig1_0503422_CPSCalv_WellLocs.mxd

FIGURE 1
CCR WELL NETWORK LOCATION MAP
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM



NSH 1/28/21
Nicholas Houtchens
No. 11108

Environmental Resources Management

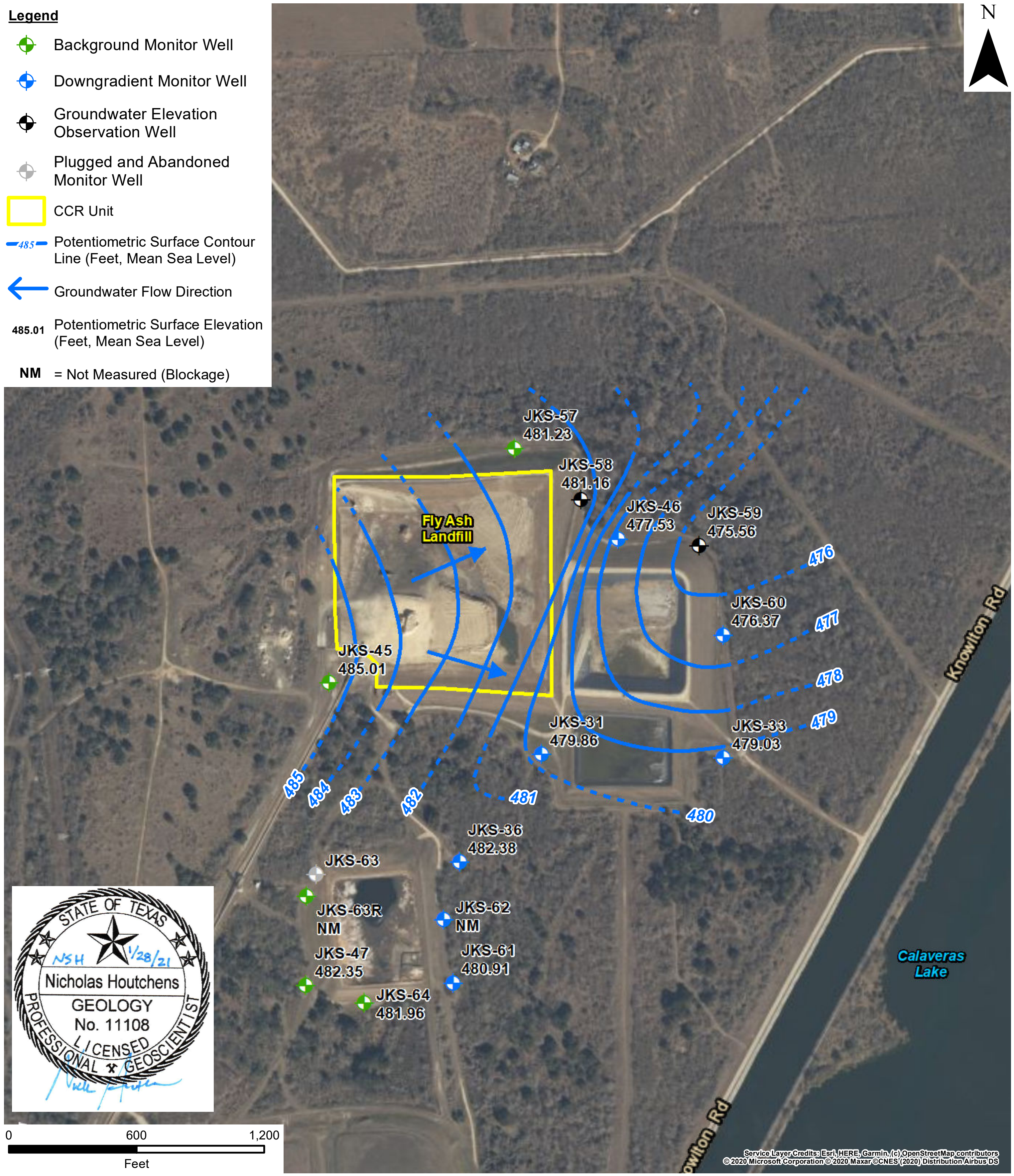
DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/22/2021	SCALE:	AS SHOWN	REVISION:	2

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2020gwmon\fig2A_0503422_CPSCalv_FlyAsh_apr2020pmapRev.mxd

FIGURE 2A
POTENTIOMETRIC SURFACE MAP -
APRIL 2020
Fly Ash Landfill CCR Unit
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM



NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Environmental Resources Management

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/22/2021	SCALE:	AS SHOWN	REVISION:	2

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2020gwmon\fig2B_0503422_CPSCalv_FlyAsh_oct2020pmapREV.mxd

FIGURE 2B
POTENTIOMETRIC SURFACE MAP - OCTOBER 2020
Fly Ash Landfill CCR Unit
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM

Laboratory Data Packages

Appendix A

(*Data Packages Available Upon Request*)

Statistical Analysis Tables and Figures

Appendix B

APPENDIX B - TABLE 1
Kruskal-Wallis Test Comparisons of Upgradient Wells
Calaveras Power Station
Fly Ash Landfill

Analyte	N	Num Detects	Percent Detect	DF	KW Statistic	p-value	Conclusion	UPL Type
Boron	28	28	100.00%	1	14	<0.001	Significant Difference	Intrawell
Calcium	27	27	100.00%	1	19.5	<0.001	Significant Difference	Intrawell
Chloride	28	28	100.00%	1	0.931	0.335	No Significant Difference	Interwell
Fluoride	28	22	78.57%	1	16.6	<0.001	Significant Difference	Intrawell
pH	28	28	100.00%	1	15.8	<0.001	Significant Difference	Intrawell
Sulfate	28	28	100.00%	1	15.6	<0.001	Significant Difference	Intrawell
Total dissolved solids	28	28	100.00%	1	15.3	<0.001	Significant Difference	Intrawell

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations

N: number of data points

DF: degrees of freedom

statistic: Kruskal Wallis test statistic

p-value: P-values below 0.05 indicate that the median concentrations in the upgradient wells are significantly different from each other and the upgradient wells should not be pooled.

p-value: P-values equal or above 0.05 indicate that the median concentrations in the upgradient wells are not significantly different from each other and the upgradient wells can be pooled.

APPENDIX B - TABLE 2
Descriptive Statistics for Upgradient Wells
Calaveras Power Station
Fly Ash Landfill

Analyte	Well	Units	N	Num Detects	Percent Detect	Min ND	Max ND	Min Detect	Median	Mean	Max Detect	SD	CV	Distribution
Boron	JKS-45	mg/L	14	14	100.00%			1.11	2.24	2.27	3.24	0.627	0.27580402	Normal
Boron	JKS-57	mg/L	14	14	100.00%			2.67	3.21	3.53	5.97	0.864	0.24512105	NDD
Calcium	JKS-45	mg/L	14	14	100.00%			101	131	138	195	29	0.21065371	Normal
Calcium	JKS-57	mg/L	13	13	100.00%			290	401	419	622	99.7	0.23770679	Normal
Chloride	Pooled	mg/L	28	28	100.00%			0.803	155	533	3770	1050	1.96750993	NDD
Fluoride	JKS-45	mg/L	14	9	64.29%	0.009	0.048	0.0621	0.1	0.131	0.337	0.117	0.89567359	Lognormal
Fluoride	JKS-57	mg/L	14	13	92.86%	0.048	0.048	2.27	3.16	2.98	4.29	1.03	0.34537829	NDD
pH	JKS-45	SU	14	14	100.00%			3.98	5.6	5.44	5.94	0.5	0.09200693	NDD
pH	JKS-57	SU	14	14	100.00%			5.13	6.43	6.37	6.73	0.416	0.06530933	NDD
Sulfate	JKS-45	mg/L	14	14	100.00%			2.95	631	582	874	235	0.40375289	NDD
Sulfate	JKS-57	mg/L	14	14	100.00%			450	3490	3380	6510	1460	0.43224959	Normal
Total dissolved solids	JKS-45	mg/L	14	14	100.00%			741	1280	1290	1680	215	0.1674253	NDD
Total dissolved solids	JKS-57	mg/L	14	14	100.00%			850	5880	6540	15100	3700	0.56576224	Normal

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations
Well = Pooled, indicates that the summary statistics were produced for the pooled upgradient wells based on the Kruskal-Wallis test (Table 1).
SU: Standard units
N: number of data points
ND: Non-detect
SD: Standard Deviation
CV: Coefficient of Variation (standard deviation divided by the mean)
NDD: No Discernible Distribution

APPENDIX B - TABLE 3
Potential Outliers in Upgradient Wells
Calaveras Power Station
Fly Ash Landfill

Well	Sample	Date	Analyte	Units	Detect	Concentration	UPL type	Distribution	Statistical Outlier	Visual Outlier	Normal Outlier	Log Statistical Outlier	Log Visual Outlier	Lognormal Outlier	Statistical and Visual Outlier	Final Outlier Decision
JKS-57	JKS 57581381-013	4/4/2018	Boron	mg/L	TRUE	4.49	Intrawell	NDD		X						
JKS-57	JKS-57-20200429-CCR	4/28/2020	Boron	mg/L	TRUE	5.97	Intrawell	NDD	X	X	X		X		0	
JKS-45	JKS-45561478-015	8/29/2017	Chloride	mg/L	TRUE	345	Interwell	NDD		X			X			
JKS-57	JKS 57558406-015	7/25/2017	Chloride	mg/L	TRUE	311	Interwell	NDD		X			X			
JKS-57	JKS 57581381-013	4/4/2018	Chloride	mg/L	TRUE	534	Interwell	NDD	X	X	X		X		0	
JKS-57	JKS 57603951-015	10/30/2018	Chloride	mg/L	TRUE	3770	Interwell	NDD	X	X	X	X	X	X	X	X
JKS-57	JKS-57005	10/23/2019	Chloride	mg/L	TRUE	841	Interwell	NDD	X	X	X		X		0	
JKS-57	JKS-57-20200429-CCR	4/28/2020	Chloride	mg/L	TRUE	3460	Interwell	NDD	X	X	X	X	X	X	X	X
JKS-57	JKS-57-20201020-CCR	10/20/2020	Chloride	mg/L	TRUE	3150	Interwell	NDD	X	X	X	X	X	X	X	X
JKS-57	JKS-57-20200429-CCR	4/28/2020	Fluoride	mg/L	TRUE	4.17	Intrawell	NDD		X						
JKS-45	JKS-45-WG-20170328	3/28/2017	pH	SU	TRUE	3.98	Intrawell	NDD	X	X	X	X	X	X	0	
JKS-57	JKS-57-WG-20170328	3/28/2017	pH	SU	TRUE	5.13	Intrawell	NDD	X	X	X	X	X	X	0	
JKS-45	JKS45620556-016	4/9/2019	Sulfate	mg/L	TRUE	874	Intrawell	NDD	X	X	X		X		0	
JKS-45	JKS-45561478-015	8/29/2017	Total dissolved solids	mg/L	TRUE	1680	Intrawell	NDD	X	X	X	X	X	X	0	
JKS-45	JKS-45-20200429-CCR	4/28/2020	Total dissolved solids	mg/L	TRUE	1590	Intrawell	NDD	X	X	X		X		0	
JKS-57	JKS 57603951-015	10/30/2018	Total dissolved solids	mg/L	TRUE	9750	Intrawell	Normal		X						
JKS-57	JKS-57-20200429-CCR	4/28/2020	Total dissolved solids	mg/L	TRUE	15100	Intrawell	Normal		X						
JKS-57	JKS-57-20201020-CCR	10/20/2020	Total dissolved solids	mg/L	TRUE	12200	Intrawell	Normal		X						

NOTES:

NDD: No Discernible Distribution
SU: Standard units
Outlier tests were performed on detected data only.
Statistical outliers were determined using a Dixon's test for N < 25 and with Rosner's test for N > 25.
Visual outliers were identified if they fall above the confidence envelope on the QQ plot.
Data points were considered potential outliers if they were both statistical and visual outliers.
NDD wells had data points considered as potential outliers if they were either a normal or lognormal outlier.
[Blank] data distribution indicates that the well data did not have enough detected data points for outlier analysis.
Lognormally distributed data was first log-transformed before visual and statistical outlier tests were performed.
Normal data distribution indicates that the well data was directly used for statistical and visual outlier tests.
NDD indicates that both the untransformed and transformed data were examined with statistical and visual outlier tests.
'0' indicates that the data point was a statistical and visual outlier but was retained after review by the hydrogeologist.

APPENDIX B - TABLE 4
Mann Kendall Test for Trends in Upgradient Wells
Calaveras Power Station
Fly Ash Landfill

Analyte	UPL Type	Well	N	Num Detects	Percent Detect	p-value	tau	Conclusion
Boron	Intrawell	JKS-45	14	14	100.00%	<0.001	0.648	Increasing Trend
Boron	Intrawell	JKS-57	14	14	100.00%	0.157	0.297	Stable, No Trend
Calcium	Intrawell	JKS-45	14	14	100.00%	0.228	0.243	Stable, No Trend
Calcium	Intrawell	JKS-57	13	13	100.00%	0.00162	0.641	Increasing Trend
Chloride	Interwell	JKS-45, JKS-57	25	25	100.00%	0.872	0.0267	Stable, No Trend
Fluoride	Intrawell	JKS-45	14	9	64.29%	0.103	-0.338	Stable, No Trend
Fluoride	Intrawell	JKS-57	14	13	92.86%	0.83	-0.0549	Stable, No Trend
pH	Intrawell	JKS-45	14	14	100.00%	0.0623	0.376	Stable, No Trend
pH	Intrawell	JKS-57	14	14	100.00%	0.324	-0.199	Stable, No Trend
Sulfate	Intrawell	JKS-45	14	14	100.00%	0.747	0.0769	Stable, No Trend
Sulfate	Intrawell	JKS-57	14	14	100.00%	0.00196	0.604	Increasing Trend
Total dissolved solids	Intrawell	JKS-45	14	14	100.00%	0.869	-0.0333	Stable, No Trend
Total dissolved solids	Intrawell	JKS-57	14	14	100.00%	<0.001	0.648	Increasing Trend

NOTES:

Non-detects were substituted with a value of zero for trend calculations

N: number of data points

tau: Kendall's tau statistic

p-value: A two-sided p-value describing the probability of the H0 being true (a=0.05)

Trend tests were performed on all upgradient data, only if the dataset met the minimum data quality criteria (ERM 2017).

APPENDIX B - TABLE 5
Calculated UPLs for Upgradient Datasets
Calaveras Power Station
Fly Ash Landfill

Analyte	UPL Type	Trend	Well	N	Num Detects	Percent Detects	LPL	UPL	Units	ND Adjustment	Transformation	Alpha	Method	Final LPL	Final UPL
Boron	Intrawell	Increasing Trend	JKS-45	14	14	100.00%		4.22	mg/L	None	No	0.00188	NP Detrended UPL		
Boron	Intrawell	Stable, No Trend	JKS-57	14	14	100.00%		5.97	mg/L	None	No	0.00861	NP Intra (normality) 1 of 2		X
Calcium	Intrawell	Stable, No Trend	JKS-45	14	14	100.00%		200	mg/L	None	No	0.00188	Param Intra 1 of 2		
Calcium	Intrawell	Increasing Trend	JKS-57	13	13	100.00%		673	mg/L	None	No	0.00188	NP Detrended UPL		X
Chloride	Interwell	Stable, No Trend	JKS-45, JKS-57	25	25	100.00%		841	mg/L	None	No	0.00274	NP Inter (normality) 1 of 2		X
Fluoride	Intrawell	Stable, No Trend	JKS-45	14	9	64.29%		2.76	mg/L	Aitchison`s	ln(x)	0.00188	Param Intra 1 of 2		
Fluoride	Intrawell	Stable, No Trend	JKS-57	14	13	92.86%		4.29	mg/L	None	No	0.00861	NP Intra (normality) 1 of 2		X
pH	Intrawell	Stable, No Trend	JKS-45	14	14	100.00%	3.98	5.94	SU	None	No	0.0172	NP Intra (normality) 1 of 2	X	
pH	Intrawell	Stable, No Trend	JKS-57	14	14	100.00%	5.13	6.73	SU	None	No	0.0172	NP Intra (normality) 1 of 2		X
Sulfate	Intrawell	Stable, No Trend	JKS-45	14	14	100.00%		874	mg/L	None	No	0.00861	NP Intra (normality) 1 of 2		
Sulfate	Intrawell	Increasing Trend	JKS-57	14	14	100.00%		9320	mg/L	None	No	0.00188	NP Detrended UPL		X
Total dissolved solids	Intrawell	Stable, No Trend	JKS-45	14	14	100.00%		1750	mg/L	None	No	0.00188	Param Intra 1 of 2		
Total dissolved solids	Intrawell	Increasing Trend	JKS-57	14	14	100.00%		15900	mg/L	None	No	0.00188	NP Detrended UPL		X

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations
UPL: upper prediction limit
LPL: Lower prediction limit. These were only calculated for pH
UPLs were constructed with a site wide false positive rate of 0.1 and a 1 of 2 retesting.
UPLs were calculated using Sanitas Software.
SU: Standard units
NP: non parametric
RL: Reporting Limit
Intra: indicates an intrawell UPL was used
Inter: indicates an interwell UPL was used
In the case where multiple UPLs were calculated for an analyte, the maximum UPL was used as the final UPL.
In the case where multiple LPLs were calculated for an pH the minimum LPL was used as the final LPL.

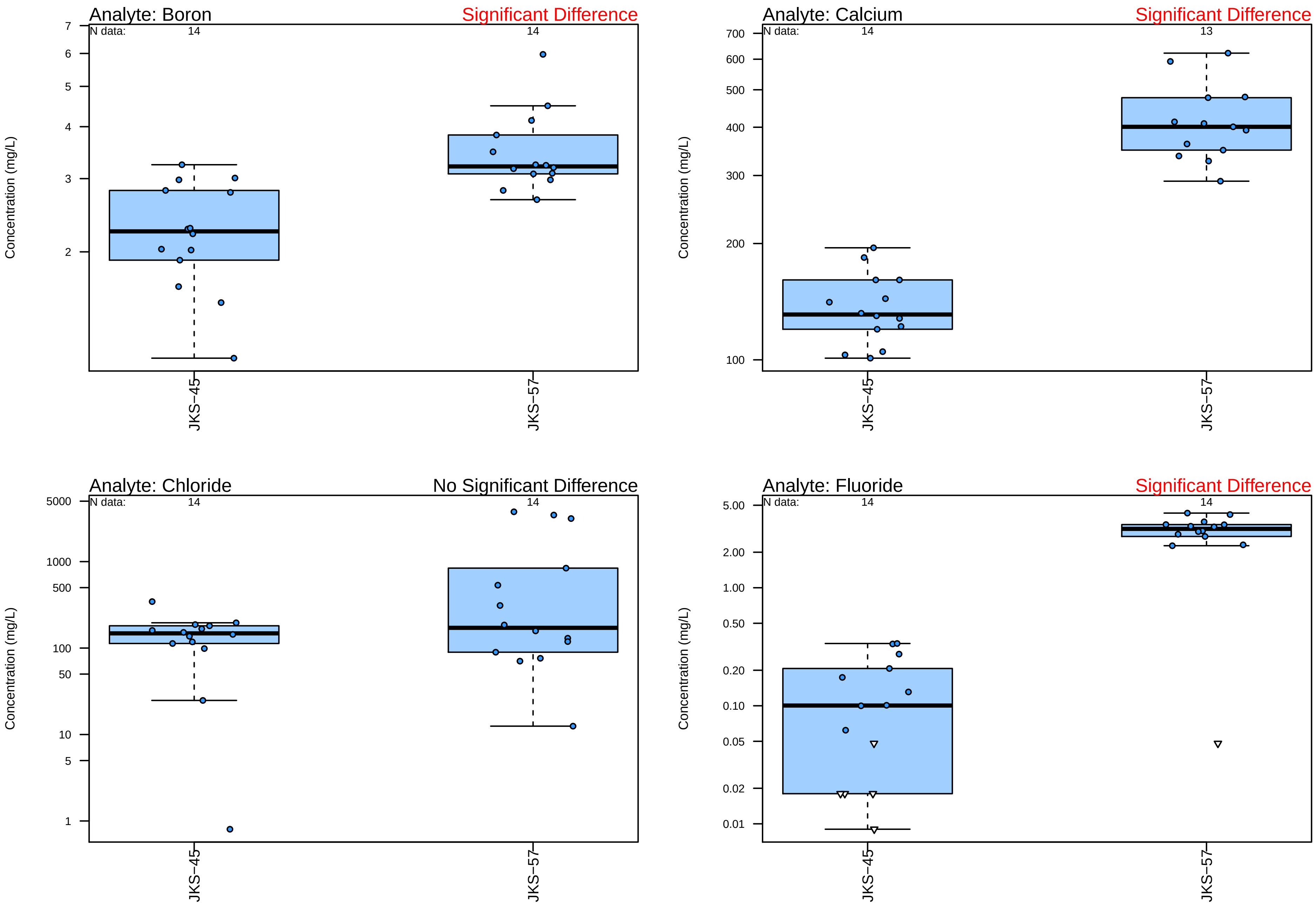
APPENDIX B - TABLE 6
Comparisons of Downgradient Wells to UPLs
Calaveras Power Station
Fly Ash Landfill

Analyte	Well	LPL	UPL	Units	Recent Date	Observation	Qualifier	Obs > UPL	Notes	Mann Kendall p-value	Mann Kendall tau	WRS p-value	WRS Conclusion	Exceed Median	Overall Conclusion
Boron	JKS-31		5.97	mg/L	10/20/2020	0.379						1	NS		No Exceedance
Boron	JKS-33		5.97	mg/L	10/20/2020	1.09						1	NS		No Exceedance
Boron	JKS-46		5.97	mg/L	10/20/2020	0.53						1	NS		No Exceedance
Boron	JKS-60		5.97	mg/L	10/20/2020	0.433						1	NS		No Exceedance
Calcium	JKS-31		673	mg/L	10/20/2020	216						0.999	NS		No Exceedance
Calcium	JKS-33		673	mg/L	10/20/2020	493						0.999	NS		No Exceedance
Calcium	JKS-46		673	mg/L	10/20/2020	107						1	NS		No Exceedance
Calcium	JKS-60		673	mg/L	10/20/2020	380						1	NS		No Exceedance
Chloride	JKS-31		841	mg/L	10/20/2020	319						1	NS		No Exceedance
Chloride	JKS-33		841	mg/L	10/20/2020	751						1	NS		No Exceedance
Chloride	JKS-46		841	mg/L	10/20/2020	23.4						1	NS		No Exceedance
Chloride	JKS-60		841	mg/L	10/20/2020	235						1	NS		No Exceedance
Fluoride	JKS-31		4.29	mg/L	10/20/2020	0.786						1	NS		No Exceedance
Fluoride	JKS-33		4.29	mg/L	10/20/2020	0.864						1	NS		No Exceedance
Fluoride	JKS-46		4.29	mg/L	10/20/2020	0.764						1	NS		No Exceedance
Fluoride	JKS-60		4.29	mg/L	10/20/2020	0.009	ND					1	NS		No Exceedance
pH	JKS-31	3.98	6.73	SU	10/20/2020	3.68		X	Trend Test: Decreasing Trend	0.00457	-0.56	0.265	NS		UPL Exceedance
pH	JKS-33	3.98	6.73	SU	10/20/2020	6.23						1	NS		No Exceedance
pH	JKS-46	3.98	6.73	SU	10/20/2020	3.01		X	Trend Test: Decreasing Trend	0.0264	-0.451	<0.001	***	X	Both Exceedance
pH	JKS-60	3.98	6.73	SU	10/20/2020	6.16						1	NS		No Exceedance
Sulfate	JKS-31		9320	mg/L	10/20/2020	914						1	NS		No Exceedance
Sulfate	JKS-33		9320	mg/L	10/20/2020	1650						1	NS		No Exceedance
Sulfate	JKS-46		9320	mg/L	10/20/2020	734						1	NS		No Exceedance
Sulfate	JKS-60		9320	mg/L	10/20/2020	963						1	NS		No Exceedance
Total dissolved solids	JKS-31		15900	mg/L	10/20/2020	1700						1	NS		No Exceedance
Total dissolved solids	JKS-33		15900	mg/L	10/20/2020	4060						1	NS		No Exceedance
Total dissolved solids	JKS-46		15900	mg/L	10/20/2020	1160						1	NS		No Exceedance
Total dissolved solids	JKS-60		15900	mg/L	10/20/2020	2520						1	NS		No Exceedance

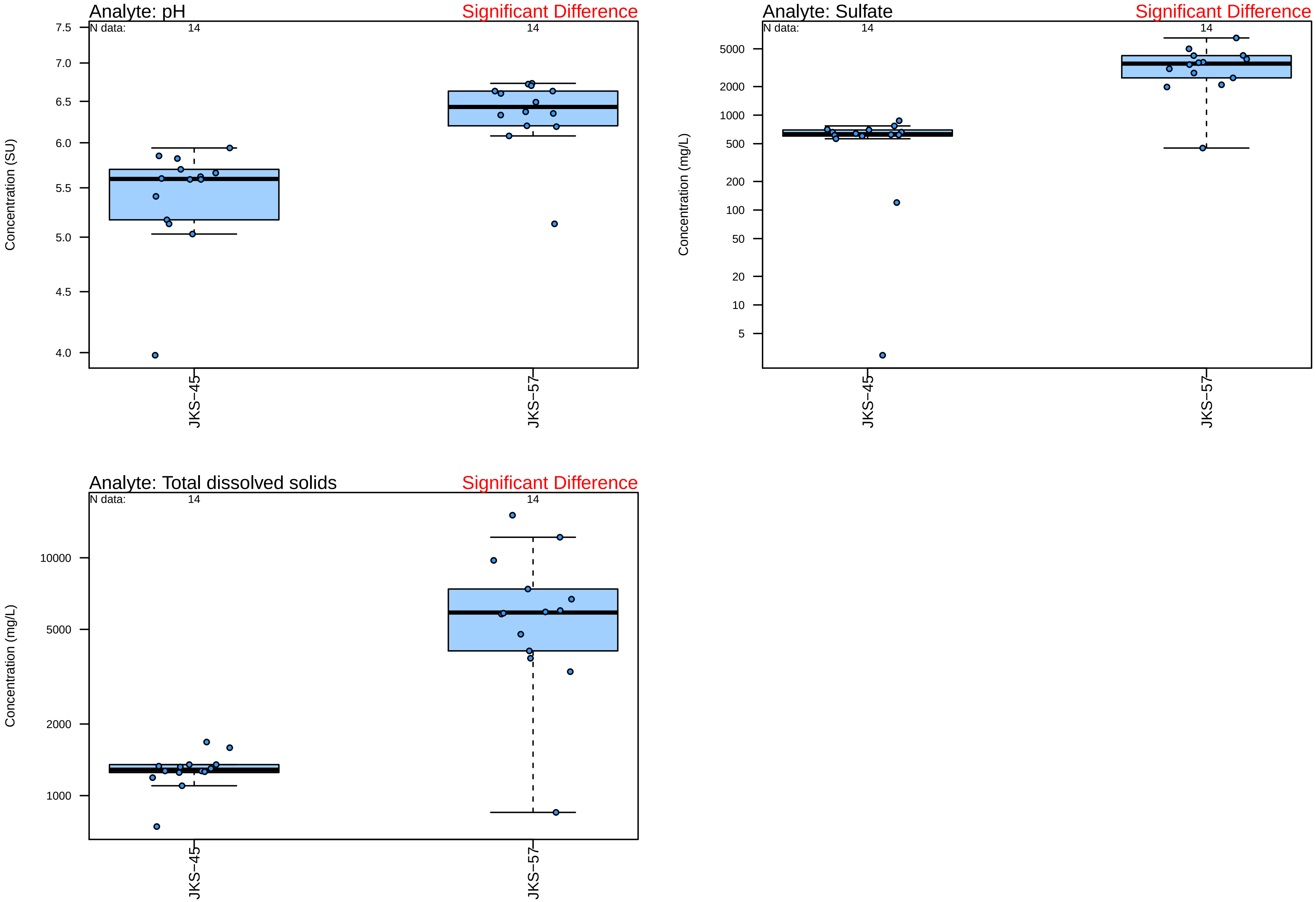
NOTES:

Non-detects were substituted with a value of zero for trend calculations
UPL: Upper Prediction Limit
ND: Not detected
SU: Standard units
tau: Kendall's tau statistic
Obs > UPL: Exceed 'X' indicates that the most recent observed value is higher than the UPL (or out of range of the LPL and UPL in the case of pH.)
Obs > UPL: Exceed 'X0' indicates that the two most recent values are higher than the UPL, but the upgradient well is 100% ND.
Obs > UPL: Exceed '0' indicated that the most recent observed value is higher than the UPL, but is not scored as an SSI due to Double Quantification Rule (ERM 2017).
WRS: Wilcoxon Rank Sum test comparing if median of downgradient well is larger than the UPL (for pH, also checks if median is less than LPL)
WRS p-value: A one-sided p-value describing the probability of the H0 (UPL/LPL) being true (a=0.05)
Overall: UPL Exceedance - most recent sampling event exceeds the UPL, but median of the well is not greater than UPL
Overall: WRS Exceedance - most recent sampling event does not exceed the UPL, but median of the well is greater than UPL
OveralB7:Q50l: Both Exceedance - most recent sampling event exceeds the UPL and median of the well is larger than the UPL

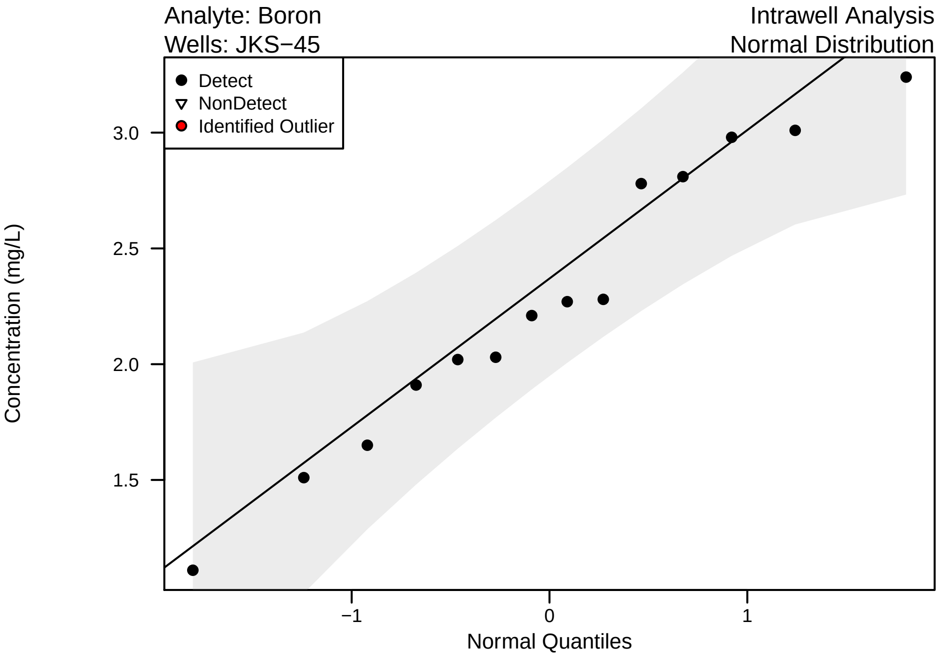
Appendix B – Figure 1
Unit: Fly Ash Landfill
Boxplots of Upgradient Wells



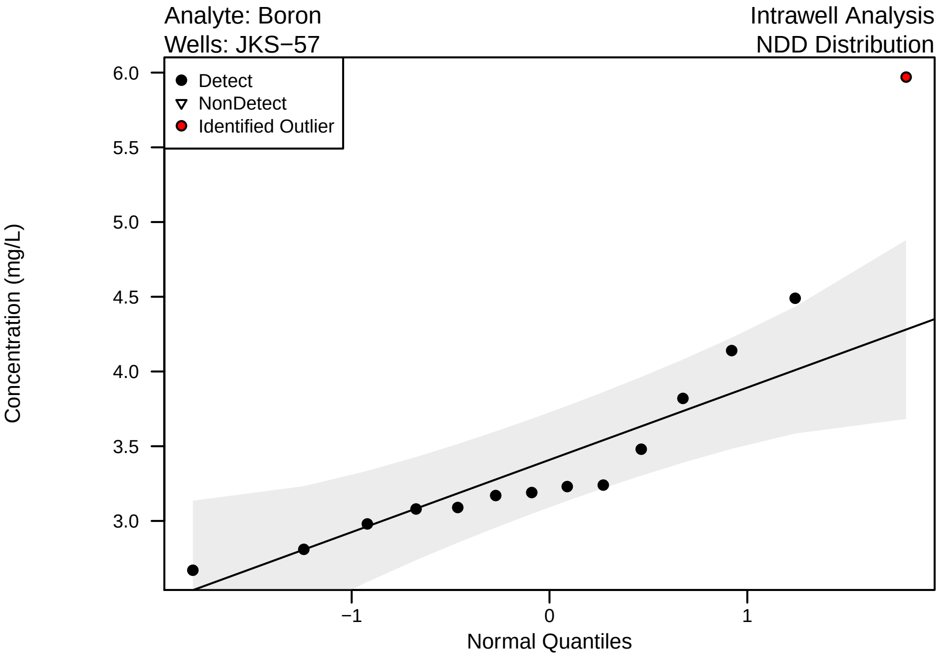
Appendix B – Figure 1
Unit: Fly Ash Landfill
Boxplots of Upgradient Wells

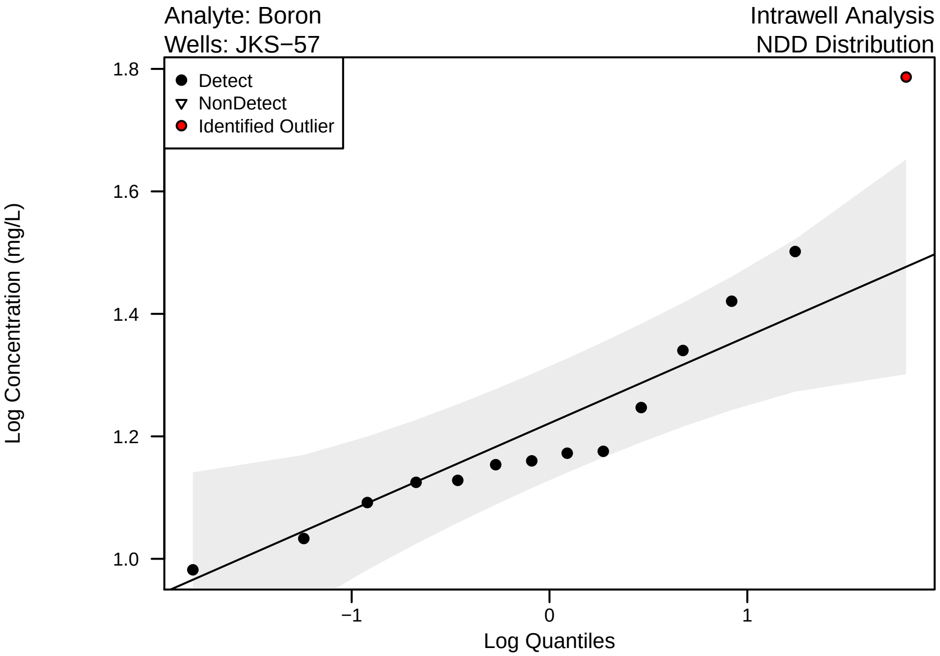


Appendix B − Figure 2
Unit: Fly Ash Landfill
QQ Plots of Upgradient Wells

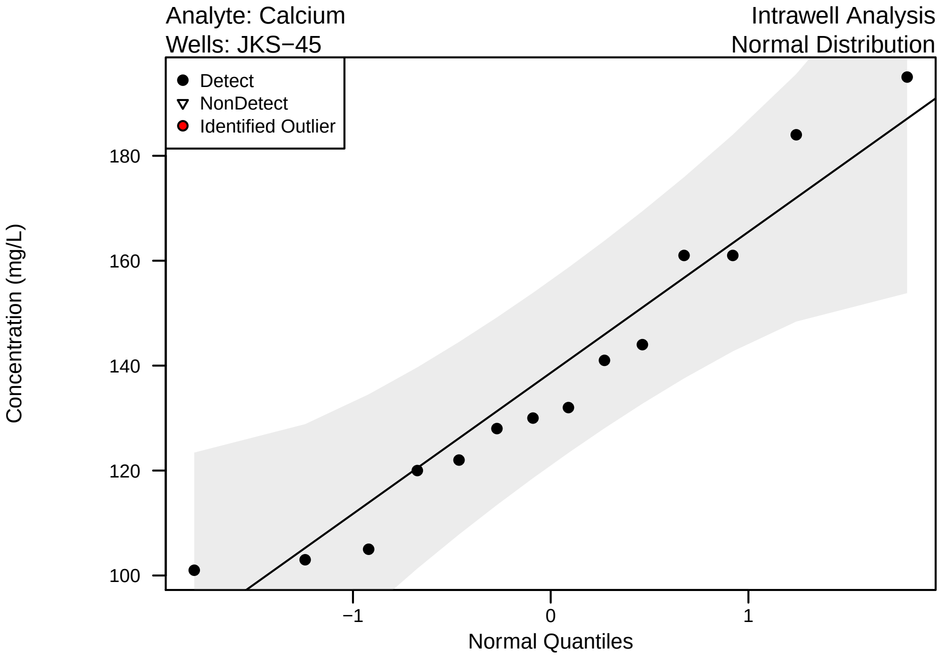


Intentionally left blank,
not Lognormal/NDD distribution.

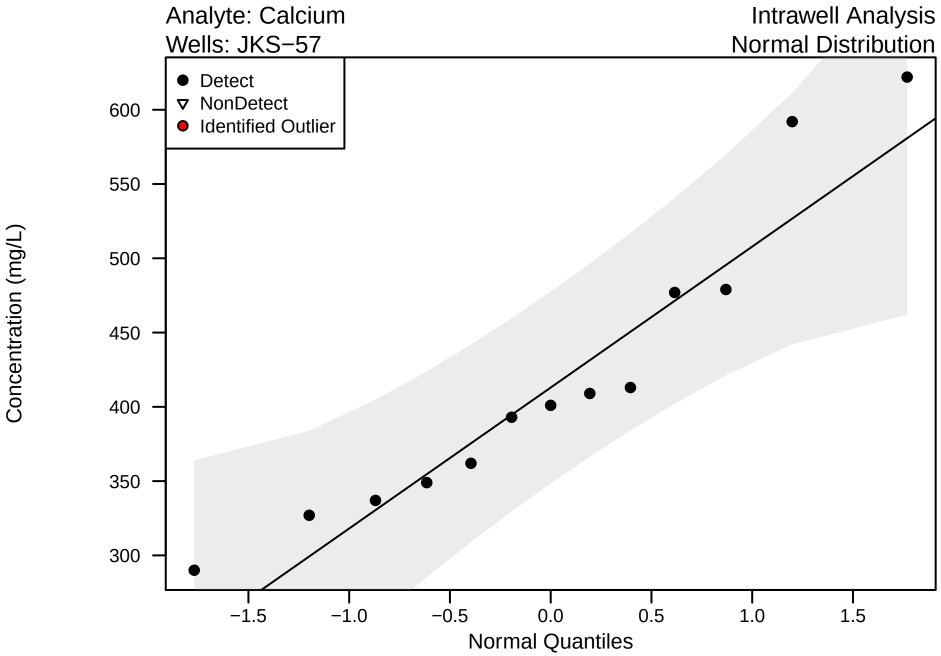




Appendix B − Figure 2
Unit: Fly Ash Landfill
QQ Plots of Upgradient Wells

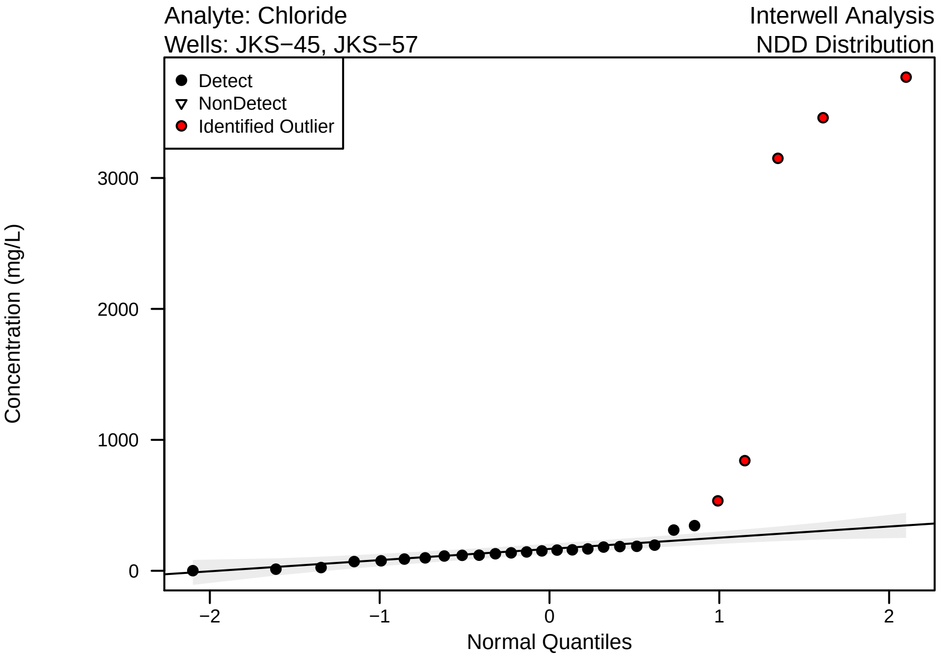

Analyte: Calcium
Wells: JKS−45
Intrawell Analysis
Normal Distribution

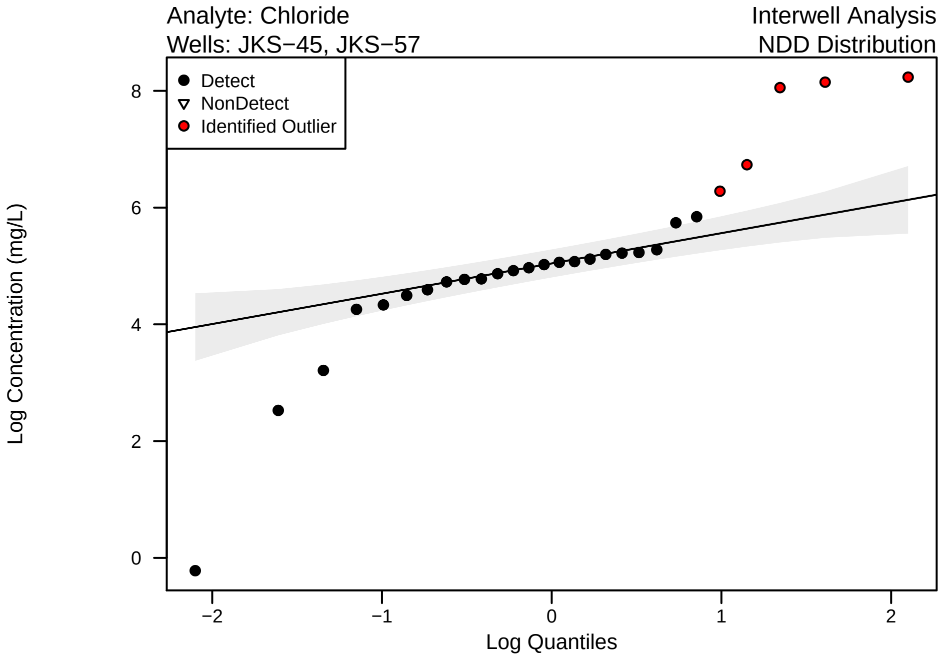
Intentionally left blank,
not Lognormal/NDD distribution.


Analyte: Calcium
Wells: JKS−57
Intrawell Analysis
Normal Distribution

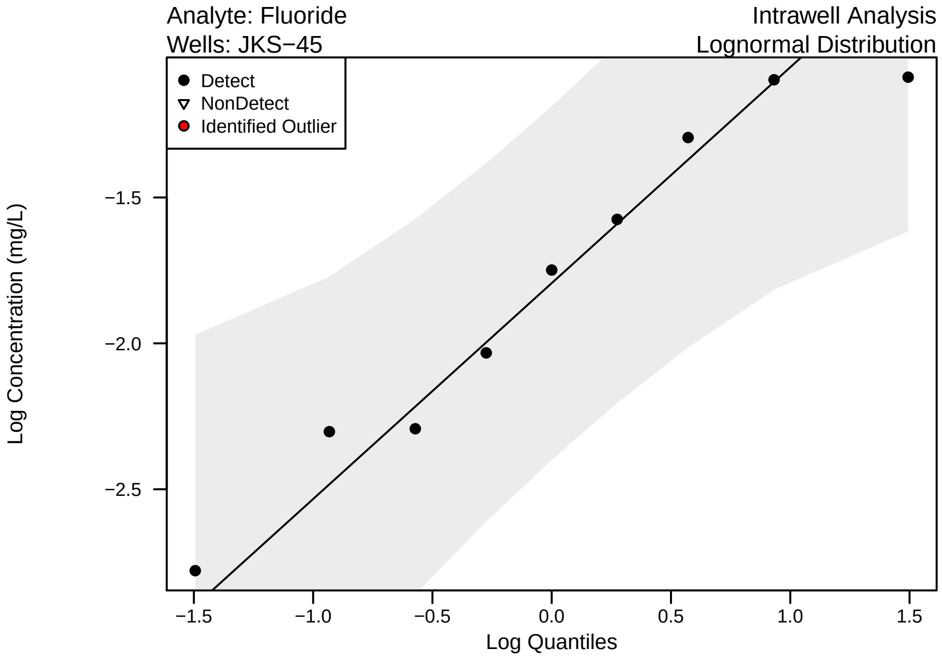
Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 2
Unit: Fly Ash Landfill
QQ Plots of Upgradient Wells

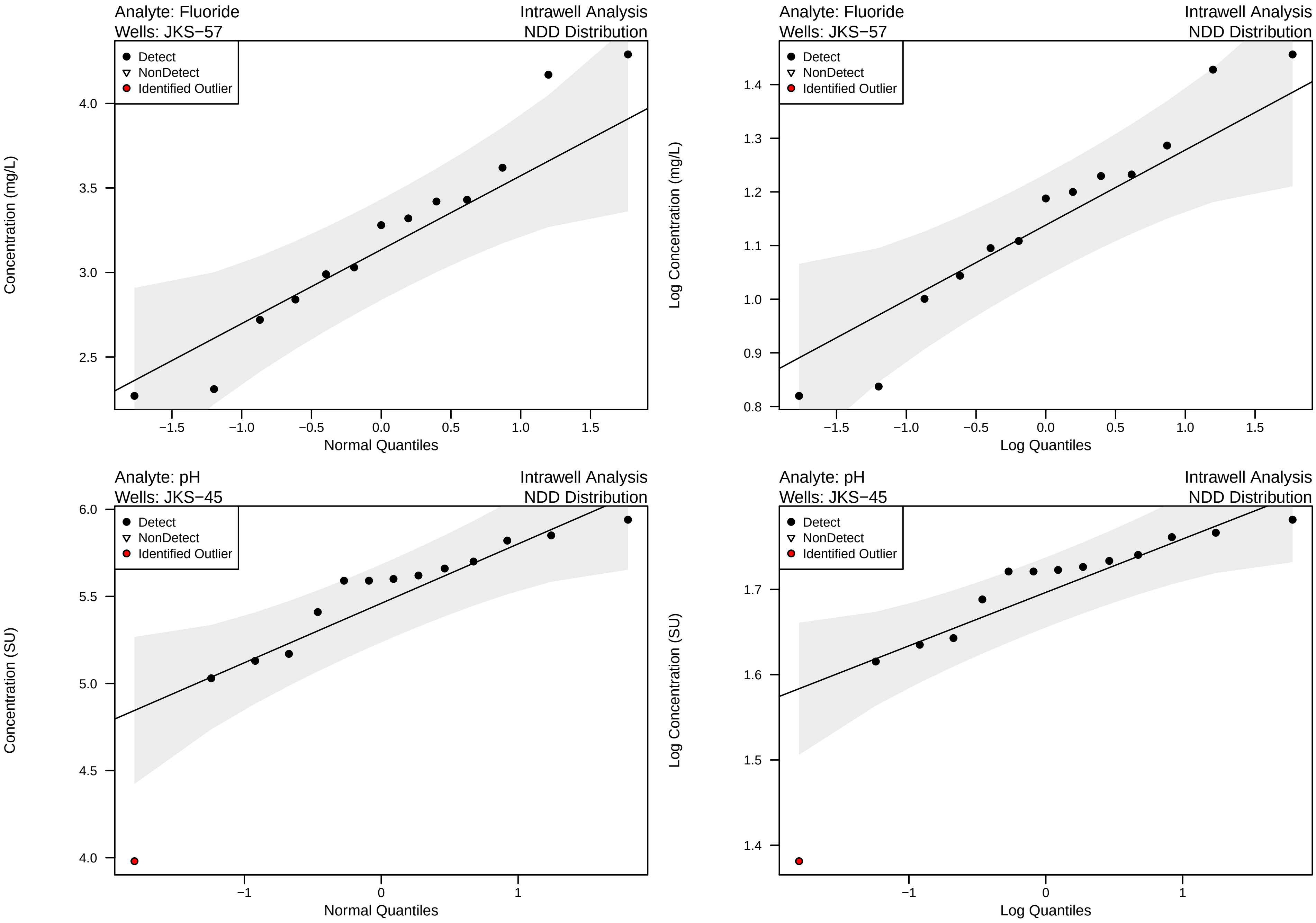

Analyte: Chloride
Wells: JKS−45, JKS−57
Interwell Analysis
NDD Distribution


Analyte: Chloride
Wells: JKS−45, JKS−57
Interwell Analysis
NDD Distribution

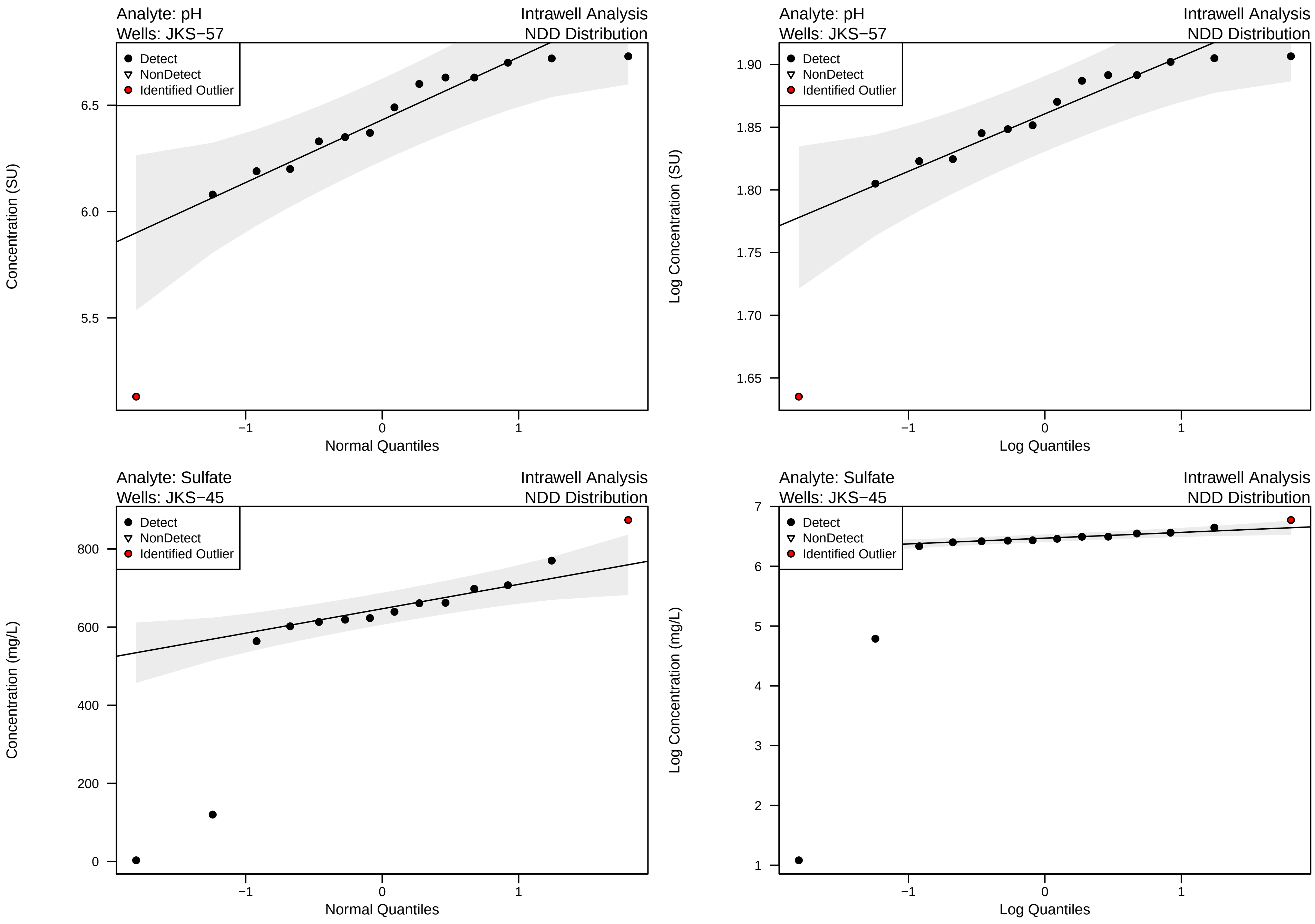
Intentionally left blank,
not Normal/NDD distribution.


Analyte: Fluoride
Wells: JKS−45
Intrawell Analysis
Lognormal Distribution

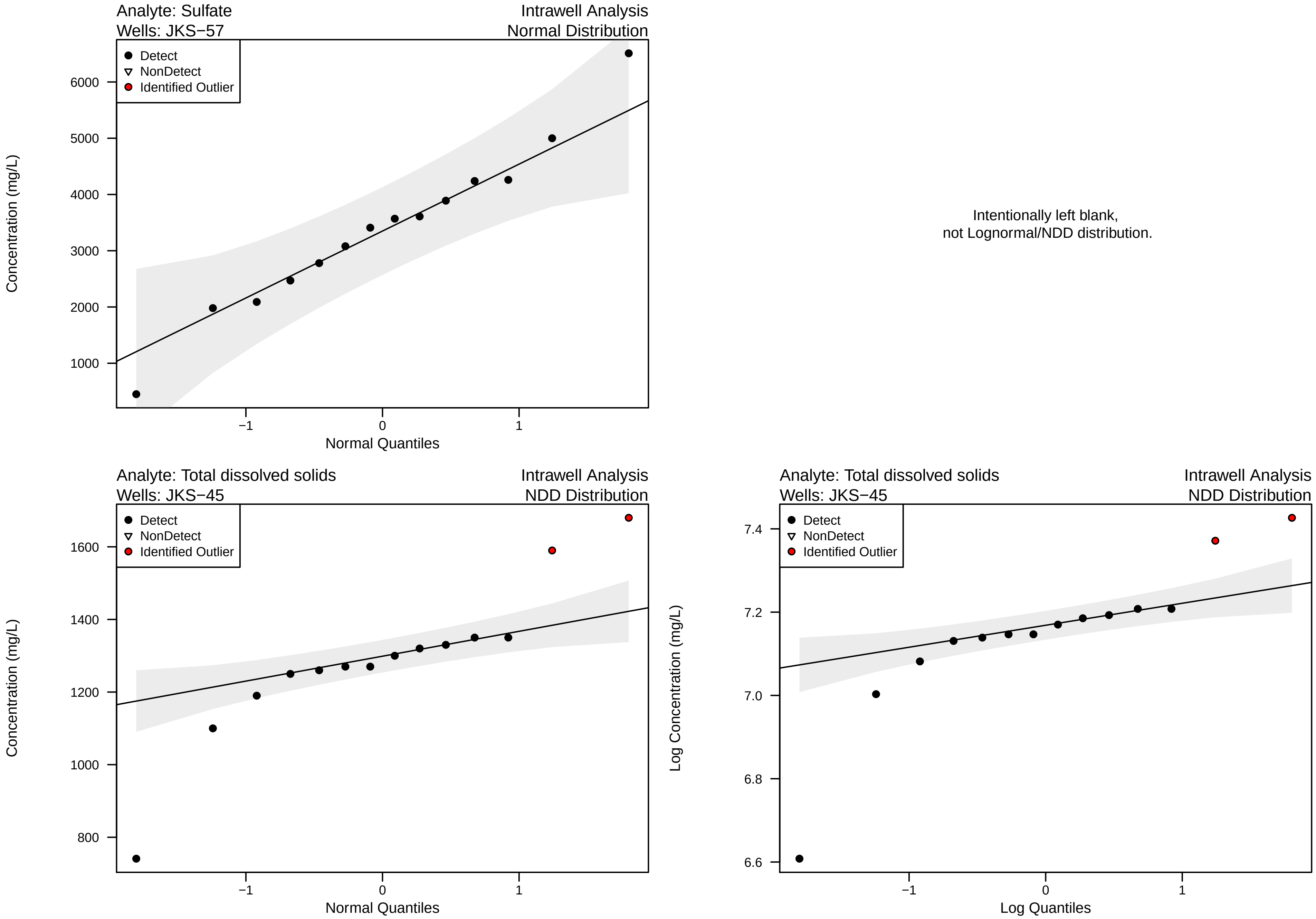
Appendix B − Figure 2
Unit: Fly Ash Landfill
QQ Plots of Upgradient Wells



Appendix B − Figure 2
Unit: Fly Ash Landfill
QQ Plots of Upgradient Wells

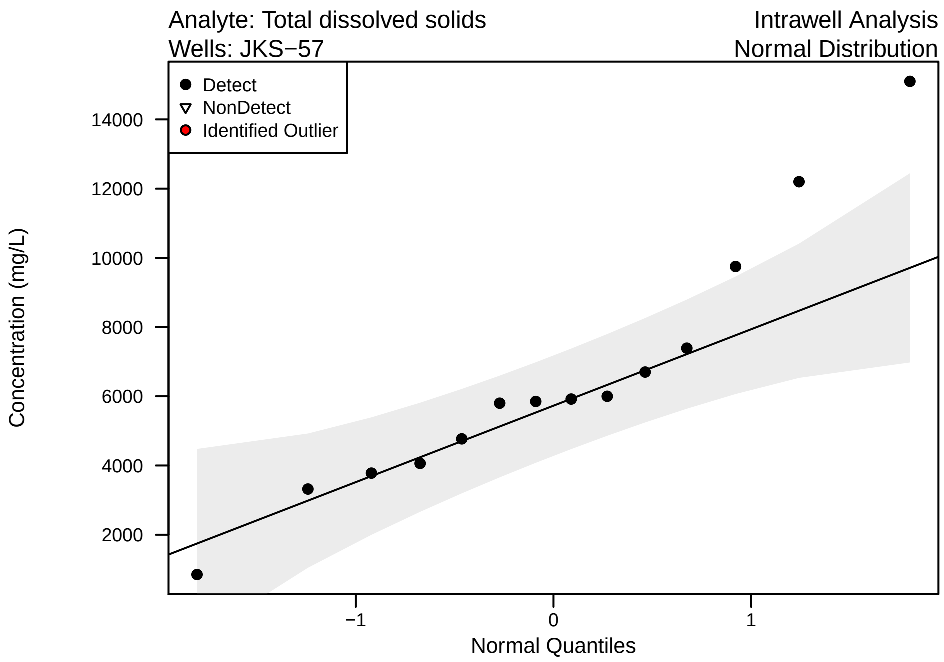


Appendix B − Figure 2
Unit: Fly Ash Landfill
QQ Plots of Upgradient Wells



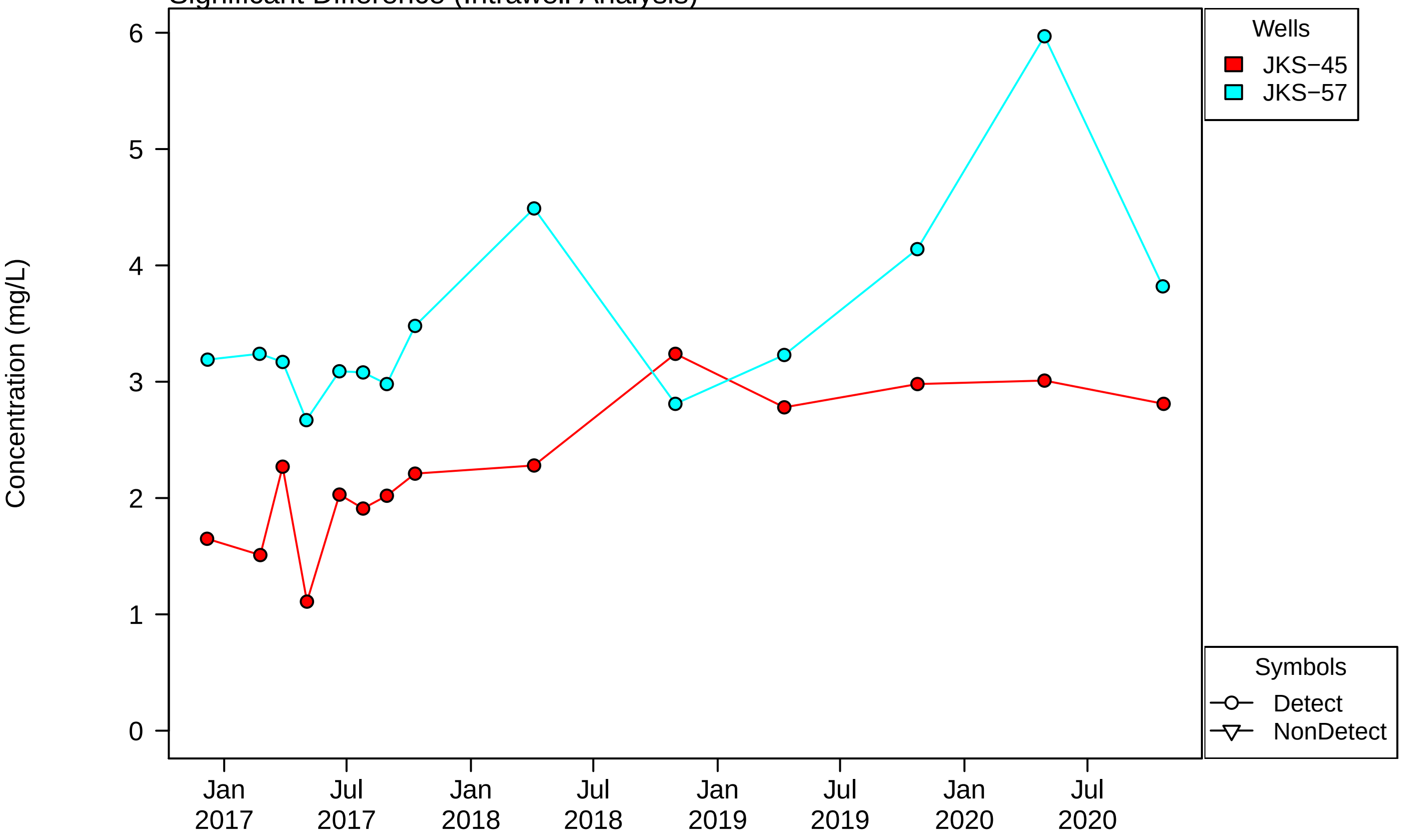
Intentionally left blank,
not Lognormal/NDD distribution.

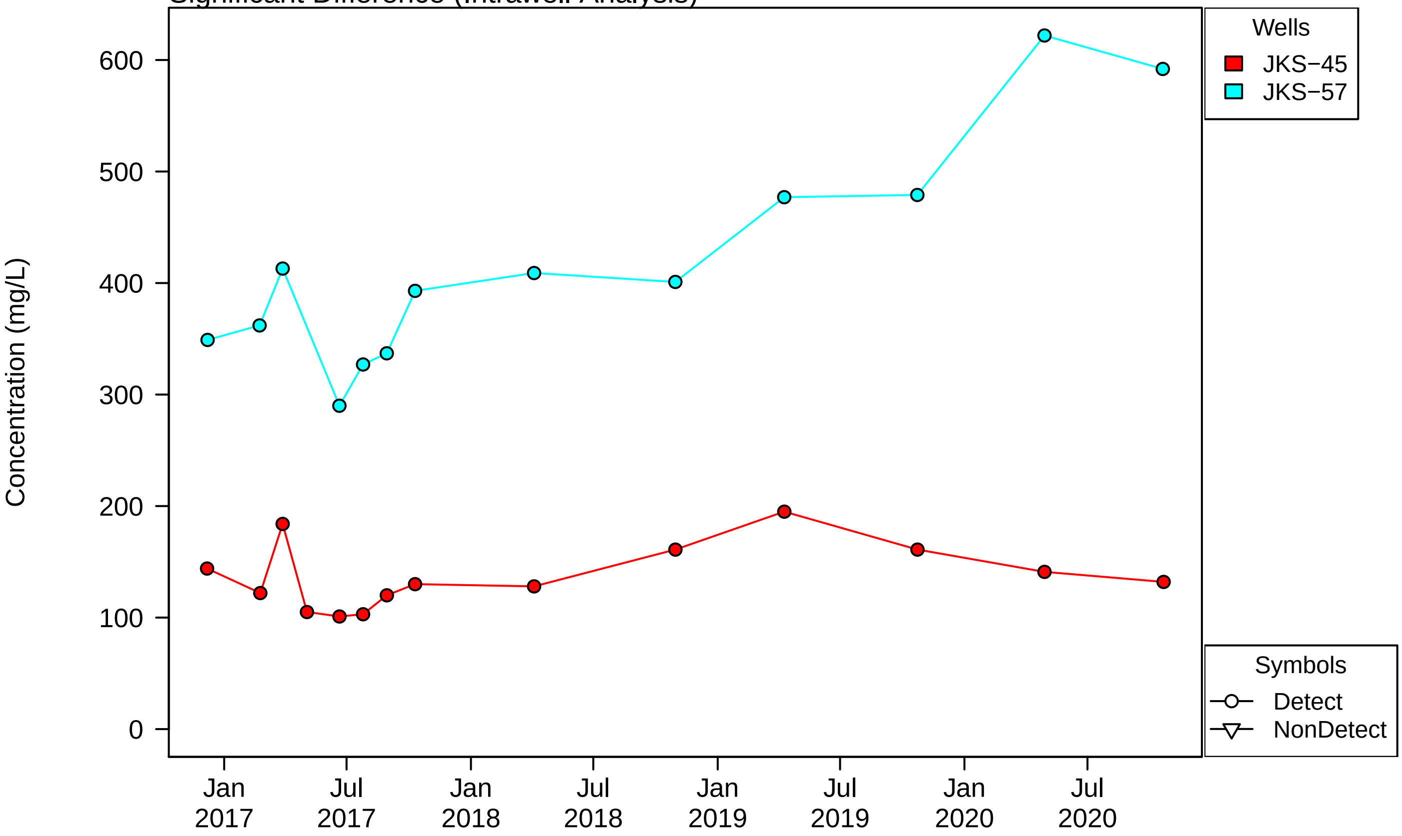
Appendix B − Figure 2
Unit: Fly Ash Landfill
QQ Plots of Upgradient Wells



Intentionally left blank,
not Lognormal/NDD distribution.

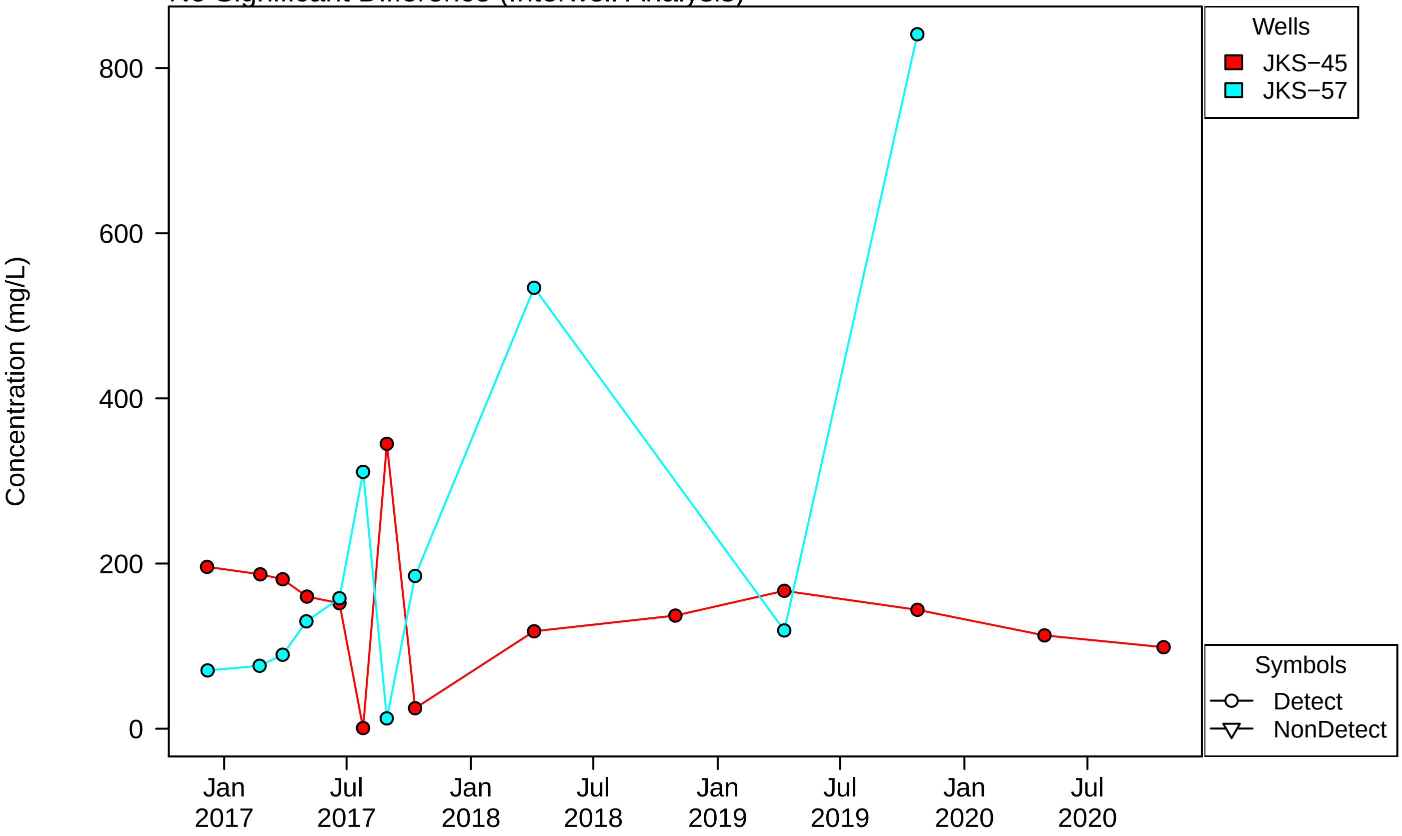
Appendix B − Figure 3
Unit: Fly Ash Landfill
Timeseries of Upgradient Wells


Chemical: Boron
Significant Difference (Intrawell Analysis)

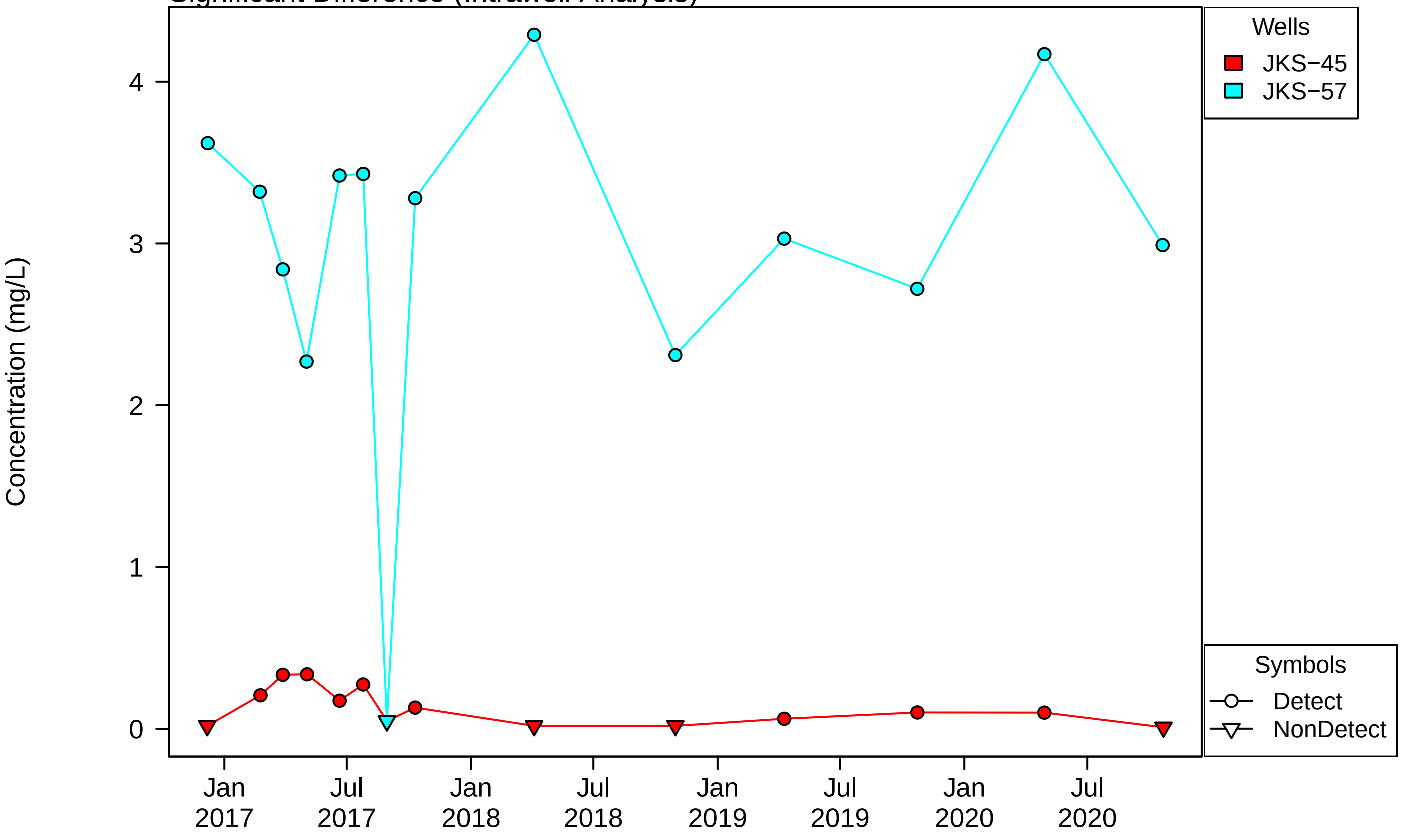

Chemical: Calcium
Significant Difference (Intrawell Analysis)

Appendix B − Figure 3
Unit: Fly Ash Landfill
Timeseries of Upgradient Wells

Chemical: Chloride
No Significant Difference (Interwell Analysis)

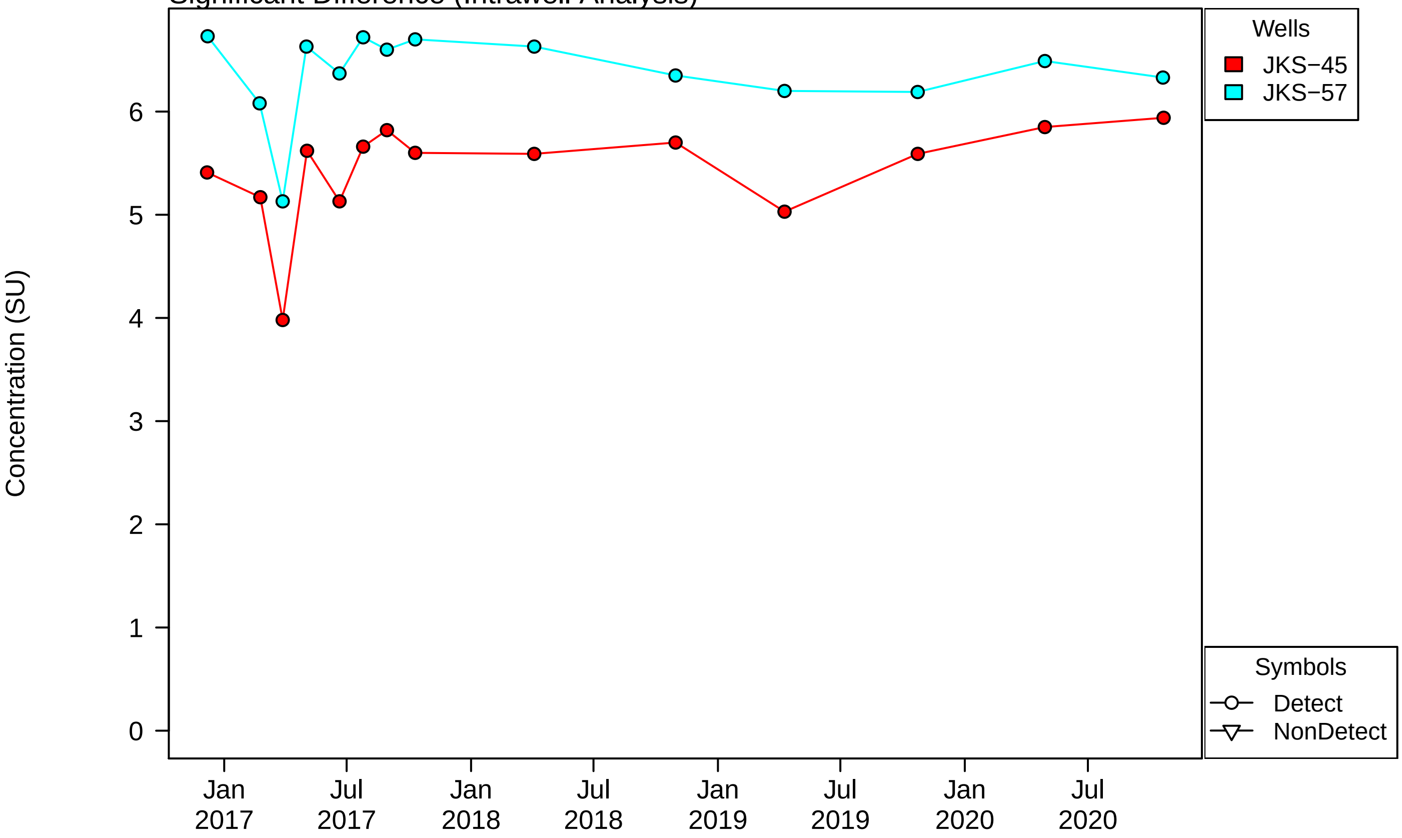


Chemical: Fluoride
Significant Difference (Intrawell Analysis)

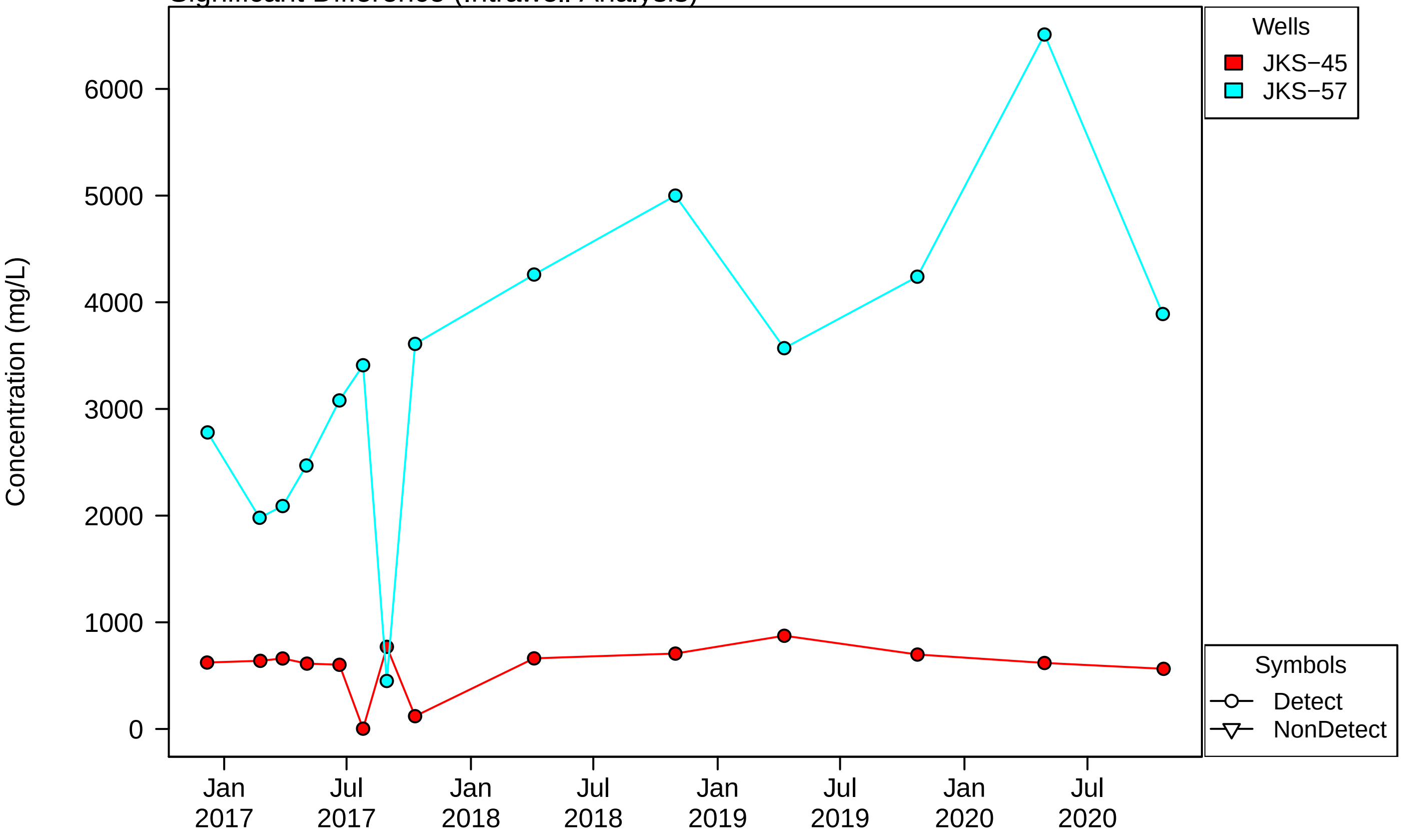


Appendix B − Figure 3
Unit: Fly Ash Landfill
Timeseries of Upgradient Wells

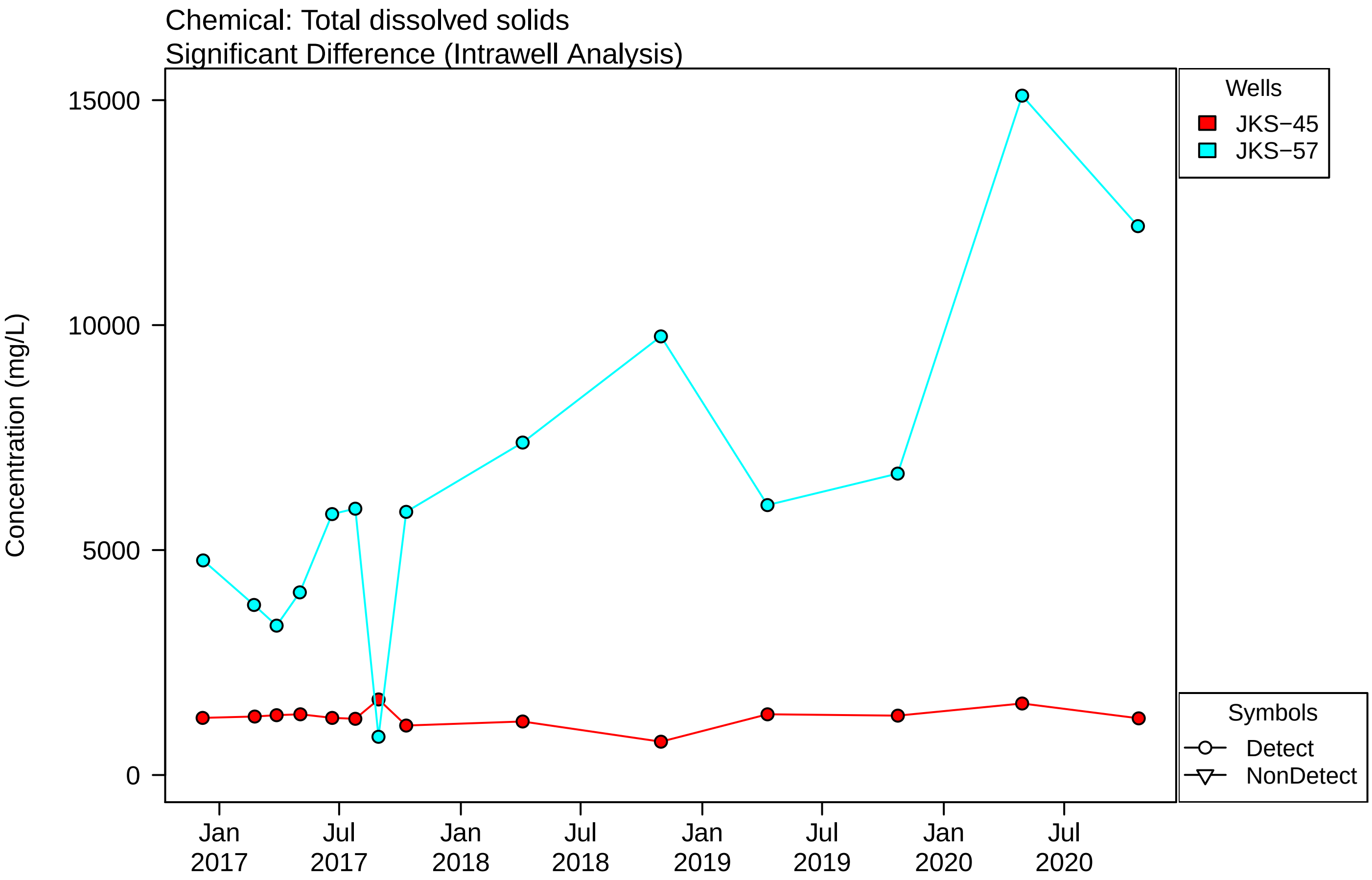
Chemical: pH
Significant Difference (Intrawell Analysis)



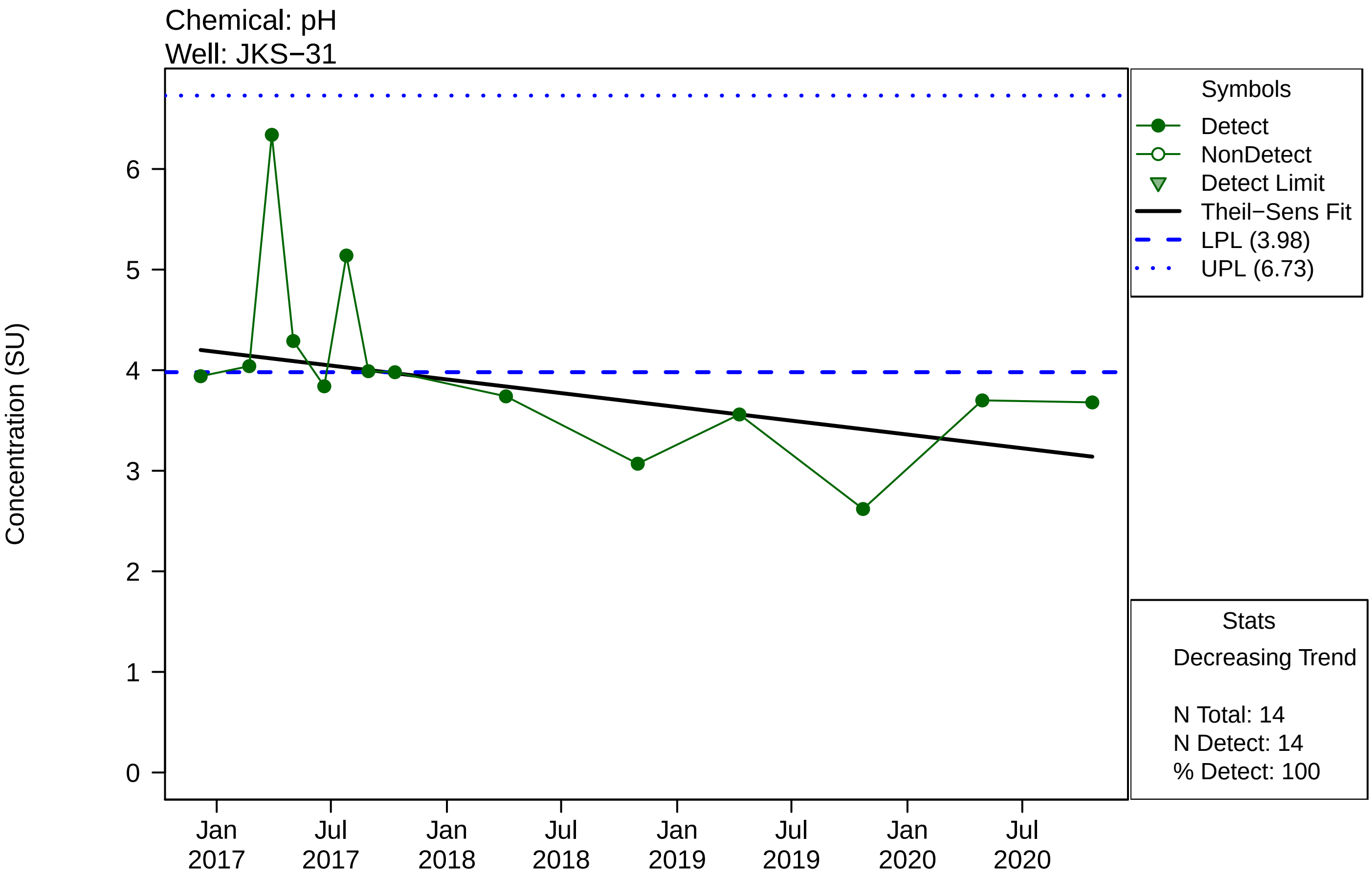
Chemical: Sulfate
Significant Difference (Intrawell Analysis)

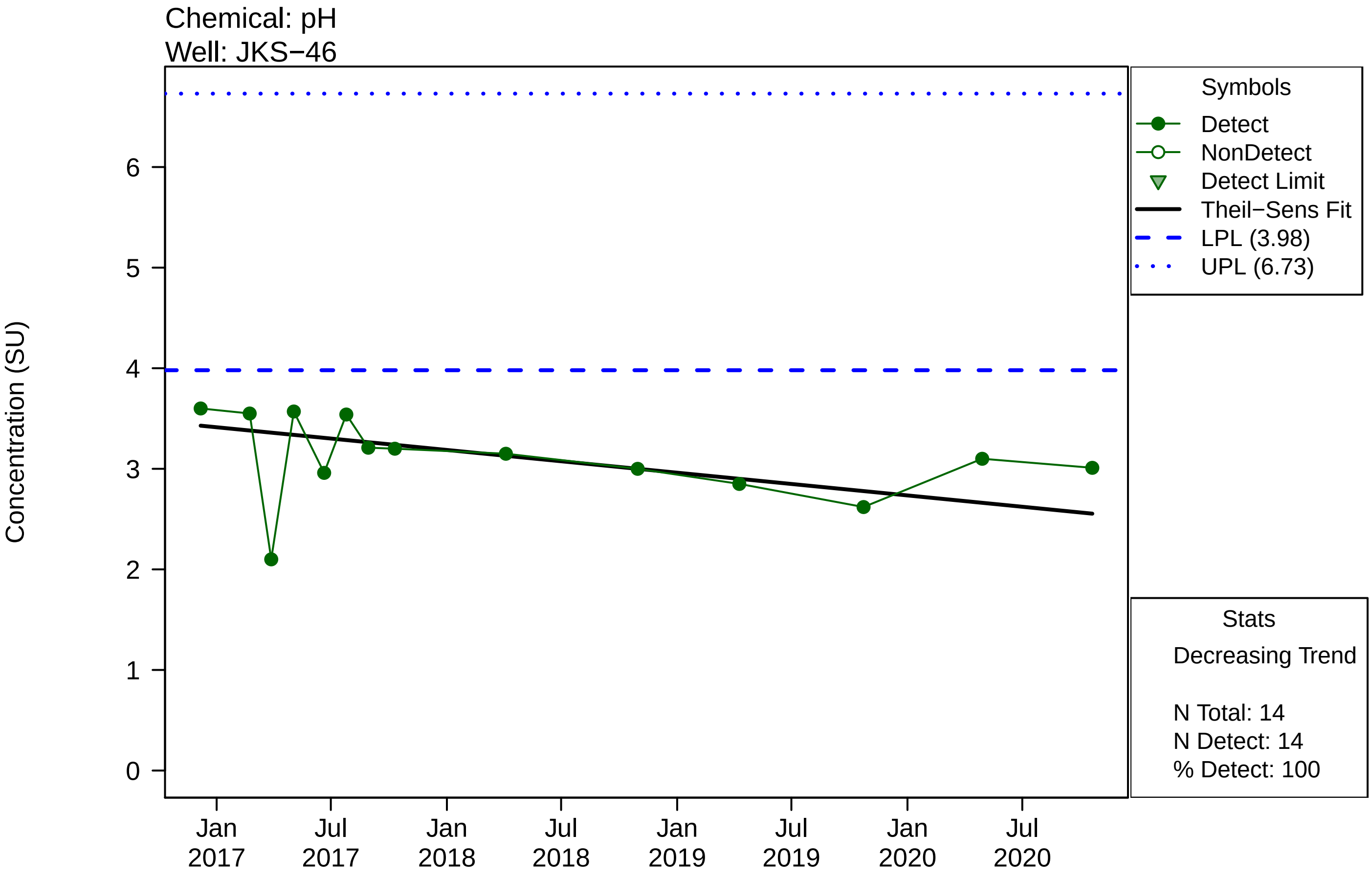


Appendix B − Figure 3
Unit: Fly Ash Landfill
Timeseries of Upgradient Wells

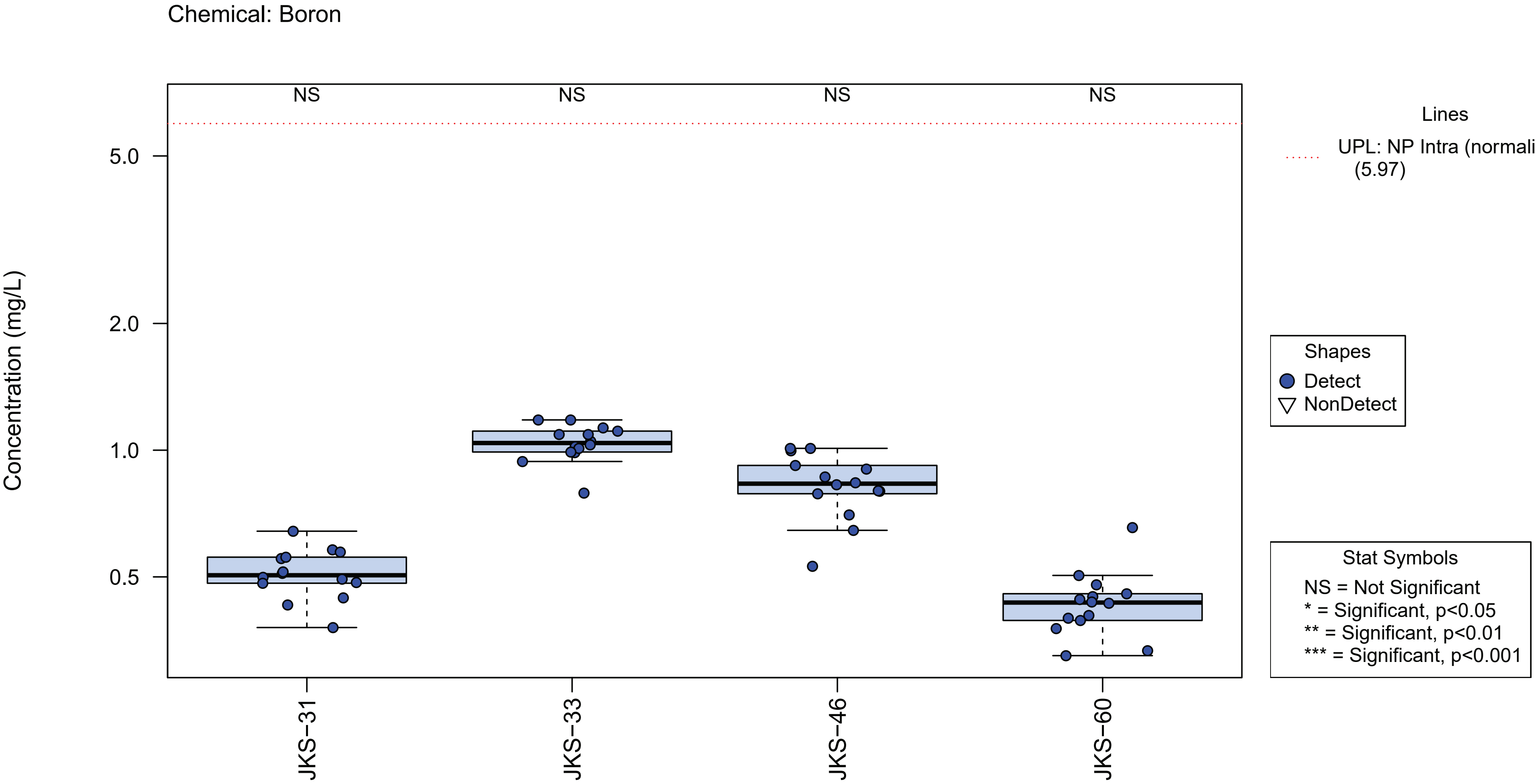


Appendix B − Figure 4
Unit: Fly Ash Landfill
Trend Analysis of Downgradient Wells with Exceedances



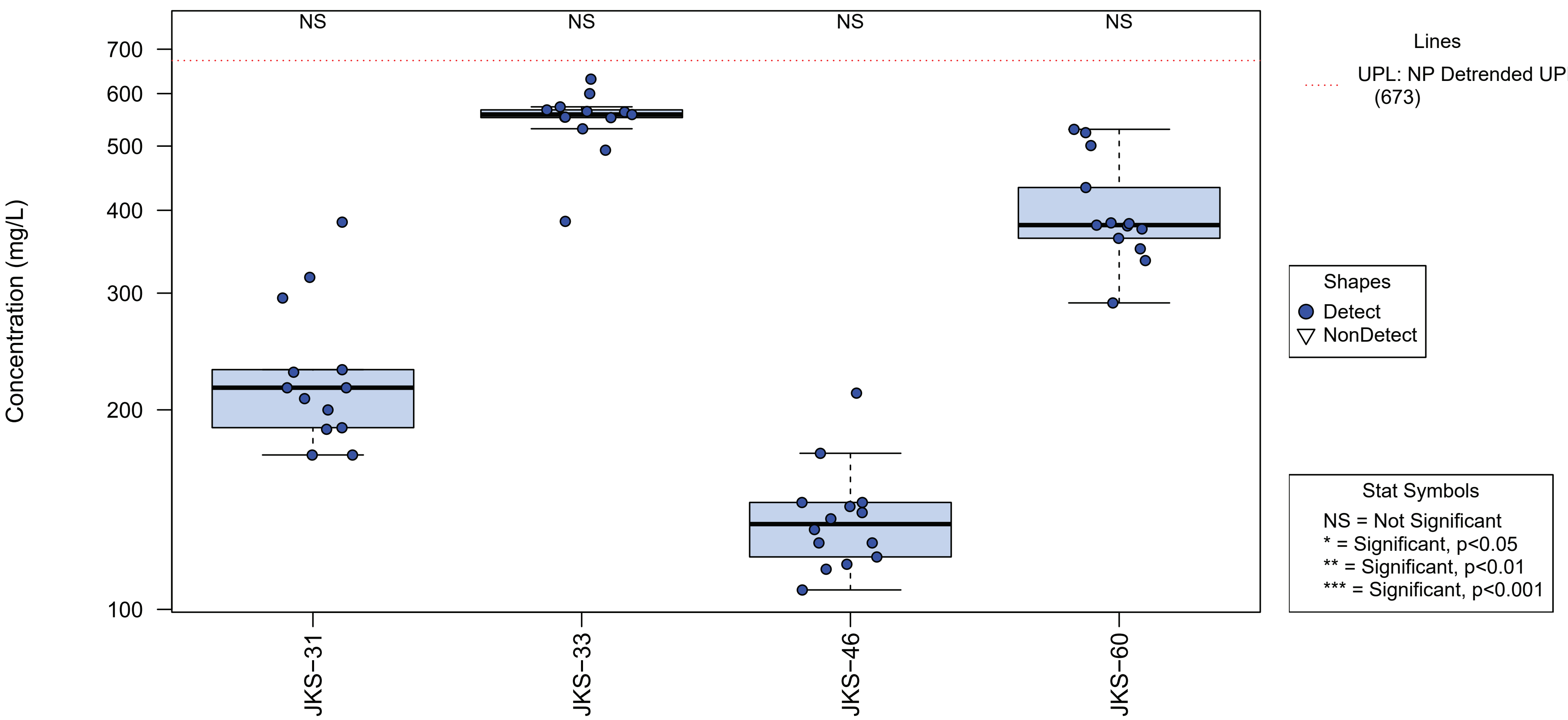


Appendix B - Figure 5
Unit: Fly Ash Landfill
Boxplots of Downgradient Wells

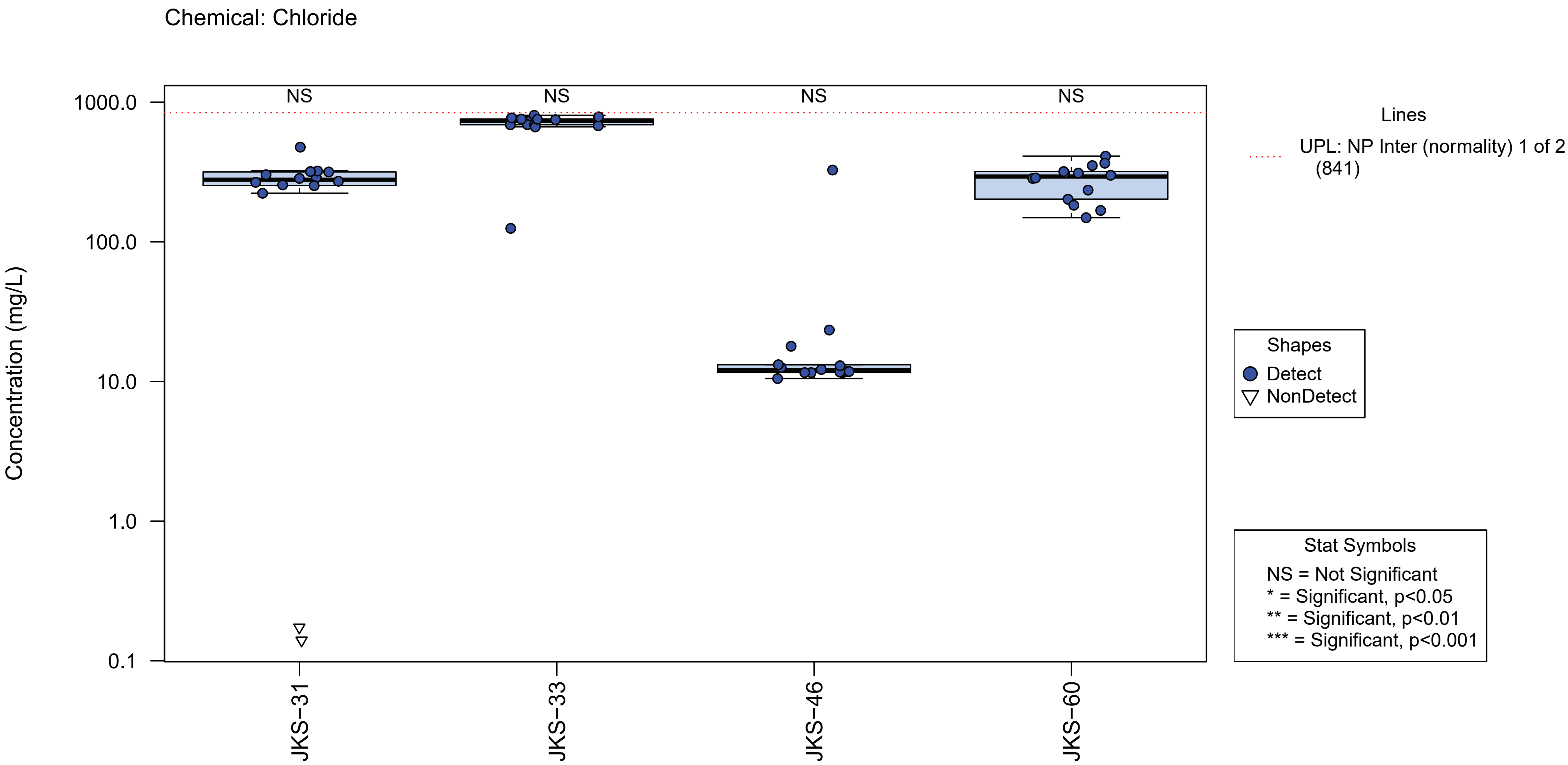


Appendix B - Figure 5
Unit: Fly Ash Landfill
Boxplots of Downgradient Wells

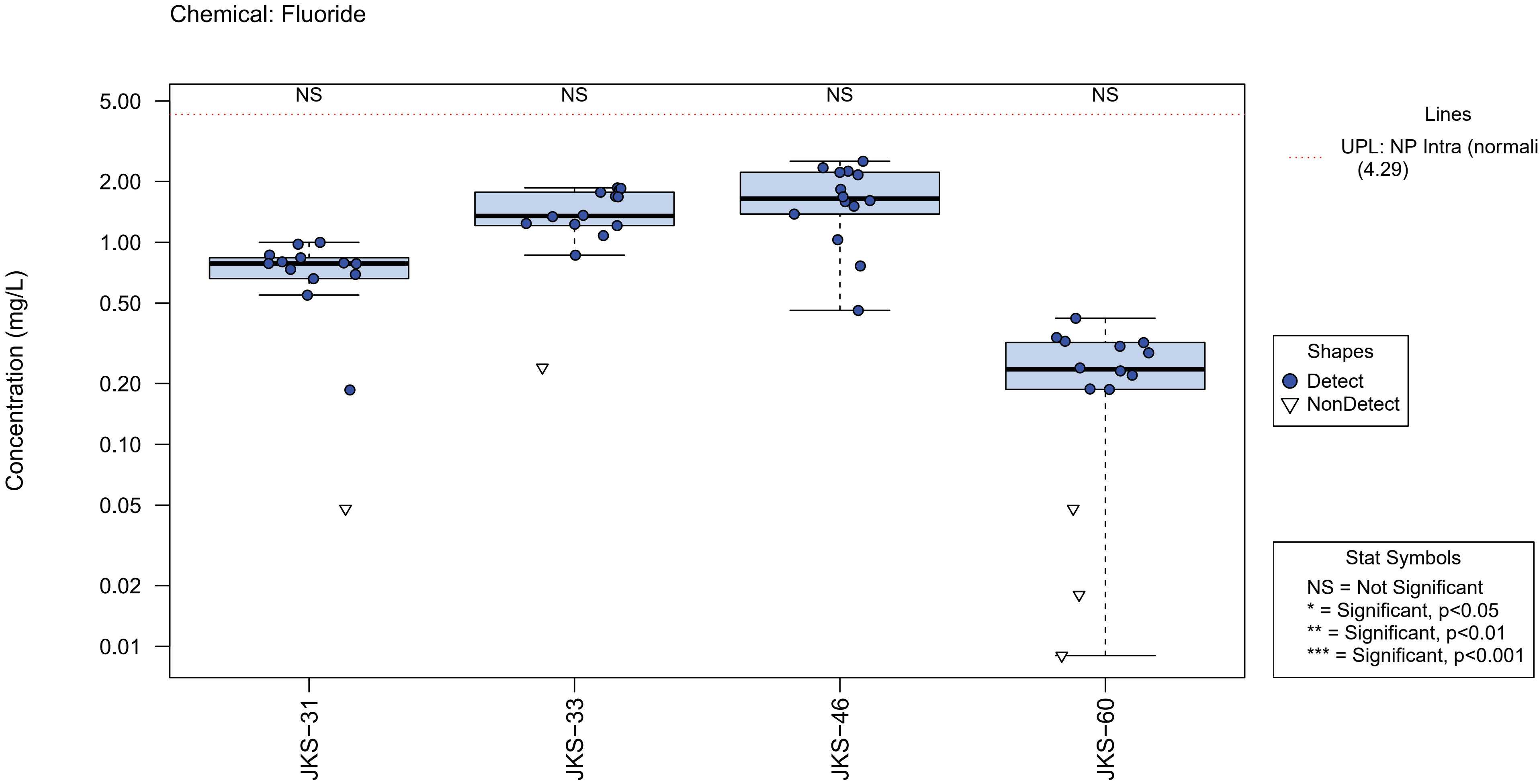
Chemical: Calcium



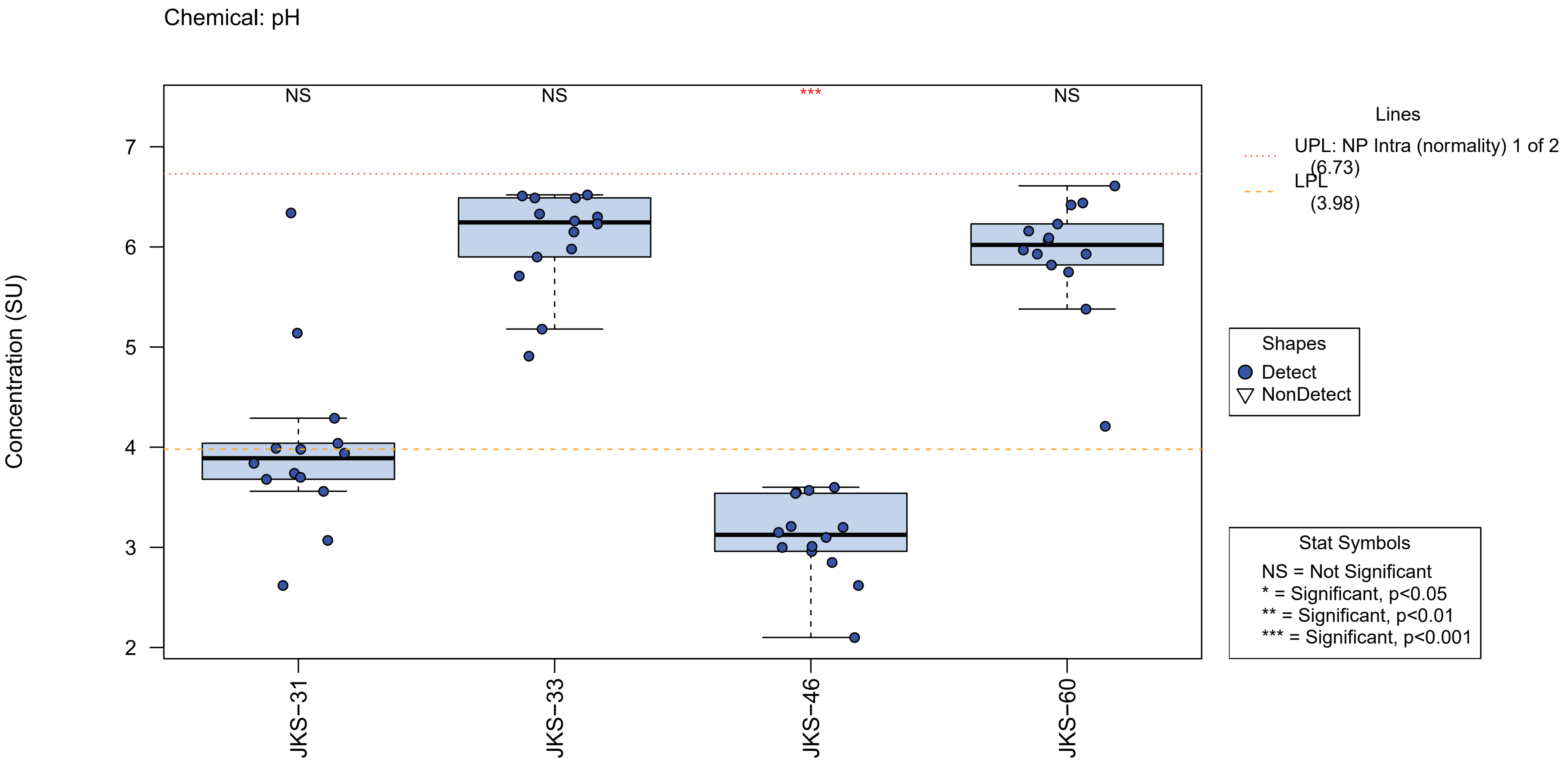
Appendix B - Figure 5
Unit: Fly Ash Landfill
Boxplots of Downgradient Wells



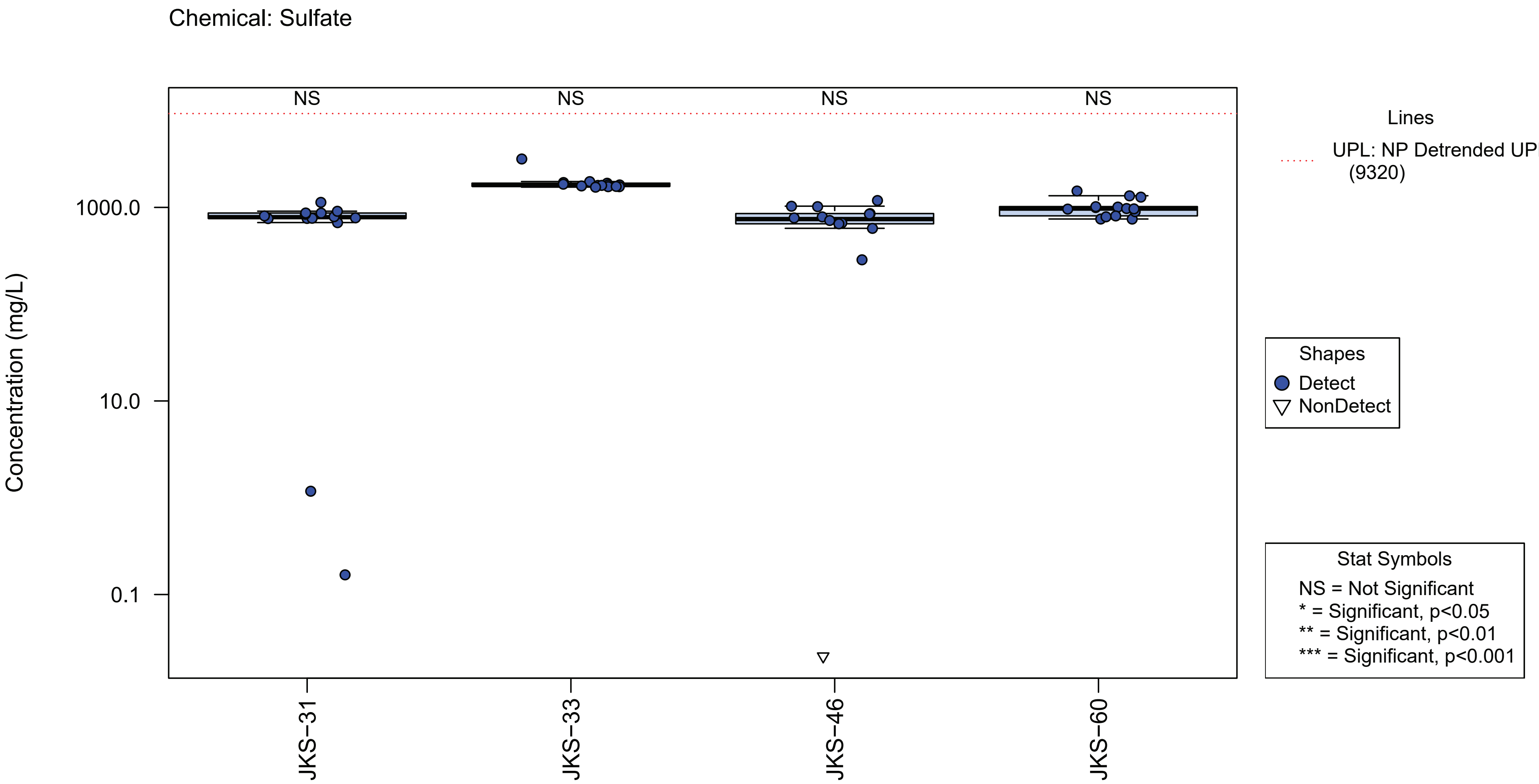
Appendix B - Figure 5
Unit: Fly Ash Landfill
Boxplots of Downgradient Wells



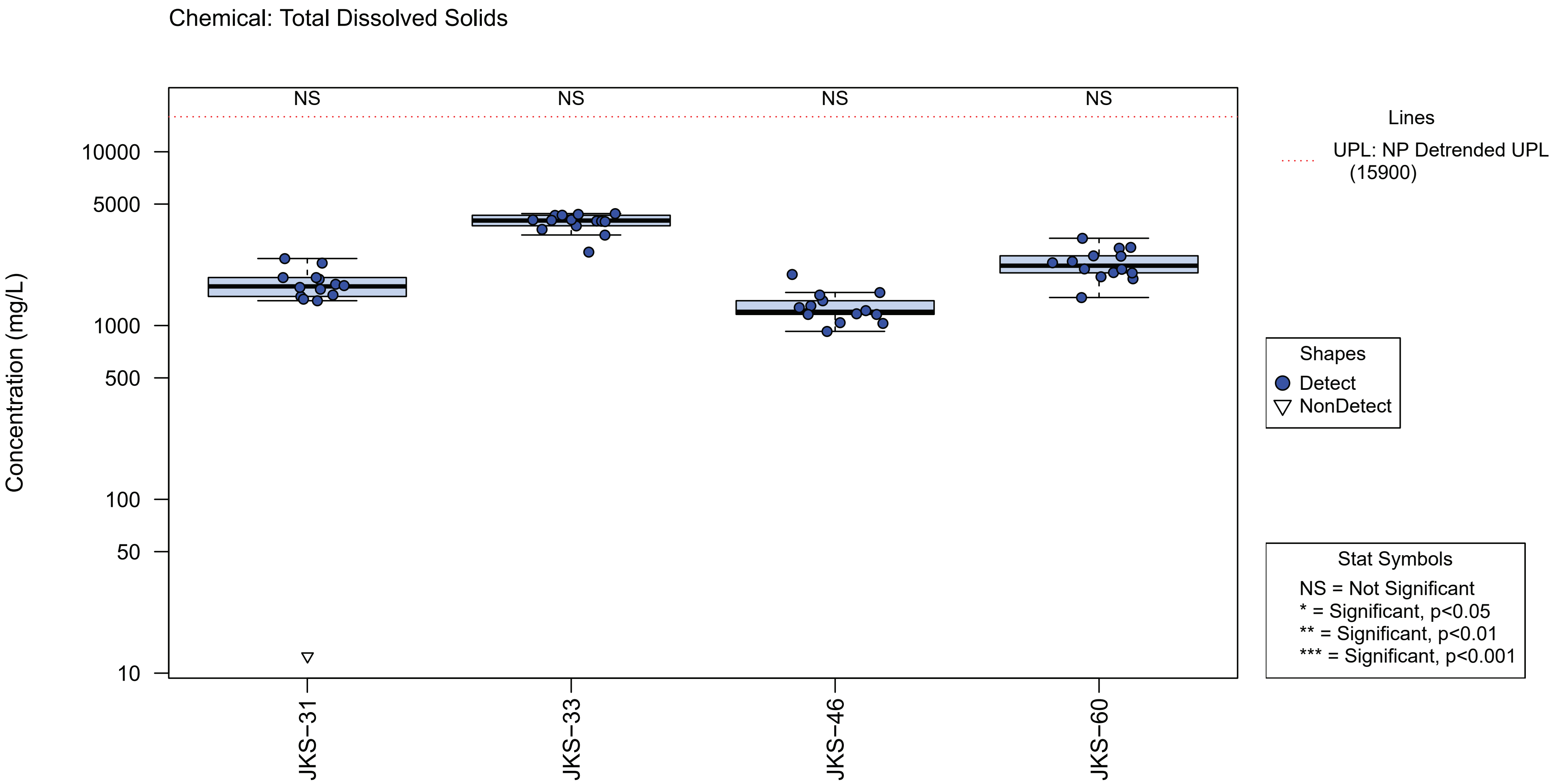
Appendix B - Figure 5
Unit: Fly Ash Landfill
Boxplots of Downgradient Wells



Appendix B - Figure 5
Unit: Fly Ash Landfill
Boxplots of Downgradient Wells



Appendix B - Figure 5
Unit: Fly Ash Landfill
Boxplots of Downgradient Wells



April 2020 Groundwater Sampling Event – Calaveras Power Station CCR Units

Appendix C

ERM

CityCentre Four
840 West Sam Houston Parkway
North, Suite 600
Houston, Texas 77024-3920

Telephone: +281 600 1000
Fax: +281 520 4625

www.erm.com

September 25, 2020

Mr. Michael Malone
CPS Energy
145 Navarro Street
San Antonio, Texas 78205

Reference: Project No. 0503422\A10320

Subject: April 2020 Groundwater Sampling Event and August 2020 Resampling Event
Calaveras Power Station CCR Units
San Antonio, Texas

Dear Mr. Malone:

Introduction

Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the Coal Combustion Residual (CCR) Rule) was published in the Federal Register in April 2015 and became effective in October 2015. One of the many requirements of the CCR Rule was for CPS Energy to determine if there are impacts to groundwater from the surface impoundments [Evaporation Pond (EP), Bottom Ash Ponds (BAPs), and Sludge Recycling Holding (SRH) Pond] and the landfill [Fly Ash Landfill (FAL)] that contain CCR at the Calaveras Power Station.

In the initial *2017 Annual Groundwater Monitoring and Corrective Action Report* for each CCR unit, the downgradient monitoring well results from the October 2016 sampling event were compared to Upper Prediction Limits (UPLs) and Lower Prediction Limits (LPLs). UPLs and LPLs were calculated in the *Annual Groundwater Monitoring and Corrective Action Reports* for the purpose of determining a potential statistically significant increase (SSI) over background levels. In the subsequent *2018* and *2019 Annual Groundwater Monitoring and Corrective Action Reports* for each CCR unit, the downgradient monitoring well results from the October 2017 and October 2018 sampling events were compared to updated UPLs and LPLs. These updated UPLs and LPLs were recalculated in the respective *Annual Groundwater Monitoring and Corrective Action Reports* using the additional data collected from the previous year. The evaluations of the April and August 2020 groundwater sample results indicated a potential SSI for a limited number of constituents from the EP, FAL, BAPs, and SRH Pond.

According to the CCR Rule [§257.94(e)], if the owner or operator of a CCR unit determines there is a SSI over background levels for one or more Appendix III constituents, the owner or operator may demonstrate that a source other than the CCR unit caused the SSI over background levels or that the SSI resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality. The CCR Rule also indicates that the owner or operator must complete the written demonstration within 90 days of detecting a SSI over the background levels. If a successful demonstration is completed within the 90-day period, the owner or operator may continue with a detection monitoring program.

To address the potential SSIs identified in the previous three *Annual Groundwater Monitoring and Corrective Action Reports*, CPS Energy prepared three *Written Demonstrations – Responses to Potential Statistically Significant Increases* (dated April 4, 2018; February 27, 2019; and April 27, 2020; respectively). Based on the evidence provided in the *Written Demonstrations*, no SSIs over background levels were determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy continued with a detection monitoring program that would include semiannual sampling.

Sampling Events Summary

The first semiannual groundwater sampling event for 2020 was conducted on April 28 through April 29, 2020. The sampling event included the collection of water level measurements and groundwater samples from all the background and downgradient monitoring wells in the CCR monitoring program. Monitoring wells were gauged and then sampled by CPS Energy using low flow sampling techniques during the sampling event. The groundwater samples were analyzed for Appendix III constituents. A resampling event of JKS-54 only was conducted on August 24, 2020.

For each CCR unit, the downgradient monitoring well results from the April and August 2020 sampling events were compared to the updated UPLs and LPLs recalculated in their respective *2019 Annual Groundwater Monitoring and Corrective Action Report*. The April and August 2020 groundwater sample results for the downgradient monitoring wells in each CCR unit are summarized in Attachment 1.

Although the evaluations of the April and August 2020 groundwater sample results indicate a potential SSI for a limited number of constituents, with the exception of sulfate in JKS-54 associated with the SRH Pond, the constituents associated with the potential SSIs are the same constituents, detected at similar concentrations, which were previously identified in one or all of the *Written Demonstrations*. The evaluations of the April and August 2020 groundwater sample results with potential SSIs are summarized below.

EP – The constituents associated with potential SSIs include fluoride in JKS-36 and JKS-61; and pH in JKS-36 and JKS-62. As previously presented in the *Written Demonstrations*, the concentrations of fluoride and pH appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

FAL – The constituent associated with a potential SSI is pH in JKS-31 and JKS-46. As previously presented in the *Written Demonstrations*, the concentrations of pH appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

BAPs – The constituents associated with potential SSIs include boron in JKS-50R and JKS-56; and fluoride in JKS-52 and JKS-55. As previously presented in the *Written Demonstrations*, the concentrations of boron and fluoride appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

SRH Pond – The constituents associated with potential SSIs include fluoride in JKS-52 and JKS-54; and sulfate in JKS-54. As previously noted in the *April 2019 Groundwater Sampling Report*, the concentrations of fluoride appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit and the reported April 2020 concentrations are within the range of naturally occurring concentrations identified in the *Annual Groundwater Monitoring and Corrective Action Reports*. Although a potential SSI of sulfate was not previously presented in the *Written Demonstrations*, the concentrations of sulfate in JKS-54 appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. While the concentration reported in the April 2020 sampling event (443 mg/L) was the highest concentration reported in JKS-54, the concentration reported in the August 2020 resampling event (425 mg/L) is within the range of concentrations reported in upgradient monitoring well JKS-51 over the previous three sampling events (405 to 439 mg/L).

Conclusions

Based on the April and August 2020 groundwater sample results and the evidence provided in one or all of the *Written Demonstrations*, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy should continue with a detection monitoring program. The second semiannual sampling event should be performed in October 2020.

We appreciate the opportunity to work with you on this project. Please contact me if you should have any questions.

Sincerely,

Environmental Resources Management

Walter Zverina

Walter Zverina
Principal Consultant

ATTACHMENT 1 APRIL AND AUGUST 2020 GROUNDWATER SAMPLE RESULTS

September 2020
Project No. 0503422

April 2020 Groundwater Sample Results
CCR Unit: Evaporation Pond
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	EP	EP	EP	EP
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-36	JKS-61	JKS-61	JKS-62
			Sample Date	4/29/2020	4/29/2020	4/29/2020	4/29/2020
			Sample Type Code	N	N	FD	N
Constituent	Units	2019 LPL - EP	2019 UPL - EP				
Boron	mg/L	--	1.88	0.459	1.82	1.85	0.484
Calcium	mg/L	--	1,300	175	154	157	122
Chloride	mg/L	--	2,780	63.3	312	317	284
Fluoride	mg/L	--	0.382	1.18	0.494	0.549	0.331
pH, Field	SU	4.58	6.47	3.42	6.27	6.27	6.54
Sulfate	mg/L	--	2,110	189	604	608	190
Total dissolved solids	mg/L	--	6,660	1,790	1,870	1,870	1,100

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

April 2020 Groundwater Sample Results
CCR Unit: Fly Ash Landfill
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	FAL	FAL	FAL	FAL	FAL
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-31	JKS-33	JKS-46	JKS-46	JKS-60
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020
			Sample Type Code	N	N	N	FD	N
Constituent	Units	2019 LPL - FAL	2019 UPL - FAL					
Boron	mg/L	--	4.29	0.429	1.18	0.864	0.806	0.325
Calcium	mg/L	--	583	171 J	573 J	143 J	133 J	530 J
Chloride	mg/L	--	841	272	756	17.9	19.2	168
Fluoride	mg/L	--	4.86	1.00	1.68	1.61 J	2.44 J	0.188
pH, Field	SU	3.98	6.73	3.70	6.30	3.10	3.10	6.61
Sulfate	mg/L	--	7,630	877	1,620	1,180	1,240	1,280
Total dissolved solids	mg/L	--	11,900	1,890	4,370	1,970	1,780	3,180

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

April 2020 Groundwater Sample Results
CCR Unit: Bottom Ash Ponds
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	BAP	BAP	BAP	BAP	BAP	BAP
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-48	JKS-50R	JKS-52	JKS-52	JKS-55	JKS-56
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020
			Sample Type Code	N	N	N	FD	N	N
Constituent	Units	2019 LPL - BAP	2019 UPL - BAP						
Boron	mg/L	--	2.40	2.36	5.52	2.05	2.16	0.779	3.55
Calcium	mg/L	--	368	130 J	126 J	174 J	180 J	137 J	103 J
Chloride	mg/L	--	608	485	102	433	430	452	101
Fluoride	mg/L	--	0.847	0.051 JH	0.510	0.908	0.952	1.01	0.552
pH, Field	SU	5.48	7.31	6.89	6.65	6.83	6.83	6.81	6.72
Sulfate	mg/L	--	431	206	194	315	313	177	138
Total dissolved solids	mg/L	--	2,240	1,400	918	1,470	1,420	1,350	904

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

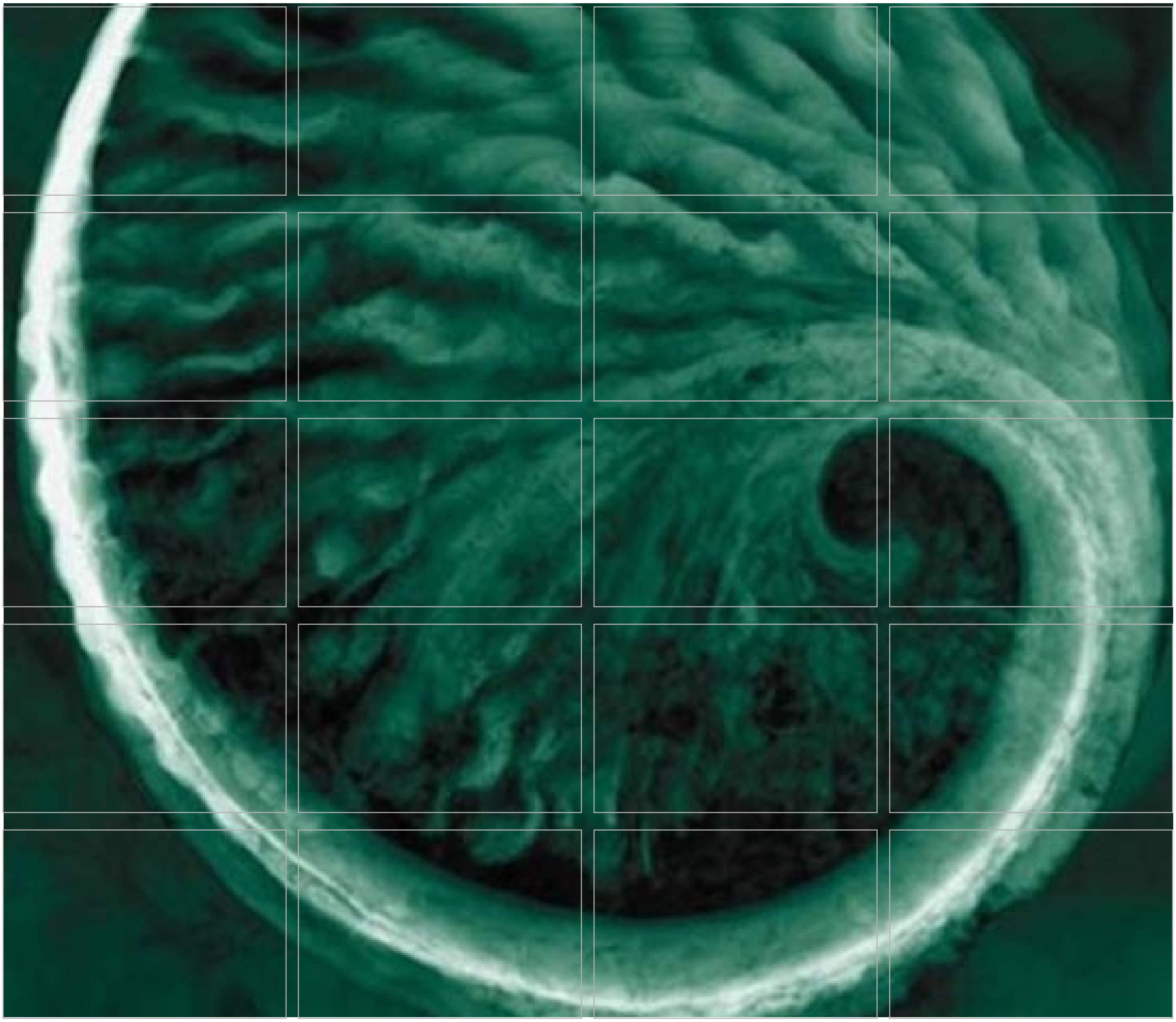
April and August 2020 Groundwater Sample Results
CCR Unit: SRH Pond
CPS Energy Calaveras Power Station
San Antonio, TX

CCR Unit				SRH Pond	SRH Pond	SRH Pond	SRH Pond	SRH Pond
Well Designation				Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
Well ID				JKS-52	JKS-52	JKS-53	JKS-54	JKS-54
Sample Date				4/28/2020	4/28/2020	4/28/2020	4/28/2020	8/24/2020
Sample Type Code				N	FD	N	N	R
Constituent	Units	2019 LPL - SRH	2019 UPL - SRH					
Boron	mg/L	--	2.40	2.05	2.16	1.43	1.23	NA
Calcium	mg/L	--	357	174 J	180 J	114 J	118 J	NA
Chloride	mg/L	--	608	433	430	381	380	NA
Fluoride	mg/L	--	0.831	0.908	0.952	0.428	0.861	0.579
pH, Field	SU	5.48	7.31	6.83	6.83	6.67	6.76	NA
Sulfate	mg/L	--	421	315	313	244	443	425
Total dissolved solids	mg/L	--	2,180	1,470	1,420	1,160	1,570	NA

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate; R - Resample
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NA: Not analyzed for this constituent

Attachment 16-4



Annual Groundwater Monitoring and Corrective Action Report

CPS Energy
Calaveras Power Station – Sludge Recycle Holding Pond
San Antonio, Texas

January 2021

www.erm.com

The business of sustainability

ERM

Calaveras Power Station – Sludge Recycle Holding Pond

Annual Groundwater Monitoring and Corrective Action Report

January 2021

Project No. 0503422
San Antonio, Texas

Jeffery L. Bauguss, P.E.
Partner-in-Charge

Walter Zverina

Walter Zverina
Project Manager

Karen Fletcher
Senior Scientist

Nicholas Houtchens, P.G.
Senior Geologist

NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, TX 78701
T: 512-459-4700

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

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1. CURRENT STATUS SUMMARY

As required in Title 40, Code of Federal Regulations, §257.90, this section provides an overview of the current status of the groundwater monitoring and corrective action program for the Sludge Recycle Holding (SRH) Pond located at the CPS Energy Calaveras Power Station:

- At the start of the 2020 annual reporting period, the SRH Pond was operating under the detection monitoring program, as defined in §257.94;
- At the end of the 2020 annual reporting period, the SRH Pond was operating under the detection monitoring program, as defined in §257.94;
- At this time, there was no confirmed statistically significant increase over background for one or more constituents listed in Appendix III pursuant to §257.94(e);
- An assessment monitoring program was not required or initiated for the SRH Pond;
- A remedy was not required or selected pursuant to §257.97 during the 2020 annual reporting period; and
- No remedial activities were initiated or are ongoing pursuant to §257.98 during the 2020 annual reporting period.

2. INTRODUCTION

CPS Energy owns and operates the Calaveras Power Station which consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the CCR Rule). The Power Station is located in unincorporated Bexar County, Texas, approximately 13 miles southeast of San Antonio. Currently, CPS Energy operates three CCR units at the Power Station: Evaporation Pond, Fly Ash Landfill, and the Sludge Recycle Holding (SRH) Pond. This *Annual Groundwater Monitoring and Corrective Action Report* (Report) only addresses the SRH Pond.

This Report was produced by Environmental Resource Management (ERM), on behalf of CPS Energy, and summarizes the groundwater monitoring activities for the SRH Pond and provides a statistical summary of the findings for samples collected during the 2020 semi-annual monitoring events. Consistent with the requirements of the CCR Rule, this Report will be posted to the facility's operating record and notification will be made to the State of Texas. Additionally, this Report will be placed on the CPS Energy publically accessible internet site. Unless otherwise mentioned, the analyses in this Report follow the *Groundwater Sampling and Analysis Program* (SAP) (ERM, 2017) posted on the internet site. The table below cross references the reporting requirements under the CCR Rule with the contents of this Report.

Regulatory Requirement Cross-Reference

Regulatory Citation	Requirement (paraphrased)	Where Addressed in this Report
§257.90(e)	Status of the groundwater monitoring and corrective action program	Sections 1 and 3
§257.90(e)	Summarize key actions completed	Section 3
§257.90(e)	Describe any problems encountered and actions to resolve problems	Section 3
§257.90(e)	Key activities for upcoming year	Section 5
§257.90(e)(1)	Map or aerial image of CCR unit and monitoring wells	Figure 1
§257.90(e)(2)	Identification of new monitoring wells installed or decommissioned during the preceding year	Section 3
§257.90(e)(3)	Summary of groundwater data, monitoring wells and dates sampled, and whether sample was required under detection or assessment monitoring	Sections 3 and 4, Tables 1 through 3, and Figure 2
§257.90(e)(4)	Narrative discussion of any transition between monitoring programs	Section 5

The SRH Pond is located east of the Power Station generating units and is adjacent to and immediately west of the Bottom Ash Ponds. The SRH Pond consists of two ponds separated by a dividing wall (oriented north and south) containing flue gas desulphurization scrubber sludge. The SRH Pond was constructed in 1992. The CCR unit location is shown on Figure 1.

3. PROGRAM STATUS

From December 2016 to October 2017, groundwater samples were collected as part of background sampling. After October 2017, groundwater samples were collected as part of detection monitoring. The samples were collected from the groundwater monitoring well network certified for use in determining compliance with the CCR Rule.

The groundwater monitoring well network consists of two upgradient monitor wells (JKS-49 and JKS-51) and three downgradient monitor wells (JKS-52, JKS-53, and JKS-54). All monitoring wells are screened within the uppermost groundwater bearing unit (GWBU) in the vicinity of the SRH Ponds. The uppermost GWBU varies in thickness from approximately 9.5 to 21.5 feet thick and is comprised of clayey/silty sand to moderately-sorted sand. The uppermost GWBU is located below semi-confining units (i.e., clay, sandy clay, or silty clay), and above a sandstone bedrock unit.

The monitoring well locations are shown in Figure 1. No problems were encountered in the data collection or in well performance, and no action was required to resolve any issues. No new monitoring wells were installed or decommissioned after the certification of the well network.

3.1. GROUNDWATER FLOW RATE AND DIRECTION

Depth to groundwater surface measurements were made at each monitoring well prior to sampling. Groundwater elevations were calculated by subtracting the depth to groundwater measurement from the surveyed reference elevation for each well.

Groundwater elevations collected during the monitoring events are summarized in Table 1. Groundwater elevations and the potentiometric surfaces for the April and October 2020 monitoring events are shown on Figure 2A and Figure 2B, respectively. As measured during the April 2020 monitoring event, groundwater in the vicinity of the SRH Pond appears to flow toward Calaveras Lake and the adjacent channel (south and southeast). The horizontal gradient is less than 0.001 feet/foot.

Groundwater elevations measured during the October 2020 monitoring event appear to display radial flow from Calaveras Lake and adjacent channel towards the SRH Pond (from the east and south), which is a change in groundwater flow direction not previously observed at the SRH Pond, including April 2020. Similar to observations made during the October 2019 monitoring event, JKS-49 was the lowest recorded potentiometric surface elevation. The horizontal gradient is approximately 0.002 feet/foot. Groundwater monitoring networks that exhibit a substantially flat gradient are more likely to experience differences in groundwater flow direction. With proximity to Calaveras Lake, the slightest lake level fluctuations may influence groundwater flow direction. The potentiometric surface elevations will continue to be monitored and a water level study will be initiated in 2021.

3.2. SAMPLING SUMMARY

A summary of the total number of samples collected from each monitoring well is provided in Table 2. Groundwater analytical results from the monitoring events are summarized in Table 3. Laboratory data packages are provided in Appendix A.

The SRH Pond monitoring wells were sampled by CPS Energy using low flow sampling techniques during the monitoring events. No data gaps were identified during the 2020 semi-annual groundwater monitoring events.

3.3. DATA QUALITY

ERM reviewed field and laboratory documentation to assess the validity, reliability and usability of the analytical results. Samples were sent to San Antonio Testing Laboratory, located in San Antonio, Texas for analysis. Data quality information reviewed for these results included field sampling forms, chain-of-custody documentation, holding times, lab methods, cooler temperatures, laboratory method blanks, laboratory control sample recoveries, field duplicate samples, matrix spikes/matrix spike duplicates, quantitation limits, and equipment blanks. A summary of the data qualifiers are included in Table 3. The data quality review found the results to be valid, reliable, and useable for decision making purposes with the listed qualifiers. No analytical results were rejected.

4. STATISTICAL ANALYSIS AND RESULTS

Consistent with the CCR Rule and the SAP, a prediction limit approach [40 CFR §257.93(f)] was used to identify potential impacts to groundwater. Tables and figures generated as part of the statistical analysis are provided in Appendix B. The steps outlined in the decision framework in the SAP include:

- Interwell versus intrawell comparisons;
- Establishment of upgradient dataset;
- Calculation of prediction limits; and
- Conclusions.

The remaining sections of this Report are focused on evaluation of the October 2020 sampling results. Note the April 2020 sampling results were evaluated as discussed in the *April 2020 Groundwater Sampling Event – Calaveras Power Station CCR Units* (ERM, 2020) provided in Appendix C.

4.1. INTERWELL VERSUS INTRAWELL COMPARISONS

When multiple upgradient wells were available within the same unit, concentrations were compared among these wells to determine if they could be pooled to create a single, interwell, upgradient dataset. For each analyte, Boxplots (Appendix B, Figure 1) and Kruskal-Wallis test results (Appendix B, Table 1) are provided for upgradient wells. The statistical test shows that:

- One Appendix III analyte [chloride] will follow interwell analysis, with no significant differences present in upgradient data; and
- The remaining six Appendix III analytes [boron, calcium, fluoride, pH, sulfate, and total dissolved solids (TDS)] will follow intrawell analysis, with significant differences present in upgradient data.

Interwell analytes will use a pooled upgradient dataset for subsequent report sections. Conversely, intrawell analytes will have each individual upgradient dataset used for subsequent report sections.

4.2. ESTABLISHMENT OF UPGRADIENT DATASET

When evaluating the concentrations of analytes in groundwater, USEPA Unified Guidance (2009) recommends performing a careful quality check of the data to identify any anomalies. In addition to the data validation that was performed, descriptive statistics, outlier testing, and temporal stationarity checks were completed to finalize the upgradient dataset.

4.2.1. Descriptive Statistics

Descriptive statistics were calculated for the upgradient wells and analytes at the SRH Pond (Appendix B, Table 2). The descriptive statistics highlight a number of relevant characteristics about the upgradient datasets including:

- There are a total of 13 well-analyte combinations for the upgradient dataset;
- 13 well-analyte combinations have detection rates greater than or equal to 50 percent;
- 12 well-analyte combinations have 100 percent detects;
- 11 well-analyte combinations follow a normal distribution (using Shapiro-Wilks Normality Test); and
- Two well-analyte combinations have no discernible distribution.

4.2.2. Outlier Determination

Both statistical and visual outlier tests were performed on the upgradient datasets. Data points identified as both a statistical and visual outlier (Appendix B, Table 3 and Appendix B, Figure 2) were reviewed before they were excluded from the dataset. A total of four potential outliers were initially flagged from the upgradient datasets. However, these values were consistent with seasonal fluctuations and concentrations detected in other upgradient wells or in historical groundwater sampling results. No analytical or sampling issues were identified during data review; therefore, the four values were considered valid and were retained for upper prediction limit (UPL) calculations.

4.2.3. Check for Temporal Stability

A trend test was performed for all values in the upgradient wells that had at least eight detected data points and at least 50 percent detection rate. Time series figures of upgradient wells are provided in Appendix B, Figure 3. Additionally, the Mann Kendall trend test results are provided in Appendix B, Table 4. The following summarize the results of the trend analysis:

- There are a total of 13 well-analyte combinations in the upgradient dataset; and
- 13 well-analyte combinations meet the data requirements of the trend test of which:
  - One well-analyte combinations had an increasing trend;
  - One well-analyte combinations had a decreasing trend; and
  - 11 well-analyte combinations had no trend (i.e., concentrations were stable over time).

4.3. CALCULATION OF PREDICTION LIMITS

A multi-part assessment of the monitoring wells was performed to determine what type of UPL to calculate as a compliance point. A decision framework was applied for each upgradient well based on inter/intrawell analysis, data availability, and presence of temporal trends.

A total of two well-analyte combinations were found to have either increasing or decreasing trends. For these well-analyte combinations, a bootstrapped UPL calculated around a Theil Sen trend was used to derive a more accurate UPL. The remaining 11 well-analyte combinations were found to have no trend. Sanitas was used to calculate static UPLs using an annual site-wide false positive rate of 0.1 with a 1-of-2 re-testing approach.

A final UPL was selected for each analyte and compared to the October 2020 sampling results in the downgradient wells. A final lower prediction limit (LPL) was also selected for pH. For the one analyte following interwell analysis, the upgradient dataset was pooled prior to UPL calculations, resulting in a single UPL value per analyte. For the six analytes following intrawell analysis, a UPL value was calculated for each of the upgradient wells. For these wells and analytes, the maximum UPL was selected as the representative UPL for each analyte. A similar approach was used to determine the LPL for pH; however, the minimum LPL was selected in the case of intrawell analysis. All final UPL and LPL values are shown in the table below. Full upgradient well calculations are provided in Appendix B, Table 5.

Final UPL and LPL Values

Analysis Type	Analyte	LPL	UPL	Unit
Intrawell	Boron	--	2.64	mg/L
Intrawell	Calcium	--	377	mg/L
Interwell	Chloride	--	608	mg/L
Intrawell	Fluoride	--	0.89	mg/L
Intrawell	pH	5.48	7.31	SU
Intrawell	Sulfate	--	452	mg/L
Intrawell	TDS	--	2,320	mg/L

4.4. CONCLUSIONS

The downgradient samples collected during the October 2020 monitoring event were used for compliance comparisons. All downgradient wells were less than the UPLs and greater than the LPLs for pH.

Additionally, each downgradient well-analyte pair had a Wilcoxon Rank Sum test comparing if their median is greater than the UPL or less than the LPL for pH. This nonparametric, rank-based test was used as an additional line of evidence for downgradient well compliance. Specific well-analyte pairs are of interest if: (1) there is a recent exceedance of the UPL, but historic concentrations place the median less than the UPL, or (2) there is not a recent exceedance of the UPL, but historic concentrations place the median greater than the UPL. All downgradient wells had medians less than the UPLs and greater than the LPLs for pH. Full downgradient results are provided in Appendix B, Table 6, with boxplots in Appendix B, Figure 4.

5. RECOMMENDATIONS

Currently, there are no plans to transition from detection monitoring to assessment monitoring.

6. REFERENCES

ERM, 2017. *Groundwater Sampling and Analysis Program*.

USEPA, 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities.* Unified Guidance. USEPA/530/R/09/007. Office of Resource Conservation and Recovery. Washington, D.C.

Tables

TABLE 1
Groundwater Elevations Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-49 Upgradient		**JKS-51 Upgradient**		**JKS-52 Downgradient**		**JKS-53 Downgradient**		**JKS-54 Downgradient**	
		TOC Elevation	**498.63**	**TOC Elevation**	**496.92**	**TOC Elevation**	**493.15**	**TOC Elevation**	**494.74**	**TOC Elevation**	**496.40**
Sampling Event	**Sampling Event Dates**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**	**Depth to Water (feet btoc)**	**Water Level (msl)**
1	12/6/16 to 12/8/16	8.81	489.82	10.76	486.16	7.53	485.62	7.70	487.04	10.19	486.21
2	2/21/17 to 2/23/17	8.56	490.07	10.80	486.12	7.43	485.72	8.52	486.22	10.48	485.92
3	3/28/17 to 3/30/17	8.90	489.73	10.59	486.33	7.33	485.82	8.95	485.79	10.64	485.76
4	5/2/17 to 5/4/17	8.85	489.78	10.56	486.36	7.35	485.80	8.74	486.00	10.64	485.76
5	6/20/17 to 6/21/17	8.75	489.88	10.56	486.36	7.46	485.69	8.47	486.27	10.71	485.69
6	7/25/17 to 7/26/17	8.46	490.17	10.68	486.24	7.50	485.65	8.85	485.89	10.85	485.55
7	8/29/17 to 8/30/17	7.21	491.42	10.48	486.44	7.40	485.75	8.55	486.19	9.50	486.90
8	10/10/17 to 10/11/17	11.17	487.46	10.98	485.94	7.53	485.62	9.21	485.53	11.17	485.23
9	4/4/18 to 4/5/18	9.00	489.63	10.93	485.99	8.48	484.67	8.90	485.84	10.76	485.64
10	10/30/18 to 10/31/18	6.88	491.75	10.45	486.47	8.33	484.82	8.40	486.34	10.55	485.85
11	4/9/19 to 4/10/19	12.52	486.11	11.02	485.90	7.65	485.50	8.96	485.78	10.75	485.65
12	10/22/19 to 10/23/19	14.84	483.79	12.00	484.92	9.40	483.75	9.91	484.83	11.47	484.93
13	4/28/20 to 4/29/20	13.58	485.05	11.79	485.13	8.20	484.95	9.75	484.99	11.33	485.07
14	10/20/20 to 10/21/20	14.42	484.21	12.11	484.81	8.07	485.08	9.73	485.01	11.47	484.93

NOTES:
btoc = below top of casing
msl = mean sea level

TABLE 2
Groundwater Sampling Summary
CPS Energy - Calaveras Power Station
SRH Pond

CCR Unit	**Well ID**	**Well Function**	**Number of Samples Collected in 2016 - 2020**	**2016 - 2020 Sample Dates**														**Monitoring Program**
				12/6/16 to 12/8/16	**2/21/17 to 2/23/17**	**3/28/17 to 3/30/17**	**5/2/17 to 5/4/17**	**6/20/17 to 6/21/17**	**7/25/17 to 7/26/17**	**8/29/17 to 8/30/17**	**10/10/17 to 10/11/17**	**4/4/18 to 4/5/18**	**10/30/18 to 10/31/18**	**4/9/19 to 4/10/19**	**10/22/19 to 10/23/19**	**4/28/20 to 4/29/20**	**10/20/20 to 10/21/20**	
SRH Pond	JKS-49	Upgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-51	Upgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-52	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-53	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection
	JKS-54	Downgradient Monitoring	14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Detection

NOTES:
X = Indicates that a sample was collected.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-49 Upgradient													
	Sample Date	**12/7/16**	**2/22/17**	**3/28/17**	**5/3/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	3.24	3.28	3.28	3.03 X	3.04 J	2.76	2.85	2.87	2.71	2.70	2.05	2.58	2.47	2.81
Calcium	mg/L	130	146	173	113	127	120	145	147	135	117 D	154 D	127 D	114 J	132
Chloride	mg/L	295 D	383 D	372 D	326	414 D	448 D	459 D	424	446 D	408	449	429	452	435
Fluoride	mg/L	0.715	0.643 JH	0.665 JH	0.809	0.627 JH	0.617 JH	0.525	0.712	0.697	0.719	0.749	0.793	0.894	0.656
Sulfate	mg/L	211 D	232 D	234 D	194	218 D	227	265 D	219 X	237	237	240	205	217	193
pH - Field Collected	SU	7.19	7.12	7.12	7.02	7.06	6.16	7.05	6.89	7.12	7.12	7.31	6.43	7.15	7.14
Total dissolved solids	mg/L	1250	1240	1190	1100	1450	1440	1490	1730	1310	1210	1290	1380	1240	1380
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00173 J	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000676 J	0.000729 J	0.00123 U	0.00123 U	0.000544 J	0.000538 J	0.000478 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0607	0.0575	0.0503	0.0554	0.0783	0.0721	0.0788	0.0735	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000859 J	0.000572 J	0.00262 U	0.00262 U	0.000963 J	0.000997 J	0.00113 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00102 J	0.00109 J	0.00124 J	0.00155 J	0.00133 J	0.00153 J	0.00155 J	0.00146 J	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.715	0.643 JH	0.665 JH	0.809	0.627 JH	0.617 JH	0.525	0.712	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000758 U	0.000155 J	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0137 J	0.0341	0.0295	0.0427	0.0252	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000690 J	0.0000263 U	0.0000490 J	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00779 J	0.00846	0.00875	0.0106	0.00908 J	0.00938	0.0107	0.0111	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00992 J	0.00597	0.00479	0.00521 J	0.00370 J	0.00235	0.00188 J	0.00141 J	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.198 ± 0.197	0.615 ± 0.272	0.747 ± 0.323	0.195 ± 0.167	0.294 ± 0.192	0.241 ± 0.193	0.159 ± 0.191	0.746 ± 0.274	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.1 ± 0.907	-1.37 ± 1.37	0.854 ± 0.724	1.08 ± 1.72	2.23 ± 0.949	0.658 ± 0.636	0.812 ± 0.604	1.43 ± 0.898	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-51 Upgradient													
Sample Date		**12/8/16**	**2/22/17**	**3/28/17**	**5/3/17**	**6/21/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/20/20**
Task		**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	0.512	0.517	0.473	0.565	0.512	0.525	0.453	0.509	0.465	0.347	0.489	0.648	0.627	0.668
Calcium	mg/L	267	292	322	266	261 X	232	236	256	246	149 D	328	336 D	334 J	298
Chloride	mg/L	403 D	331 D	414 D	447	424 D	455 D	384 D	375	395 D	301	559	574 D	555	493
Fluoride	mg/L	0.247	0.341 JH	0.415 JH	0.534	0.354	0.391	0.0960 U	0.407 JH	0.305 J	0.291 J	0.329 J	0.405 J	0.470	0.018 U
Sulfate	mg/L	293 D	330 D	348 D	359	342 D	330 D	314 D	302	354 D	260	428	405 D	439	376
pH - Field Collected	SU	6.59	6.51	6.48	6.56	6.40	5.48	6.38	6.20	6.44	6.70	6.66	5.73	6.43	6.47
Total dissolved solids	mg/L	1650	1650	1490	1980	1530	1580	1390	1650	1320	916	1890	2150	2010	1930
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.000953 J	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000412 J	0.000390 J	0.00123 U	0.000392 J	0.000344 J	0.000395 J	0.000418 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0655	0.0563	0.0517	0.0512	0.0534	0.0520	0.0520	0.0564	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000212 J	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000941 J	0.000525 U	0.00262 U	0.000657 J	0.000874 J	0.00113 J	0.00133 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000350 U	0.0000770 J	0.0000920 J	0.000350 U	0.000124 J	0.0000940 J	0.0000800 J	0.000108 J	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.247	0.341 JH	0.415 JH	0.534	0.354	0.391	0.0960 U	0.407 JH	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0322	0.0874	0.0790	0.0958 JX	0.0718	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.000199 J	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000255 U	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.09 ± 0.376	0.104 ± 0.122	0.618 ± 0.247	0.197 ± 0.145	0.328 ± 0.195	0.0847 ± 0.186	4.83 ± 0.763	0.682 ± 0.309	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.312 ± 0.688	1.09 ± 1.37	2.32 ± 1.45	-1.26 ± 1.37	-0.799 ± 0.928	1.57 ± 0.786	0.762 ± 0.706	0.963 ± 0.954	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-52 Downgradient													
	Sample Date	**12/7/16**	**2/21/17**	**3/28/17**	**5/2/17**	**6/21/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	1.66	2.11	1.63	1.51	1.33	1.43	1.46	1.71 X	1.95	1.54	1.46 X	1.65	2.05	2.21
Calcium	mg/L	169	181	189	--	145	140	162	168	175	153 D	195 DX	171 D	174 J	199
Chloride	mg/L	331 D	377 D	323 DX	320	326 D	343 D	417 D	355	360 D	326	336	320	433	408
Fluoride	mg/L	0.796	0.665	0.718 JH	0.915 JH	0.705	0.996 JH	0.0960 U	0.740	0.720	0.710	0.831	0.808	0.908	0.659
Sulfate	mg/L	277 D	318 D	299 DX	290	287 D	292 D	171 D	289	278 D	292	268	288 D	315	282
pH - Field Collected	SU	7.01	6.47	6.91	6.94	6.87	5.87	6.81	6.63	6.79	6.76	6.91	6.00	6.83	6.78
Total dissolved solids	mg/L	1290	1380	1100	1250	1280	1250	1250	1220	1240	1210	1170	1270	1470	1430
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000565 J	0.000398 J	0.000425 J	0.000427 J	0.000392 J	0.000412 J	0.000448 J	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0646	0.0583	0.0519	0.0483	0.0527	0.0558	0.0565	0.0616	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000153 J	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000525 U	0.000525 U	0.000525 U	0.000841 J	0.000860 J	0.00123 J	0.00108 J	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00188 J	0.00233	0.00112 J	0.00119 J	0.00211	0.00183 J	0.00159 J	0.00189 J	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.796	0.665	0.718 JH	0.915 JH	0.705	0.996 JH	0.0960 U	0.740	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000292 J	0.000152 U	0.000152 U	0.000163 J	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0471	0.000476 U	--	0.0616	0.0605	0.0827	0.0588	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.000234	0.0000263 U	0.0000263 U	0.0000263 U	0.0000810 J	0.0000263 U	0.0000263 UX	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.00128 J	0.00115 J	0.00102 J	0.000911 J	0.000865 J	0.000843 J	0.000914 J	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.71 ± 0.465	0.608 ± 0.289	0.296 ± 0.169	0 ± 0.150	0.435 ± 0.241	0.449 ± 0.196	0.194 ± 0.194	0.704 ± 0.319	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.65 ± 1.12	0.744 ± 0.833	0.0645 ± 0.649	0.53 ± 1.10	0.928 ± 0.784	1.16 ± 0.867	0.716 ± 0.767	1.54 ± 1.22	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-53 Downgradient													
	Sample Date	**12/8/16**	**2/23/17**	**3/29/17**	**5/2/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/20/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	1.50	1.38	1.55	1.54	1.47	1.45	1.36	1.45	1.60	1.61	1.42	1.36	1.43	1.47
Calcium	mg/L	134	105	156	NR	94.1	97.0	99.0	113	113	111 D	116	123 D	114 J	117
Chloride	mg/L	383 D	336 D	315 D	322	335 D	329 X	341	313	361	350	354	342	381	359
Fluoride	mg/L	0.230	0.377	0.408	0.547 JH	0.339	0.385 J	0.412	0.0360 U	0.392 J	0.265 J	0.270 J	0.352 J	0.428	0.018 U
Sulfate	mg/L	283 D	267 D	238 D	241	236 D	234 X	227	214	249	236	224	213	244	224
pH - Field Collected	SU	6.80	6.63	6.54	6.56	6.67	6.69	6.62	6.50	6.67	6.65	6.60	5.60	6.67	6.60
Total dissolved solids	mg/L	1390	1250	1160	1180	1150	1220	1150	1140	1160	1140	1150	1250	1160	1320
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000284 J	0.000266 J	0.000274 J	0.000276 J	0.000246 U	0.000246 U	0.000246 U	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0692	0.0633	0.0633	0.0623	0.0597	0.0638	0.0541	0.0617	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000701 J	0.000525 U	0.000525 U	0.000525 U	0.000557 J	0.000906 J	0.000525 U	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000356 J	0.000140 J	0.000135 J	0.000165 J	0.000137 J	0.000150 J	0.000163 J	0.0000699 U	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.230	0.377	0.408	0.547 JH	0.339	0.385 J	0.412	0.0360 U	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0279	0.0816	0.000476 U	NR	0.0931	0.104	0.125	0.109	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000780 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000470 JX	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000290 J	0.000255 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.306 ± 0.261	0.909 ± 0.363	0.117 ± 0.211 U	0.519 ± 0.221	0.558 ± 0.232	0.385 ± 0.244	2.76 ± 0.582	0.451 ± 0.270	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.09 ± 1.24	2.33 ± 1.13	1.81 ± 1.61	0.906 ± 1.02	-0.0622 ± 0.583	1.9 ± 1.24	1.44 ± 0.713	0.919 ± 0.853	NR	NR	NR	NR	NR	NR

NOTES:

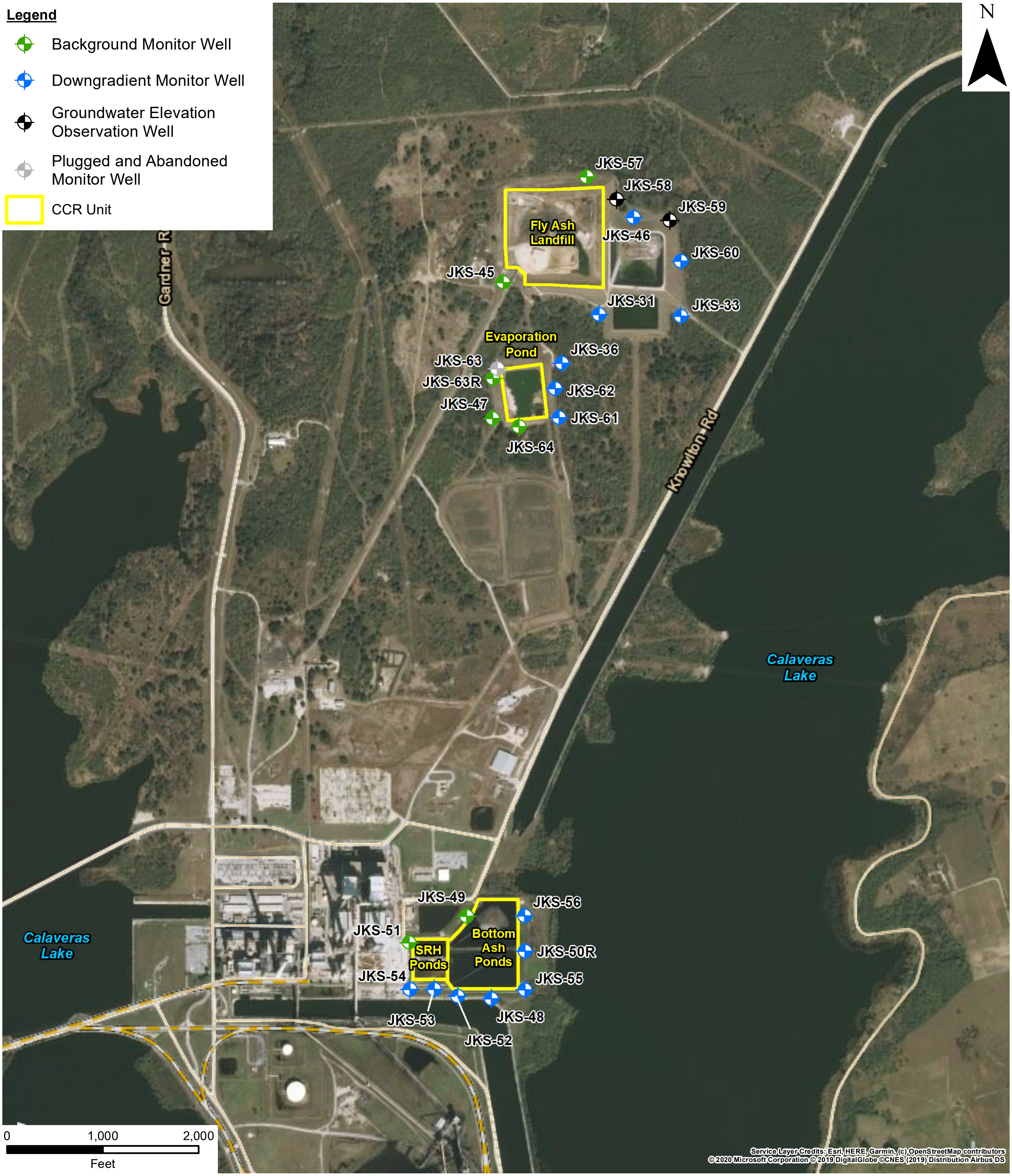
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-54 Downgradient													
	Sample Date	**12/8/16**	**2/23/17**	**3/28/17**	**5/2/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/5/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/20/20**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**
Appendix III - Detection Monitoring															
Boron	mg/L	1.24	1.16	1.35	1.26	1.14	1.26	1.16	1.28	1.26	1.30	1.38	1.50	1.23	1.31
Calcium	mg/L	114	106	160	--	103	102	95.8	113	111	98.2 D	117	117 D	118 J	129
Chloride	mg/L	345 D	350 D	353 D	344	355 D	354 D	339 D	328	382	356	385	368	380	383
Fluoride	mg/L	0.718	0.731	0.655 JH	0.850 JH	0.623	0.728	0.0960 U	0.661	0.742	0.643	0.711	0.773	0.861	0.455
Sulfate	mg/L	308 D	312 D	315 D	312	304 D	305 D	298 D	287	309	283	309	341 D	443	398
pH - Field Collected	SU	6.98	6.78	6.92	6.89	6.88	6.91	6.79	6.69	6.86	6.85	6.75	5.60	6.76	6.74
Total dissolved solids	mg/L	1370	1430	1310	1310	1410	1320	1360	1500	1230	1240	1470	1470	1570	1530
Appendix IV - Assessment Monitoring															
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000369 J	0.000898 J	0.000351 J	0.000354 J	0.000484 J	0.000324 J	0.000246 U	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0631	0.0564	0.0611	0.0537	0.0543	0.0593	0.0471	0.0558	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000162 J	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000657 J	0.00186 J	0.000525 U	0.000525 U	0.000693 J	0.000765 J	0.000525 U	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000420 J	0.000212 J	0.00199 J	0.000253 J	0.000260 J	0.000532 J	0.000334 J	0.0000699 U	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.718	0.731	0.655 JH	0.850 JH	0.623	0.728	0.0960 U	0.661	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000862 J	0.000152 U	0.000152 U	0.000241 J	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0452	0.00238 U	--	0.0595	0.0599	0.0712	0.0608	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000620 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000447 J	0.000367 J	0.000377 J	0.000342 J	0.000352 J	0.000260 J	0.000255 U	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.88 ± 0.339	0.878 ± 0.358	0.546 ± 0.213	0.217 ± 0.217	0.433 ± 0.249	0.313 ± 0.254	0.926 ± 0.324	0.42 ± 0.205	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.12 ± 1.11	1.94 ± 1.01	0.429 ± 0.781	0.574 ± 1.41	0.451 ± 0.660	0.766 ± 1.29	1.48 ± 0.968	1.17 ± 0.827	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

Figures



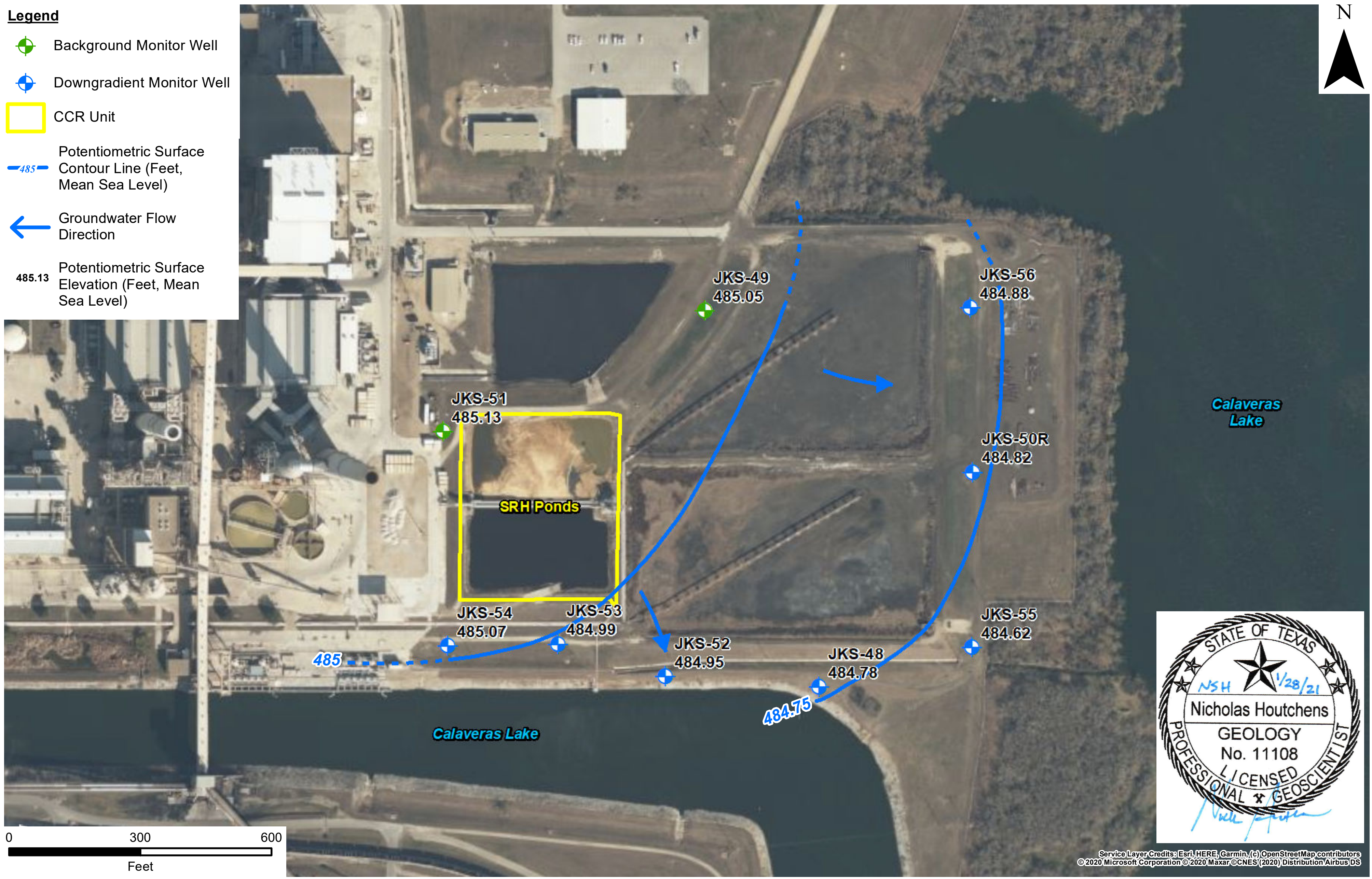
Environmental Resources Management

DESIGN:	WZ	DRAWN:	EFC	CHKD.:	WZ
DATE:	1/17/2020	SCALE:	AS SHOWN	REVISION:	0

\\ushoufs01\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2019gwmon\fig1_0503422_CPSCalv_WellLocs.mxd

FIGURE 1
CCR WELL NETWORK LOCATION MAP
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM



NSH 1/28/21

Nicholas Houtchens

GEOLOGY

No. 11108

Environmental Resources Management

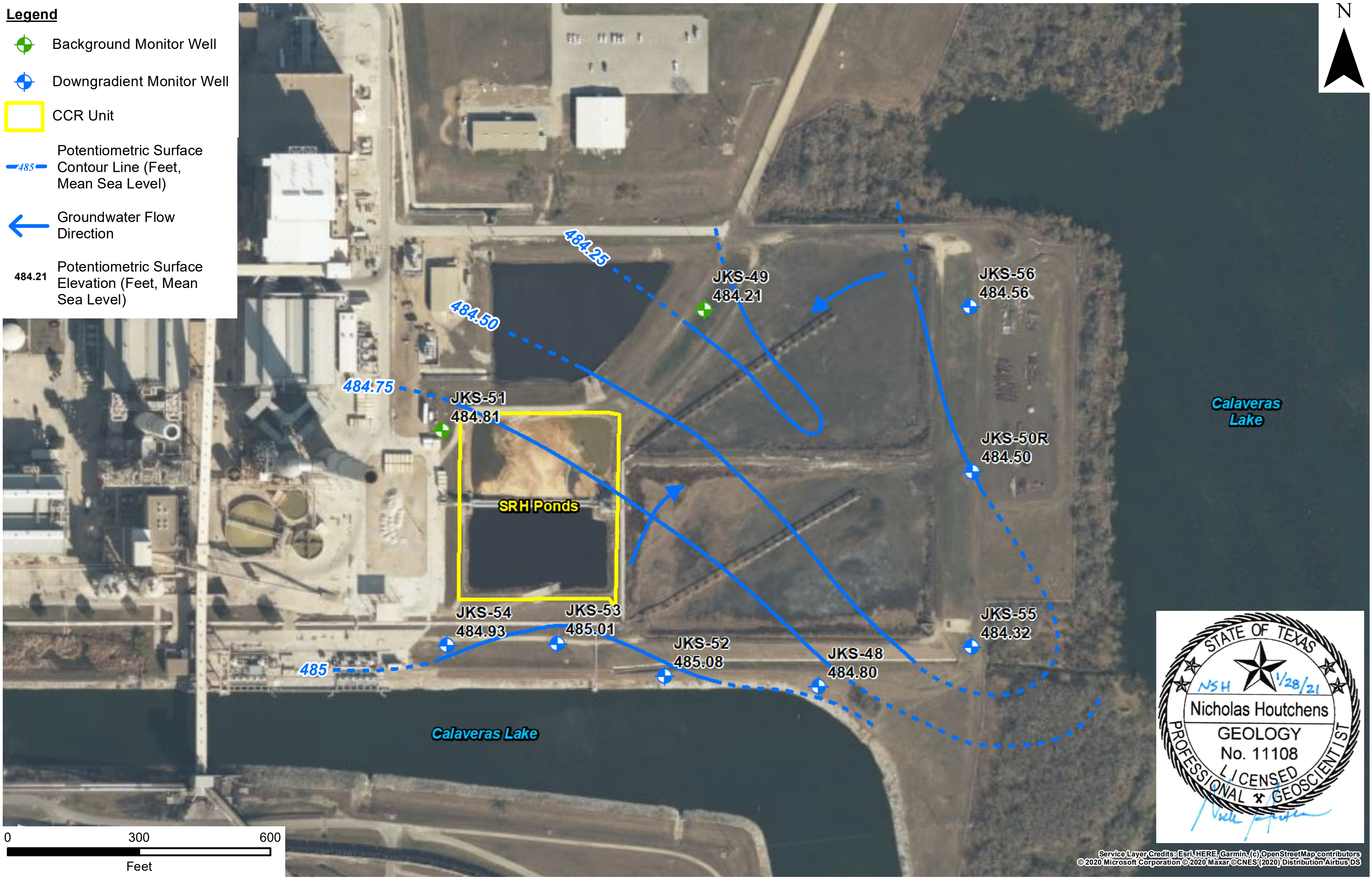
DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/19/2021	SCALE:	AS SHOWN	REVISION:	2

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2020gwmon\fig2A_0503422_CPSCalv_SRHPonds_apr2020pmap.mxd

FIGURE 2A
POTENTIOMETRIC SURFACE MAP -
APRIL 2020
SRH Pond CCR Unit
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM



NSH 1/28/21
Nicholas Houtchens
GEOLOGY
No. 11108

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
© 2020 Microsoft Corporation © 2020 Maxar ©CNES (2020) Distribution Airbus DS

Environmental Resources Management

DESIGN: NH	DRAWN: LSC	CHKD.: WZ
DATE: 1/19/2021	SCALE: AS SHOWN	REVISION: 1

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2020gwmon\fig2B_0503422_CPSCalv_SRHPonds_oct2020pmap.mxd

FIGURE 2B
POTENTIOMETRIC SURFACE MAP -
OCTOBER 2020
SRH Pond CCR Unit
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM

Laboratory Data Packages

Appendix A

(*Data Packages Available Upon Request*)

Statistical Analysis Tables and Figures

Appendix B

APPENDIX B - TABLE 1
Kruskal-Wallis Test Comparisons of Upgradient Wells
Calaveras Power Station
SRH Pond

Analyte	**N**	**Num Detects**	**Percent Detect**	**DF**	**KW Statistic**	**p-value**	**Conclusion**	**UPL Type**
Boron	28	28	100.00%	1	20.3	<0.001	Significant Difference	Intrawell
Calcium	28	28	100.00%	1	19.5	<0.001	Significant Difference	Intrawell
Chloride	28	28	100.00%	1	0.256	0.613	No Significant Difference	Interwell
Fluoride	28	26	92.86%	1	19.9	<0.001	Significant Difference	Intrawell
pH	28	28	100.00%	1	12.7	<0.001	Significant Difference	Intrawell
Sulfate	28	28	100.00%	1	19.9	<0.001	Significant Difference	Intrawell
Total dissolved solids	28	28	100.00%	1	9.64	0.00191	Significant Difference	Intrawell

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations

N: number of data points

DF: degrees of freedom

statistic: Kruskal Wallis test statistic

p-value: P-values below 0.05 indicate that the median concentrations in the upgradient wells are significantly different from each other and the upgradient wells should not be pooled.

p-value: P-values equal or above 0.05 indicate that the median concentrations in the upgradient wells are not significantly different from each other and the upgradient wells can be pooled.

APPENDIX B - TABLE 2
Descriptive Statistics for Upgradient Wells
Calaveras Power Station
SRH Pond

Analyte	Well	Units	N	Num Detects	Percent Detect	Min ND	Max ND	Min Detect	Median	Mean	Max Detect	SD	CV	Distribution
Boron	JKS-49	mg/L	14	14	100.00%			2.05	2.83	2.83	3.28	0.339	0.119723	Normal
Boron	JKS-51	mg/L	14	14	100.00%			0.347	0.512	0.522	0.668	0.0844	0.16163289	Normal
Calcium	JKS-49	mg/L	14	14	100.00%			113	131	134	173	17.1	0.127299	Normal
Calcium	JKS-51	mg/L	14	14	100.00%			149	266	273	336	51	0.18665915	Normal
Chloride	Pooled	mg/L	28	28	100.00%			295	424	423	574	68.9	0.16275852	Normal
Fluoride	JKS-49	mg/L	14	14	100.00%			0.525	0.704	0.702	0.894	0.0922	0.1314425	Normal
Fluoride	JKS-51	mg/L	14	12	85.71%	0.009	0.048	0.247	0.348	0.325	0.534	0.146	0.44841955	Normal
pH	JKS-49	SU	14	14	100.00%			6.16	7.12	6.99	7.31	0.314	0.044881	NDD
pH	JKS-51	SU	14	14	100.00%			5.48	6.46	6.36	6.7	0.346	0.05443283	NDD
Sulfate	JKS-49	mg/L	14	14	100.00%			193	223	224	265	19.5	0.08726818	Normal
Sulfate	JKS-51	mg/L	14	14	100.00%			260	345	349	439	50.8	0.14583131	Normal
Total dissolved solids	JKS-49	mg/L	14	14	100.00%			1100	1300	1340	1730	159	0.11894501	Normal
Total dissolved solids	JKS-51	mg/L	14	14	100.00%			916	1650	1650	2150	326	0.19748063	Normal

NOTES:

Non-detects were substituted with a value of half the detection limit for calculation
Well = Pooled, indicates that the summary statistics were produced for the pooled upgradient wells based on the Kruskal-Wallis test (Table 1
SU: Standard units
N: number of data points
ND: Non-detect
SD: Standard Deviation
CV: Coefficient of Variation (standard deviation divided by the mean
NDD: No Discernible Distribution

APPENDIX B - TABLE 3
Potential Outliers in Upgradient Wells
Calaveras Power Station
SRH Pond

Well	Sample	Date	Analyte	Units	Detect	Concentration	UPL type	Distribution	Statistical Outlier	Visual Outlier	Normal Outlier	Log Statistical Outlier	Log Visual Outlier	Lognormal Outlier	Statistical and Visual Outlier
JKS-51	JKS-51004	10/22/2019	Boron	mg/L	TRUE	0.648	Intrawell	Normal		X					
JKS-51	JKS-51-20200428-CCR	4/28/2020	Boron	mg/L	TRUE	0.627	Intrawell	Normal		X			X		
JKS-51	JKS51620699-001	4/10/2019	Chloride	mg/L	TRUE	559	Interwell	Normal		X			X		
JKS-51	JKS-51-20200428-CCR	4/28/2020	Chloride	mg/L	TRUE	555	Interwell	Normal		X			X		
JKS-49	JKS-49-WG-20170725	7/25/2017	pH	SU	TRUE	6.16	Intrawell	NDD	X	X	X	X	X	X	0
JKS-49	JKS-49-WG-20171010	10/10/2017	pH	SU	TRUE	6.89	Intrawell	NDD		X			X		
JKS-49	JKS-49-WG-20191022-02	10/22/2019	pH	SU	TRUE	6.43	Intrawell	NDD	X	X	X	X	X	X	0
JKS-51	JKS-51-WG-20170725	7/25/2017	pH	SU	TRUE	5.48	Intrawell	NDD	X	X	X	X	X	X	0
JKS-51	JKS-51-WG-20171010	10/10/2017	pH	SU	TRUE	6.2	Intrawell	NDD		X			X		
JKS-51	JKS-51-WG-20191022-02	10/22/2019	pH	SU	TRUE	5.73	Intrawell	NDD	X	X	X	X	X	X	0

<u>NOTES:</u>

NDD: No Discernible Distribution
SU: Standard units
Outlier tests were performed on detected data only
Statistical outliers were determined using a Dixon's test for N < 25 and with Rosner's test for N > 25
Visual outliers were identified if they fall above the confidence envelope on the QQ plot
Data points were considered potential outliers if they were both statistical and visual outliers
NDD wells had data points considered as potential outliers if they were either a normal or lognormal outlier
[Blank] data distribution indicates that the well data did not have enough detected data points for outlier analysis.
Lognormally distributed data was first log-transformed before visual and statistical outlier tests were performed
Normal data distribution indicates that the well data was directly used for statistical and visual outlier tests
NDD indicates that both the untransformed and transformed data were examined with statistical and visual outlier tests
'0' indicates that the data point was a statistical and visual outlier but was retained after review by the hydrogeologist

APPENDIX B - TABLE 4
Mann Kendall Test for Trends in Upgradient Wells
Calaveras Power Station
SRH Pond

Analyte	UPL Type	Well	N	Num Detects	Percent Detect	p-value	tau	Conclusion
Boron	Intrawell	JKS-49	14	14	100%	<0.001	-0.685	Decreasing Trend
Boron	Intrawell	JKS-51	14	14	100%	0.511	0.133	Stable, No Trend
Calcium	Intrawell	JKS-49	14	14	100%	0.584	-0.11	Stable, No Trend
Calcium	Intrawell	JKS-51	14	14	100%	0.747	0.0769	Stable, No Trend
Chloride	Interwell	JKS-51	28	28	100%	0.00137	0.43	Increasing Trend
Fluoride	Intrawell	JKS-49	14	14	100%	0.233	0.253	Stable, No Trend
Fluoride	Intrawell	JKS-51	14	12	86%	0.826	-0.0442	Stable, No Trend
pH	Intrawell	JKS-49	14	14	100%	0.782	0.0569	Stable, No Trend
pH	Intrawell	JKS-51	14	14	100%	0.518	-0.143	Stable, No Trend
Sulfate	Intrawell	JKS-49	14	14	100%	0.913	-0.0221	Stable, No Trend
Sulfate	Intrawell	JKS-51	14	14	100%	0.1	0.331	Stable, No Trend
Total dissolved solids	Intrawell	JKS-49	14	14	100%	0.546	0.122	Stable, No Trend
Total dissolved solids	Intrawell	JKS-51	14	14	100%	0.441	0.156	Stable, No Trend

NOTES:

Non-detects were substituted with a value of zero for trend calculations
N: number of data points
tau: Kendall's tau statistic
p-value: A two-sided p-value describing the probability of the H0 being true (a=0.05)
Trend tests were performed on all upgradient data, only if the dataset met the minimum data quality criteria (ERM 2017).

APPENDIX B - TABLE 5
Calculated UPLs for Upgradient Datasets
Calaveras Power Station
SRH Pond

Analyte	UPL Type	Trend	Well	N	Num Detects	Percent Detects	LPL	UPL	Units	ND Adjustment	Transformation	Alpha	Method	Final LPL	Final UPL
Boron	Intrawell	Decreasing Trend	JKS-49	14	14	100%		2.64	mg/L	None	No	0.0025	NP Detrended UPL		X
Boron	Intrawell	Stable, No Trend	JKS-51	14	14	100%		0.694	mg/L	None	No	0.0025	Param Intra 1 of 2		
Calcium	Intrawell	Stable, No Trend	JKS-49	14	14	100%		169	mg/L	None	No	0.0025	Param Intra 1 of 2		
Calcium	Intrawell	Stable, No Trend	JKS-51	14	14	100%		377	mg/L	None	No	0.0025	Param Intra 1 of 2		X
Chloride	Interwell	Increasing Trend	JKS-49, JKS-51	28	28	100%		608	mg/L	None	No	0.0025	NP Detrended UPL		X
Fluoride	Intrawell	Stable, No Trend	JKS-49	14	14	100%		0.89	mg/L	None	No	0.0025	Param Intra 1 of 2		X
Fluoride	Intrawell	Stable, No Trend	JKS-51	14	12	86%		0.622	mg/L	None	No	0.0025	Param Intra 1 of 2		
pH	Intrawell	Stable, No Trend	JKS-49	14	14	100%	6.16	7.31	SU	None	No	0.0172	NP Intra (normality) 1 of 2		X
pH	Intrawell	Stable, No Trend	JKS-51	14	14	100%	5.48	6.7	SU	None	No	0.0172	NP Intra (normality) 1 of 2	X	
Sulfate	Intrawell	Stable, No Trend	JKS-49	14	14	100%		263	mg/L	None	No	0.0025	Param Intra 1 of 2		
Sulfate	Intrawell	Stable, No Trend	JKS-51	14	14	100%		452	mg/L	None	No	0.0025	Param Intra 1 of 2		X
Total dissolved solids	Intrawell	Stable, No Trend	JKS-49	14	14	100%		1660	mg/L	None	No	0.0025	Param Intra 1 of 2		
Total dissolved solids	Intrawell	Stable, No Trend	JKS-51	14	14	100%		2320	mg/L	None	No	0.0025	Param Intra 1 of 2		X

NOTES:

Non-detects were substituted with a value of half the detection limit for calculations
UPL: upper prediction limit
LPL: Lower prediction limit. These were only calculated for pH
UPLs were constructed with a site wide false positive rate of 0.1 and a 1 of 2 retesting.
UPLs were calculated using Sanitas Software.
SU: Standard units
NP: non parametric
RL: Reporting Limit
Intra: indicates an intrawell UPL was used
Inter: indicates an interwell UPL was used
In the case where multiple UPLs were calculated for an analyte, the maximum UPL was used as the final UPL.
In the case where multiple LPLs were calculated for an pH the minimum LPL was used as the final LPL.

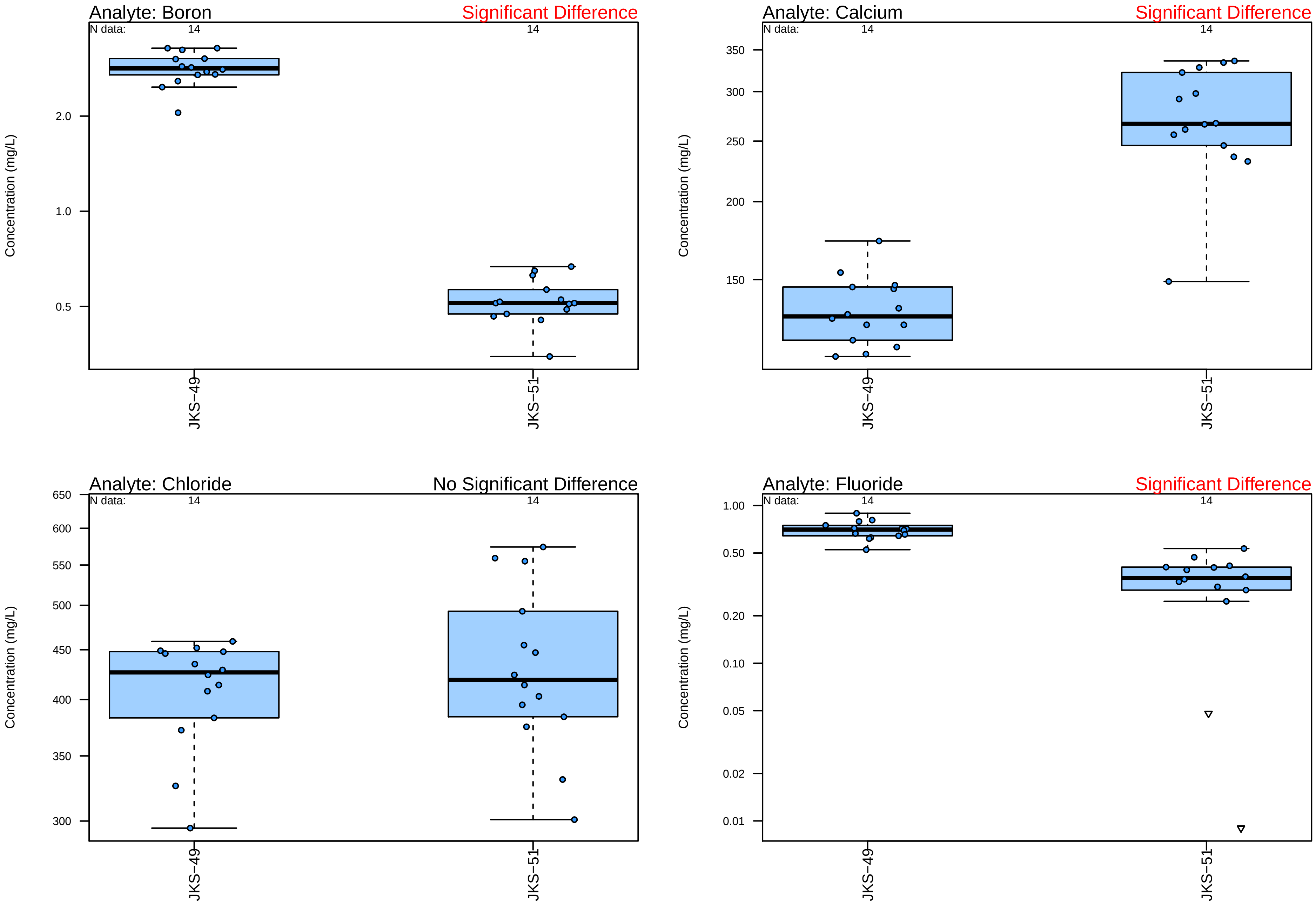
APPENDIX B - TABLE 6
Comparisons of Downgradient Wells to UPLs
Calaveras Power Station
SRH Pond

Analyte	Well	LPL	UPL	Units	Recent Date	Observation	Qualifier	Obs > UPL	Mann Kendall p-value	Mann Kendall tau	WRS p-value	WRS Conclusion	Exceed Median	Overall Conclusion
Boron	JKS-52		2.64	mg/L	10/21/2020	2.21					1	NS		No Exceedance
Boron	JKS-53		2.64	mg/L	10/20/2020	1.47					1	NS		No Exceedance
Boron	JKS-54		2.64	mg/L	10/20/2020	1.31					1	NS		No Exceedance
Calcium	JKS-52		377	mg/L	10/21/2020	199					1	NS		No Exceedance
Calcium	JKS-53		377	mg/L	10/20/2020	117					0.999	NS		No Exceedance
Calcium	JKS-54		377	mg/L	10/20/2020	129					0.999	NS		No Exceedance
Chloride	JKS-52		608	mg/L	10/21/2020	408					1	NS		No Exceedance
Chloride	JKS-53		608	mg/L	10/20/2020	359					1	NS		No Exceedance
Chloride	JKS-54		608	mg/L	10/20/2020	383					1	NS		No Exceedance
Fluoride	JKS-52		0.89	mg/L	10/21/2020	0.659					0.998	NS		No Exceedance
Fluoride	JKS-53		0.89	mg/L	10/20/2020	0.009	ND				1	NS		No Exceedance
Fluoride	JKS-54		0.89	mg/L	10/20/2020	0.455					1	NS		No Exceedance
pH	JKS-52	5.48	7.31	SU	10/21/2020	6.78					1	NS		No Exceedance
pH	JKS-53	5.48	7.31	SU	10/20/2020	6.6					1	NS		No Exceedance
pH	JKS-54	5.48	7.31	SU	10/20/2020	6.74					1	NS		No Exceedance
Sulfate	JKS-52		452	mg/L	10/21/2020	282					1	NS		No Exceedance
Sulfate	JKS-53		452	mg/L	10/20/2020	224					1	NS		No Exceedance
Sulfate	JKS-54		452	mg/L	10/20/2020	398					1	NS		No Exceedance
Total dissolved solids	JKS-52		2320	mg/L	10/21/2020	1430					1	NS		No Exceedance
Total dissolved solids	JKS-53		2320	mg/L	10/20/2020	1320					1	NS		No Exceedance
Total dissolved solids	JKS-54		2320	mg/L	10/20/2020	1530					1	NS		No Exceedance

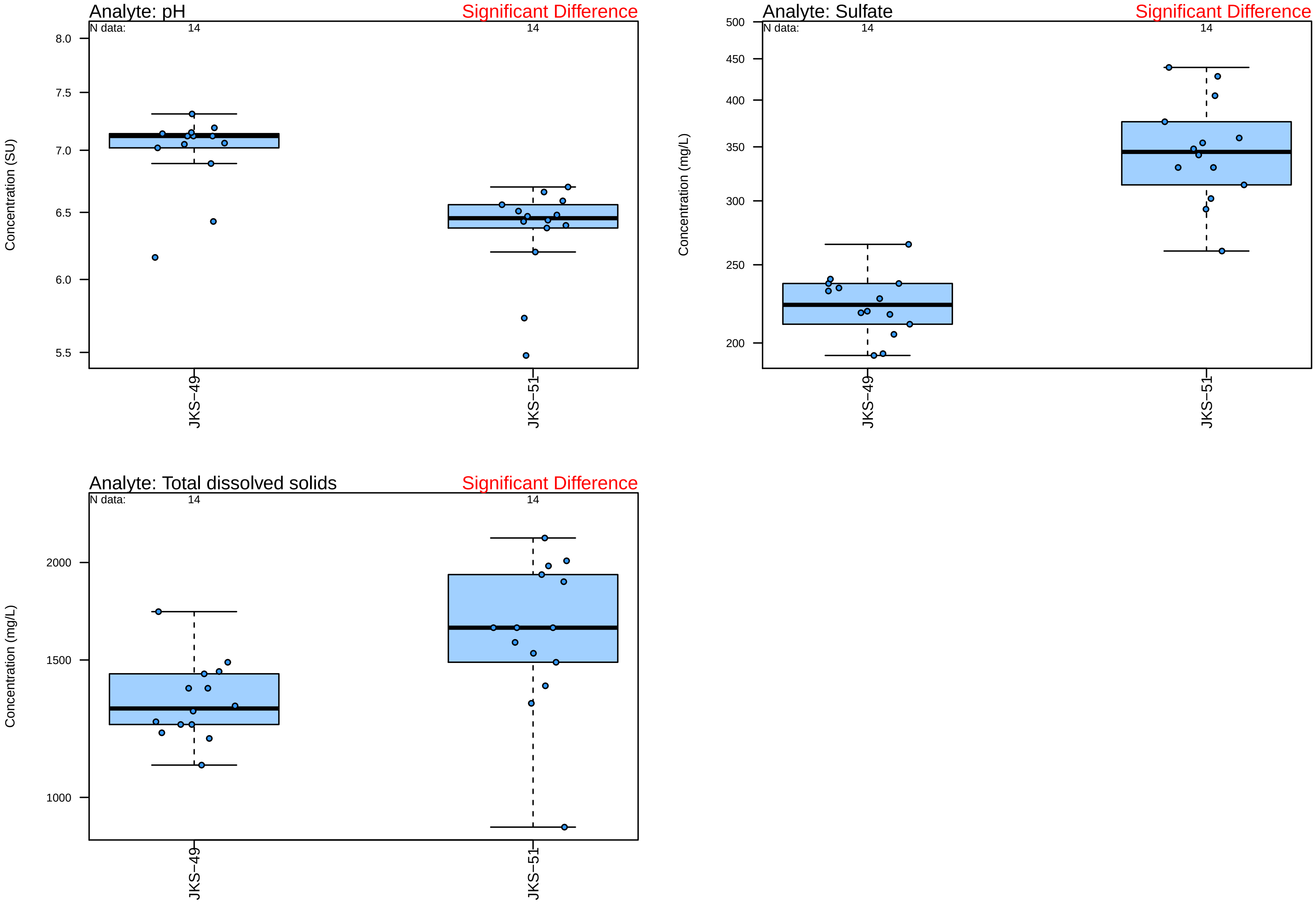
NOTES:

Non-detects were substituted with a value of zero for trend calculation
UPL: Upper Prediction Limit
ND: Not detected
SU: Standard units
tau: Kendall's tau statistic
Obs > UPL: Exceed 'X' indicates that the most recent observed value is higher than the UPL (or out of range of the LPL and UPL in the case of p
Obs > UPL: Exceed 'X0' indicates that the two most recent values are higher than the UPL, but the upgradient well is 100% N
Obs > UPL: Exceed '0' indicated that the most recent observed value is higher than the UPL, but is not scored as an SSI due to Double Quantification Rule (ERM 201
WRS: Wilcoxon Rank Sum test comparing if median of downgradient well is larger than the UPL (for pH, also checks if median is less than LPL)
WRS p-value: A one-sided p-value describing the probability of the H0 (UPL/LPL) being true (a=0.05)
Overall: UPL Exceedance - most recent sampling event exceeds the UPL, but median of the well is not greater than UPL
Overall: WRS Exceedance - most recent sampling event does not exceed the UPL, but median of the well is greater than UPL
Overall: Both Exceedance - most recent sampling event exceeds the UPL and median of the well is larger than the UPL

Appendix B – Figure 1
Unit: SRH Pond
Boxplots of Upgradient Wells



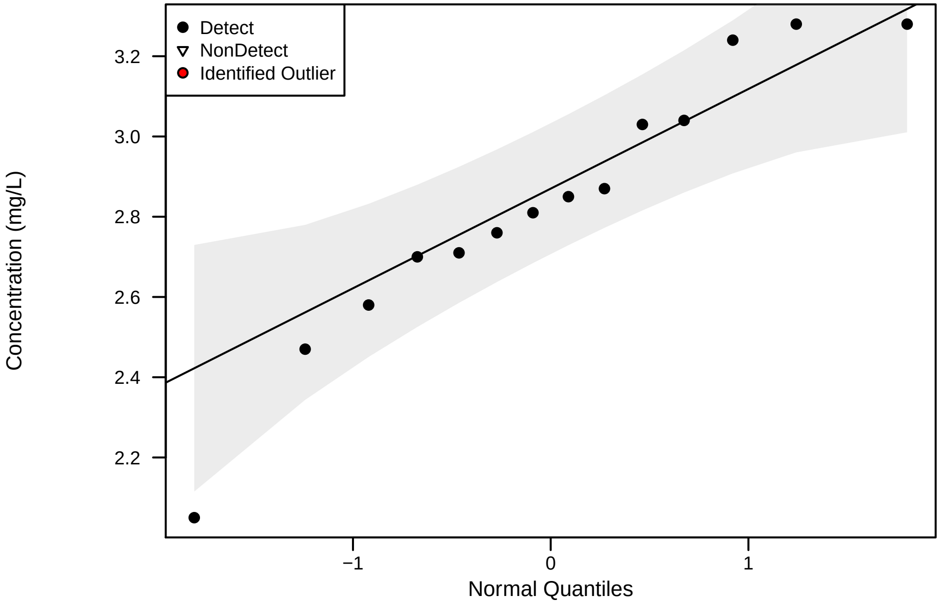
Appendix B – Figure 1
Unit: SRH Pond
Boxplots of Upgradient Wells



Appendix B − Figure 2
Unit: SRH Pond
QQ Plots of Upgradient Wells

Analyte: Boron
Wells: JKS−49

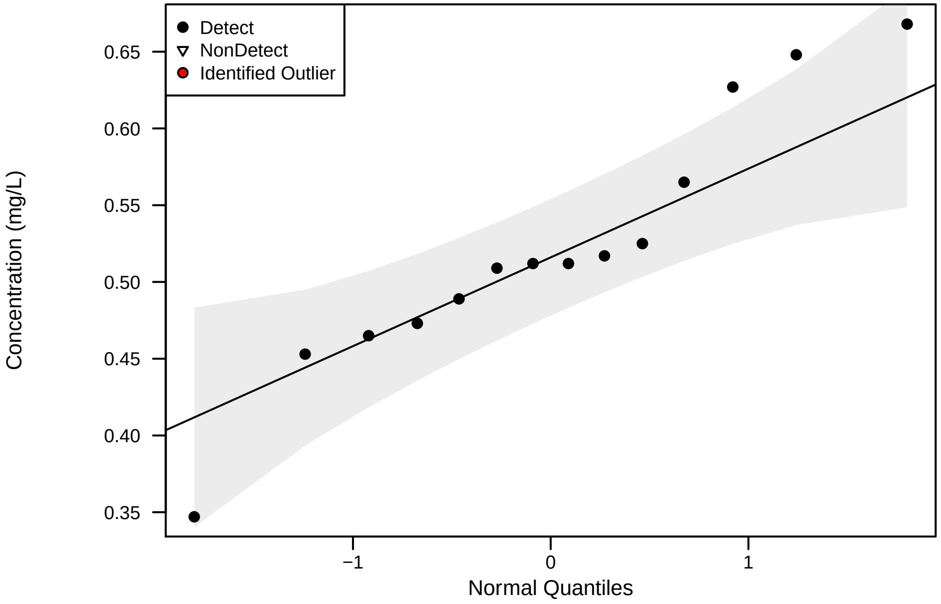
Intrawell Analysis
Normal Distribution



Intentionally left blank,
not Lognormal/NDD distribution.

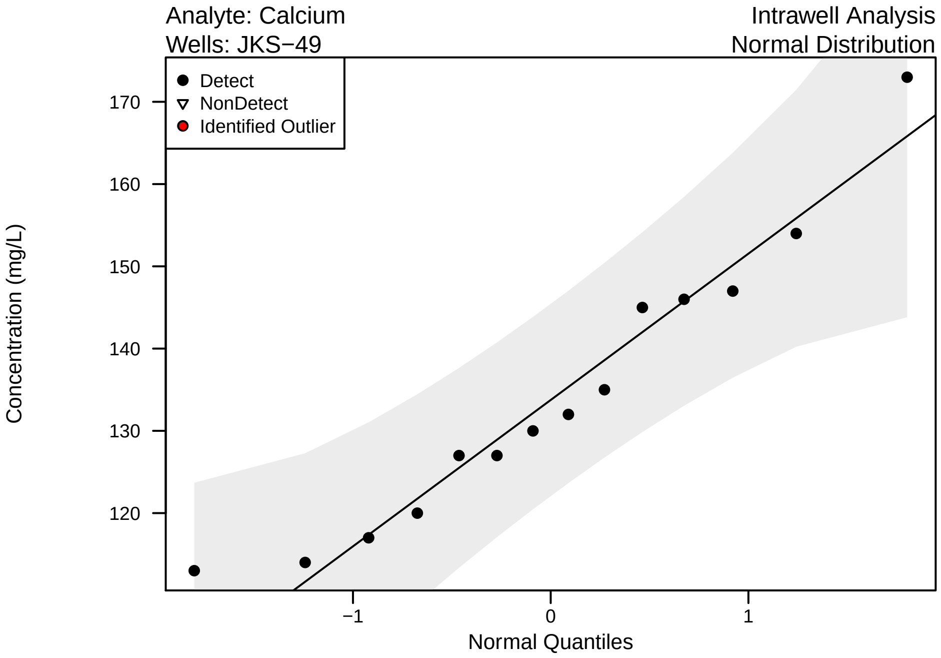
Analyte: Boron
Wells: JKS−51

Intrawell Analysis
Normal Distribution

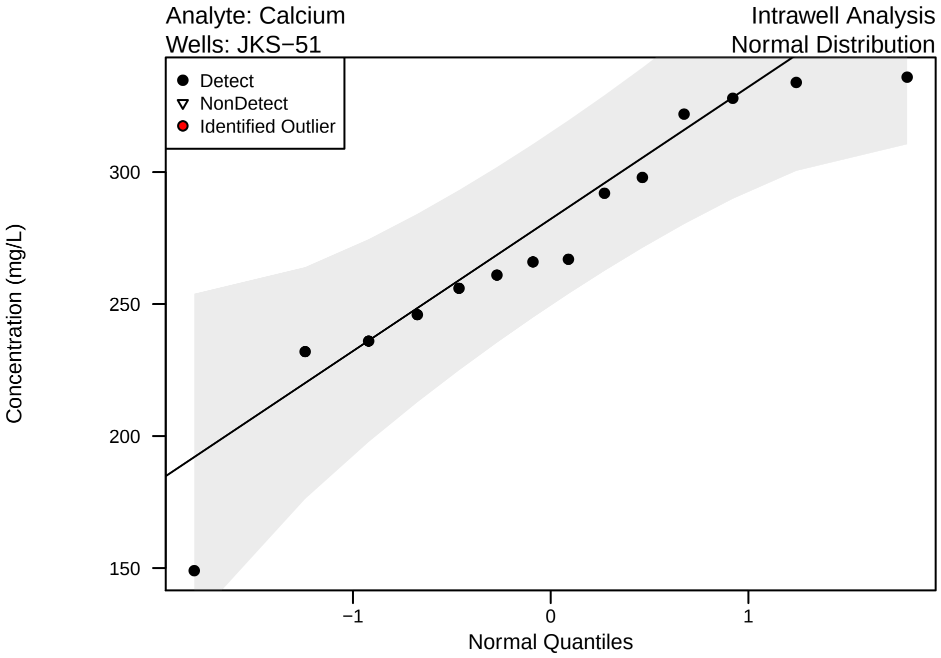


Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 2
Unit: SRH Pond
QQ Plots of Upgradient Wells

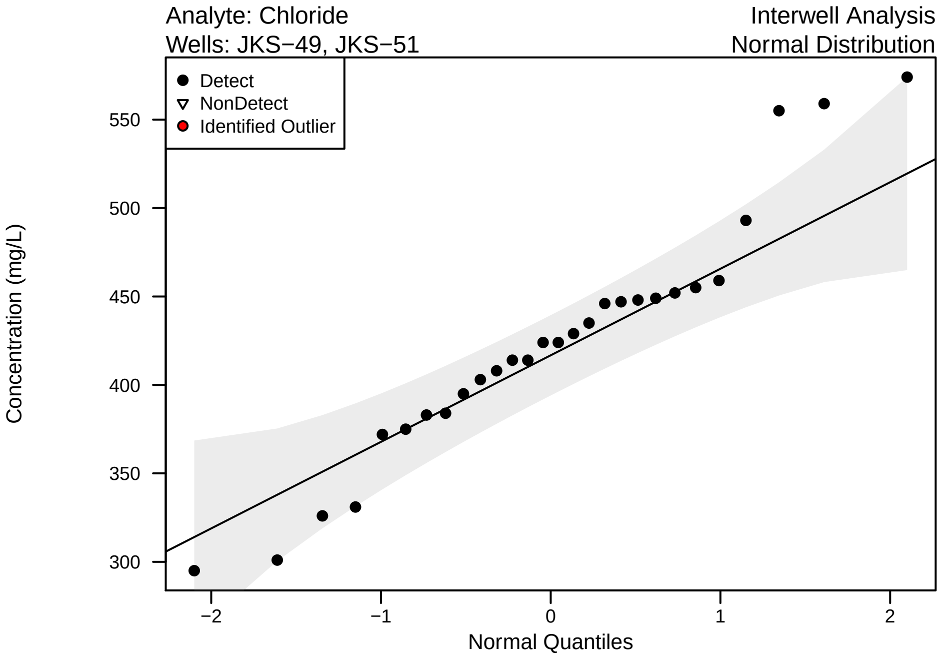


Intentionally left blank,
not Lognormal/NDD distribution.

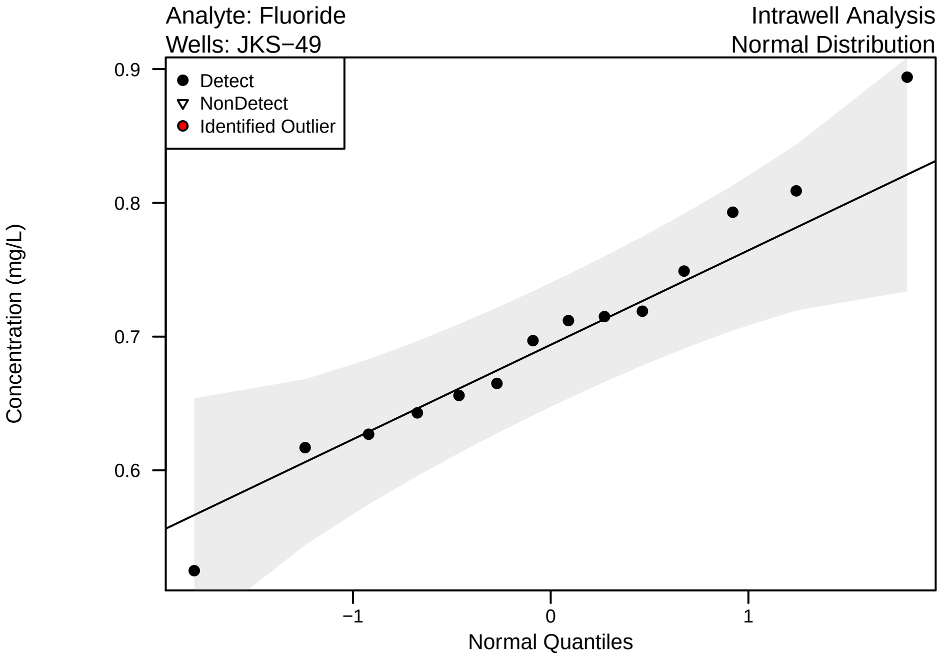


Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 2
Unit: SRH Pond
QQ Plots of Upgradient Wells



Intentionally left blank,
not Lognormal/NDD distribution.

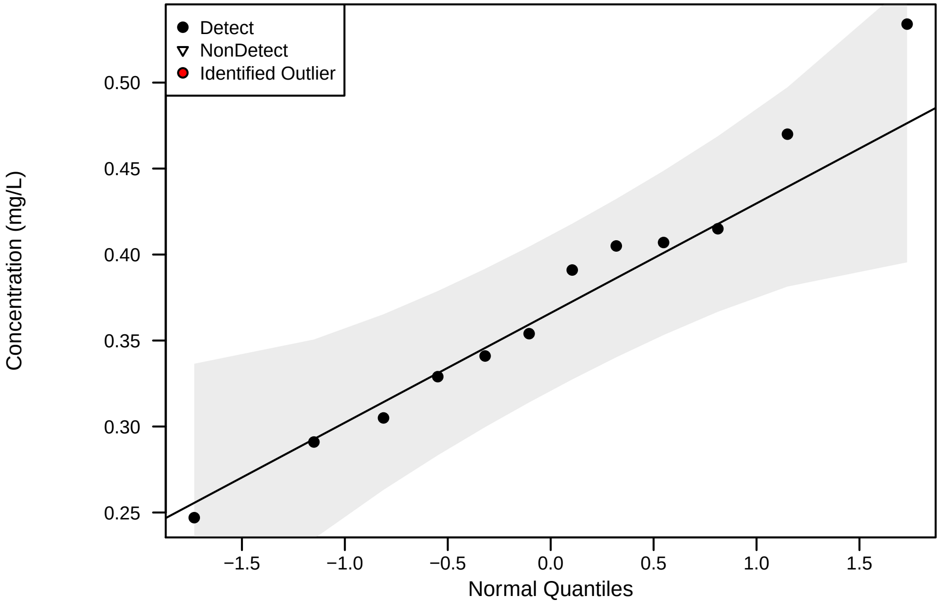


Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 2
Unit: SRH Pond
QQ Plots of Upgradient Wells

Analyte: Fluoride
Wells: JKS−51

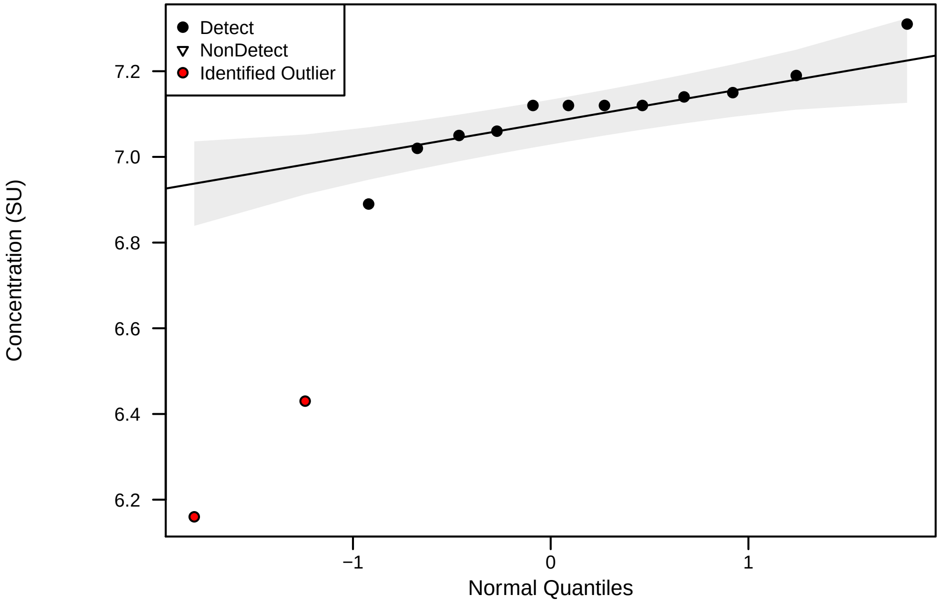
Intrawell Analysis
Normal Distribution



Intentionally left blank,
not Lognormal/NDD distribution.

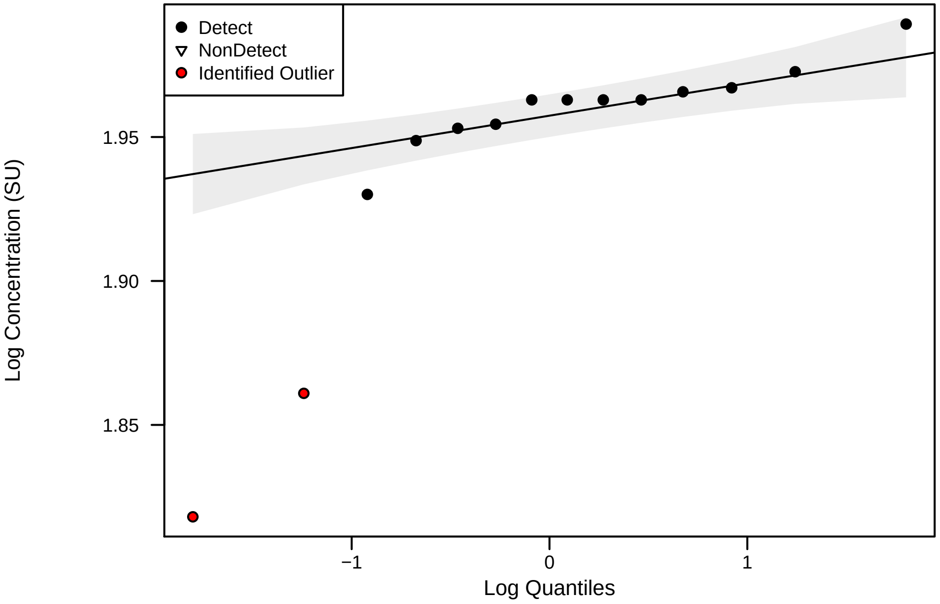
Analyte: pH
Wells: JKS−49

Intrawell Analysis
NDD Distribution

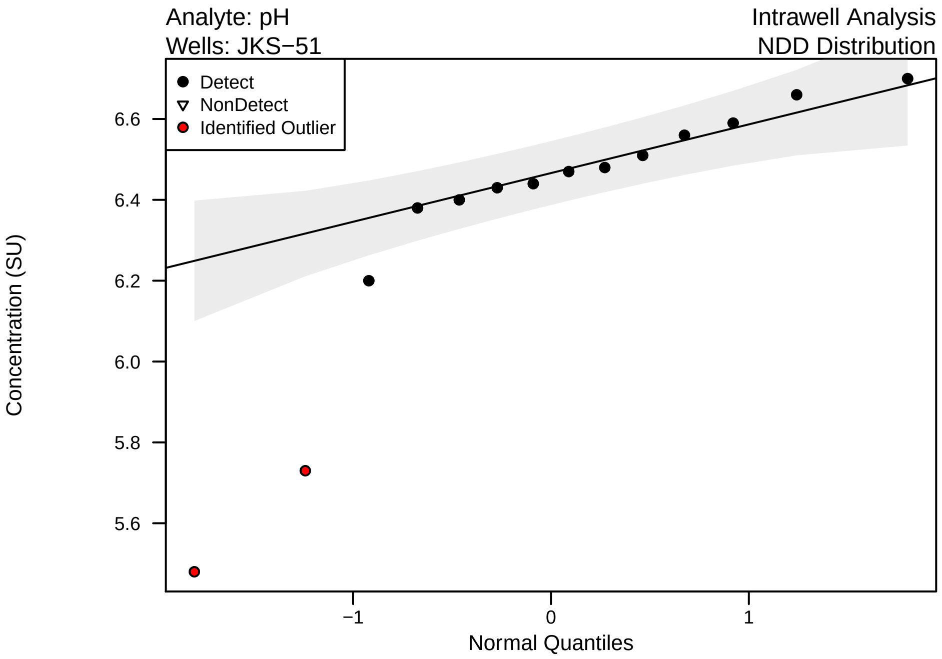


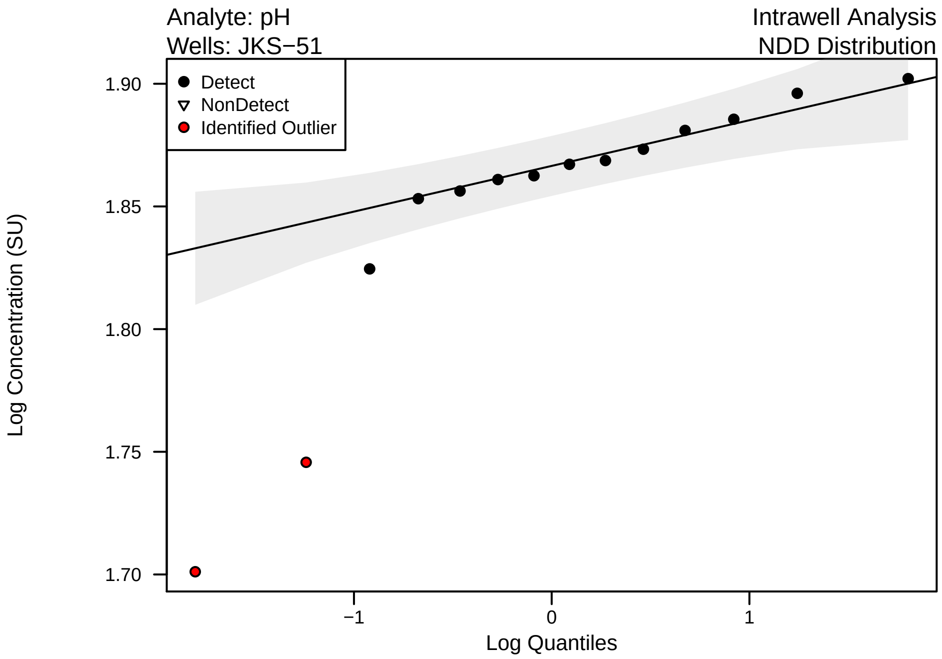
Analyte: pH
Wells: JKS−49

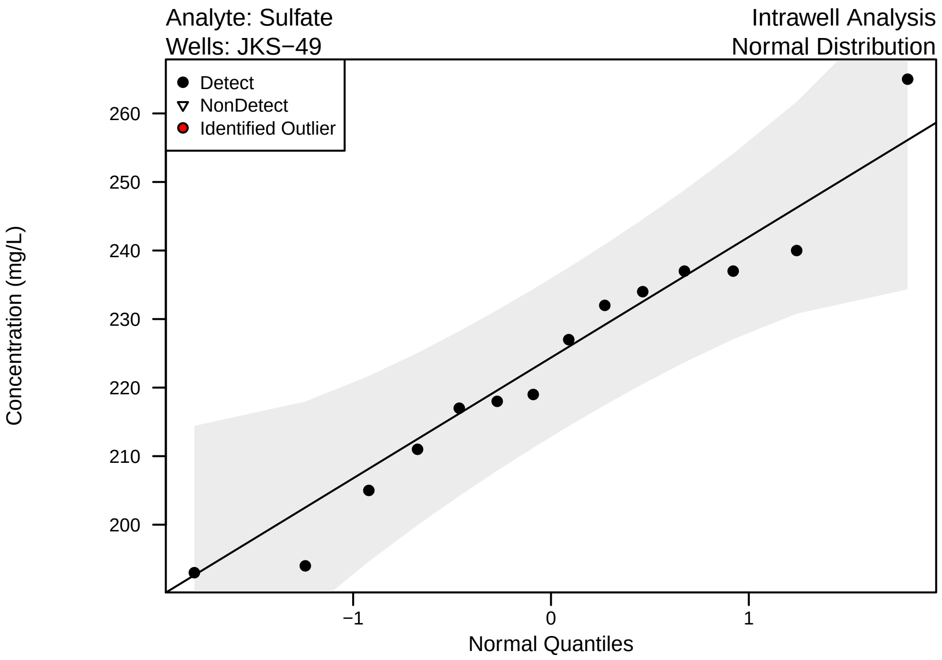
Intrawell Analysis
NDD Distribution



Appendix B − Figure 2
Unit: SRH Pond
QQ Plots of Upgradient Wells

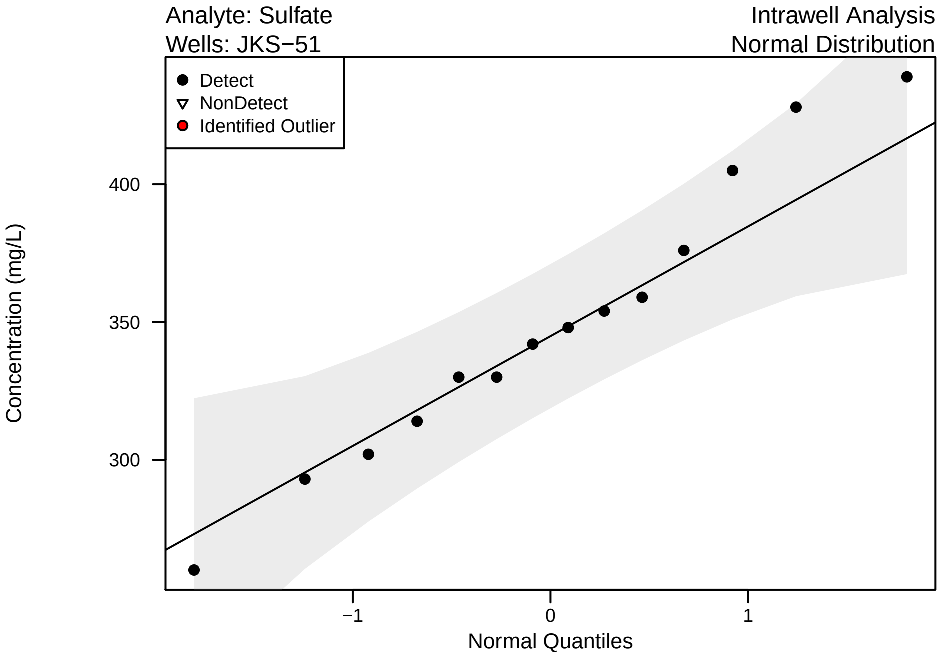






Intentionally left blank,
not Lognormal/NDD distribution.

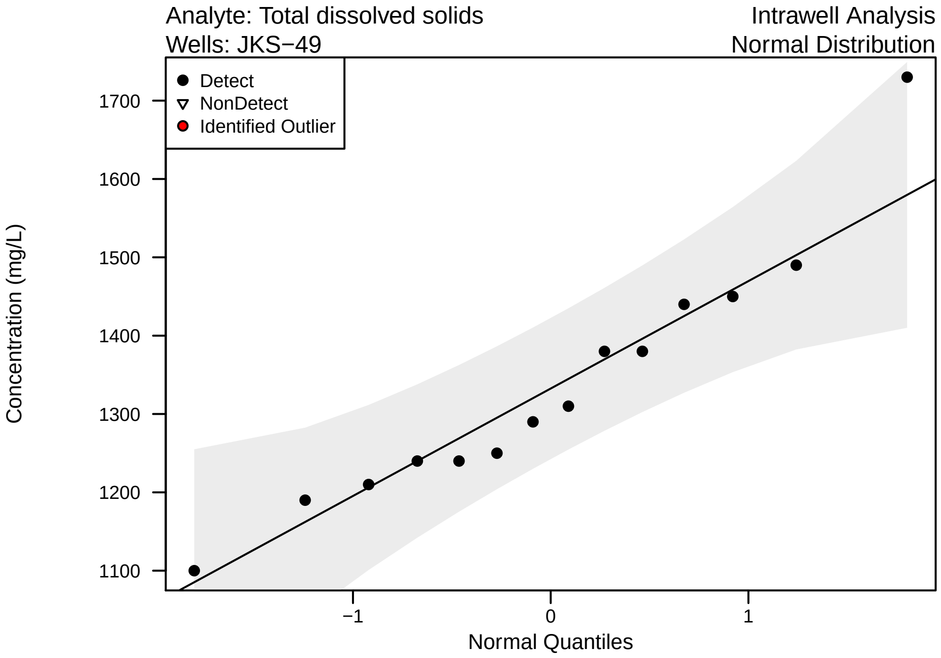
Appendix B − Figure 2
Unit: SRH Pond
QQ Plots of Upgradient Wells



Analyte: Sulfate
Wells: JKS−51

Intrawell Analysis
Normal Distribution

Intentionally left blank,
not Lognormal/NDD distribution.

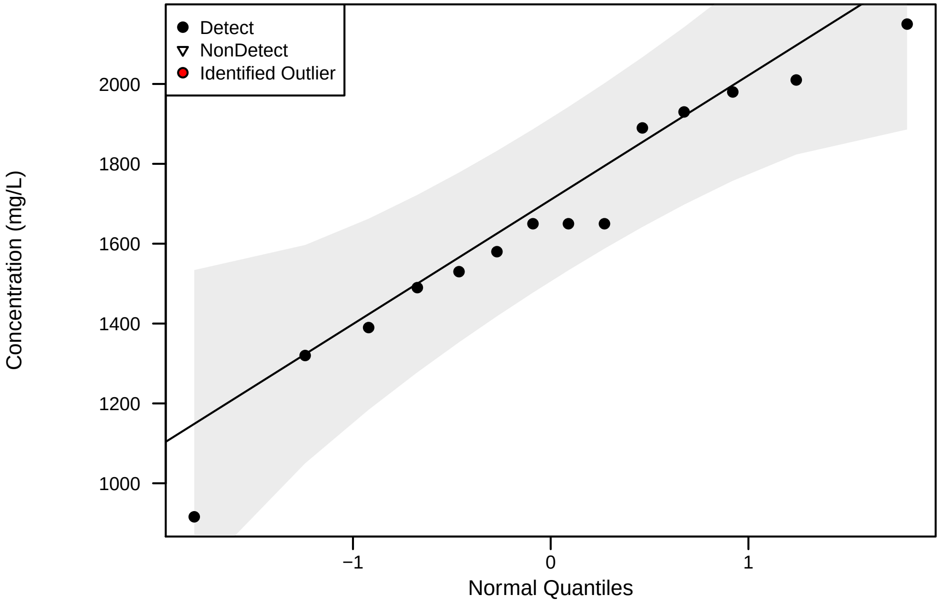


Analyte: Total dissolved solids
Wells: JKS−49

Intrawell Analysis
Normal Distribution

Intentionally left blank,
not Lognormal/NDD distribution.

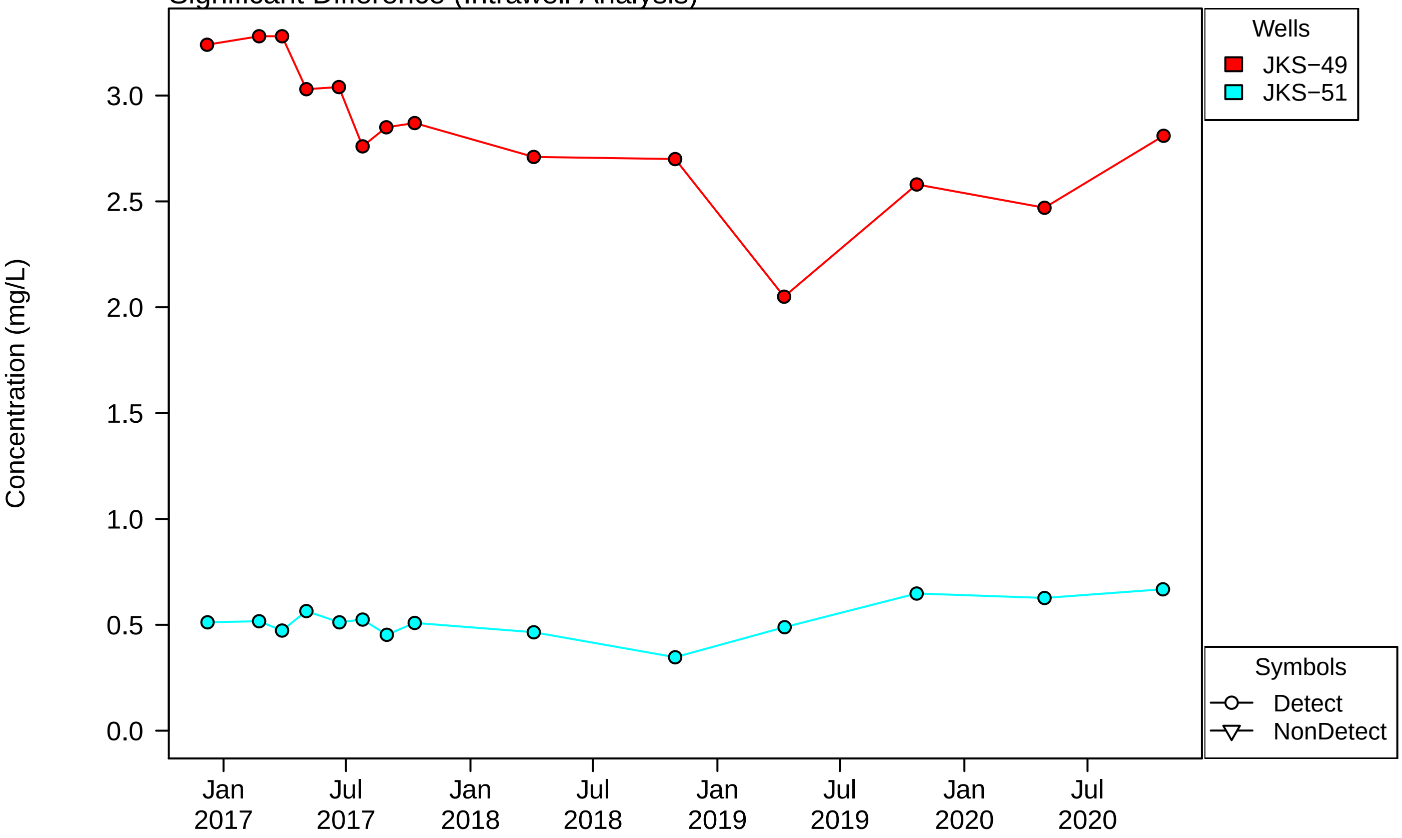
Appendix B − Figure 2
Unit: SRH Pond
QQ Plots of Upgradient Wells


Analyte: Total dissolved solids
Wells: JKS−51
Intrawell Analysis
Normal Distribution

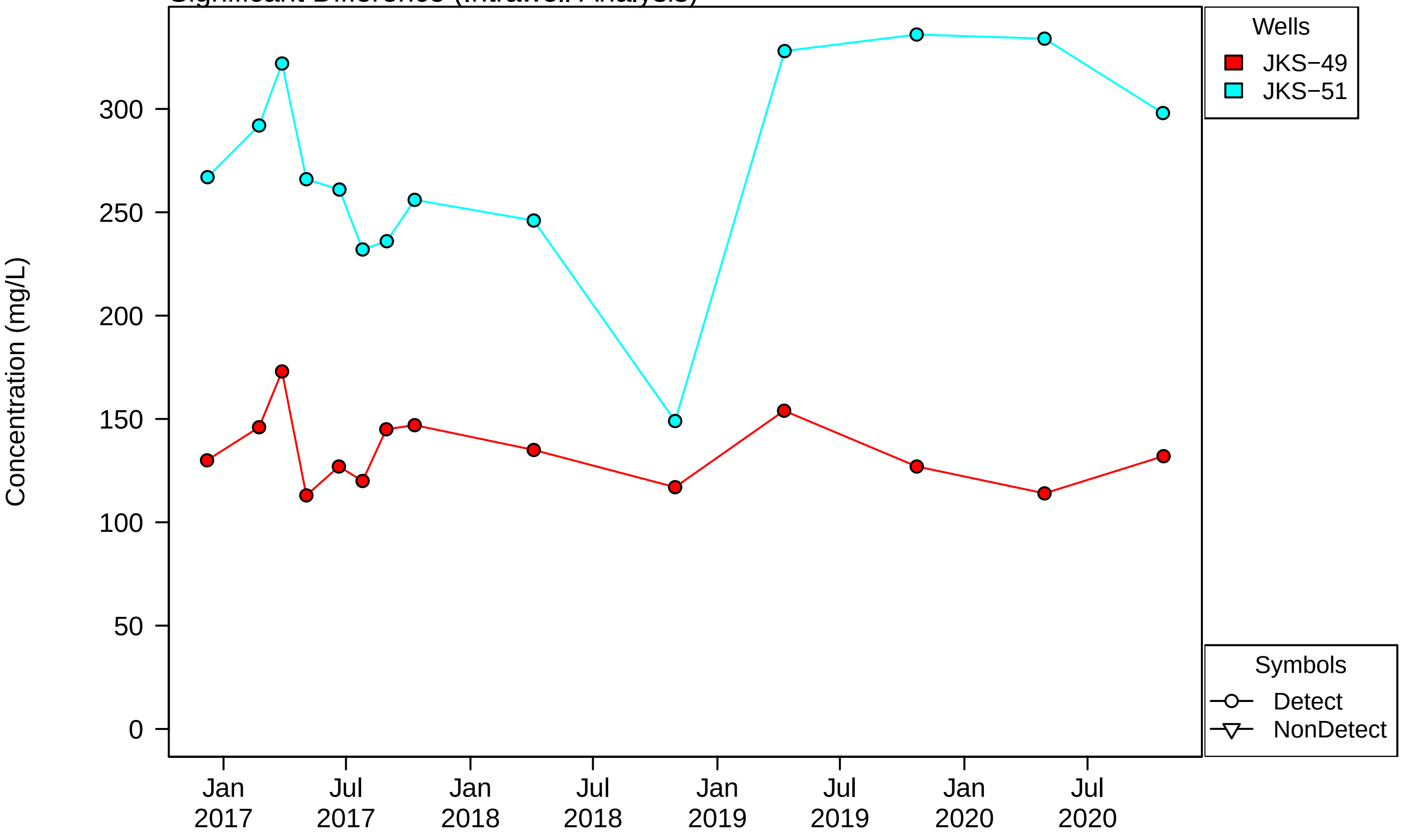
Intentionally left blank,
not Lognormal/NDD distribution.

Appendix B − Figure 3
Unit: SRH Pond
Timeseries of Upgradient Wells

Chemical: Boron
Significant Difference (Intrawell Analysis)

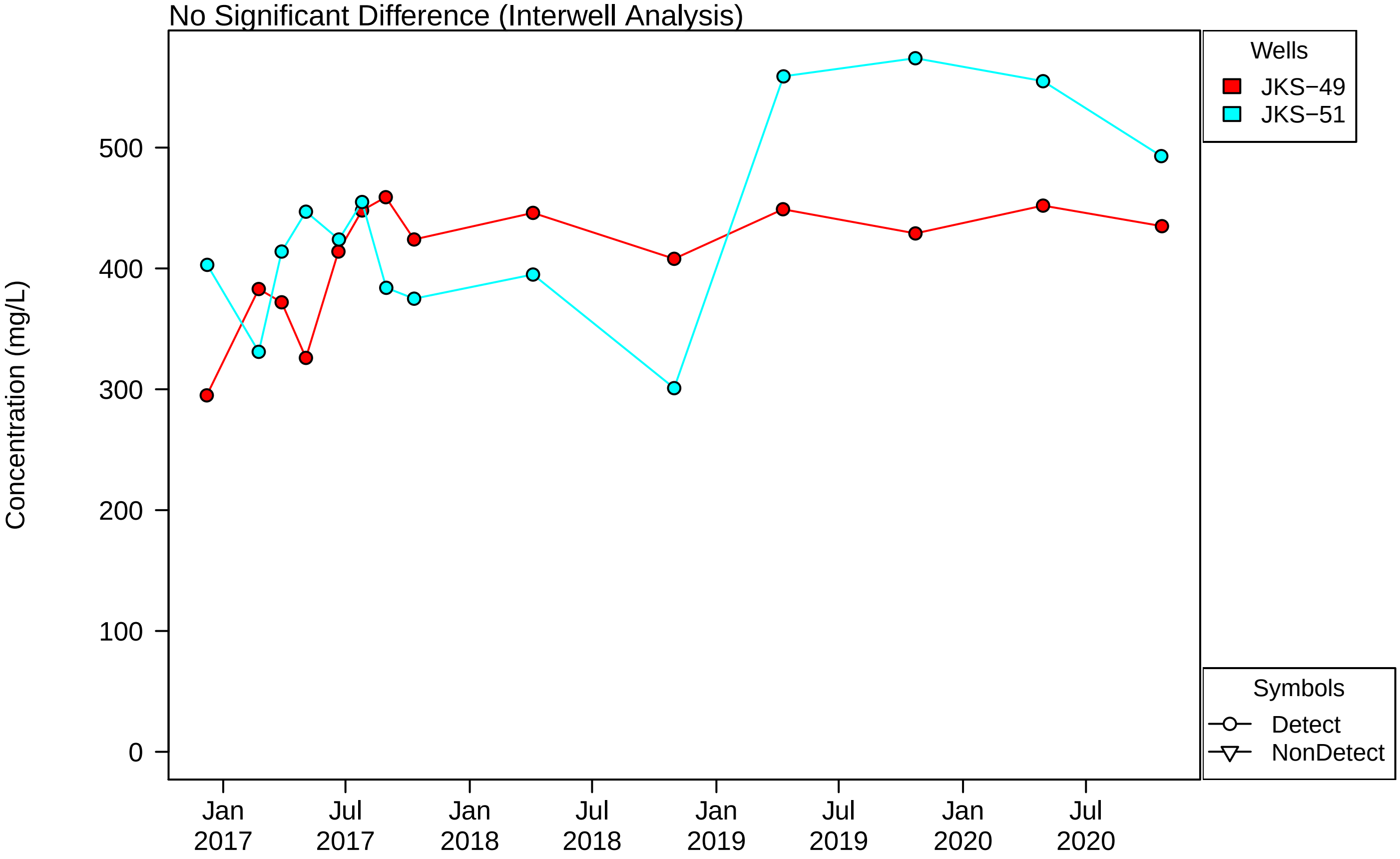


Chemical: Calcium
Significant Difference (Intrawell Analysis)

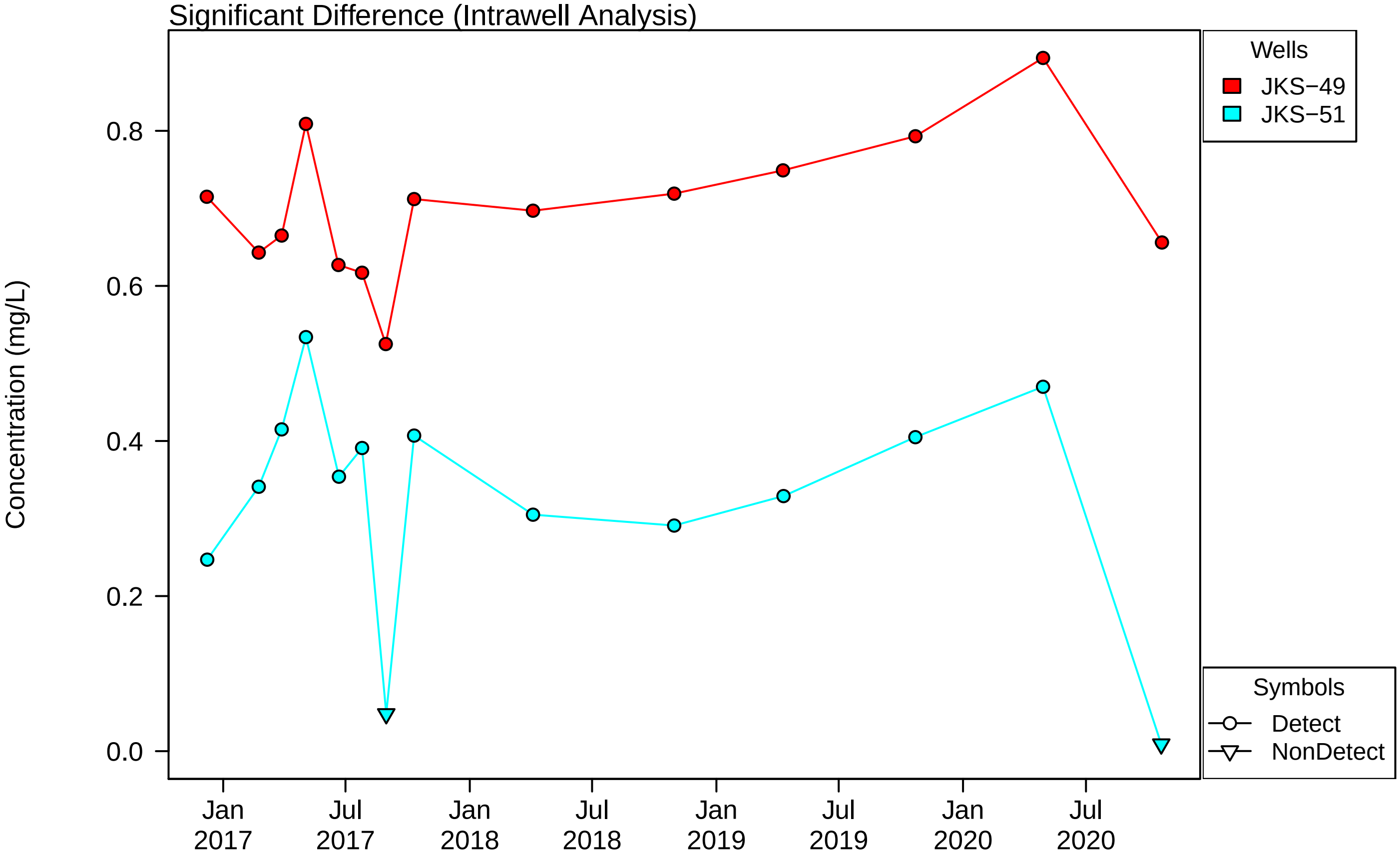


Appendix B − Figure 3
Unit: SRH Pond
Timeseries of Upgradient Wells

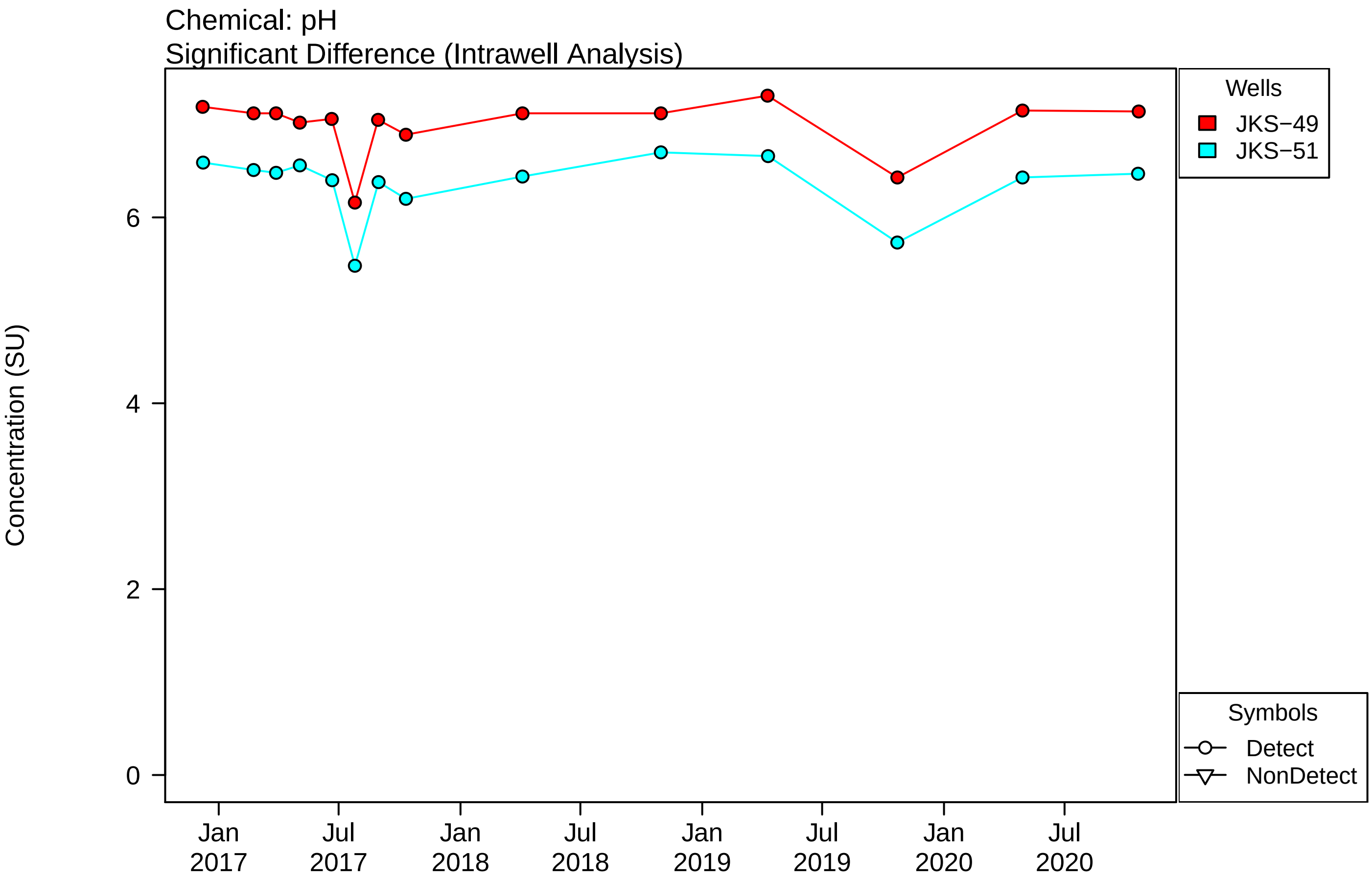
Chemical: Chloride
No Significant Difference (Interwell Analysis)

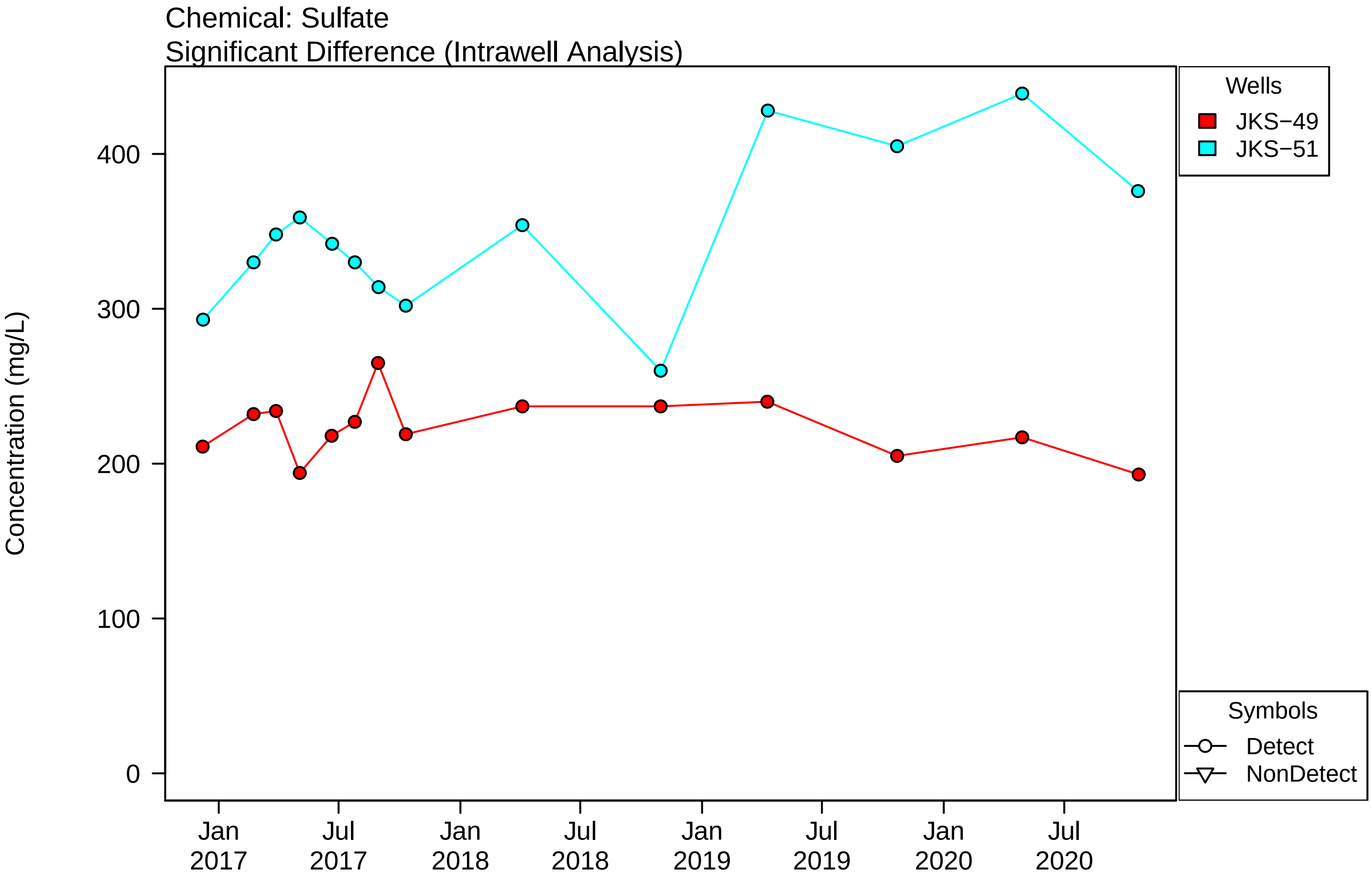


Chemical: Fluoride
Significant Difference (Intrawell Analysis)

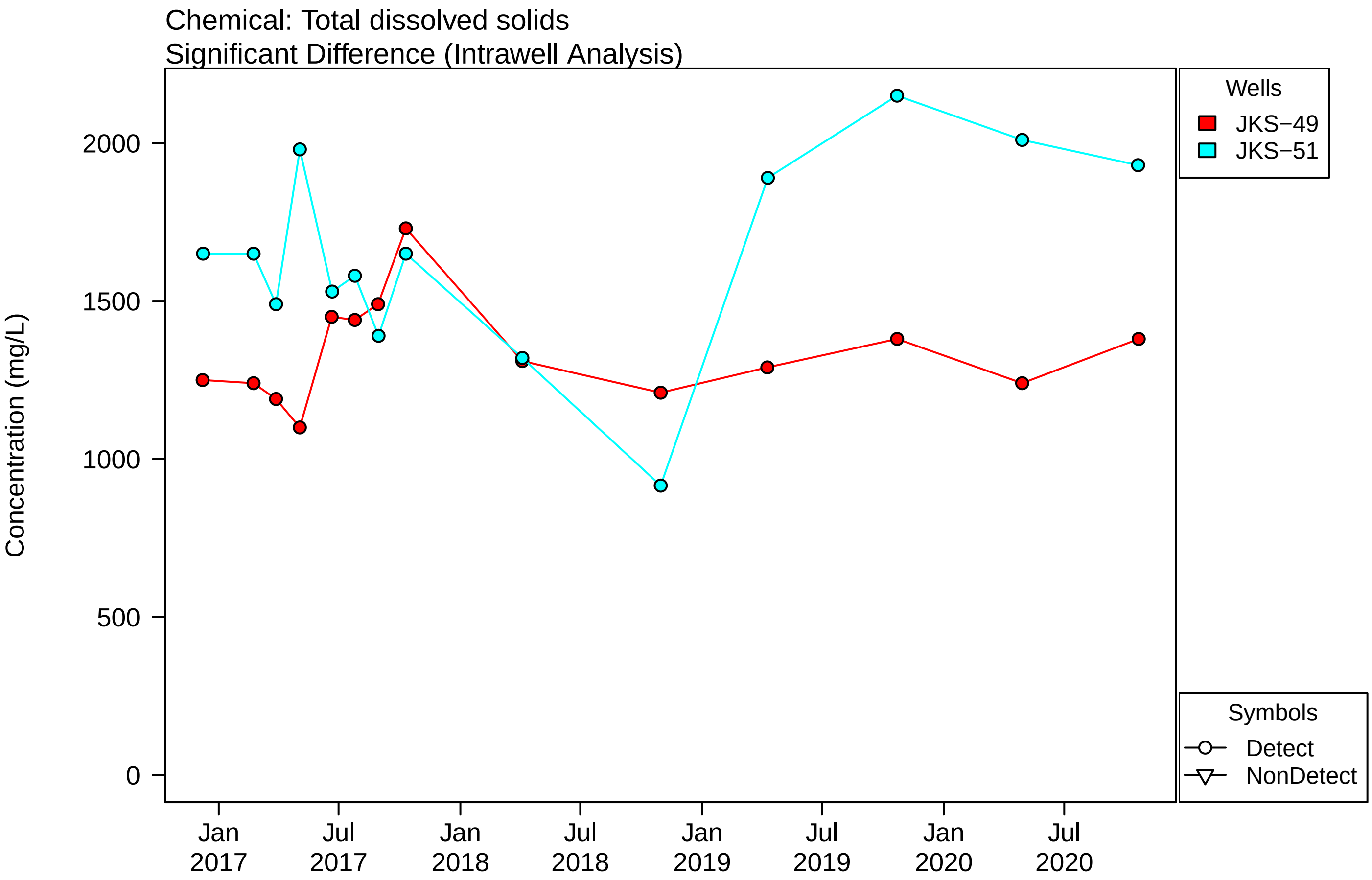


Appendix B − Figure 3
Unit: SRH Pond
Timeseries of Upgradient Wells

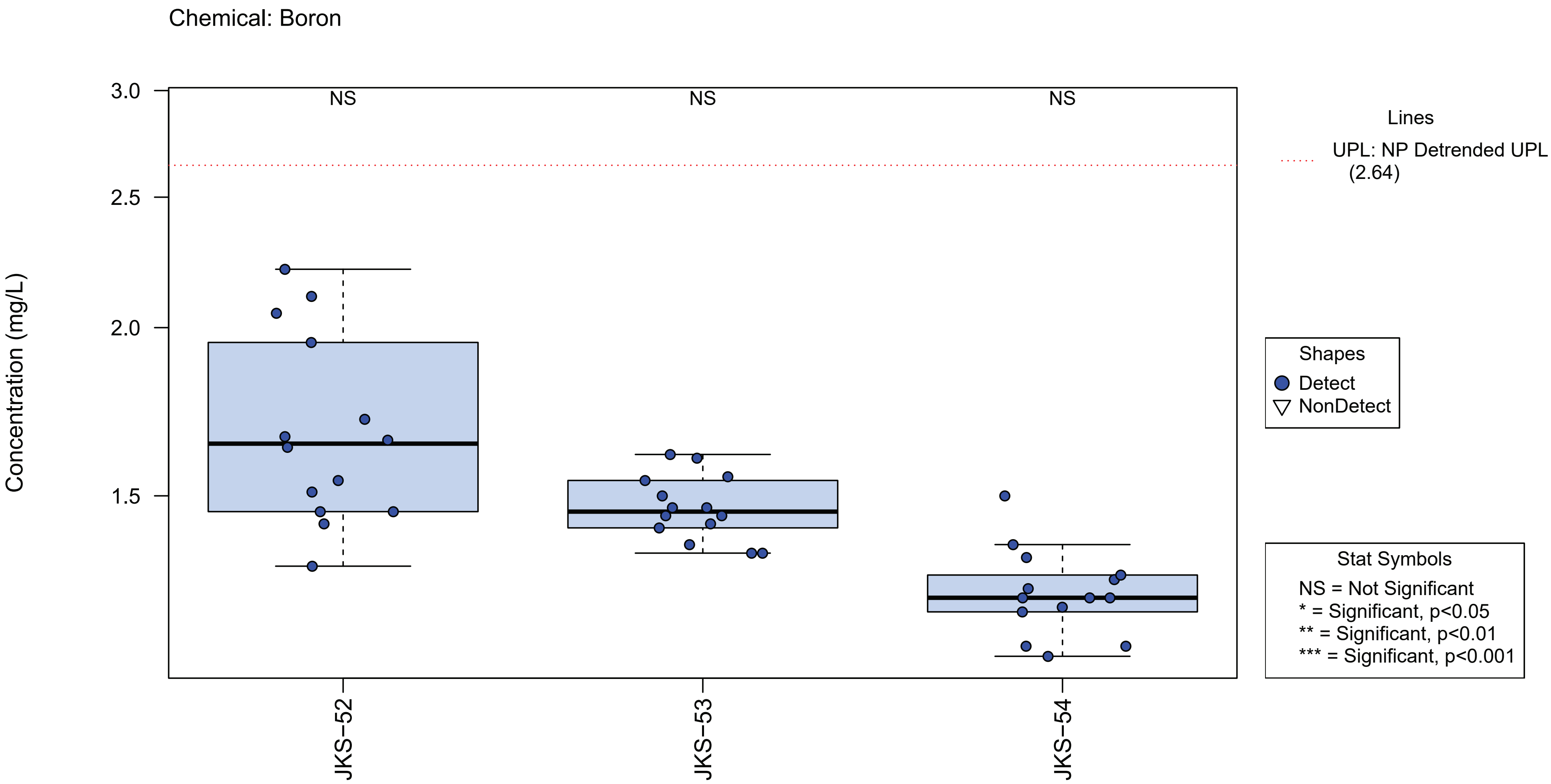




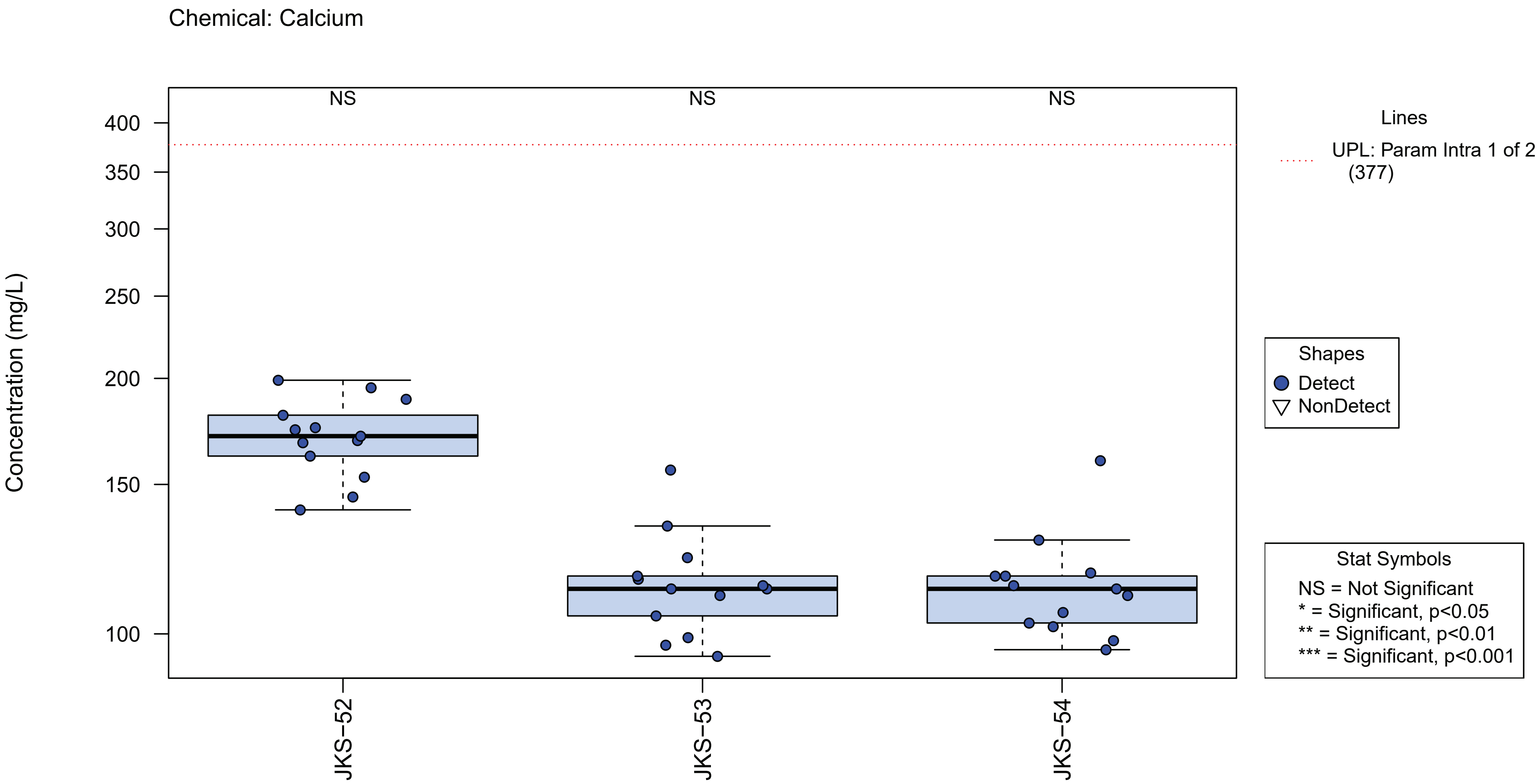
Appendix B − Figure 3
Unit: SRH Pond
Timeseries of Upgradient Wells



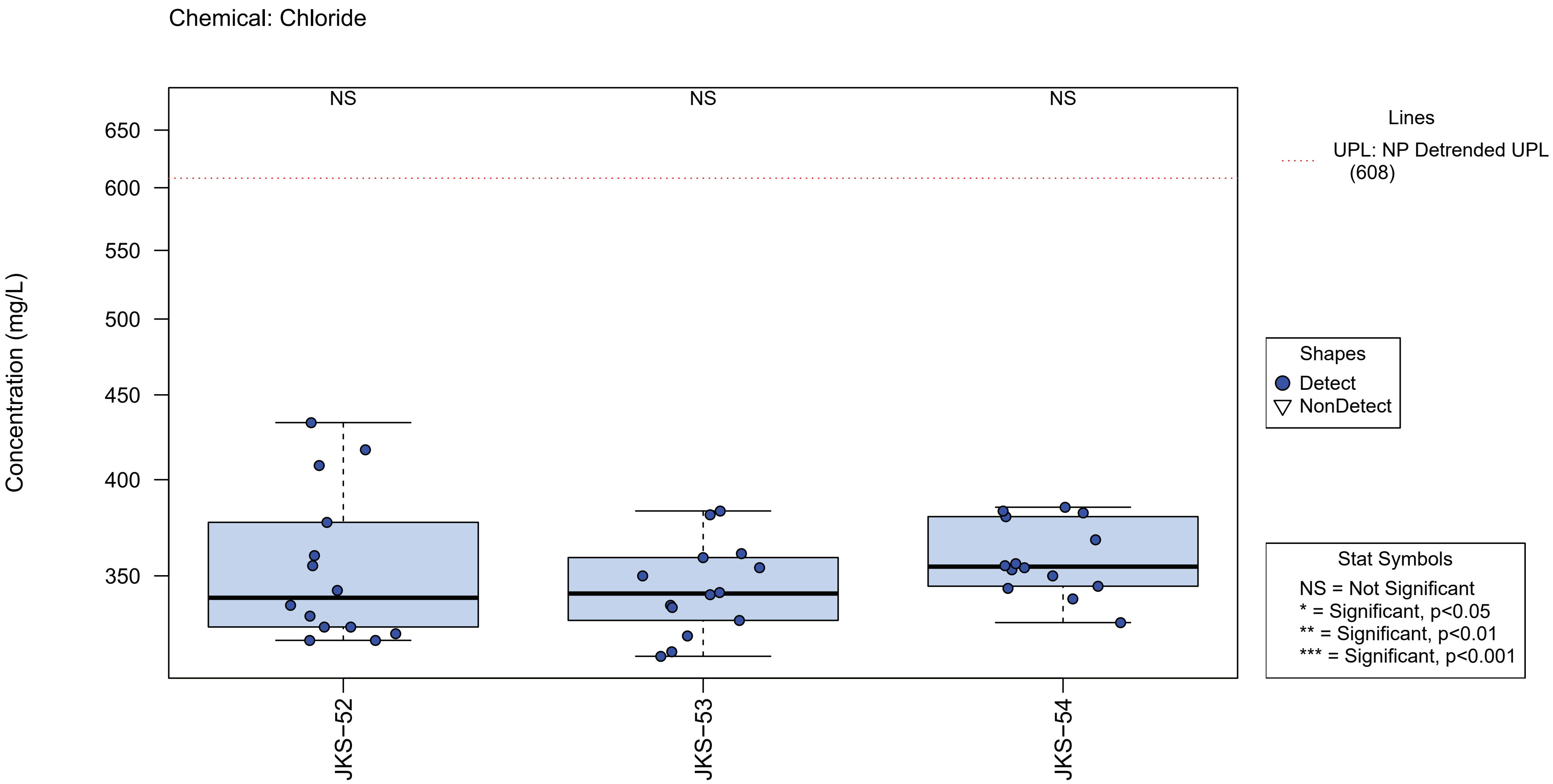
Appendix B - Figure 4
Unit: SRH Pond
Boxplots of Downgradient Wells



Appendix B - Figure 4
Unit: SRH Pond
Boxplots of Downgradient Wells

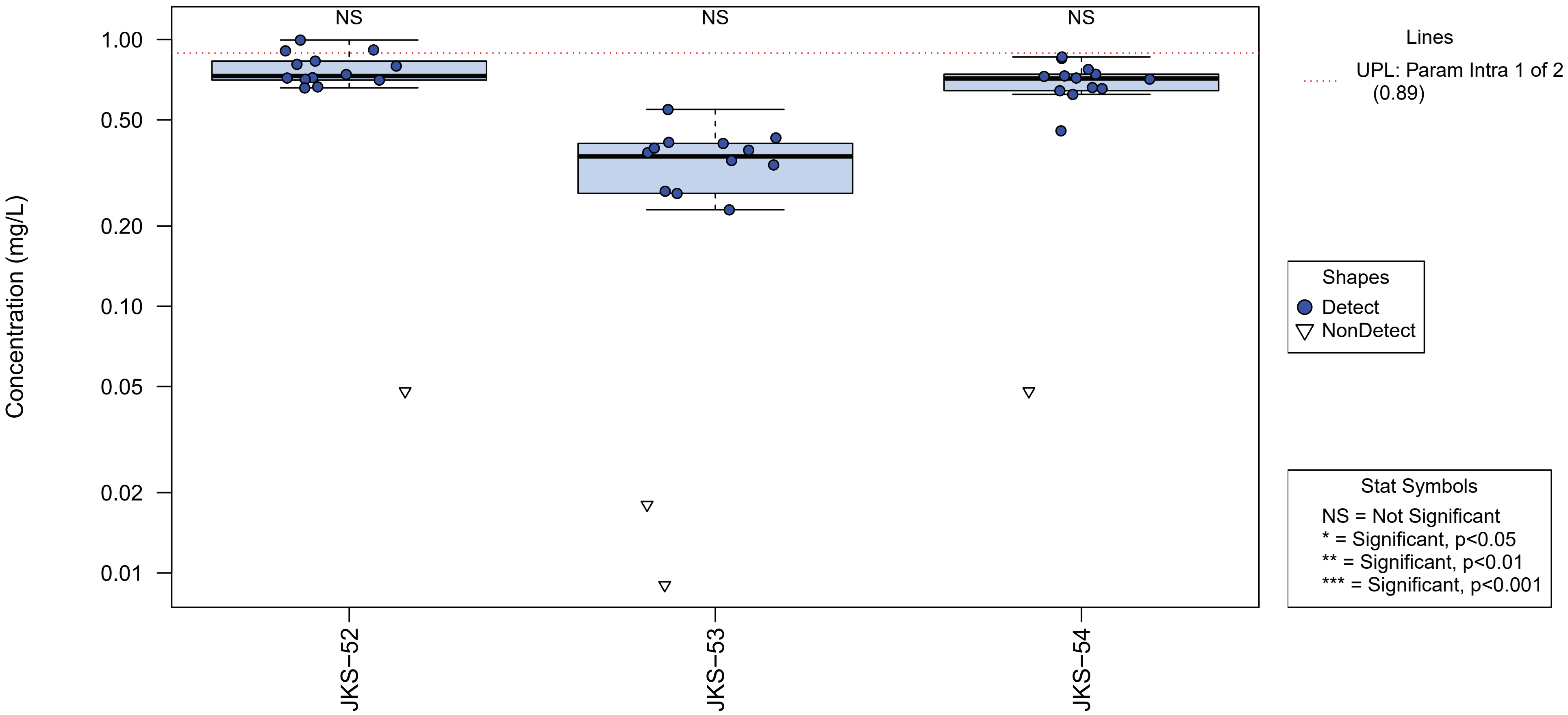


Appendix B - Figure 4
Unit: SRH Pond
Boxplots of Downgradient Wells

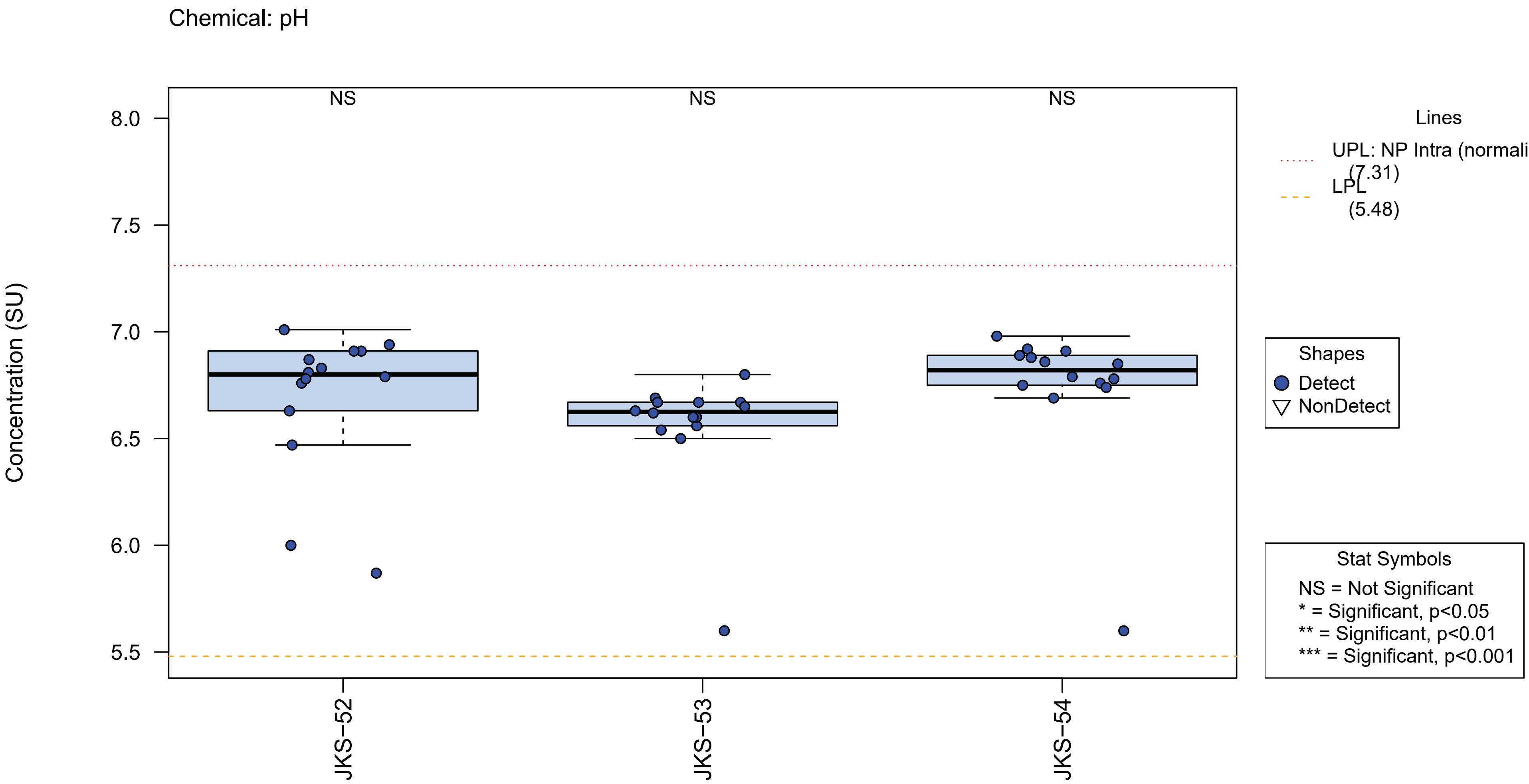


Appendix B - Figure 4
Unit: SRH Pond
Boxplots of Downgradient Wells

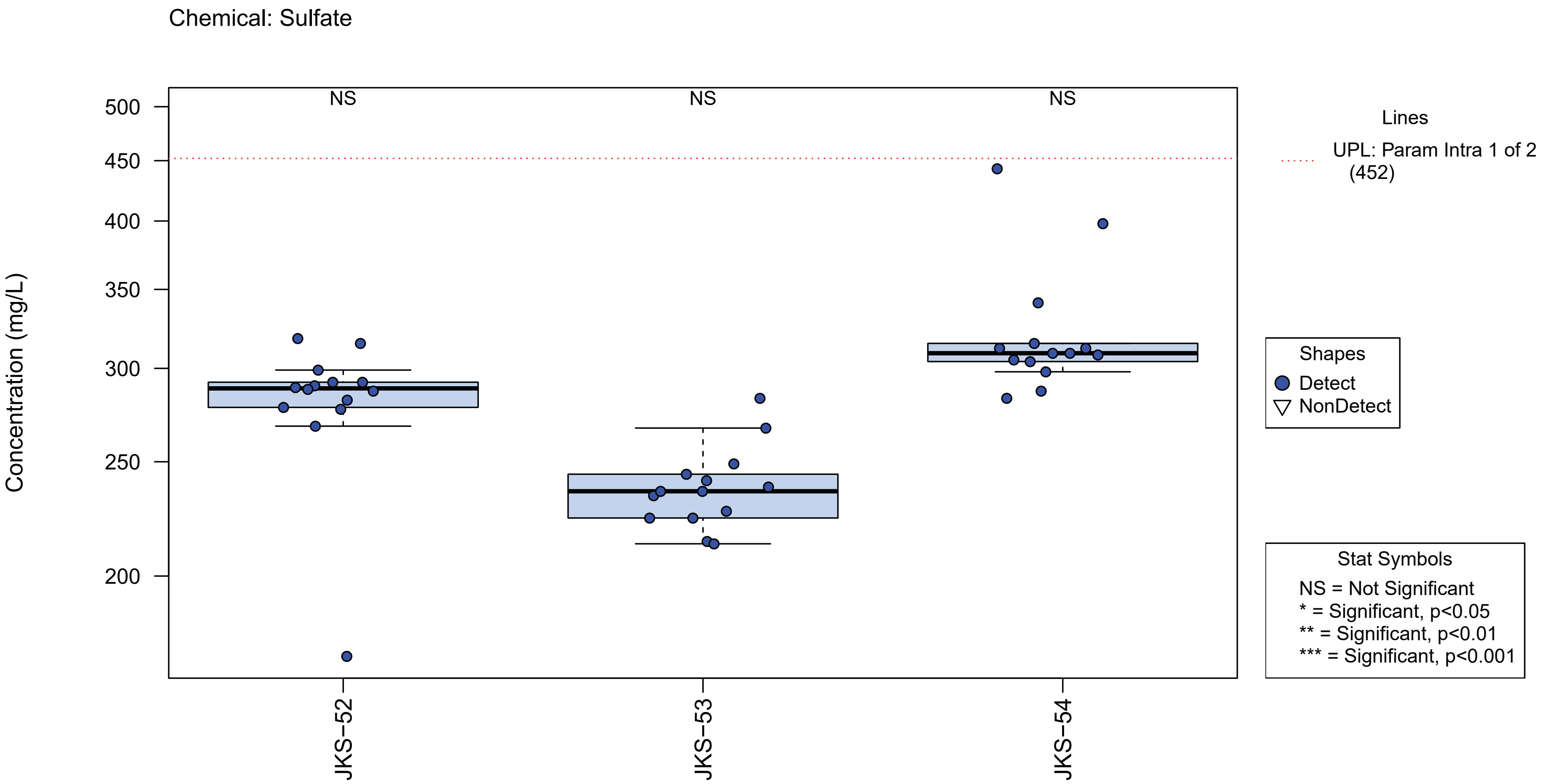
Chemical: Fluoride



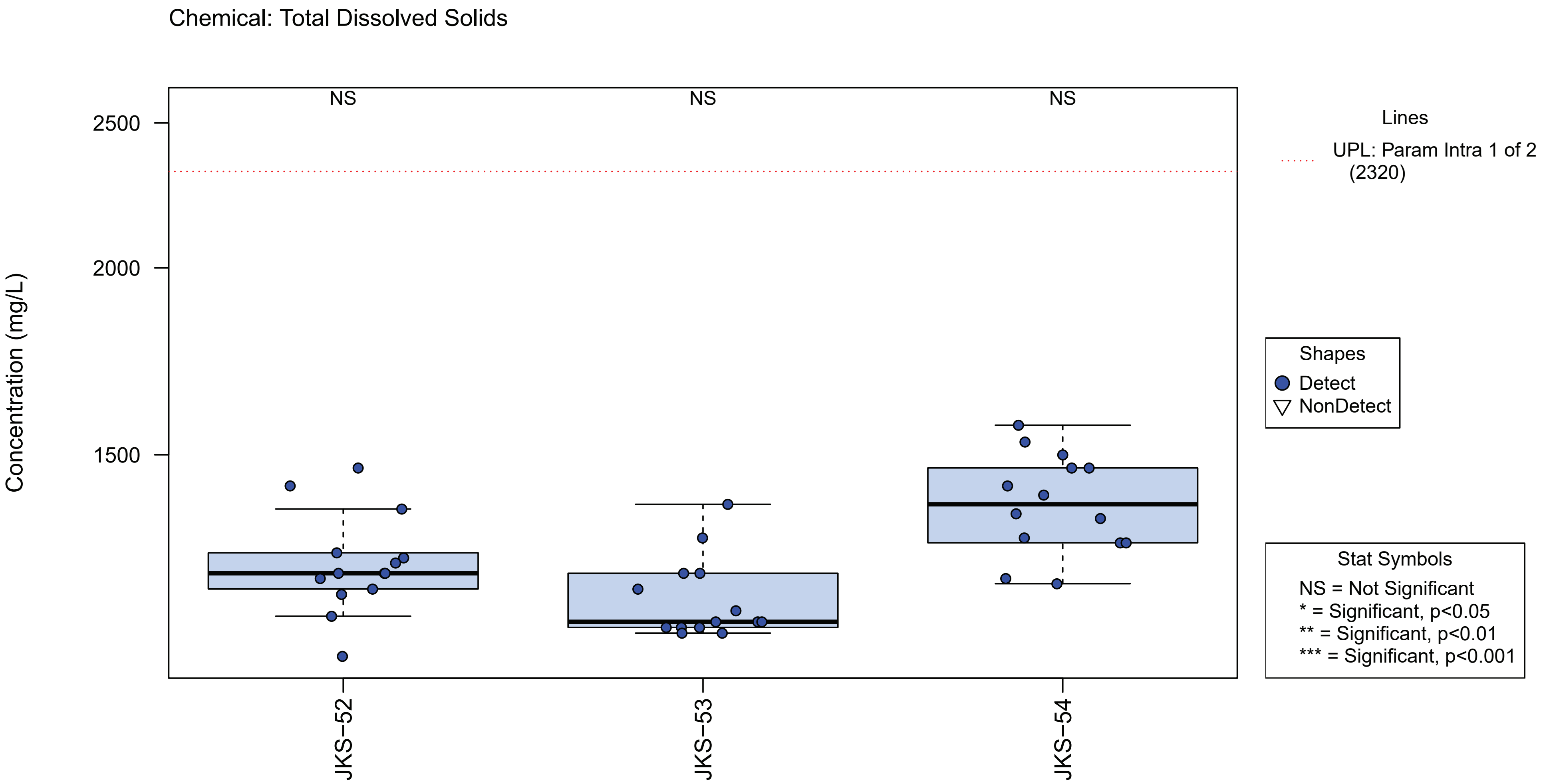
Appendix B - Figure 4
Unit: SRH Pond
Boxplots of Downgradient Wells



Appendix B - Figure 4
Unit: SRH Pond
Boxplots of Downgradient Wells



Appendix B - Figure 4
Unit: SRH Pond
Boxplots of Downgradient Wells



April 2020 Groundwater Sampling Event – Calaveras Power Station CCR Units

Appendix C

ERM

CityCentre Four
840 West Sam Houston Parkway
North, Suite 600
Houston, Texas 77024-3920

Telephone: +281 600 1000
Fax: +281 520 4625

www.erm.com

ERM

September 25, 2020

Mr. Michael Malone
CPS Energy
145 Navarro Street
San Antonio, Texas 78205

Reference: Project No. 0503422\A10320

Subject: April 2020 Groundwater Sampling Event and August 2020 Resampling Event
Calaveras Power Station CCR Units
San Antonio, Texas

Dear Mr. Malone:

Introduction

Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the Coal Combustion Residual (CCR) Rule) was published in the Federal Register in April 2015 and became effective in October 2015. One of the many requirements of the CCR Rule was for CPS Energy to determine if there are impacts to groundwater from the surface impoundments [Evaporation Pond (EP), Bottom Ash Ponds (BAPs), and Sludge Recycling Holding (SRH) Pond] and the landfill [Fly Ash Landfill (FAL)] that contain CCR at the Calaveras Power Station.

In the initial *2017 Annual Groundwater Monitoring and Corrective Action Report* for each CCR unit, the downgradient monitoring well results from the October 2016 sampling event were compared to Upper Prediction Limits (UPLs) and Lower Prediction Limits (LPLs). UPLs and LPLs were calculated in the *Annual Groundwater Monitoring and Corrective Action Reports* for the purpose of determining a potential statistically significant increase (SSI) over background levels. In the subsequent *2018* and *2019 Annual Groundwater Monitoring and Corrective Action Reports* for each CCR unit, the downgradient monitoring well results from the October 2017 and October 2018 sampling events were compared to updated UPLs and LPLs. These updated UPLs and LPLs were recalculated in the respective *Annual Groundwater Monitoring and Corrective Action Reports* using the additional data collected from the previous year. The evaluations of the April and August 2020 groundwater sample results indicated a potential SSI for a limited number of constituents from the EP, FAL, BAPs, and SRH Pond.

According to the CCR Rule [§257.94(e)], if the owner or operator of a CCR unit determines there is a SSI over background levels for one or more Appendix III constituents, the owner or operator may demonstrate that a source other than the CCR unit caused the SSI over background levels or that the SSI resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality. The CCR Rule also indicates that the owner or operator must complete the written demonstration within 90 days of detecting a SSI over the background levels. If a successful demonstration is completed within the 90-day period, the owner or operator may continue with a detection monitoring program.

To address the potential SSIs identified in the previous three *Annual Groundwater Monitoring and Corrective Action Reports*, CPS Energy prepared three *Written Demonstrations – Responses to Potential Statistically Significant Increases* (dated April 4, 2018; February 27, 2019; and April 27, 2020; respectively). Based on the evidence provided in the *Written Demonstrations*, no SSIs over background levels were determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy continued with a detection monitoring program that would include semiannual sampling.

Sampling Events Summary

The first semiannual groundwater sampling event for 2020 was conducted on April 28 through April 29, 2020. The sampling event included the collection of water level measurements and groundwater samples from all the background and downgradient monitoring wells in the CCR monitoring program. Monitoring wells were gauged and then sampled by CPS Energy using low flow sampling techniques during the sampling event. The groundwater samples were analyzed for Appendix III constituents. A resampling event of JKS-54 only was conducted on August 24, 2020.

For each CCR unit, the downgradient monitoring well results from the April and August 2020 sampling events were compared to the updated UPLs and LPLs recalculated in their respective *2019 Annual Groundwater Monitoring and Corrective Action Report*. The April and August 2020 groundwater sample results for the downgradient monitoring wells in each CCR unit are summarized in Attachment 1.

Although the evaluations of the April and August 2020 groundwater sample results indicate a potential SSI for a limited number of constituents, with the exception of sulfate in JKS-54 associated with the SRH Pond, the constituents associated with the potential SSIs are the same constituents, detected at similar concentrations, which were previously identified in one or all of the *Written Demonstrations*. The evaluations of the April and August 2020 groundwater sample results with potential SSIs are summarized below.

EP – The constituents associated with potential SSIs include fluoride in JKS-36 and JKS-61; and pH in JKS-36 and JKS-62. As previously presented in the *Written Demonstrations*, the concentrations of fluoride and pH appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

FAL – The constituent associated with a potential SSI is pH in JKS-31 and JKS-46. As previously presented in the *Written Demonstrations*, the concentrations of pH appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

BAPs – The constituents associated with potential SSIs include boron in JKS-50R and JKS-56; and fluoride in JKS-52 and JKS-55. As previously presented in the *Written Demonstrations*, the concentrations of boron and fluoride appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. The reported April 2020 concentrations were within the range of naturally occurring concentrations identified in the *Written Demonstrations*.

SRH Pond – The constituents associated with potential SSIs include fluoride in JKS-52 and JKS-54; and sulfate in JKS-54. As previously noted in the *April 2019 Groundwater Sampling Report*, the concentrations of fluoride appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit and the reported April 2020 concentrations are within the range of naturally occurring concentrations identified in the *Annual Groundwater Monitoring and Corrective Action Reports*. Although a potential SSI of sulfate was not previously presented in the *Written Demonstrations*, the concentrations of sulfate in JKS-54 appear to reflect natural variation in groundwater quality in the vicinity of the CCR unit. While the concentration reported in the April 2020 sampling event (443 mg/L) was the highest concentration reported in JKS-54, the concentration reported in the August 2020 resampling event (425 mg/L) is within the range of concentrations reported in upgradient monitoring well JKS-51 over the previous three sampling events (405 to 439 mg/L).

Conclusions

Based on the April and August 2020 groundwater sample results and the evidence provided in one or all of the *Written Demonstrations*, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy should continue with a detection monitoring program. The second semiannual sampling event should be performed in October 2020.

We appreciate the opportunity to work with you on this project. Please contact me if you should have any questions.

Sincerely,

Environmental Resources Management

Walter Zverina

Walter Zverina
Principal Consultant

ATTACHMENT 1 APRIL AND AUGUST 2020 GROUNDWATER SAMPLE RESULTS

September 2020
Project No. 0503422

April 2020 Groundwater Sample Results
CCR Unit: Evaporation Pond
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	EP	EP	EP	EP
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-36	JKS-61	JKS-61	JKS-62
			Sample Date	4/29/2020	4/29/2020	4/29/2020	4/29/2020
			Sample Type Code	N	N	FD	N
Constituent	Units	2019 LPL - EP	2019 UPL - EP				
Boron	mg/L	--	1.88	0.459	1.82	1.85	0.484
Calcium	mg/L	--	1,300	175	154	157	122
Chloride	mg/L	--	2,780	63.3	312	317	284
Fluoride	mg/L	--	0.382	1.18	0.494	0.549	0.331
pH, Field	SU	4.58	6.47	3.42	6.27	6.27	6.54
Sulfate	mg/L	--	2,110	189	604	608	190
Total dissolved solids	mg/L	--	6,660	1,790	1,870	1,870	1,100

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

April 2020 Groundwater Sample Results
CCR Unit: Fly Ash Landfill
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	FAL	FAL	FAL	FAL	FAL
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-31	JKS-33	JKS-46	JKS-46	JKS-60
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020
			Sample Type Code	N	N	N	FD	N
Constituent	Units	2019 LPL - FAL	2019 UPL - FAL					
Boron	mg/L	--	4.29	0.429	1.18	0.864	0.806	0.325
Calcium	mg/L	--	583	171 J	573 J	143 J	133 J	530 J
Chloride	mg/L	--	841	272	756	17.9	19.2	168
Fluoride	mg/L	--	4.86	1.00	1.68	1.61 J	2.44 J	0.188
pH, Field	SU	3.98	6.73	3.70	6.30	3.10	3.10	6.61
Sulfate	mg/L	--	7,630	877	1,620	1,180	1,240	1,280
Total dissolved solids	mg/L	--	11,900	1,890	4,370	1,970	1,780	3,180

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

April 2020 Groundwater Sample Results
CCR Unit: Bottom Ash Ponds
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	BAP	BAP	BAP	BAP	BAP	BAP
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-48	JKS-50R	JKS-52	JKS-52	JKS-55	JKS-56
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020	4/28/2020
			Sample Type Code	N	N	N	FD	N	N
Constituent	Units	2019 LPL - BAP	2019 UPL - BAP						
Boron	mg/L	--	2.40	2.36	5.52	2.05	2.16	0.779	3.55
Calcium	mg/L	--	368	130 J	126 J	174 J	180 J	137 J	103 J
Chloride	mg/L	--	608	485	102	433	430	452	101
Fluoride	mg/L	--	0.847	0.051 JH	0.510	0.908	0.952	1.01	0.552
pH, Field	SU	5.48	7.31	6.89	6.65	6.83	6.83	6.81	6.72
Sulfate	mg/L	--	431	206	194	315	313	177	138
Total dissolved solids	mg/L	--	2,240	1,400	918	1,470	1,420	1,350	904

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.

April and August 2020 Groundwater Sample Results
CCR Unit: SRH Pond
CPS Energy Calaveras Power Station
San Antonio, TX

			CCR Unit	SRH Pond	SRH Pond	SRH Pond	SRH Pond	SRH Pond
			Well Designation	Downgradient	Downgradient	Downgradient	Downgradient	Downgradient
			Well ID	JKS-52	JKS-52	JKS-53	JKS-54	JKS-54
			Sample Date	4/28/2020	4/28/2020	4/28/2020	4/28/2020	8/24/2020
			Sample Type Code	N	FD	N	N	R
Constituent	Units	2019 LPL - SRH	2019 UPL - SRH					
Boron	mg/L	--	2.40	2.05	2.16	1.43	1.23	NA
Calcium	mg/L	--	357	174 J	180 J	114 J	118 J	NA
Chloride	mg/L	--	608	433	430	381	380	NA
Fluoride	mg/L	--	0.831	0.908	0.952	0.428	0.861	0.579
pH, Field	SU	5.48	7.31	6.83	6.83	6.67	6.76	NA
Sulfate	mg/L	--	421	315	313	244	443	425
Total dissolved solids	mg/L	--	2,180	1,470	1,420	1,160	1,570	NA

NOTES:

Shaded results either exceed of the Upper Prediction Limit (UPL) or are below the Lower Prediction Limit (LPL) for this CCR unit.
Sample Type Code: N - Normal; FD - Field Duplicate; R - Resample
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NA: Not analyzed for this constituent

Attachment 16-5

ERM

City Centre Four
840 West Sam Houston Parkway
North, Suite 600
Houston, Texas 77024-3920

Telephone: +281-600-1000
Fax: +281-520-4625

www.erm.com

ERM

27 January 2022

Mr. Michael Malone
CPS Energy
500 McCullough Avenue
San Antonio, Texas 78215

Reference: Project No. 0503422

Subject: *2021 Water Level Study Report*
Calaveras Power Station
San Antonio, Texas

Executive Summary

On behalf of CPS Energy, Environmental Resources Management Southwest, Inc. (ERM) has prepared this *Water Level Study Report* (Report) for the Coal Combustion Residual (CCR) Units located at the Calaveras Power Station (Power Station or Site). The objective of this Report is to summarize a one-year study (Study) of 2021 groundwater elevations and flow direction observations at the active CCR Units [i.e., Fly Ash Landfill (FAL), Evaporation Pond (EP), and Sludge Recycle Holding (SRH) Pond] and inactive CCR Units [i.e., North and South Bottom Ash Ponds (BAPs)].

As documented in each CCR Unit's *2020 Annual Groundwater Monitoring and Corrective Action Report*, a number of non-proportional groundwater elevation changes or uncharacteristic groundwater flow changes were observed during 2020. To better understand the temporal changes in hydrogeology at each CCR Unit, an analysis of site-wide groundwater elevation data was conducted during five groundwater observation events in 2021.

The results of the Study indicate four monitoring wells were found to be inconsistently acting in an upgradient capacity: JKS-57 at the FAL, JKS-64 at the EP, and JKS-49 and JKS-51 at the SRH Pond/BAPs. It is ERM's recommendation to install two to four new monitoring wells, one or two wells at the FAL and one or two wells at the SRH Pond/BAPs. Additionally, it is ERM's recommendation to re-designate JKS-64 as a downgradient monitoring well at the EP.

Introduction and Approach

CPS Energy owns and operates the Calaveras Power Station that consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under the CCR Rule (i.e., Title 40, Code of Federal Regulations, Part 257). The Power Station is located in unincorporated Bexar County, Texas, approximately 13 miles southeast of San Antonio. Currently, CPS Energy operates three CCR units at the Power Station: Fly Ash Landfill (FAL), Evaporation Pond (EP), and the SRH Pond. Although the J.T. Deely Power Plant ceased operation at the end of December 2018 and sluiced bottom ash is no longer being received at the BAPs, the BAPs will continue to be monitored until the units have undergone closure.

Annual Groundwater Monitoring and Corrective Action Reports have been completed for each of these CCR units since 2017. Included in these annual reports is a summary of each CCR Unit's groundwater elevations and an analysis of groundwater flow directions, the purpose of which is to monitor for any changes that could potentially affect well functionality and designation within the monitoring well networks. As noted in all four of the 2020 *Annual Groundwater Monitoring and Corrective Action Reports*, groundwater flow directions and/or groundwater elevations at select monitoring wells at each CCR unit appear to have changed when compared to previous observations. These apparent changes included the following:

- **FAL:** A non-proportional change in water levels was observed at upgradient well JKS-57 during the 2020 monitoring events which resulted in an apparent change in groundwater flow direction.
- **(EP):** A non-proportional change in water levels was observed at downgradient well JKS-36 during the 2020 monitoring events which resulted in an apparent change in groundwater flow direction.
- **SRH Pond/BAPs:** Groundwater flow during the October 2020 monitoring event was observed from Calaveras Lake towards the SRH Pond/BAPs which is a change in groundwater flow direction not previously observed in this area, but similar to observations made during the October 2019 monitoring event.

Groundwater monitoring networks like those at the Calaveras Power Station, that exhibit substantially flat gradients, are more likely to experience differences in groundwater flow direction. These apparent changes/differences could potentially impact the designation of upgradient and downgradient wells and the interpretation of statistical analyses. Because of these apparent changes, it was noted in each 2020 *Annual Groundwater Monitoring and Corrective Action Report* that a Water Level Study would be conducted at each of the CCR Units in 2021.

Methodology

A total of five rounds of groundwater level measurements were collected at each CCR monitoring well network from February to October 2021, occurring approximately every two months (i.e., February, April, June, August, and October). During those groundwater observation events, additional groundwater elevations were collected from other on-site monitoring wells (not associated with CCR unit monitoring) in order to gain better understanding of site-wide groundwater flow characteristics. Monitoring well locations are shown on Figure 1. A description of groundwater monitoring well networks utilized in the Study are provided below:

- **FAL:** The well network consists of two upgradient monitoring wells (JKS-45 and JKS-57) and four downgradient monitoring wells (JKS-31, JKS-33, JKS-46, and JKS-60). For discussion purposes in this Study, the FAL and EP are mapped together as the "Northern Units."
- **EP:** The well network consists of three upgradient monitoring wells (JKS-47, JKS-63R, and JKS-64) and three downgradient monitoring wells (JKS-36, JKS-61, and JKS-62). For discussion purposes in this Study, the FAL and EP are mapped together as the "Northern Units."

- **SRH Pond:** The well network consists of two upgradient monitoring wells (JKS-49 and JKS-51) and three downgradient monitoring wells (JKS-52, JKS-53, and JKS-54). For discussion purposes in this Study, the SRH Pond and BAPs are mapped and collectively analyzed together as the "Southern Units."
- **BAPs:** The well network consists of two upgradient monitoring wells (JKS-49 and JKS-51) and five downgradient monitoring wells (JKS-48, JKS-50R, JKS-52, JKS-55, and JKS-56). For discussion purposes in this Study, the BAPs and SRH Pond are mapped and collectively analyzed together as the "Southern Units."
- **Non-CCR Observation Wells** – The following twelve additional on-site wells, not affiliated with the CCR Program, were measured as part of the Study: JKS-32, JKS-34, JKS-37, JKS-39, JKS-40, JKS-42, JKS-43, JKS-44, JTD-1, JTD-2, JTD-4, and JTD-5.

Groundwater Observations and Conclusions

Groundwater elevations collected during each of the five groundwater observation events, including historical data collected prior to 2021, for the CCR Units and Non-CCR Observation Wells are summarized in Table 1 and Table 2, respectively. Groundwater elevations and the potentiometric surfaces from February to October 2021 for the Northern Units are shown on Figures 2A through Figures 2E, respectively, and for the Southern Units on Figures 3A through Figures 3E, respectively. Graphs of Calaveras Lake level elevations and monitoring well level elevations collected through the entirety of the CCR Program are shown on Figure 4A through Figure 7A, respectively. Additionally, graphs of level elevations for only the 2021 groundwater observation events are shown on Figures 4B through Figure 7B, respectively.

FAL

As shown in Figures 2A through 2E, groundwater in the vicinity of the FAL appears to flow radially to the northwest, northeast, and east from a potentiometric high located at JKS-45, consistent with observations from 2020. A holistic consideration of groundwater elevations associated with the FAL, EP, and other non-CCR observation wells indicates the presence of a potential groundwater divide that roughly trends southwest to northeast along the bottom ash conveyor/plant road that terminates into and beyond the southwest corner of the FAL. This divide also corresponds to the topographically highest part of land between the upper two arms of Calaveras Lake. Groundwater elevation observations also appear to indicate that this groundwater divide fluctuates in size and shape temporally, and may extend beyond the northwest corner of the FAL.

During the Study, the horizontal gradient ranged from approximately 0.011 to 0.020 feet/foot (ft/ft), with an average of 0.014 ft/ft. These are the highest calculated gradients at the Site, and generally indicate the presence of a moderate gradient. Horizontal gradients calculated during each of the groundwater observation events are provided below.

February 2021	April 2021	June 2021	August 2021	October 2021	Average
0.011 ft/ft	0.011 ft/ft	0.016 ft/ft	0.015 ft/ft	0.020 ft/ft	0.014 ft/ft

As shown in Figures 4A and 4B, the FAL network wells have generally had a lower groundwater elevation with respect to Calaveras Lake. The exceptions include JKS-45, which has had a relatively stable groundwater elevation similar to the lake water level, and JKS-57 and JKS-58, which show larger overall water level fluctuations above and below the lake water levels and appear to be influenced by periods of increased or decreased rainfall. In particular, JKS-58 showed a significant increase in groundwater elevation between the April and August events, which correlates well to increased precipitation experienced within the same time frame. It is possible that a buildup of precipitation within drainage features located outside the northeast corner of the FAL may have had an influence on the groundwater elevations observed at JKS-58 during the Study.

During the Study, JKS-45 consistently served in an upgradient capacity, and therefore should continue to be considered a viable background well for the FAL. Conversely, JKS-57 showed non-proportional changes in groundwater elevation similar to observations from 2020. JKS-57 had lower groundwater elevations than downgradient well JKS-58 during all 2021 events and had a lower groundwater elevation than downgradient wells JKS-31 and JKS-33 during the June and August events. JKS-57 has performed inconsistently as a background well (as shown on Figure 4A), and may be functionally downgradient of groundwater flow from JKS-45 and JKS-58 (as shown in Figures 2A through 2E). Thus, JKS-57 no longer appears to be a viable background well for the FAL.

EP

As shown in Figures 2A through 2E, groundwater in the vicinity of the EP appears to flow southeast from the potential groundwater divide (as described above) and northeast from the Closed Landfills (located immediately south of the EP) towards the CCR Unit, consistent with observations from 2020. A holistic consideration of groundwater elevations associated with the FAL, EP, and other non-CCR observation wells indicates groundwater flow downgradient of the EP flows in an east to northeast direction.

During the Study, the horizontal gradient ranged from approximately 0.002 to 0.004 ft/ft, with an average of 0.003 ft/ft and generally indicates the presence of a relatively flat gradient. Horizontal gradients calculated during each of the groundwater observation events are provided below.

February 2021	April 2021	June 2021	August 2021	October 2021	Average
0.003 ft/ft	0.003 ft/ft	0.002 ft/ft	0.004 ft/ft	0.003 ft/ft	0.003 ft/ft

As shown in Figures 5A and 5B, groundwater elevations of the EP network wells are below the Calaveras Lake water level and typically display greater changes in groundwater elevation than the relatively stable lake level elevation. The wells appear to show a moderate correlation in increased/decreased elevation changes when compared to increases and decreases in rainfall.

During the Study, JKS-47 and JKS-63R consistently served in an upgradient capacity, with the exception of the August event where downgradient well JKS-36 observed the highest groundwater elevation of the EP network wells. This was the second instance of JKS-36 recording the highest groundwater elevation (i.e., second non-proportional elevation change), the first occurring in October 2020. Overall, this occurrence appears to be anomalous considering its general downgradient performance during the CCR Program (as shown in Figure 5A). Thus, JKS-47 and JKS-63R continue to be viable background wells for the EP. The third background well, JKS-64, had lower groundwater elevations than JKS-36 during the February and April events, but performed in a more upgradient capacity during the final three events, having higher groundwater elevations than JKS-47 and JKS-63R during the August and October events. Considering the variable performance of JKS-64 to maintain a higher groundwater elevation than JKS-36 over the entire CCR Program (as shown in Figure 5B), JKS-64 no longer appears to be a viable background well for the EP.

Southern Units (SRH Pond/BAPs)

As shown in Figures 3A through 3E, groundwater in the vicinity of the Southern Units appears to flow towards Calaveras Lake and the adjacent channel (south and southeast) during the February, June, and August events, which is similar to observations made in April 2020. Groundwater flow during the April event appears to have a more easterly flow from the Southern Units to Calaveras Lake. Groundwater elevations measured during the October event appear to display a radial-type flow from a potentiometric high that begins near JKS-50R and extends west towards the SRH Pond. While groundwater to the northeast, east and south appears to flow towards Calaveras Lake and the adjacent channel (similar to observations from earlier 2021 events), groundwater also appears to flow from the BAPs west towards the SRH Pond and northeast towards the CRP Runoff Pond 1.

During the 2021 Study, the horizontal gradient ranged from approximately 0.001 to 0.005 ft/ft, with an average of 0.002 ft/ft. These are the lowest calculated gradients at the Site, and generally indicate the presence of a relatively flat gradient. Horizontal gradients calculated during each of the groundwater observation events are provided below.

February 2021	April 2021	June 2021	August 2021	October 2021	Average
0.001 ft/ft	0.001 ft/ft	0.002 ft/ft	0.002 ft/ft	0.005 ft/ft	0.002 ft/ft

As shown in Figures 6A and 6B, a majority of the groundwater elevations from the Southern Units wells correlate well with Calaveras Lake water levels, especially after the April 2019 event. JKS-49 has been the exception, and appears to be influenced to a greater degree by precipitation rate or other additional factors, especially prior to April 2019.

During the Study, JKS-49 and JKS-51 inconsistently acted in an upgradient capacity, as JKS-49 had the highest groundwater elevation in three out of five events (February, June, August) and JKS-51 had the second highest groundwater elevation in four events for the BAPs (February through August) and two events for the SRH Pond (February and August). Specifically, during the April event, JKS-49 had a lower groundwater level than JKS-52 and the SRH Pond downgradient wells, and a lower elevation than JKS-50R and JKS-53 during the October event (as shown in Figure 6B). Specifically, JKS-51 had a lower groundwater elevation than JKS-50R during the October event, a lower elevation than JKS-53 during the April, June, and October events, and a lower elevation than JKS-54 during the June and October events (as shown in Figure 6B). The overall flat gradient observed near the Southern Units make seasonal fluctuations of groundwater flow more prominent, as higher precipitation rates and elevated lake levels typically correlate to higher groundwater elevations at downgradient monitoring wells. Considering the temporal variability of groundwater elevations at JKS-49 and JKS-51, these wells no longer appear to be a viable background wells for the Southern Units.

Recommendations

Based on the observations from the Study, ERM recommends the following actions:

Site-wide – Conduct a site-wide re-survey of select monitoring wells installed prior to the start of the CCR Program (i.e., wells installed before 2016). Many of these wells were installed and surveyed over ten years ago and may have settled or been damaged/repaired and were not re-surveyed to account for possible changes in elevations. An updated survey of these wells will ensure that all wells are correctly referenced under a single datum.

FAL – Installation of one or two new monitoring wells, located west and/or northwest of the FAL. It is anticipated that the new well(s) will be designated as a background well(s) at the FAL.

EP – Re-designation of JKS-64 as a downgradient well for monitoring and statistical analysis comparisons. The EP has two other viable background wells and installation of a new well is not warranted at this time.

Southern Units – Installation of one or two new monitoring wells, located north of the SRH Pond and CRP Runoff Pond 1, and northwest of the BAPs. It is anticipated that the new well(s) will be designated as a background well(s) at the Southern Units.

We appreciate the opportunity to support CPS Energy at the Calaveras Power Station. Please do not hesitate to contact me if you should have any questions.

Yours sincerely,

Environmental Resources Management Southwest, Inc.

Nicholas Houtchens
Senior Geologist

1/27/22
Nicholas Houtchens
GEOLOGY
No. 11108

Attachments

Table 1 – Groundwater Elevations Summary – CCR Unit Wells
Table 2 – Groundwater Elevations Summary – Non-CCR Unit Observation Wells
Figure 1 – CCR Well Network Location Map
Figure 2A – Potentiometric Surface Map – February 2021 (Northern CCR Units)
Figure 2B – Potentiometric Surface Map – April 2021 (Northern CCR Units)
Figure 2C – Potentiometric Surface Map – June 2021 (Northern CCR Units)
Figure 2D – Potentiometric Surface Map – August 2021 (Northern CCR Units)
Figure 2E – Potentiometric Surface Map – October 2021 (Northern CCR Units)
Figure 3A – Potentiometric Surface Map – February 2021 (Southern CCR Units)
Figure 3B – Potentiometric Surface Map – April 2021 (Southern CCR Units)
Figure 3C – Potentiometric Surface Map – June 2021 (Southern CCR Units)
Figure 3D – Potentiometric Surface Map – August 2021 (Southern CCR Units)
Figure 3E – Potentiometric Surface Map – October 2021 (Southern CCR Units)
Figure 4A – Graph of Fly Ash Landfill Groundwater Elevations (All Events)
Figure 4B – Graph of Fly Ash Landfill Groundwater Elevations (2021 Events)
Figure 5A – Graph of Evaporation Pond Groundwater Elevations (All Events)
Figure 5B – Graph of Evaporation Pond Groundwater Elevations (2021 Events)
Figure 6A – Graph of Southern CCR Units Groundwater Elevations (All Events)
Figure 6B – Graph of Southern CCR Units Groundwater Elevations (2021 Events)

TABLES

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-45 Upgradient	FAL	531.46	1	12/6/2016	46.83	484.63
JKS-45 Upgradient	FAL	531.46	2	2/21/2017	46.64	484.82
JKS-45 Upgradient	FAL	531.46	3	3/28/2017	46.52	484.94
JKS-45 Upgradient	FAL	531.46	4	5/2/2017	46.35	485.11
JKS-45 Upgradient	FAL	531.46	5	6/20/2017	46.64	484.82
JKS-45 Upgradient	FAL	531.46	6	7/25/2017	46.38	485.08
JKS-45 Upgradient	FAL	531.46	7	8/29/2017	46.73	484.73
JKS-45 Upgradient	FAL	531.46	8	10/10/2017	46.50	484.96
JKS-45 Upgradient	FAL	531.46	9	4/4/2018	46.59	484.87
JKS-45 Upgradient	FAL	531.46	10	10/30/2018	46.55	484.91
JKS-45 Upgradient	FAL	531.46	11	4/9/2019	46.21	485.25
JKS-45 Upgradient	FAL	531.46	12	10/22/2019	46.63	484.83
JKS-45 Upgradient	FAL	531.46	13	4/23/2020	46.21	485.25
JKS-45 Upgradient	FAL	531.46	14	10/15/2020	46.45	485.01
JKS-45 Upgradient	FAL	531.46	15	2/23/2021	46.70	484.76
JKS-45 Upgradient	FAL	531.46	16	4/8/2021	46.74	484.72
JKS-45 Upgradient	FAL	531.46	17	6/30/2021	46.84	484.62
JKS-45 Upgradient	FAL	531.46	18	8/19/2021	46.67	484.79
JKS-45 Upgradient	FAL	531.46	19	10/5/2021	46.89	484.57
JKS-57 Upgradient	FAL	506.91	1	12/6/2016	19.89	487.02
JKS-57 Upgradient	FAL	506.91	2	2/21/2017	18.95	487.96
JKS-57 Upgradient	FAL	506.91	3	3/28/2017	18.20	488.71
JKS-57 Upgradient	FAL	506.91	4	5/2/2017	18.80	488.11
JKS-57 Upgradient	FAL	506.91	5	6/20/2017	20.23	486.68
JKS-57 Upgradient	FAL	506.91	6	7/25/2017	21.16	485.75
JKS-57 Upgradient	FAL	506.91	7	8/29/2017	19.44	487.47
JKS-57 Upgradient	FAL	506.91	8	10/10/2017	21.67	485.24
JKS-57 Upgradient	FAL	506.91	9	4/4/2018	23.22	483.69
JKS-57 Upgradient	FAL	506.91	10	10/30/2018	24.65	482.26
JKS-57 Upgradient	FAL	506.91	11	4/9/2019	21.09	485.82
JKS-57 Upgradient	FAL	506.91	12	10/22/2019	22.61	484.30
JKS-57 Upgradient	FAL	506.91	13	4/23/2020	23.97	482.94
JKS-57 Upgradient	FAL	506.91	14	10/15/2020	25.68	481.23
JKS-57 Upgradient	FAL	506.91	15	2/23/2021	26.64	480.27
JKS-57 Upgradient	FAL	506.91	16	4/8/2021	26.89	480.02
JKS-57 Upgradient	FAL	506.91	17	6/30/2021	27.31	479.60
JKS-57 Upgradient	FAL	506.91	18	8/19/2021	26.77	480.14
JKS-57 Upgradient	FAL	506.91	19	10/5/2021	26.02	480.89

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-58 Water Level Only	FAL	504.45	1	12/6/2016	18.85	485.60
JKS-58 Water Level Only	FAL	504.45	2	2/21/2017	15.95	488.50
JKS-58 Water Level Only	FAL	504.45	3	3/28/2017	15.10	489.35
JKS-58 Water Level Only	FAL	504.45	4	5/2/2017	16.50	487.95
JKS-58 Water Level Only	FAL	504.45	5	6/20/2017	18.38	486.07
JKS-58 Water Level Only	FAL	504.45	6	7/25/2017	15.63	488.82
JKS-58 Water Level Only	FAL	504.45	7	8/29/2017	19.90	484.55
JKS-58 Water Level Only	FAL	504.45	8	10/10/2017	20.67	483.78
JKS-58 Water Level Only	FAL	504.45	9	4/4/2018	21.86	482.59
JKS-58 Water Level Only	FAL	504.45	10	10/30/2018	21.63	482.82
JKS-58 Water Level Only	FAL	504.45	11	4/9/2019	17.79	486.66
JKS-58 Water Level Only	FAL	504.45	12	10/22/2019	20.90	483.55
JKS-58 Water Level Only	FAL	504.45	13	4/23/2020	22.17	482.28
JKS-58 Water Level Only	FAL	504.45	14	10/15/2020	23.29	481.16
JKS-58 Water Level Only	FAL	504.45	15	2/23/2021	24.10	480.35
JKS-58 Water Level Only	FAL	504.45	16	4/8/2021	23.94	480.51
JKS-58 Water Level Only	FAL	504.45	17	6/30/2021	23.01	481.44
JKS-58 Water Level Only	FAL	504.45	18	8/19/2021	20.81	483.64
JKS-58 Water Level Only	FAL	504.45	19	10/5/2021	21.20	483.25
JKS-59 Water Level Only	FAL	496.45	1	12/6/2016	15.67	480.78
JKS-59 Water Level Only	FAL	496.45	2	2/21/2017	14.12	482.33
JKS-59 Water Level Only	FAL	496.45	3	3/28/2017	14.12	482.33
JKS-59 Water Level Only	FAL	496.45	4	5/2/2017	14.94	481.51
JKS-59 Water Level Only	FAL	496.45	5	6/20/2017	16.46	479.99
JKS-59 Water Level Only	FAL	496.45	6	7/25/2017	17.80	478.65
JKS-59 Water Level Only	FAL	496.45	7	8/29/2017	17.77	478.68
JKS-59 Water Level Only	FAL	496.45	8	10/10/2017	18.00	478.45
JKS-59 Water Level Only	FAL	496.45	9	4/4/2018	17.36	479.09
JKS-59 Water Level Only	FAL	496.45	10	10/30/2018	19.00	477.45
JKS-59 Water Level Only	FAL	496.45	11	4/9/2019	17.08	479.37
JKS-59 Water Level Only	FAL	496.45	12	10/22/2019	19.55	476.90
JKS-59 Water Level Only	FAL	496.45	13	4/23/2020	18.53	477.92
JKS-59 Water Level Only	FAL	496.45	14	10/15/2020	20.89	475.56
JKS-59 Water Level Only	FAL	496.45	15	2/23/2021	19.64	476.81
JKS-59 Water Level Only	FAL	496.45	16	4/8/2021	19.48	476.97
JKS-59 Water Level Only	FAL	496.45	17	6/30/2021	18.75	477.70
JKS-59 Water Level Only	FAL	496.45	18	8/19/2021	17.06	479.39
JKS-59 Water Level Only	FAL	496.45	19	10/5/2021	18.40	478.05

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-31 Downgradient	FAL	507.45	1	12/6/2016	27.01	480.44
JKS-31 Downgradient	FAL	507.45	2	2/21/2017	26.50	480.95
JKS-31 Downgradient	FAL	507.45	3	3/28/2017	25.98	481.47
JKS-31 Downgradient	FAL	507.45	4	5/2/2017	26.60	480.85
JKS-31 Downgradient	FAL	507.45	5	6/20/2017	26.70	480.75
JKS-31 Downgradient	FAL	507.45	6	7/25/2017	26.77	480.68
JKS-31 Downgradient	FAL	507.45	7	8/29/2017	26.58	480.87
JKS-31 Downgradient	FAL	507.45	8	10/10/2017	26.73	480.72
JKS-31 Downgradient	FAL	507.45	9	4/4/2018	26.86	480.59
JKS-31 Downgradient	FAL	507.45	10	10/30/2018	26.70	480.75
JKS-31 Downgradient	FAL	507.45	11	4/9/2019	25.10	482.35
JKS-31 Downgradient	FAL	507.45	12	10/22/2019	27.04	480.41
JKS-31 Downgradient	FAL	507.45	13	4/23/2020	26.51	480.94
JKS-31 Downgradient	FAL	507.45	14	10/15/2020	27.59	479.86
JKS-31 Downgradient	FAL	507.45	15	2/23/2021	27.72	479.73
JKS-31 Downgradient	FAL	507.45	16	4/8/2021	27.54	479.91
JKS-31 Downgradient	FAL	507.45	17	6/30/2021	27.27	480.18
JKS-31 Downgradient	FAL	507.45	18	8/19/2021	26.95	480.50
JKS-31 Downgradient	FAL	507.45	19	10/5/2021	27.34	480.11
JKS-33 Downgradient	FAL	498.71	1	12/6/2016	18.03	480.68
JKS-33 Downgradient	FAL	498.71	2	2/21/2017	17.32	481.39
JKS-33 Downgradient	FAL	498.71	3	3/28/2017	16.99	481.72
JKS-33 Downgradient	FAL	498.71	4	5/2/2017	17.27	481.44
JKS-33 Downgradient	FAL	498.71	5	6/20/2017	18.08	480.63
JKS-33 Downgradient	FAL	498.71	6	7/25/2017	18.50	480.21
JKS-33 Downgradient	FAL	498.71	7	8/29/2017	18.23	480.48
JKS-33 Downgradient	FAL	498.71	8	10/10/2017	18.10	480.61
JKS-33 Downgradient	FAL	498.71	9	4/4/2018	17.28	481.43
JKS-33 Downgradient	FAL	498.71	10	10/30/2018	18.25	480.46
JKS-33 Downgradient	FAL	498.71	11	4/9/2019	17.10	481.61
JKS-33 Downgradient	FAL	498.71	12	10/22/2019	18.80	479.91
JKS-33 Downgradient	FAL	498.71	13	4/23/2020	18.18	480.53
JKS-33 Downgradient	FAL	498.71	14	10/15/2020	19.68	479.03
JKS-33 Downgradient	FAL	498.71	15	2/23/2021	19.19	479.52
JKS-33 Downgradient	FAL	498.71	16	4/8/2021	18.83	479.88
JKS-33 Downgradient	FAL	498.71	17	6/30/2021	18.89	479.82
JKS-33 Downgradient	FAL	498.71	18	8/19/2021	18.22	480.49
JKS-33 Downgradient	FAL	498.71	19	10/5/2021	18.89	479.82

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-46 Downgradient	FAL	499.08	1	12/6/2016	17.61	481.47
JKS-46 Downgradient	FAL	499.08	2	2/21/2017	16.30	482.78
JKS-46 Downgradient	FAL	499.08	3	3/28/2017	16.10	482.98
JKS-46 Downgradient	FAL	499.08	4	5/2/2017	16.70	482.38
JKS-46 Downgradient	FAL	499.08	5	6/20/2017	17.98	481.10
JKS-46 Downgradient	FAL	499.08	6	7/25/2017	18.80	480.28
JKS-46 Downgradient	FAL	499.08	7	8/29/2017	18.91	480.17
JKS-46 Downgradient	FAL	499.08	8	10/10/2017	19.37	479.71
JKS-46 Downgradient	FAL	499.08	9	4/4/2018	19.65	479.43
JKS-46 Downgradient	FAL	499.08	10	10/30/2018	20.54	478.54
JKS-46 Downgradient	FAL	499.08	11	4/9/2019	18.90	480.18
JKS-46 Downgradient	FAL	499.08	12	10/22/2019	20.45	478.63
JKS-46 Downgradient	FAL	499.08	13	4/23/2020	20.22	478.86
JKS-46 Downgradient	FAL	499.08	14	10/15/2020	21.55	477.53
JKS-46 Downgradient	FAL	499.08	15	2/23/2021	21.57	477.51
JKS-46 Downgradient	FAL	499.08	16	4/8/2021	21.29	477.79
JKS-46 Downgradient	FAL	499.08	17	6/30/2021	20.90	478.18
JKS-46 Downgradient	FAL	499.08	18	8/19/2021	19.83	479.25
JKS-46 Downgradient	FAL	499.08	19	10/5/2021	20.20	478.88
JKS-60 Downgradient	FAL	495.7	1	12/6/2016	17.15	478.55
JKS-60 Downgradient	FAL	495.7	2	2/21/2017	16.34	479.36
JKS-60 Downgradient	FAL	495.7	3	3/28/2017	15.93	479.77
JKS-60 Downgradient	FAL	495.7	4	5/2/2017	15.96	479.74
JKS-60 Downgradient	FAL	495.7	5	6/20/2017	16.43	479.27
JKS-60 Downgradient	FAL	495.7	6	7/25/2017	17.00	478.70
JKS-60 Downgradient	FAL	495.7	7	8/29/2017	17.52	478.18
JKS-60 Downgradient	FAL	495.7	8	10/10/2017	17.20	478.50
JKS-60 Downgradient	FAL	495.7	9	4/4/2018	16.95	478.75
JKS-60 Downgradient	FAL	495.7	10	10/30/2018	17.75	477.95
JKS-60 Downgradient	FAL	495.7	11	4/9/2019	16.53	479.17
JKS-60 Downgradient	FAL	495.7	12	10/22/2019	18.03	477.67
JKS-60 Downgradient	FAL	495.7	13	4/23/2020	17.76	477.94
JKS-60 Downgradient	FAL	495.7	14	10/15/2020	19.33	476.37
JKS-60 Downgradient	FAL	495.7	15	2/23/2021	19.01	476.69
JKS-60 Downgradient	FAL	495.7	16	4/8/2021	18.81	476.89
JKS-60 Downgradient	FAL	495.7	17	6/30/2021	18.62	477.08
JKS-60 Downgradient	FAL	495.7	18	8/19/2021	18.20	477.50
JKS-60 Downgradient	FAL	495.7	19	10/5/2021	18.44	477.26

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-47 Upgradient	EP	513.63	1	12/6/2016	30.98	482.65
JKS-47 Upgradient	EP	513.63	2	2/21/2017	30.64	482.99
JKS-47 Upgradient	EP	513.63	3	3/28/2017	30.47	483.16
JKS-47 Upgradient	EP	513.63	4	5/2/2017	30.29	483.34
JKS-47 Upgradient	EP	513.63	5	6/20/2017	30.40	483.23
JKS-47 Upgradient	EP	513.63	6	7/25/2017	30.62	483.01
JKS-47 Upgradient	EP	513.63	7	8/29/2017	30.50	483.13
JKS-47 Upgradient	EP	513.63	8	10/10/2017	30.71	482.92
JKS-47 Upgradient	EP	513.63	9	4/4/2018	30.42	483.21
JKS-47 Upgradient	EP	513.63	10	10/30/2018	30.90	482.73
JKS-47 Upgradient	EP	513.63	11	4/9/2019	30.17	483.46
JKS-47 Upgradient	EP	513.63	12	10/22/2019	30.87	482.76
JKS-47 Upgradient	EP	513.63	13	4/23/2020	30.60	483.03
JKS-47 Upgradient	EP	513.63	14	10/15/2020	31.28	482.35
JKS-47 Upgradient	EP	513.63	15	2/23/2021	31.45	482.18
JKS-47 Upgradient	EP	513.63	16	4/8/2021	31.24	482.39
JKS-47 Upgradient	EP	513.63	17	6/30/2021	31.28	482.35
JKS-47 Upgradient	EP	513.63	18	8/19/2021	31.12	482.51
JKS-47 Upgradient	EP	513.63	19	10/5/2021	31.12	482.51
JKS-63 Upgradient	EP	526.86	1	12/6/2016	44.45	482.41
JKS-63 Upgradient	EP	526.86	2	2/21/2017	44.25	482.61
JKS-63 Upgradient	EP	526.86	3	3/28/2017	44.12	482.74
JKS-63 Upgradient	EP	526.86	4	5/2/2017	43.89	482.97
JKS-63 Upgradient	EP	526.86	5	6/20/2017	43.85	483.01
JKS-63 Upgradient	EP	526.86	6	7/25/2017	44.00	482.86
JKS-63 Upgradient	EP	526.86	7	8/29/2017	43.90	482.96
JKS-63 Upgradient	EP	526.86	8	10/10/2017	44.05	482.81
JKS-63 Upgradient	EP	526.86	9	4/4/2018	43.81	483.05
JKS-63R Upgradient	EP	522.27	Initial	8/20/2019	39.27	483.00
JKS-63R Upgradient	EP	522.27	12	10/22/2019	39.48	482.79
JKS-63R Upgradient	EP	522.27	13	4/23/2020	39.36	482.91
JKS-63R Upgradient	EP	522.27	14	11/17/2020	40.25	482.02
JKS-63R Upgradient	EP	522.27	15	2/23/2021	40.00	482.27
JKS-63R Upgradient	EP	522.27	16	4/8/2021	39.85	482.42
JKS-63R Upgradient	EP	522.27	17	6/30/2021	39.88	482.39
JKS-63R Upgradient	EP	522.27	18	8/19/2021	39.79	482.48
JKS-63R Upgradient	EP	522.27	19	10/5/2021	39.91	482.36

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-64 Upgradient	EP	507.84	1	12/6/2016	24.98	482.86
JKS-64 Upgradient	EP	507.84	2	2/21/2017	24.24	483.60
JKS-64 Upgradient	EP	507.84	3	3/28/2017	24.21	483.63
JKS-64 Upgradient	EP	507.84	4	5/2/2017	24.46	483.38
JKS-64 Upgradient	EP	507.84	5	6/20/2017	24.40	483.44
JKS-64 Upgradient	EP	507.84	6	7/25/2017	24.78	483.06
JKS-64 Upgradient	EP	507.84	7	8/29/2017	25.70	482.14
JKS-64 Upgradient	EP	507.84	8	10/10/2017	24.95	482.89
JKS-64 Upgradient	EP	507.84	9	4/4/2018	24.67	483.17
JKS-64 Upgradient	EP	507.84	10	10/30/2018	25.46	482.38
JKS-64 Upgradient	EP	507.84	11	4/9/2019	24.50	483.34
JKS-64 Upgradient	EP	507.84	12	10/22/2019	25.30	482.54
JKS-64 Upgradient	EP	507.84	13	4/23/2020	25.15	482.69
JKS-64 Upgradient	EP	507.84	14	10/15/2020	25.88	481.96
JKS-64 Upgradient	EP	507.84	15	2/23/2021	26.03	481.81
JKS-64 Upgradient	EP	507.84	16	4/8/2021	25.88	481.96
JKS-64 Upgradient	EP	507.84	17	6/30/2021	25.68	482.16
JKS-64 Upgradient	EP	507.84	18	8/19/2021	25.30	482.54
JKS-64 Upgradient	EP	507.84	19	10/5/2021	25.12	482.72
JKS-36 Downgradient	EP	508.41	1	12/6/2016	25.99	482.42
JKS-36 Downgradient	EP	508.41	2	2/21/2017	25.78	482.63
JKS-36 Downgradient	EP	508.41	3	3/28/2017	25.37	483.04
JKS-36 Downgradient	EP	508.41	4	5/2/2017	43.89	464.52
JKS-36 Downgradient	EP	508.41	5	6/20/2017	25.40	483.01
JKS-36 Downgradient	EP	508.41	6	7/25/2017	25.62	482.79
JKS-36 Downgradient	EP	508.41	7	8/29/2017	25.70	482.71
JKS-36 Downgradient	EP	508.41	8	10/10/2017	25.91	482.50
JKS-36 Downgradient	EP	508.41	9	4/4/2018	25.46	482.95
JKS-36 Downgradient	EP	508.41	10	10/30/2018	25.90	482.51
JKS-36 Downgradient	EP	508.41	11	4/9/2019	25.23	483.18
JKS-36 Downgradient	EP	508.41	12	10/22/2019	25.90	482.51
JKS-36 Downgradient	EP	508.41	13	4/23/2020	25.45	482.96
JKS-36 Downgradient	EP	508.41	14	10/15/2020	26.03	482.38
JKS-36 Downgradient	EP	508.41	15	2/23/2021	26.34	482.07
JKS-36 Downgradient	EP	508.41	16	4/8/2021	26.08	482.33
JKS-36 Downgradient	EP	508.41	17	6/30/2021	26.31	482.10
JKS-36 Downgradient	EP	508.41	18	8/19/2021	25.15	483.26
JKS-36 Downgradient	EP	508.41	19	10/5/2021	26.14	482.27

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-61 Downgradient	EP	505.51	1	12/6/2016	23.95	481.56
JKS-61 Downgradient	EP	505.51	2	2/21/2017	23.31	482.20
JKS-61 Downgradient	EP	505.51	3	3/28/2017	23.10	482.41
JKS-61 Downgradient	EP	505.51	4	5/2/2017	22.85	482.66
JKS-61 Downgradient	EP	505.51	5	6/20/2017	22.05	483.46
JKS-61 Downgradient	EP	505.51	6	7/25/2017	23.50	482.01
JKS-61 Downgradient	EP	505.51	7	8/29/2017	23.60	481.91
JKS-61 Downgradient	EP	505.51	8	10/10/2017	23.97	481.54
JKS-61 Downgradient	EP	505.51	9	4/4/2018	23.08	482.43
JKS-61 Downgradient	EP	505.51	10	10/30/2018	23.94	481.57
JKS-61 Downgradient	EP	505.51	11	4/9/2019	22.97	482.54
JKS-61 Downgradient	EP	505.51	12	10/22/2019	24.20	481.31
JKS-61 Downgradient	EP	505.51	13	4/23/2020	23.74	481.77
JKS-61 Downgradient	EP	505.51	14	10/15/2020	24.60	480.91
JKS-61 Downgradient	EP	505.51	15	2/23/2021	24.76	480.75
JKS-61 Downgradient	EP	505.51	16	4/8/2021	24.54	480.97
JKS-61 Downgradient	EP	505.51	17	6/30/2021	24.37	481.14
JKS-61 Downgradient	EP	505.51	18	8/19/2021	24.10	481.41
JKS-61 Downgradient	EP	505.51	19	10/5/2021	24.05	481.46
JKS-62 Downgradient	EP	509.84	1	12/6/2016	28.63	481.21
JKS-62 Downgradient	EP	509.84	2	2/21/2017	28.30	481.54
JKS-62 Downgradient	EP	509.84	3	3/28/2017	28.42	481.42
JKS-62 Downgradient	EP	509.84	4	5/2/2017	28.00	481.84
JKS-62 Downgradient	EP	509.84	5	6/20/2017	28.05	481.79
JKS-62 Downgradient	EP	509.84	6	7/25/2017	28.12	481.72
JKS-62 Downgradient	EP	509.84	7	8/29/2017	28.12	481.72
JKS-62 Downgradient	EP	509.84	8	10/10/2017	28.00	481.84
JKS-62 Downgradient	EP	509.84	9	4/4/2018	27.66	482.18
JKS-62 Downgradient	EP	509.84	10	10/30/2018	28.33	481.51
JKS-62 Downgradient	EP	509.84	11	4/9/2019	27.52	482.32
JKS-62 Downgradient	EP	509.84	12	10/22/2019	27.85	481.99
JKS-62 Downgradient	EP	509.84	13	4/23/2020	27.78	482.06
JKS-62 Downgradient	EP	509.84	14	11/17/2020	29.10	480.74
JKS-62 Downgradient	EP	509.84	15	2/23/2021	28.50	481.34
JKS-62 Downgradient	EP	509.84	16	4/8/2021	28.56	481.28
JKS-62 Downgradient	EP	509.84	17	6/30/2021	28.50	481.34
JKS-62 Downgradient	EP	509.84	18	8/19/2021	28.19	481.65
JKS-62 Downgradient	EP	509.84	19	10/5/2021	28.19	481.65

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-49 Upgradient	BAP/SRH	498.63	1	12/6/2016	8.81	489.82
JKS-49 Upgradient	BAP/SRH	498.63	2	2/21/2017	8.56	490.07
JKS-49 Upgradient	BAP/SRH	498.63	3	3/28/2017	8.90	489.73
JKS-49 Upgradient	BAP/SRH	498.63	4	5/2/2017	8.85	489.78
JKS-49 Upgradient	BAP/SRH	498.63	5	6/20/2017	8.75	489.88
JKS-49 Upgradient	BAP/SRH	498.63	6	7/25/2017	8.46	490.17
JKS-49 Upgradient	BAP/SRH	498.63	7	8/29/2017	7.21	491.42
JKS-49 Upgradient	BAP/SRH	498.63	8	10/10/2017	11.17	487.46
JKS-49 Upgradient	BAP/SRH	498.63	9	4/4/2018	9.00	489.63
JKS-49 Upgradient	BAP/SRH	498.63	10	10/30/2018	6.88	491.75
JKS-49 Upgradient	BAP/SRH	498.63	11	4/9/2019	12.52	486.11
JKS-49 Upgradient	BAP/SRH	498.63	12	10/22/2019	14.84	483.79
JKS-49 Upgradient	BAP/SRH	498.63	13	4/23/2020	13.58	485.05
JKS-49 Upgradient	BAP/SRH	498.63	14	10/15/2020	14.42	484.21
JKS-49 Upgradient	BAP/SRH	498.63	15	2/23/2021	13.18	485.45
JKS-49 Upgradient	BAP/SRH	498.63	16	4/8/2021	13.60	485.03
JKS-49 Upgradient	BAP/SRH	498.63	17	6/30/2021	12.46	486.17
JKS-49 Upgradient	BAP/SRH	498.63	18	8/19/2021	11.99	486.64
JKS-49 Upgradient	BAP/SRH	498.63	19	10/5/2021	13.33	485.30
JKS-51 Upgradient	BAP/SRH	496.92	1	12/6/2016	10.76	486.16
JKS-51 Upgradient	BAP/SRH	496.92	2	2/21/2017	10.80	486.12
JKS-51 Upgradient	BAP/SRH	496.92	3	3/28/2017	10.59	486.33
JKS-51 Upgradient	BAP/SRH	496.92	4	5/2/2017	10.56	486.36
JKS-51 Upgradient	BAP/SRH	496.92	5	6/20/2017	10.56	486.36
JKS-51 Upgradient	BAP/SRH	496.92	6	7/25/2017	10.68	486.24
JKS-51 Upgradient	BAP/SRH	496.92	7	8/29/2017	10.48	486.44
JKS-51 Upgradient	BAP/SRH	496.92	8	10/10/2017	10.98	485.94
JKS-51 Upgradient	BAP/SRH	496.92	9	4/4/2018	10.93	485.99
JKS-51 Upgradient	BAP/SRH	496.92	10	10/30/2018	10.45	486.47
JKS-51 Upgradient	BAP/SRH	496.92	11	4/9/2019	11.02	485.90
JKS-51 Upgradient	BAP/SRH	496.92	12	10/22/2019	12.00	484.92
JKS-51 Upgradient	BAP/SRH	496.92	13	4/23/2020	11.79	485.13
JKS-51 Upgradient	BAP/SRH	496.92	14	10/15/2020	12.11	484.81
JKS-51 Upgradient	BAP/SRH	496.92	15	2/23/2021	11.79	485.13
JKS-51 Upgradient	BAP/SRH	496.92	16	4/8/2021	11.80	485.12
JKS-51 Upgradient	BAP/SRH	496.92	17	6/30/2021	11.53	485.39
JKS-51 Upgradient	BAP/SRH	496.92	18	8/19/2021	11.25	485.67
JKS-51 Upgradient	BAP/SRH	496.92	19	10/5/2021	11.67	485.25

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-48 Downgradient	BAP	497.19	1	12/6/2016	11.47	485.72
JKS-48 Downgradient	BAP	497.19	2	2/21/2017	11.80	485.39
JKS-48 Downgradient	BAP	497.19	3	3/28/2017	11.64	485.55
JKS-48 Downgradient	BAP	497.19	4	5/2/2017	11.72	485.47
JKS-48 Downgradient	BAP	497.19	5	6/20/2017	12.00	485.19
JKS-48 Downgradient	BAP	497.19	6	7/25/2017	11.91	485.28
JKS-48 Downgradient	BAP	497.19	7	8/29/2017	11.77	485.42
JKS-48 Downgradient	BAP	497.19	8	10/10/2017	12.24	484.95
JKS-48 Downgradient	BAP	497.19	9	4/4/2018	12.15	485.04
JKS-48 Downgradient	BAP	497.19	10	10/30/2018	11.73	485.46
JKS-48 Downgradient	BAP	497.19	11	4/9/2019	11.80	485.39
JKS-48 Downgradient	BAP	497.19	12	10/22/2019	12.57	484.62
JKS-48 Downgradient	BAP	497.19	13	4/23/2020	12.41	484.78
JKS-48 Downgradient	BAP	497.19	14	10/15/2020	12.39	484.80
JKS-48 Downgradient	BAP	497.19	15	2/23/2021	12.55	484.64
JKS-48 Downgradient	BAP	497.19	16	4/8/2021	12.33	484.86
JKS-48 Downgradient	BAP	497.19	17	6/30/2021	12.04	485.15
JKS-48 Downgradient	BAP	497.19	18	8/19/2021	12.00	485.19
JKS-48 Downgradient	BAP	497.19	19	10/5/2021	12.20	484.99
JKS-50R Downgradient	BAP	498.48	1	12/6/2016	12.50	485.98
JKS-50R Downgradient	BAP	498.48	2	2/21/2017	12.70	485.78
JKS-50R Downgradient	BAP	498.48	3	3/28/2017	12.32	486.16
JKS-50R Downgradient	BAP	498.48	4	5/2/2017	12.49	485.99
JKS-50R Downgradient	BAP	498.48	5	6/20/2017	12.81	485.67
JKS-50R Downgradient	BAP	498.48	6	7/25/2017	12.78	485.70
JKS-50R Downgradient	BAP	498.48	7	8/29/2017	12.53	485.95
JKS-50R Downgradient	BAP	498.48	8	10/10/2017	13.44	485.04
JKS-50R Downgradient	BAP	498.48	9	4/4/2018	14.03	484.45
JKS-50R Downgradient	BAP	498.48	10	10/30/2018	12.08	486.40
JKS-50R Downgradient	BAP	498.48	11	4/9/2019	13.10	485.38
JKS-50R Downgradient	BAP	498.48	12	10/22/2019	14.10	484.38
JKS-50R Downgradient	BAP	498.48	13	4/23/2020	13.66	484.82
JKS-50R Downgradient	BAP	498.48	14	10/15/2020	13.98	484.50
JKS-50R Downgradient	BAP	498.48	15	2/23/2021	13.99	484.49
JKS-50R Downgradient	BAP	498.48	16	4/8/2021	13.73	484.75
JKS-50R Downgradient	BAP	498.48	17	6/30/2021	13.46	485.02
JKS-50R Downgradient	BAP	498.48	18	8/19/2021	13.12	485.36
JKS-50R Downgradient	BAP	498.48	19	10/5/2021	12.77	485.71

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-52 Downgradient	BAP/SRH	493.15	1	12/6/2016	7.53	485.62
JKS-52 Downgradient	BAP/SRH	493.15	2	2/21/2017	7.43	485.72
JKS-52 Downgradient	BAP/SRH	493.15	3	3/28/2017	7.33	485.82
JKS-52 Downgradient	BAP/SRH	493.15	4	5/2/2017	7.35	485.80
JKS-52 Downgradient	BAP/SRH	493.15	5	6/20/2017	7.46	485.69
JKS-52 Downgradient	BAP/SRH	493.15	6	7/25/2017	7.50	485.65
JKS-52 Downgradient	BAP/SRH	493.15	7	8/29/2017	7.40	485.75
JKS-52 Downgradient	BAP/SRH	493.15	8	10/10/2017	7.53	485.62
JKS-52 Downgradient	BAP/SRH	493.15	9	4/4/2018	8.48	484.67
JKS-52 Downgradient	BAP/SRH	493.15	10	10/30/2018	8.33	484.82
JKS-52 Downgradient	BAP/SRH	493.15	11	4/9/2019	7.65	485.50
JKS-52 Downgradient	BAP/SRH	493.15	12	10/22/2019	9.40	483.75
JKS-52 Downgradient	BAP/SRH	493.15	13	4/23/2020	8.20	484.95
JKS-52 Downgradient	BAP/SRH	493.15	14	10/15/2020	8.07	485.08
JKS-52 Downgradient	BAP/SRH	493.15	15	2/23/2021	8.17	484.98
JKS-52 Downgradient	BAP/SRH	493.15	16	4/8/2021	8.04	485.11
JKS-52 Downgradient	BAP/SRH	493.15	17	6/30/2021	7.86	485.29
JKS-52 Downgradient	BAP/SRH	493.15	18	8/19/2021	7.59	485.56
JKS-52 Downgradient	BAP/SRH	493.15	19	10/5/2021	7.99	485.16
JKS-55 Downgradient	BAP	493.81	1	12/6/2016	8.15	485.66
JKS-55 Downgradient	BAP	493.81	2	2/21/2017	8.51	485.30
JKS-55 Downgradient	BAP	493.81	3	3/28/2017	8.25	485.56
JKS-55 Downgradient	BAP	493.81	4	5/2/2017	8.40	485.41
JKS-55 Downgradient	BAP	493.81	5	6/20/2017	8.79	485.02
JKS-55 Downgradient	BAP	493.81	6	7/25/2017	8.77	485.04
JKS-55 Downgradient	BAP	493.81	7	8/29/2017	8.59	485.22
JKS-55 Downgradient	BAP	493.81	8	10/10/2017	8.92	484.89
JKS-55 Downgradient	BAP	493.81	9	4/4/2018	8.90	484.91
JKS-55 Downgradient	BAP	493.81	10	10/30/2018	8.25	485.56
JKS-55 Downgradient	BAP	493.81	11	4/9/2019	8.60	485.21
JKS-55 Downgradient	BAP	493.81	12	10/22/2019	9.64	484.17
JKS-55 Downgradient	BAP	493.81	13	4/23/2020	9.19	484.62
JKS-55 Downgradient	BAP	493.81	14	10/15/2020	9.49	484.32
JKS-55 Downgradient	BAP	493.81	15	2/23/2021	9.40	484.41
JKS-55 Downgradient	BAP	493.81	16	4/8/2021	9.19	484.62
JKS-55 Downgradient	BAP	493.81	17	6/30/2021	9.00	484.81
JKS-55 Downgradient	BAP	493.81	18	8/19/2021	8.78	485.03
JKS-55 Downgradient	BAP	493.81	19	10/5/2021	9.13	484.68

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-56 Downgradient	BAP	496.66	1	12/6/2016	11.12	485.54
JKS-56 Downgradient	BAP	496.66	2	2/21/2017	10.90	485.76
JKS-56 Downgradient	BAP	496.66	3	3/28/2017	10.50	486.16
JKS-56 Downgradient	BAP	496.66	4	5/2/2017	10.65	486.01
JKS-56 Downgradient	BAP	496.66	5	6/20/2017	11.00	485.66
JKS-56 Downgradient	BAP	496.66	6	7/25/2017	10.95	485.71
JKS-56 Downgradient	BAP	496.66	7	8/29/2017	10.72	485.94
JKS-56 Downgradient	BAP	496.66	8	10/10/2017	11.61	485.05
JKS-56 Downgradient	BAP	496.66	9	4/4/2018	11.13	485.53
JKS-56 Downgradient	BAP	496.66	10	10/30/2018	10.27	486.39
JKS-56 Downgradient	BAP	496.66	11	4/9/2019	11.30	485.36
JKS-56 Downgradient	BAP	496.66	12	10/22/2019	12.34	484.32
JKS-56 Downgradient	BAP	496.66	13	4/23/2020	11.78	484.88
JKS-56 Downgradient	BAP	496.66	14	10/15/2020	12.10	484.56
JKS-56 Downgradient	BAP	496.66	15	2/23/2021	12.09	484.57
JKS-56 Downgradient	BAP	496.66	16	4/8/2021	11.85	484.81
JKS-56 Downgradient	BAP	496.66	17	6/30/2021	11.64	485.02
JKS-56 Downgradient	BAP	496.66	18	8/19/2021	11.30	485.36
JKS-56 Downgradient	BAP	496.66	19	10/5/2021	11.77	484.89
JKS-53 Downgradient	SRH	494.74	1	12/6/2016	7.70	487.04
JKS-53 Downgradient	SRH	494.74	2	2/21/2017	8.52	486.22
JKS-53 Downgradient	SRH	494.74	3	3/28/2017	8.95	485.79
JKS-53 Downgradient	SRH	494.74	4	5/2/2017	8.74	486.00
JKS-53 Downgradient	SRH	494.74	5	6/20/2017	8.47	486.27
JKS-53 Downgradient	SRH	494.74	6	7/25/2017	8.85	485.89
JKS-53 Downgradient	SRH	494.74	7	8/29/2017	8.55	486.19
JKS-53 Downgradient	SRH	494.74	8	10/10/2017	9.21	485.53
JKS-53 Downgradient	SRH	494.74	9	4/4/2018	8.90	485.84
JKS-53 Downgradient	SRH	494.74	10	10/30/2018	8.40	486.34
JKS-53 Downgradient	SRH	494.74	11	4/9/2019	8.96	485.78
JKS-53 Downgradient	SRH	494.74	12	10/22/2019	9.91	484.83
JKS-53 Downgradient	SRH	494.74	13	4/23/2020	9.75	484.99
JKS-53 Downgradient	SRH	494.74	14	10/15/2020	9.73	485.01
JKS-53 Downgradient	SRH	494.74	15	2/23/2021	9.70	485.04
JKS-53 Downgradient	SRH	494.74	16	4/8/2021	9.59	485.15
JKS-53 Downgradient	SRH	494.74	17	6/30/2021	9.25	485.49
JKS-53 Downgradient	SRH	494.74	18	8/19/2021	9.20	485.54
JKS-53 Downgradient	SRH	494.74	19	10/5/2021	9.43	485.31

TABLE 1
Groundwater Elevations Summary - CCR Unit Wells
CPS Energy - Calaveras Power Station

Well	CCR Unit	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-54 Downgradient	SRH	496.40	1	12/6/2016	10.19	486.21
JKS-54 Downgradient	SRH	496.40	2	2/21/2017	10.48	485.92
JKS-54 Downgradient	SRH	496.40	3	3/28/2017	10.64	485.76
JKS-54 Downgradient	SRH	496.40	4	5/2/2017	10.64	485.76
JKS-54 Downgradient	SRH	496.40	5	6/20/2017	10.71	485.69
JKS-54 Downgradient	SRH	496.40	6	7/25/2017	10.85	485.55
JKS-54 Downgradient	SRH	496.40	7	8/29/2017	9.50	486.90
JKS-54 Downgradient	SRH	496.40	8	10/10/2017	11.17	485.23
JKS-54 Downgradient	SRH	496.40	9	4/4/2018	10.76	485.64
JKS-54 Downgradient	SRH	496.40	10	10/30/2018	10.55	485.85
JKS-54 Downgradient	SRH	496.40	11	4/9/2019	10.75	485.65
JKS-54 Downgradient	SRH	496.40	12	10/22/2019	11.47	484.93
JKS-54 Downgradient	SRH	496.40	13	4/23/2020	11.33	485.07
JKS-54 Downgradient	SRH	496.40	14	10/15/2020	11.47	484.93
JKS-54 Downgradient	SRH	496.40	15	2/23/2021	11.34	485.06
JKS-54 Downgradient	SRH	496.40	16	4/8/2021	11.29	485.11
JKS-54 Downgradient	SRH	496.40	17	6/30/2021	10.99	485.41
JKS-54 Downgradient	SRH	496.40	18	8/19/2021	10.95	485.45
JKS-54 Downgradient	SRH	496.40	19	10/5/2021	11.10	485.30

Notes
ft - feet
msl - mean sea level
btoc - below top of casing

TABLE 2
Groundwater Elevations Summary - Non-CCR Unit Observation Wells
CPS Energy - Calaveras Power Station

Well	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JKS-32	497.45	15	2/23/2021	15.56	481.89
JKS-32	497.45	16	4/8/2021	15.20	482.25
JKS-32	497.45	17	6/30/2021	14.81	482.64
JKS-32	497.45	18	8/19/2021	14.45	483.00
JKS-32	497.45	19	10/5/2021	15.04	482.41
JKS-34	495.11	15	2/23/2021	24.43	470.68
JKS-34	495.11	16	4/8/2021	24.13	470.98
JKS-34	495.11	17	6/30/2021	22.22	472.89
JKS-34	495.11	18	8/19/2021	20.57	474.54
JKS-34	495.11	19	10/5/2021	22.89	472.22
JKS-37	509.97	15	2/23/2021	30.36	479.61
JKS-37	509.97	16	4/8/2021	32.04	477.93
JKS-37	509.97	17	6/30/2021	32.09	477.88
JKS-37	509.97	18	8/19/2021	32.02	477.95
JKS-37	509.97	19	10/5/2021	32.11	477.86
JKS-39	504.92	15	2/23/2021	23.87	481.05
JKS-39	504.92	16	4/8/2021	23.46	481.46
JKS-39	504.92	17	6/30/2021	23.40	481.52
JKS-39	504.92	18	8/19/2021	23.20	481.72
JKS-39	504.92	19	10/5/2021	23.57	481.35
JKS-40	494.16	15	2/23/2021	10.85	483.31
JKS-40	494.16	16	4/8/2021	10.47	483.69
JKS-40	494.16	17	6/30/2021	10.74	483.42
JKS-40	494.16	18	8/19/2021	10.43	483.73
JKS-40	494.16	19	10/5/2021	10.97	483.19
JKS-42	493.78	15	2/23/2021	15.09	478.69
JKS-42	493.78	16	4/8/2021	15.47	478.31
JKS-42	493.78	17	6/30/2021	15.31	478.47
JKS-42	493.78	18	8/19/2021	14.62	479.16
JKS-42	493.78	19	10/5/2021	15.37	478.41
JKS-43	528.58	15	2/23/2021	46.31	482.27
JKS-43	528.58	16	4/8/2021	46.22	482.36
JKS-43	528.58	17	6/30/2021	46.53	482.05
JKS-43	528.58	18	8/19/2021	46.43	482.15
JKS-43	528.58	19	10/5/2021	46.37	482.21
JKS-44	540.55	15	2/23/2021	65.10	475.45
JKS-44	540.55	16	4/8/2021	64.92	475.63
JKS-44	540.55	17	6/30/2021	66.30	474.25
JKS-44	540.55	18	8/19/2021	65.13	475.42
JKS-44	540.55	19	10/5/2021	65.17	475.38

TABLE 2
Groundwater Elevations Summary - Non-CCR Unit Observation Wells
CPS Energy - Calaveras Power Station

Well	Well Elevation (ft msl)	Event No.	Date	Depth to Water (ft btoc)	Water Level (ft msl)
JTD-1	504.02	15	2/23/2021	18.68	485.34
JTD-1	504.02	16	4/8/2021	18.34	485.68
JTD-1	504.02	17	6/30/2021	12.48	491.54
JTD-1	504.02	18	8/19/2021	18.25	485.77
JTD-1	504.02	19	10/5/2021	18.45	485.57
JTD-2	500.36	15	2/23/2021	15.66	484.70
JTD-2	500.36	16	4/8/2021	15.60	484.76
JTD-2	500.36	17	6/30/2021	15.35	485.01
JTD-2	500.36	18	8/19/2021	15.20	485.16
JTD-2	500.36	19	10/5/2021	15.54	484.82
JTD-4	532.28	15	2/23/2021	40.74	491.54
JTD-4	532.28	16	4/8/2021	40.74	491.54
JTD-4	532.28	17	6/30/2021	39.79	492.49
JTD-4	532.28	18	8/19/2021	40.90	491.38
JTD-4	532.28	19	10/5/2021	40.60	491.68
JTD-5	499.30	15	2/23/2021	13.90	485.40
JTD-5	499.30	16	4/8/2021	13.64	485.66
JTD-5	499.30	17	6/30/2021	13.83	485.47
JTD-5	499.30	18	8/19/2021	13.60	485.70
JTD-5	499.30	19	10/5/2021	13.77	485.53

<u>Notes</u>

ft - feet
msl - mean sea level
btoc - below top of casing

FIGURES

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
© 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS

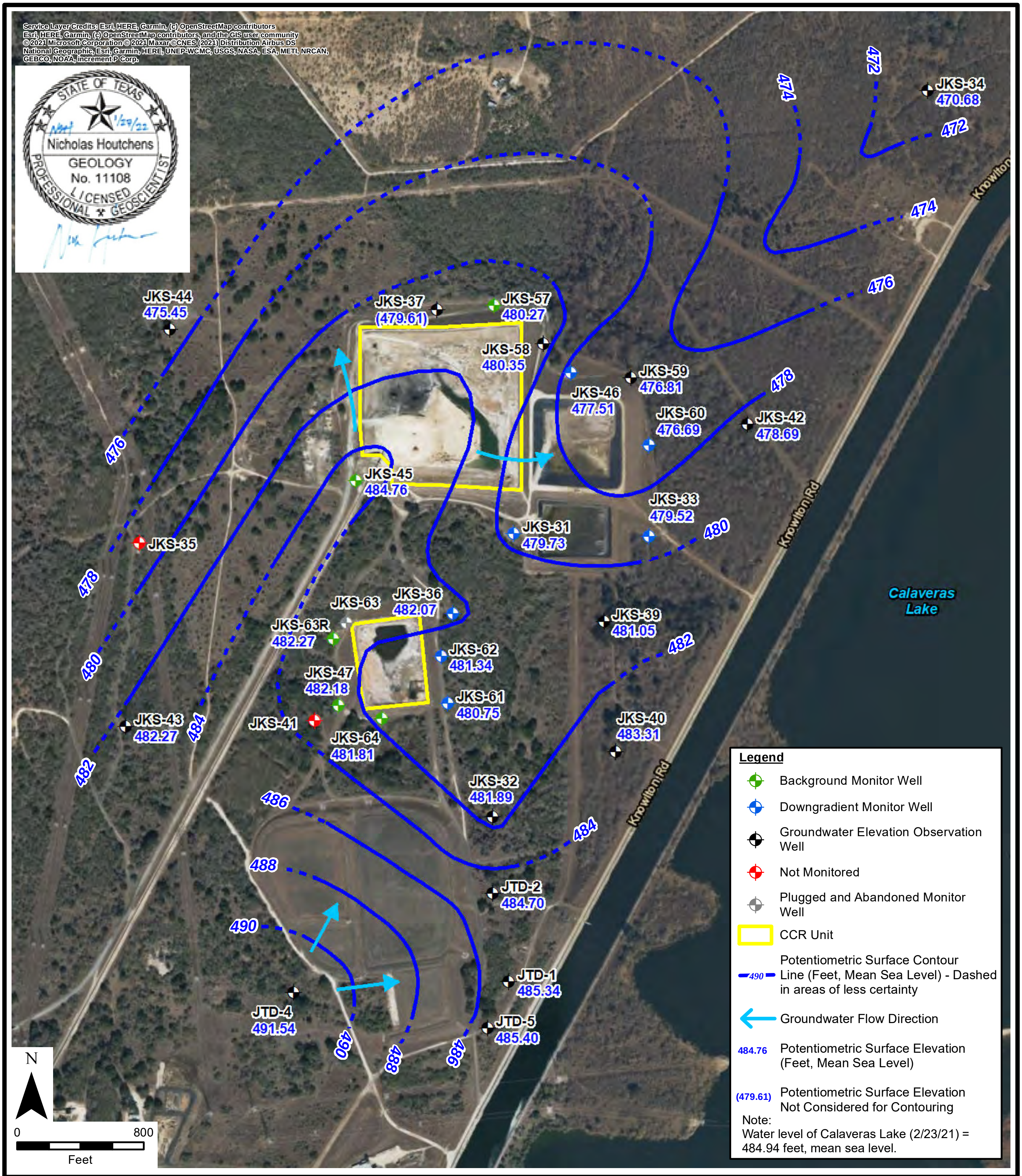
Environmental Resources Management

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/13/2022	SCALE:	AS SHOWN	REVISION:	2

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\
2021_fig1_0503422_CPSCalv_WellLocs.mxd

FIGURE 1
CCR WELL NETWORK LOCATION MAP
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM



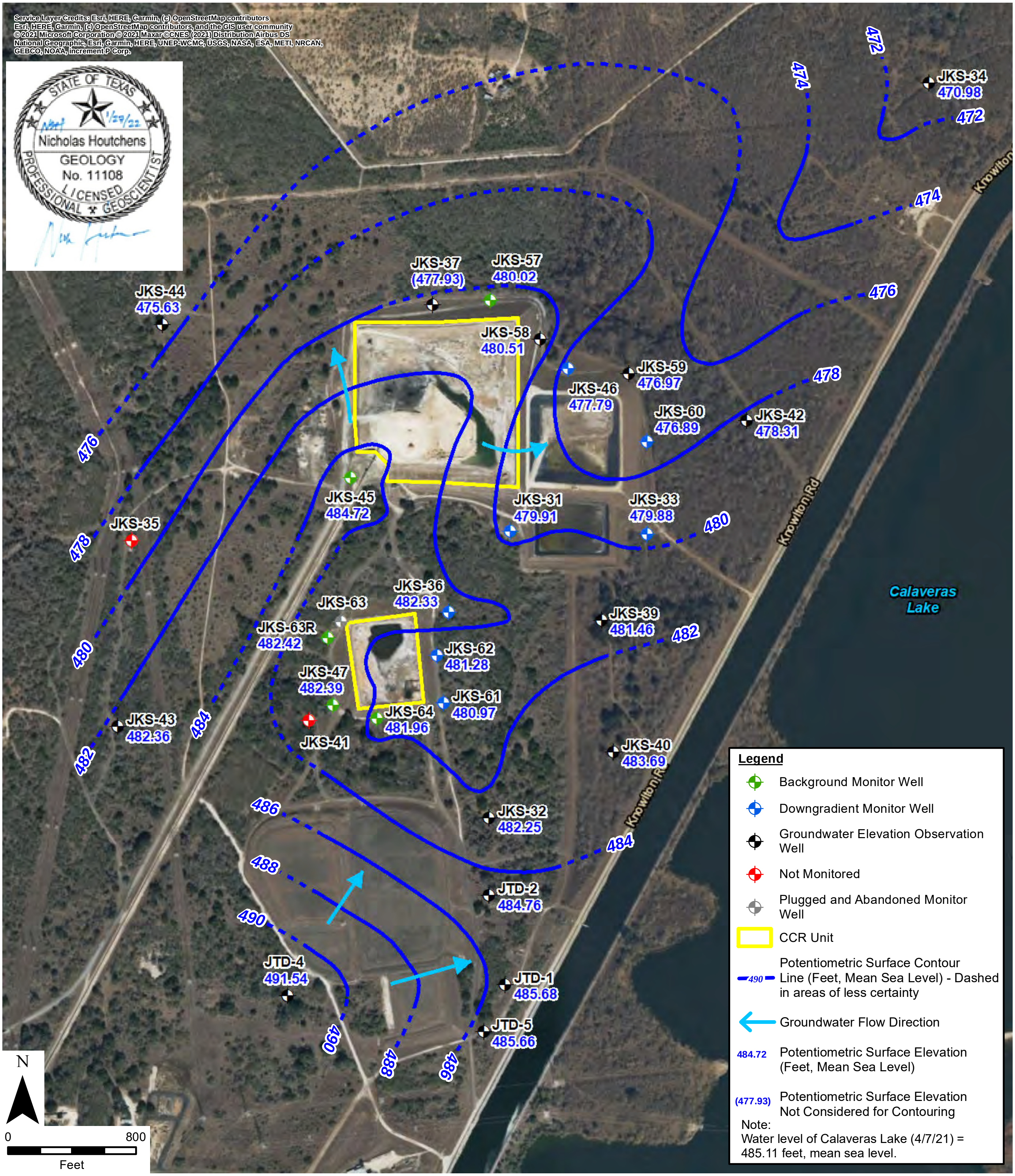
Environmental Resources Management

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

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/7/2022	SCALE:	AS SHOWN	REVISION:	1

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202102_fig2A_0503422_CPSCalv_Closed_BasemapPotmapFinal.mxd

FIGURE 2A
POTENTIOMETRIC SURFACE MAP -
FEBRUARY 2021
Northern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas



Note:
Water level of Calaveras Lake (4/7/21) = 485.11 feet, mean sea level.

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
© 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Nicholas Houtchens
GEOLOGY
No. 11108
1/27/22

Environmental Resources Management

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

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/7/2022	SCALE:	AS SHOWN	REVISION:	1

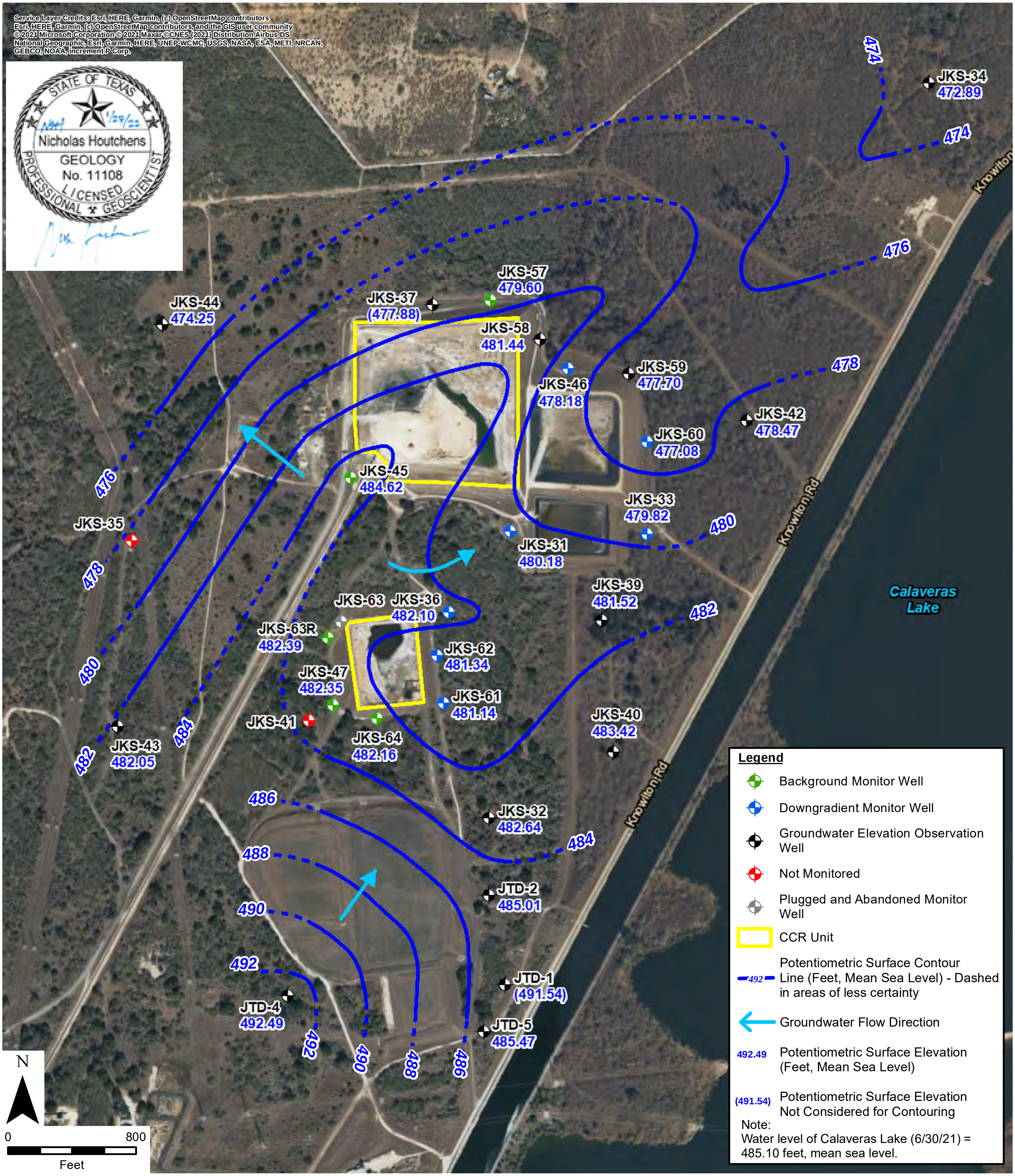
\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202104_fig2B_0503422_CPSCalv_Closed_BasemapPotmapFinal.mxd

FIGURE 2B
POTENTIOMETRIC SURFACE MAP - APRIL 2021
Northern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
© 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN,
GEBCO, NOAA, increment P Corp.

Nicholas Houtchens
No. 11108
1/27/22



Legend

⊕	Background Monitor Well
⊕	Downgradient Monitor Well
⊕	Groundwater Elevation Observation Well
⊕	Not Monitored
⊕	Plugged and Abandoned Monitor Well
▭	CCR Unit
492	Potentiometric Surface Contour Line (Feet, Mean Sea Level) - Dashed in areas of less certainty
←	Groundwater Flow Direction
492.49	Potentiometric Surface Elevation (Feet, Mean Sea Level)
(491.54)	Potentiometric Surface Elevation Not Considered for Contouring

Note:
Water level of Calaveras Lake (6/30/21) = 485.10 feet, mean sea level.

Environmental Resources Management

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

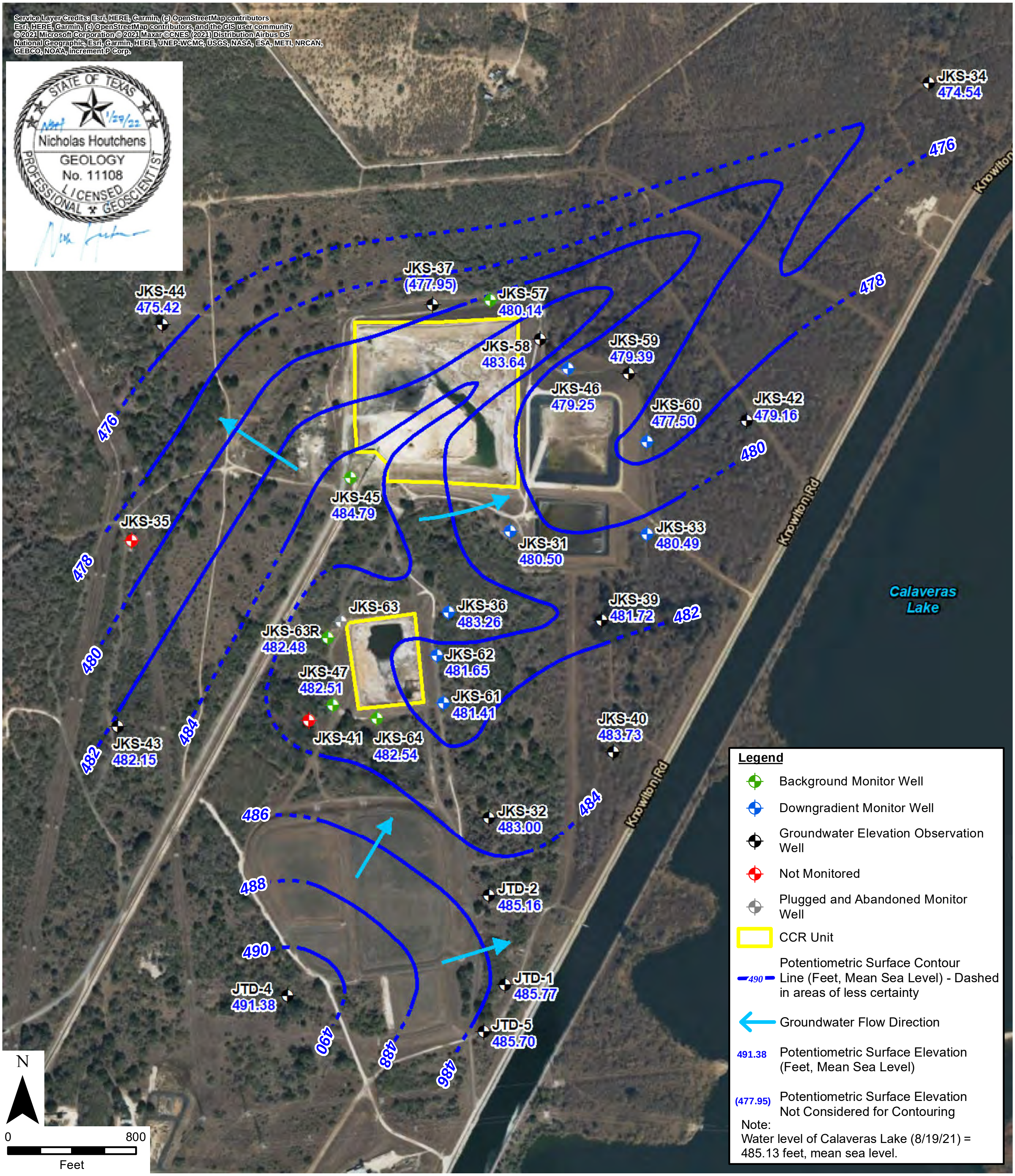
DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/7/2022	SCALE:	AS SHOWN	REVISION:	1

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202106_fig2C_0503422_CPSCalv_Closed_BasemapPotmapFinal.mxd

FIGURE 2C
POTENTIOMETRIC SURFACE MAP -
JUNE 2021
Northern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

Nicholas Houtchens
GEOLOGY
No. 11108
1/27/22



Environmental Resources Management

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

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/7/2022	SCALE:	AS SHOWN	REVISION:	1

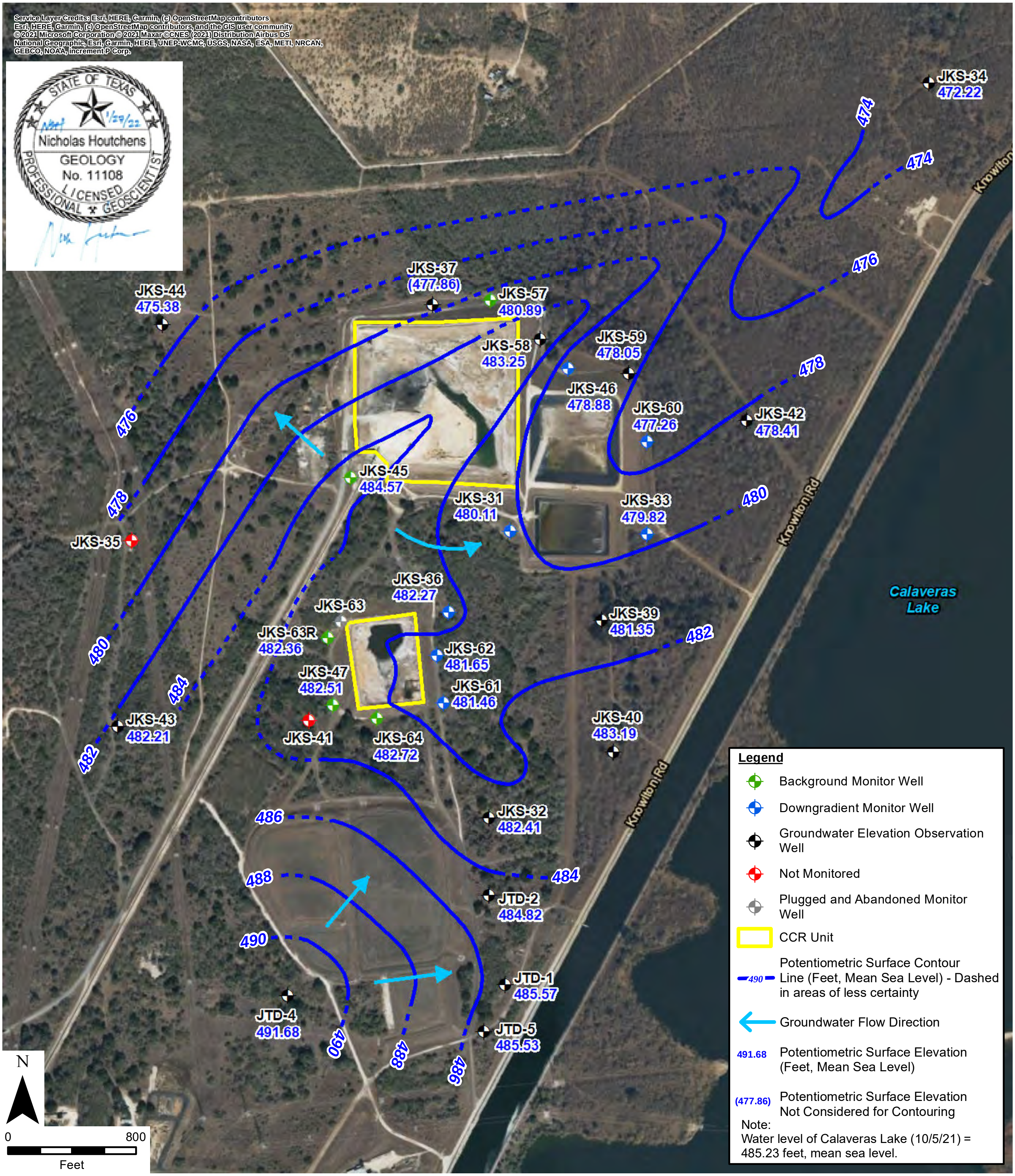
\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202108_fig2D_0503422_CPSCalv_Closed_BasemapPotmapFinal.mxd

FIGURE 2D
POTENTIOMETRIC SURFACE MAP - AUGUST 2021
Northern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
© 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN,
GEBCO, NOAA, increment P Corp.

Nicholas Houtchens
GEOLOGY
No. 11108
1/27/22



Note:
Water level of Calaveras Lake (10/5/21) = 485.23 feet, mean sea level.

Environmental Resources Management

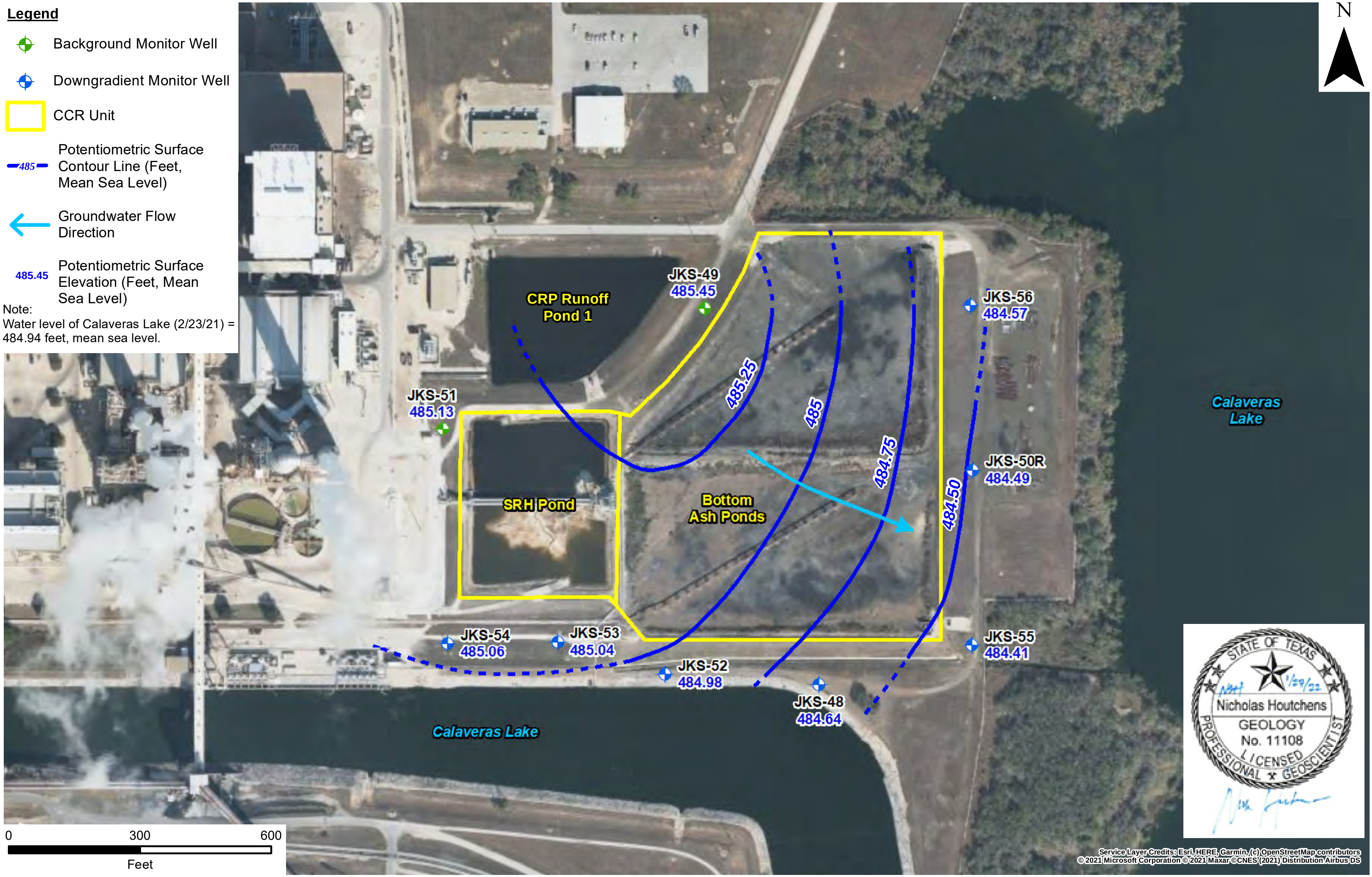
Texas Registered Engineering Firm F-2393
Texas Board of Professional Geoscientist Firm 50036

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/7/2022	SCALE:	AS SHOWN	REVISION:	1

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202110_fig2E_0503422_CPSCalv_Closed_BasemapPotmapFinal.mxd

FIGURE 2E
POTENTIOMETRIC SURFACE MAP -
OCTOBER 2021
Northern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM



Note:
Water level of Calaveras Lake (2/23/21) = 484.94 feet, mean sea level.

Nicholas Houtchens
GEOLOGY
No. 11108
1/13/22

Environmental Resources Management

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/13/2022	SCALE:	AS SHOWN	REVISION:	2

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202102_fig2A_0503422_CPSCalv_BotAshPond_BasemapPotmap.mxd

FIGURE 3A
POTENTIOMETRIC SURFACE MAP -
FEBRUARY 2021
Southern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM

Environmental Resources Management

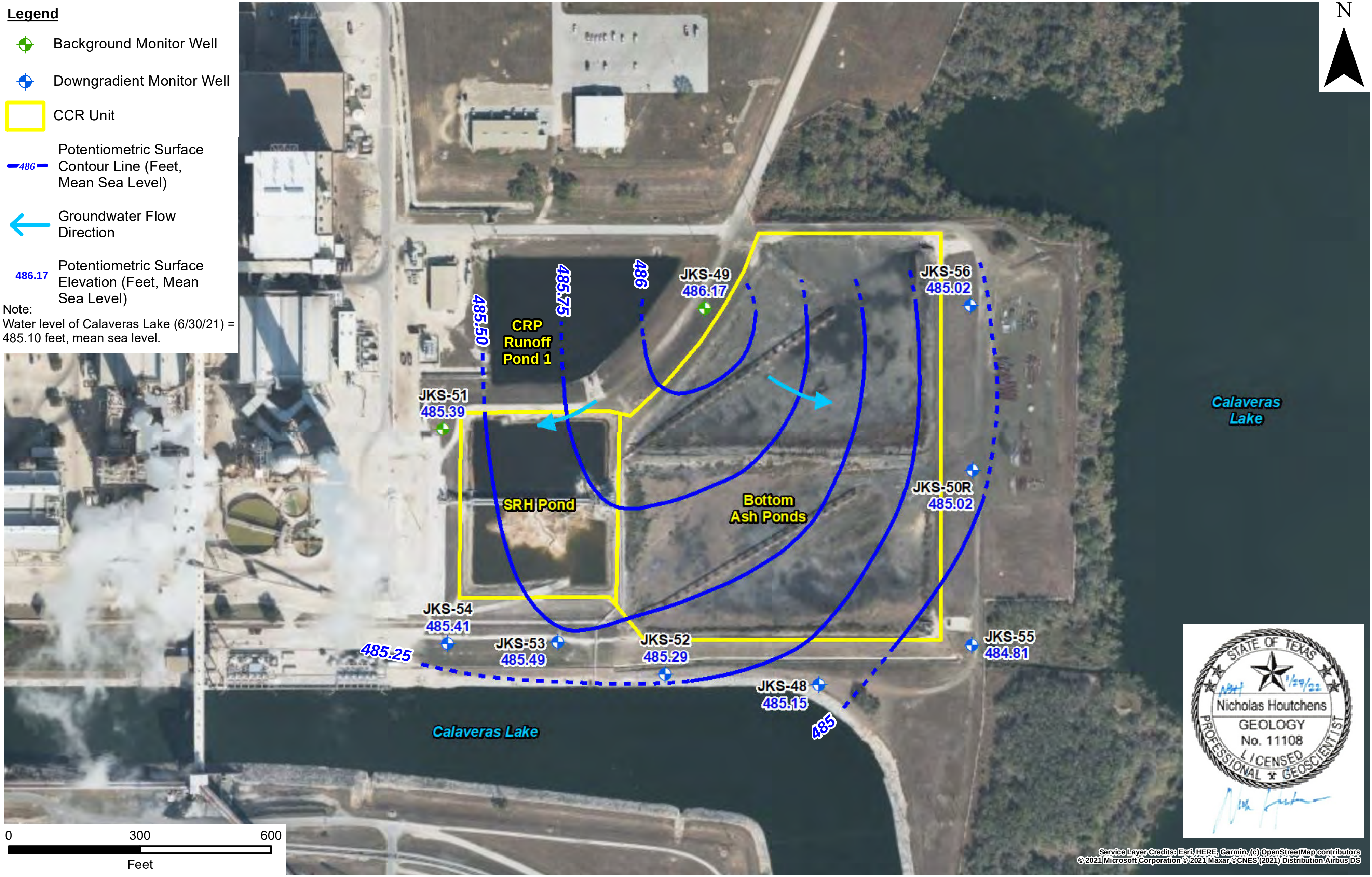
DESIGN: NH	DRAWN: LSC	CHKD.: WZ
DATE: 1/13/2022	SCALE: AS SHOWN	REVISION: 2

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202104_fig2B_0503422_CPSCalv_BotAshPond_BasemapPotmap.mxd

FIGURE 3B
POTENTIOMETRIC SURFACE MAP -
APRIL 2021
Southern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM



Note:
Water level of Calaveras Lake (6/30/21) = 485.10 feet, mean sea level.

Nicholas Houtchens
GEOLOGY
No. 11108
1/29/22

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors
© 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS

Environmental Resources Management

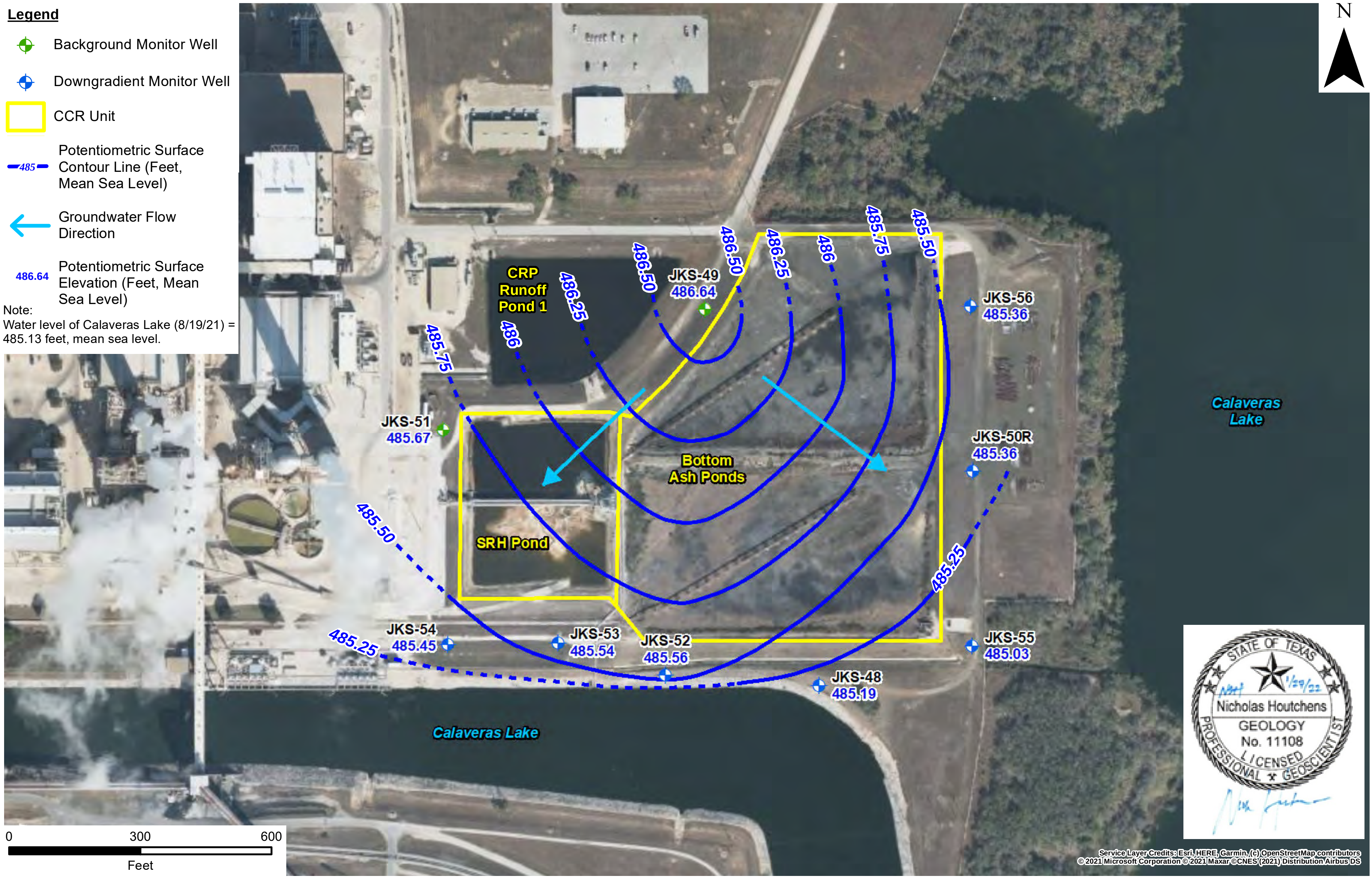
DESIGN: NH	DRAWN: LSC	CHKD.: WZ
DATE: 1/13/2022	SCALE: AS SHOWN	REVISION: 3

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202106_fig2C_0503422_CPSCalv_BotAshPond_BasemapPotmapFinal.mxd

FIGURE 3C
POTENTIOMETRIC SURFACE MAP -
JUNE 2021
Southern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM



1/13/22
Nicholas Houtchens
GEOLOGY
No. 11108

Environmental Resources Management

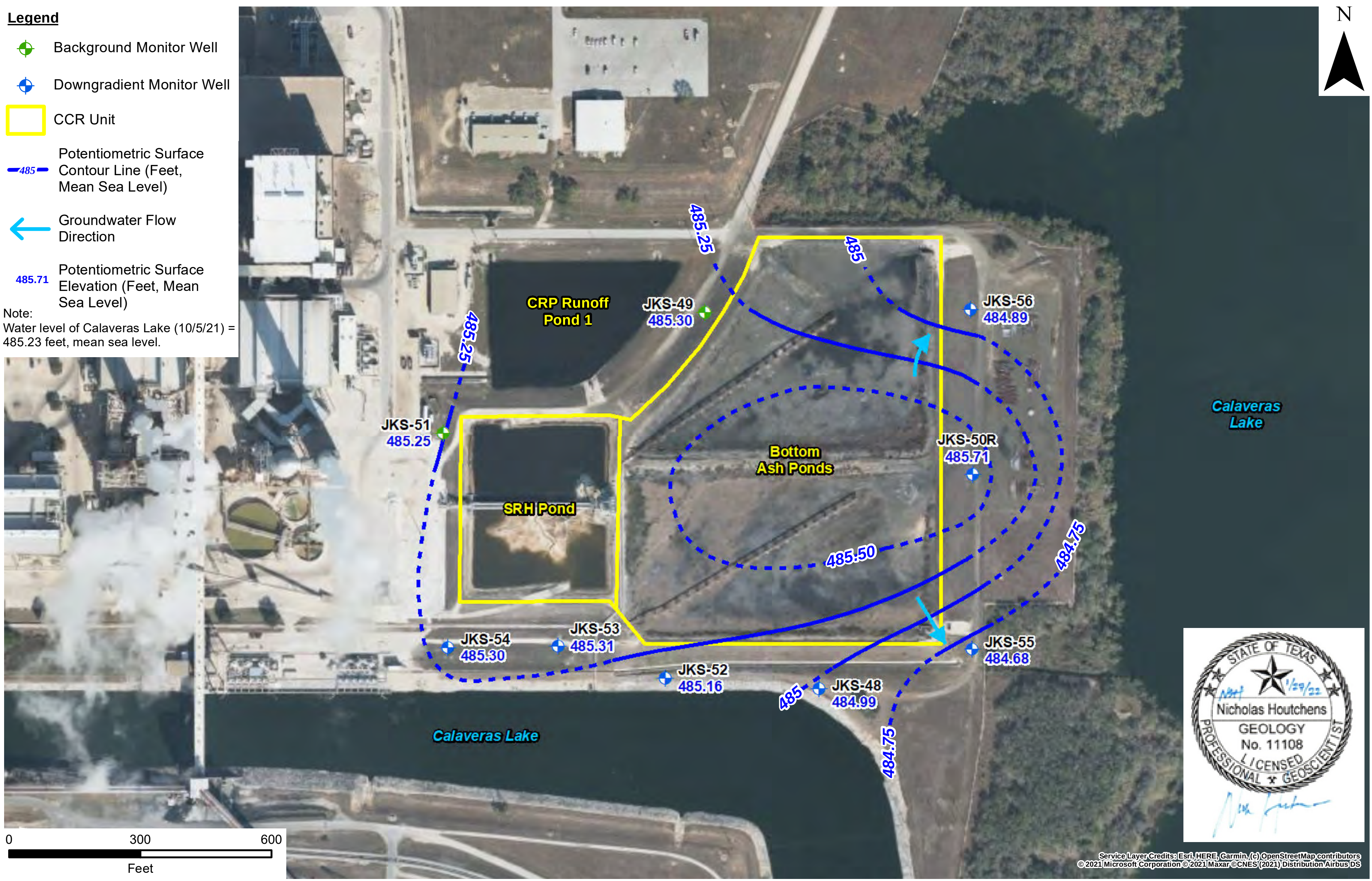
DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/13/2022	SCALE:	AS SHOWN	REVISION:	3

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202108_fig2D_0503422_CPSCalv_BotAshPond_BasemapPotmapFinal.mxd

FIGURE 3D
POTENTIOMETRIC SURFACE MAP -
AUGUST 2021
Southern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM



Note:
Water level of Calaveras Lake (10/5/21) = 485.23 feet, mean sea level.

Environmental Resources Management

DESIGN:	NH	DRAWN:	LSC	CHKD.:	WZ
DATE:	1/13/2022	SCALE:	AS SHOWN	REVISION:	4

\\USBDCFS02\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\2021gwmon\202110_fig2E_0503422_CPSCalv_BotAshPond_BasemapPotmapFinal.mxd

FIGURE 3E
POTENTIOMETRIC SURFACE MAP -
OCTOBER 2021
Southern CCR Units
CPS Energy - Calaveras Power Station
San Antonio, Texas

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

ERM

Figure 4A - Fly Ash Landfill Groundwater Elevations (All Events)

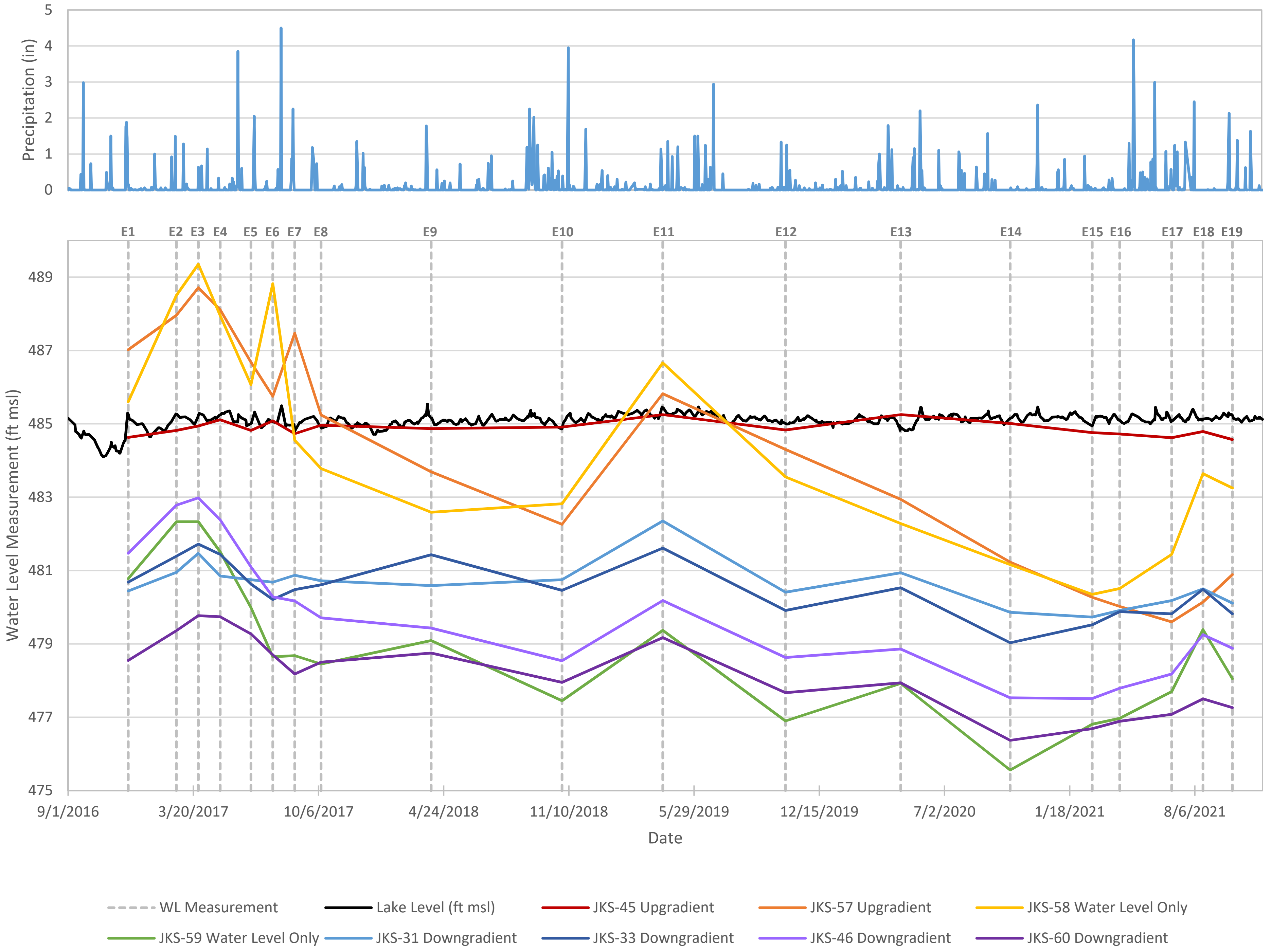
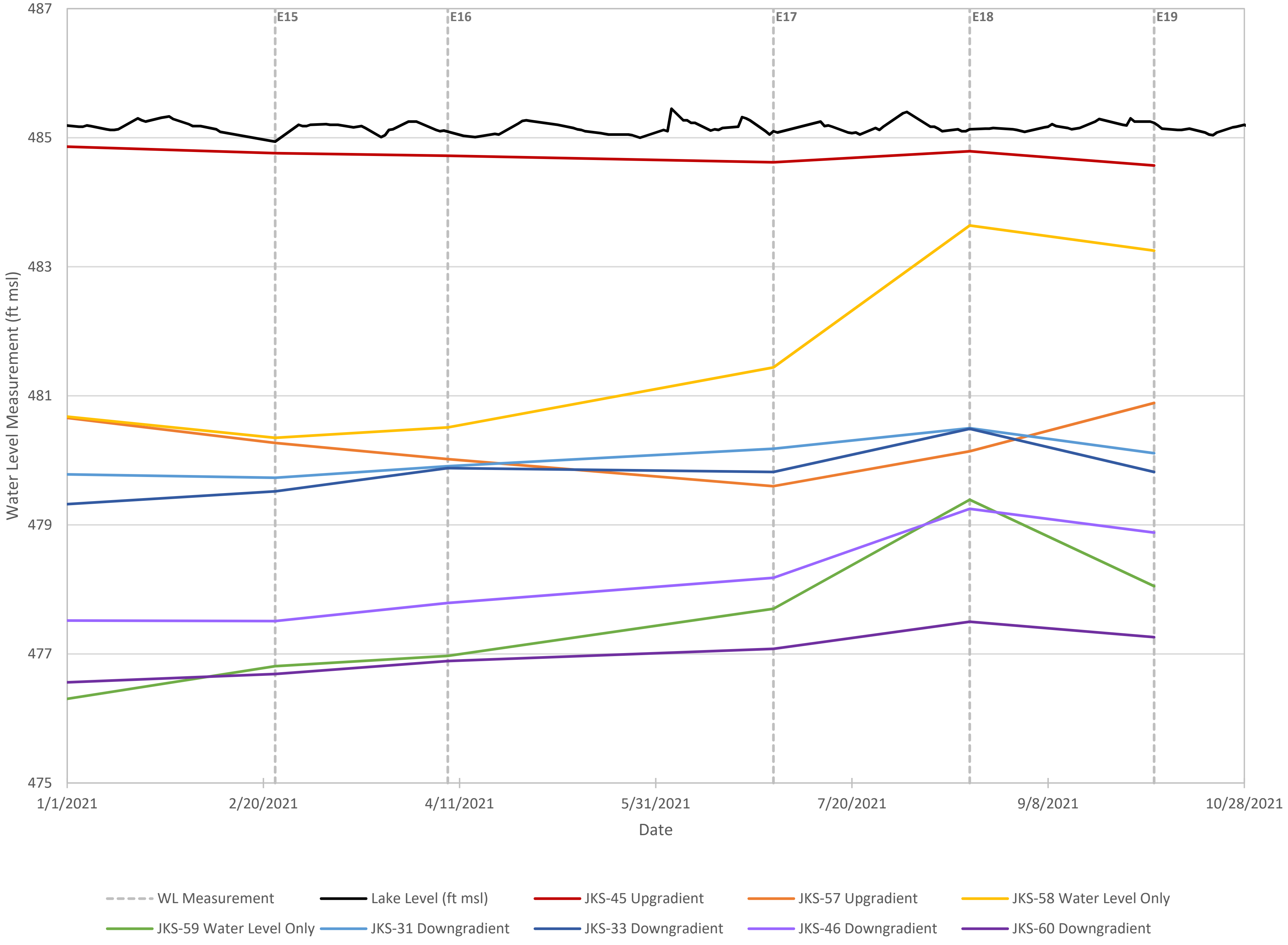


Figure 4B - Fly Ash Landfill Groundwater Elevations (2021 Events)



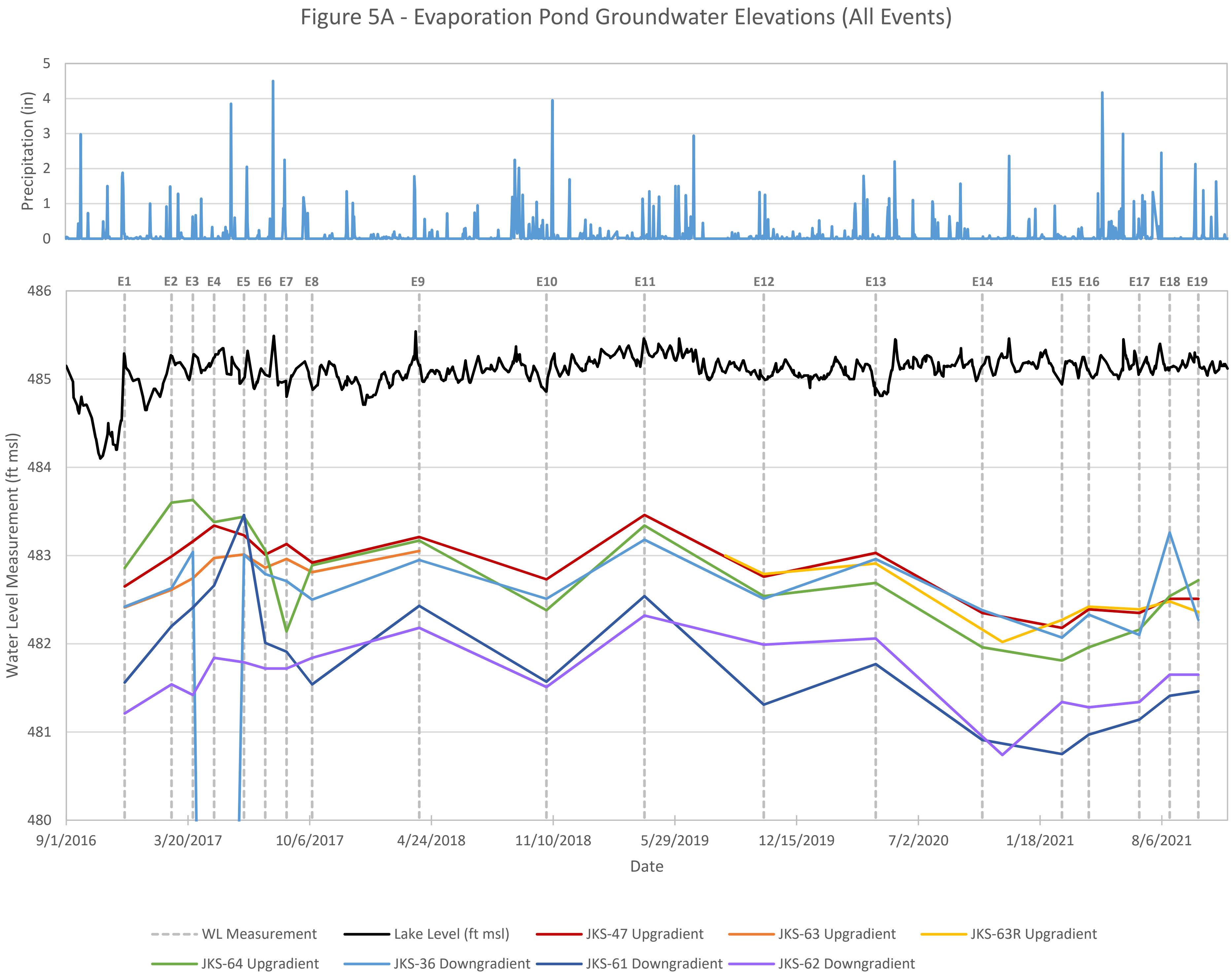


Figure 5A - Evaporation Pond Groundwater Elevations (All Events)
Precipitation (in)
5
4
3
2
1
0
E1
E2
E3
E4
E5
E6
E7
E8
E9
E10
E11
E12
E13
E14
E15
E16
E17
E18
E19
Water Level Measurement (ft msl)
486
485
484
483
482
481
480
9/1/2016
3/20/2017
10/6/2017
4/24/2018
11/10/2018
5/29/2019
12/15/2019
7/2/2020
1/18/2021
8/6/2021
Date
WL Measurement
Lake Level (ft msl)
JKS-47 Upgradient
JKS-63 Upgradient
JKS-63R Upgradient
JKS-64 Upgradient
JKS-36 Downgradient
JKS-61 Downgradient
JKS-62 Downgradient

Figure 5B - Evaporation Pond Groundwater Elevations (2021 Events)

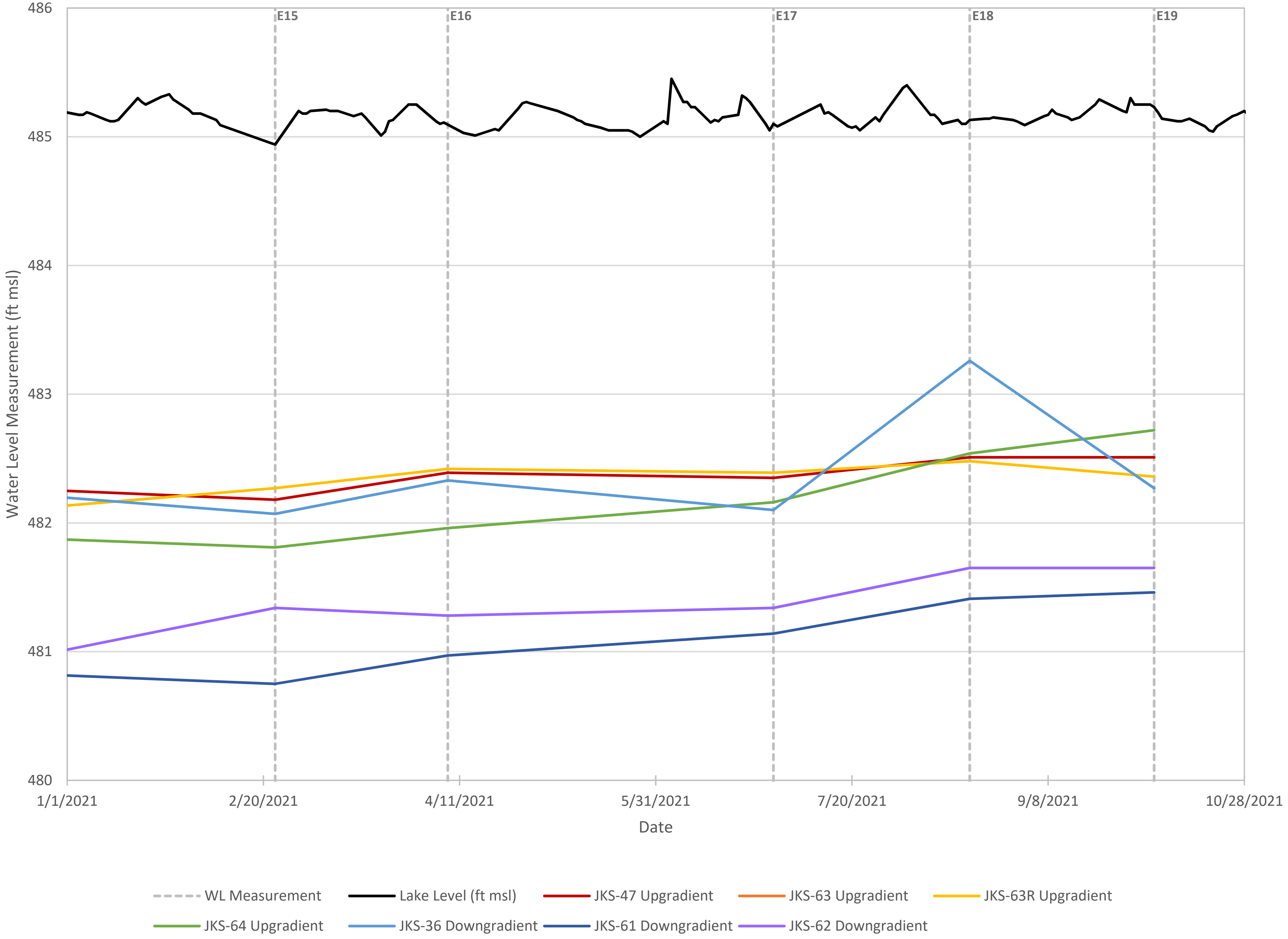
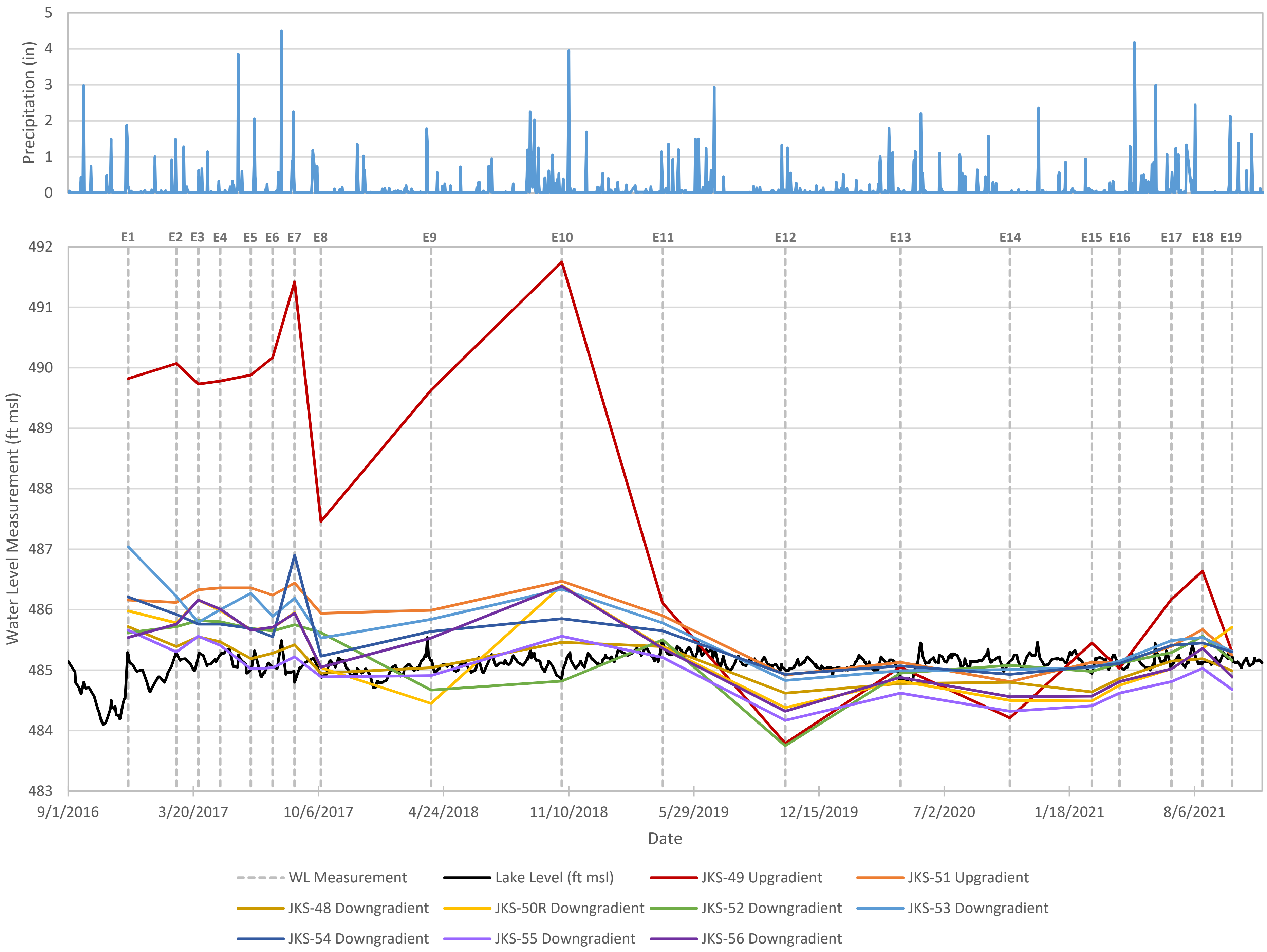


Figure 6A - Southern CCR Units Groundwater Elevations (All Events)



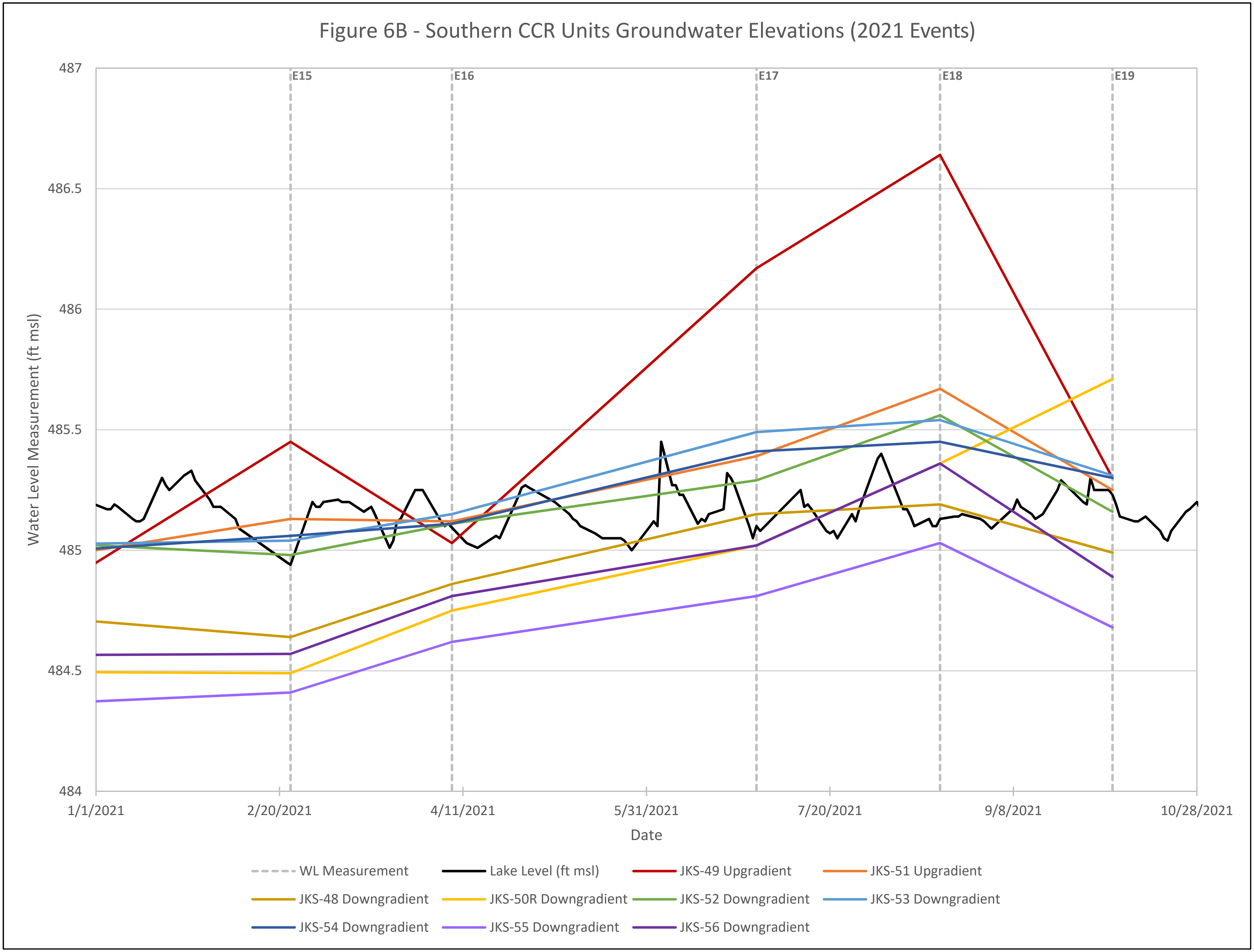
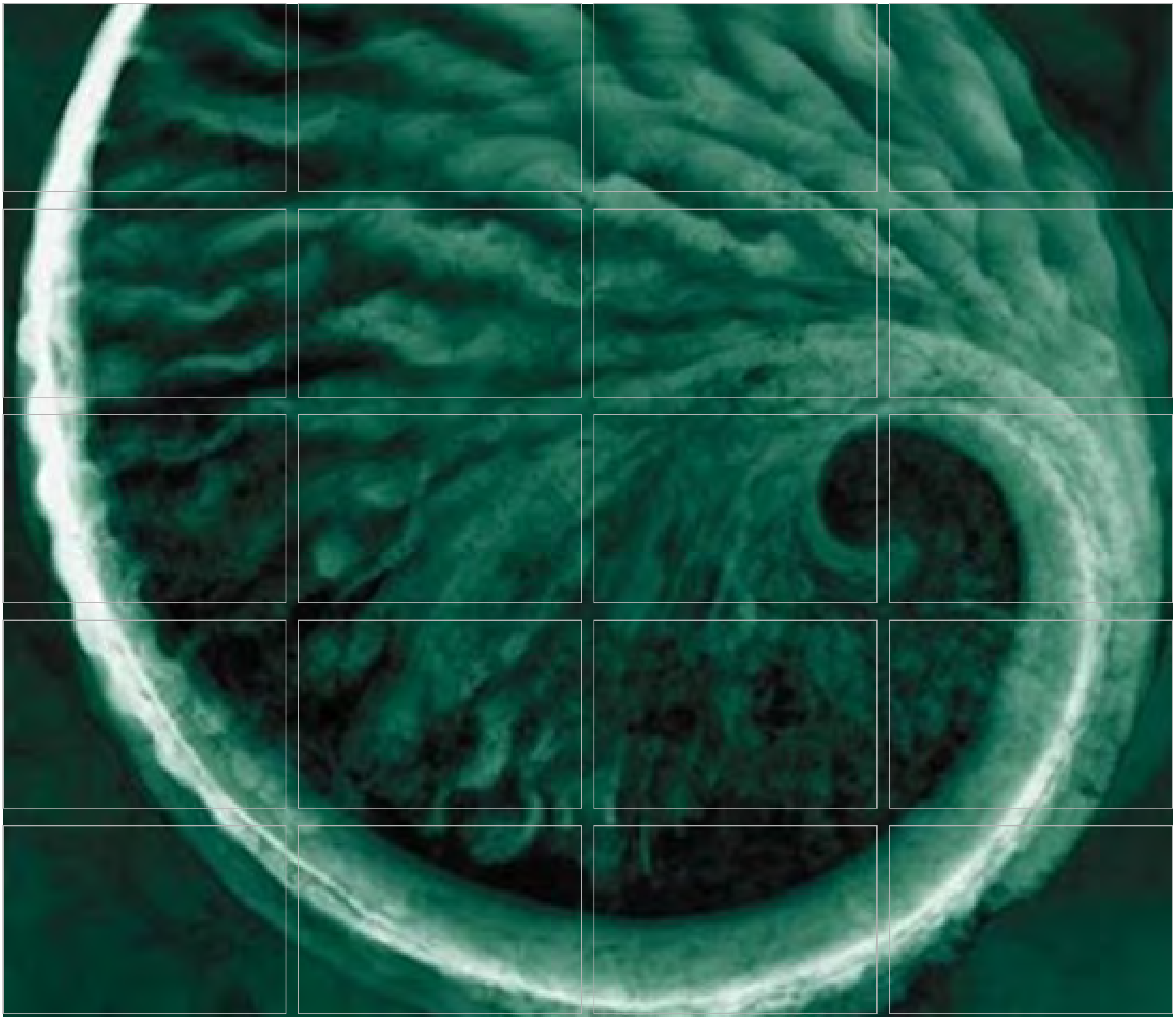


Figure 6B - Southern CCR Units Groundwater Elevations (2021 Events)
Water Level Measurement (ft msl)
487
486.5
486
485.5
485
484.5
484
E15
E16
E17
E18
E19
1/1/2021
2/20/2021
4/11/2021
5/31/2021
7/20/2021
9/8/2021
10/28/2021
Date
WL Measurement
Lake Level (ft msl)
JKS-49 Upgradient
JKS-51 Upgradient
JKS-48 Downgradient
JKS-50R Downgradient
JKS-52 Downgradient
JKS-53 Downgradient
JKS-54 Downgradient
JKS-55 Downgradient
JKS-56 Downgradient

Attachment 17   Groundwater Monitoring System



Groundwater Monitoring System

CPS Energy Calaveras Power Station
San Antonio, TX

October 2017

www.erm.com

The business of sustainability

ERM

CPS Energy Calaveras Power Station

Groundwater Monitoring System

October 2017

Project No. 0366643

Jeffery L. Bauguss, P.E.
Partner-in-Charge

Walter Zverina

Walter Zverina
Senior Consultant / Project Manager

Melissa Boysun, P.G.
Project Geologist

MELISSA BOYSUN
GEOLOGY
No. 11387
10/13/2017

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, TX 78701
T: 512-459-4700
F: 512-597-8368

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

TABLE OF CONTENTS

APPENDICES

A	***Soil Boring Logs, Well Completion Logs, and State Well Reports***
B	***Laboratory Results***
C	***Groundwater Monitoring System Certification***

TABLE OF CONTENTS (Cont'd)

List of Tables

List of Figures

1.0 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) (a/k/a the "CCR Rule").

2.0 BACKGROUND

2.1 SITE DESCRIPTION

CPS Energy owns and operates the Calaveras Power Station located southeast of San Antonio in Bexar County, Texas. Within this power station, two plants are coal fired plants (JT Deely Power Plant and JK Spruce Power Plant) that generate CCR that are subject to the CCR Rule. A general site location map is provided as **Figure 1**.

2.2 USEPA CCR RULE

The USEPA published rules for the management of CCR generated from electric utilities. The CCR Rule specifies requirements for active and inactive surface impoundments and active piles and landfills that manage CCR.

CPS Energy has identified five onsite CCR Units:

1. Fly Ash Landfill;
2. Evaporation Pond;
3. Sludge Recycle Holding (SRH) Pond;
4. North Bottom Ash Pond (BAP); and
5. South BAP.

For the purposes of this investigation, the Fly Ash Landfill and the Evaporation Pond are termed the Northern CCR Units and the SRH Pond and BAPs are termed the Southern CCR Units.

This report presents site-specific data obtained by ERM that is intended to address the following CCR Rule requirements 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 …"*

3.0 SCOPE AND OBJECTIVES

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

<u>Initial Evaluation</u>

1. Measure groundwater elevations from existing monitor wells located in the vicinity of the Fly Ash Landfill and Evaporation Pond to evaluate preliminary groundwater flow direction;
2. Inspect existing wells located in the vicinity of the Fly Ash Landfill and Evaporation Pond for potential future use in CCR monitor well networks; and
3. Evaluate placement and construction requirements for future well installation activities to take place during Phase I activities.

<u>Phase I: Hydrogeological Investigation</u>

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

<u>Phase II: Hydrogeological Investigation and Installation of Groundwater Monitor Well Network</u>

1. Confirm and further characterize the hydrogeologic information obtained during the Phase I hydrogeologic investigation in the vicinity of the Northern and Southern CCR Units;

2. 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;
3. Measure additional site-wide groundwater flow direction data at each CCR Unit; and
4. Complete installation of groundwater monitor well networks at the Fly Ash Landfill, Evaporation Pond, and Southern CCR Units.

4.0 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 2**). 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:

1. A review of available site drawings showing the location of buried utilities;
2. A site-walk of each boring location with CPS personal knowledgeable of known and potential subsurface assets;

3. Geophysical clearance using a third party line locator. Geophysical clearance was performed by Ground Penetrating Radar Systems, Inc. on February 29, 2016 and on August 24, 2016; and
4. 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. on March 1, 2016 and August 29 – September 2, 2016.

ERM subcontracted Strata Core Services, LLC (Strata Core) to advance soil borings and install groundwater monitor wells using a hollow-stem auger (HSA) drill rig. Drilling and well installation were completed by Strata Core under the supervision of an ERM geologist from April 4-8, 2016 and September 1-12, 2016. 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 2**). 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 2**). 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 complete 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-63, 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 (15-30 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.

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 of the hydrogeologic investigation and 10 feet to 20 feet during Phase II. The borehole annulus around the well screen was backfilled one to two feet above the top of the well-screen with 20/40 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 and Phase II 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. In addition, grab samples were collected from representative materials overlying the confining/semi-confining unit 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 21 newly installed monitor wells were surveyed by a land surveyor. Monitor well survey data are summarized in **Table 2**.

5.0 INVESTIGATION RESULTS

5.1 SITE-WIDE GEOLOGY

According to the Bureau of Economic Geology (BEG) Geologic Atlas of Texas San Antonio Sheet[1], 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 formation[2]. The Wilcox Group consists mostly of mudstone, with various amounts of sandstone, lignite, ironstone concretions, and is glauconitic[3]. 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 of the subsurface lithology/stratigraphy in the vicinities of the Northern CCR Units and the Southern CCR Units using data from the newly installed borings (**Appendix A**). Cross section transects are shown in **Figure 3**.

- Cross section A-A′ (**Figure 4A**), B-B′ (**Figure 4B**), and C-C′ (**Figure 4C**) reflect subsurface lithology/stratigraphy in the vicinity of the Northern CCR Units; and
- Cross section D-D′ (**Figure 4D**), E-E′ (**Figure 4E**), and F-F′ (**Figure 4F**) reflect subsurface lithology/stratigraphy in the vicinity of the Southern CCR Units.

---

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

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

[3] 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.

5.1.1 *Northern CCR Units*

The stratigraphic sequence is generally characterized by approximately 8 feet to 32 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, 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 Evaporation Pond, and thins towards the northwest (northwest of the Fly Ash Landfill). 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. A high plasticity clay interval was observed above the groundwater-bearing unit at monitor well JKS-45, but appears to be discontinuous as it was not encountered during the installation of any other monitor wells in the vicinity of the Northern CCR Units.

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 clay[4]. A summary of the geotechnical testing results is provided in **Table 1**. HTS laboratory test results are provided in **Appendix B**.

5.1.2 *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.

---

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

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 lower confining unit were reported on the order of 10^{-6} to 10^{-8} (cm/sec). A summary of 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 on December 6, 2016, ERM constructed potentiometric surface maps in the vicinities of the Northern CCR Units and the Southern CCR Units (**Figures 5A** and **5B**). In addition, based on water level measurements 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

Groundwater in the vicinity of the Fly Ash Landfill and the Evaporation Pond appears to flow towards Lake Calaveras (southeast to east). Groundwater elevation data is summarized in **Table 2**.

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′ (**Figure 4A** through **4C**) and indicated on the boring logs, 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 Southern CCR Units

The groundwater flow in the vicinity of the Southern CCR Units is radial toward the lake and adjacent channel and away from a groundwater high represented by the water level elevation measured in JKS-49. Groundwater elevation data is summarized in **Table 2**.

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 F-F′ (**Figure 4D** through **4F**) and indicated on the boring logs, 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 Section D-D′ and E-E′ (**Figures 4D** and **4E**, respectively), and indicated on the boring logs, there is a bedrock unit underlying the groundwater-bearing unit in the southern area.

Three surface water elevations were measured on Calaveras Lake in April 2016 to understand the potentiometric relationship of the lake water levels and the groundwater elevations in the Southern CCR Units monitor wells. In general, lake surface water elevations are comparable to groundwater elevations measured within the monitor well closest to the lake. Surface water elevation data is also summarized in **Table 2.**

6.0 CCR UNIT MONITOR WELL NETWORKS

According to the CCR Rule, 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 Fly Ash Landfill and the Evaporation Pond, 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 monitor 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 three upgradient wells and at least three or more downgradient wells.

The locations for groundwater monitor well networks at the Northern and Southern CCR Units are shown in **Figure 2**, and the respective well functions are as follows:

Fly Ash Landfill 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*

Evaporation Pond Monitor Well Network

Well ID	**Well Function**	**Comment**
JKS-47	*Background Monitoring*	*Collect sample and measure water elevation*
JKS-63	*Background Monitoring*	*Collect sample and measure water elevation*
JKS-64	*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*

SRH Pond Monitor Well Network

Well ID	**Well Function**	**Comment**
JKS-51	*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-49	*Background Monitoring*	*Collect sample and measure water elevation*
JKS-48	*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*

7.0 CONCLUSIONS

1. The groundwater flow in the vicinity of the Fly Ash Landfill and Evaporation Pond is generally to the southeast to east, towards the lake.
2. 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.
3. The groundwater flow in the vicinity of the Southern CCR Units is radial toward the lake and adjacent channel.
4. The groundwater-bearing unit in the vicinity of the Southern CCR Units appears to exhibit semi-confined conditions and is underlain by bedrock (sandstone).
5. Lake surface water elevations are comparable to groundwater elevations measured within the monitor well closest to the lake and channel.

6. 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:
    - Fly Ash Landfill Unit: 2 background wells; 4 downgradient wells; 2 observation wells
    - Evaporation Pond Unit: 3 background wells; 3 downgradient wells
    - SRH Pond: 1 background well; 3 downgradient wells
    - BAPs: 1 background well; 5 downgradient wells
7. 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 is provided in **Appendix C**.

Tables

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, Texas 78701
(512) 459-4700

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	--	--

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 and Water Levels Summary
CPS Energy
Calaveras Power Station

Monitor Well Survey Data						Groundwater Elevation									
Well ID	Northing (US Survey Feet)	Easting (US Survey Feet)	TOC Elevation (feet MSL)	Ground Surface Elevation (feet MSL)	Casing Height (feet)	05/31/16		08/03/16		09/21/16		10/28/16		12/06/16	
						DTW (feet BTOC)	GWE (feet MSL)	DTW (feet BTOC)	GWE (feet MSL)	DTW (feet BTOC)	GWE (feet MSL)	DTW (feet BTOC)	GWE (feet MSL)	DTW (feet BTOC)	GWE (feet MSL)
Fly Ash Landfill															
JKS-31	13666796.23	2187611.68	507.45	505.27	2.18	27.25	480.20	27.53	479.92	26.89	480.56	27.60	479.85	27.01	480.44
JKS-33	13666778.96	2188466.98	498.71	497.77	0.94	--	--	--	--	--	--	--	--	18.03	480.68
JKS-45	13667132.78	2186615.40	531.46	528.31	3.15	47.19	484.27	47.15	484.31	47.01	484.45	47.07	484.39	46.83	484.63
JKS-46	13667810.11	2187972.31	499.08	495.75	3.33	19.38	479.70	17.87	481.21	17.55	481.53	18.51	480.57	17.61	481.47
JKS-57	13668235.72	2187486.38	506.91	503.83	3.08	--	--	--	--	20.07	486.84	20.71	486.20	19.89	487.02
JKS-58	13667994.99	2187797.39	504.45	500.94	3.51	--	--	--	--	21.09	483.36	19.41	485.04	18.85	485.60
JKS-59	13667779.88	2188352.07	496.45	493.53	2.92	--	--	--	--	15.49	480.96	16.84	479.61	15.67	480.78
JKS-60	13667357.02	2188465.44	495.70	492.68	3.02	--	--	--	--	17.40	478.30	17.57	478.13	17.15	478.55
Evaporation Pond															
JKS-36	13666288.91	2187227.29	508.41	506.95	1.46	26.38	482.03	26.45	481.96	26.24	482.17	26.46	481.95	25.99	482.42
JKS-47	13665709.79	2186503.87	513.63	510.28	3.35	31.37	482.26	30.39	483.24	31.16	482.47	31.24	482.39	30.98	482.65
JKS-61	13665721.04	2187196.65	505.51	502.52	2.99	--	--	--	--	24.46	481.05	24.30	481.21	23.95	481.56
JKS-62	13666020.13	2187153.88	509.84	506.71	3.13	--	--	--	--	28.90	480.94	28.90	480.94	28.63	481.21
JKS-63	13666230.86	2186553.38	526.86	523.55	3.31	--	--	--	--	44.70	482.16	44.75	482.11	44.45	482.41
JKS-64	13665627.14	2186778.76	507.84	504.38	3.46	--	--	--	--	25.06	482.78	25.12	482.72	24.98	482.86
SRH Pond															
JKS-51	13660243.53	2185630.39	496.92	494.04	2.88	10.56	486.36	11.04	485.88	10.61	486.31	11.16	485.76	10.76	486.16
JKS-52	13659683.26	2186139.05	493.15	493.56	-0.41	--	--	--	--	7.30	485.85	7.64	485.51	7.53	485.62
JKS-53	13659757.34	2185892.80	494.74	491.33	3.41	--	--	--	--	8.50	486.24	8.91	485.83	7.70	487.04
JKS-54	13659753.34	2185641.96	496.40	492.69	3.71	--	--	--	--	10.79	485.61	11.28	485.12	10.19	486.21
Bottom Ash Ponds															
JKS-48	13659658.78	2186490.78	497.19	493.71	3.48	11.28	485.91	11.69	485.50	11.70	485.49	12.22	484.97	11.47	485.72
JKS-49	13660519.40	2186229.15	498.63	495.17	3.46	9.32	489.31	12.37	486.26	11.61	487.02	12.60	486.03	8.81	489.82
JKS-50	13660122.87	2186836.72	498.20	494.87	3.33	11.76	486.44	DRY	DRY	P&A	--	P&A	--	P&A	--
JKS-50R	13660149.90	2186841.92	498.48	494.96	3.52	--	--	--	--	12.67	485.81	13.61	484.87	12.50	485.98
JKS-55	13659749.75	2186840.46	493.81	490.13	3.68	--	--	--	--	8.36	485.45	9.10	484.71	8.15	485.66
JKS-56	13660382.47	2186847.61	496.66	493.07	3.59	--	--	--	--	11.20	485.46	11.87	484.79	11.12	485.54

Surface Water Location	Northing (US Survey Feet)	Easting (US Survey Feet)	Surface Water Elevation (feet MSL)
SWA-1 *(Southeast of JKS-48)*	13659530.02	2186591.55	484.97
SWA-2 *(West of JKS-48)*	13659654.68	2185974.38	485.08
SWB-1 *(East-Northeast of JKS-49)*	13660737.32	2186922.00	484.91

NOTES:
TOC = top of casing
feet MSL = feet above mean sea level
feet BTOC = feet below top of casing
DTW = depth to water
GWE = groundwater elevation
P&A = JKS-50 was plugged and abandoned on 09/09/16
Surface water survey elevations collected on 5/31/16.
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
206 East 9th Street, Suite 1700
Austin, Texas 78701
(512) 459-4700

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

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

ERM

Service Layer Credits: Image courtesy of USGS Image courtesy of ImagePatch.com Earthstar Geographics SIO © 2017 Microsoft Corporation Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Environmental Resources Management

DESIGN:	NH	DRAWN:	EFC	CHKD.:	WZ
DATE:	1/12/2017	SCALE:	AS SHOWN	REVISION:	0
W.O.NO.:	P:\Projects\0366643 CPS Energy Calaveras CCR Well Network.WZ\GIS\MXD\HydroInv CPSCalv WellsLocs.mxd				

FIGURE 2
CCR WELL NETWORK LOCATION MAP

CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

Service Layer Credits: Image courtesy of USGS Image courtesy of ImagePatch.com Earthstar Geographics SIO © 2017 Microsoft Corporation
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

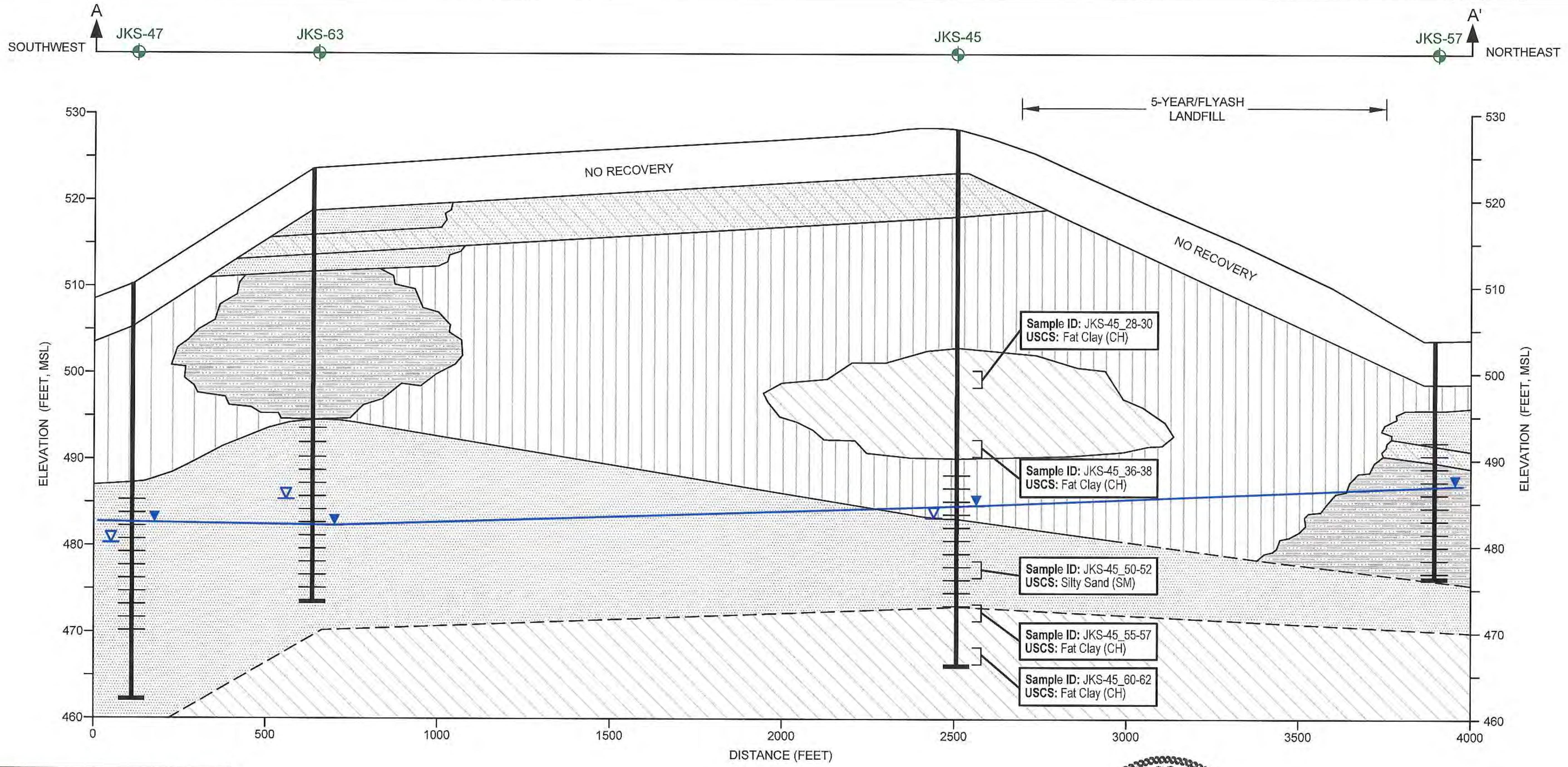
Environmental Resources Management

DESIGN:	NH	DRAWN:	EFC	CHKD.:	WZ
DATE:	1/4/2017	SCALE:	AS SHOWN	REVISION:	0
W.O.NO.:	P:\Projects\0366643 CPS Energy Calaveras CCR Well Network.WZ\GIS\MXD\HydroInv CPSCalv XsecLocs.mxd				

FIGURE 3
STRATIGRAPHIC CROSS SECTION
TRANSECT MAP

CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM



▨ 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

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)

⊕ BACKGROUND MONITOR WELL

MELISSA BOYSUN
GEOLOGY
No. 11387

10/13/2017

10'
VERTICAL
0
300'
HORIZONTAL

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

Notes:
1. Approximate ground surface elevation interpolated from surveyed elevations.
2. Aerial Source: ESRI.

Environmental Resources Management

Figure 4A
Stratigraphic Cross Section A-A'

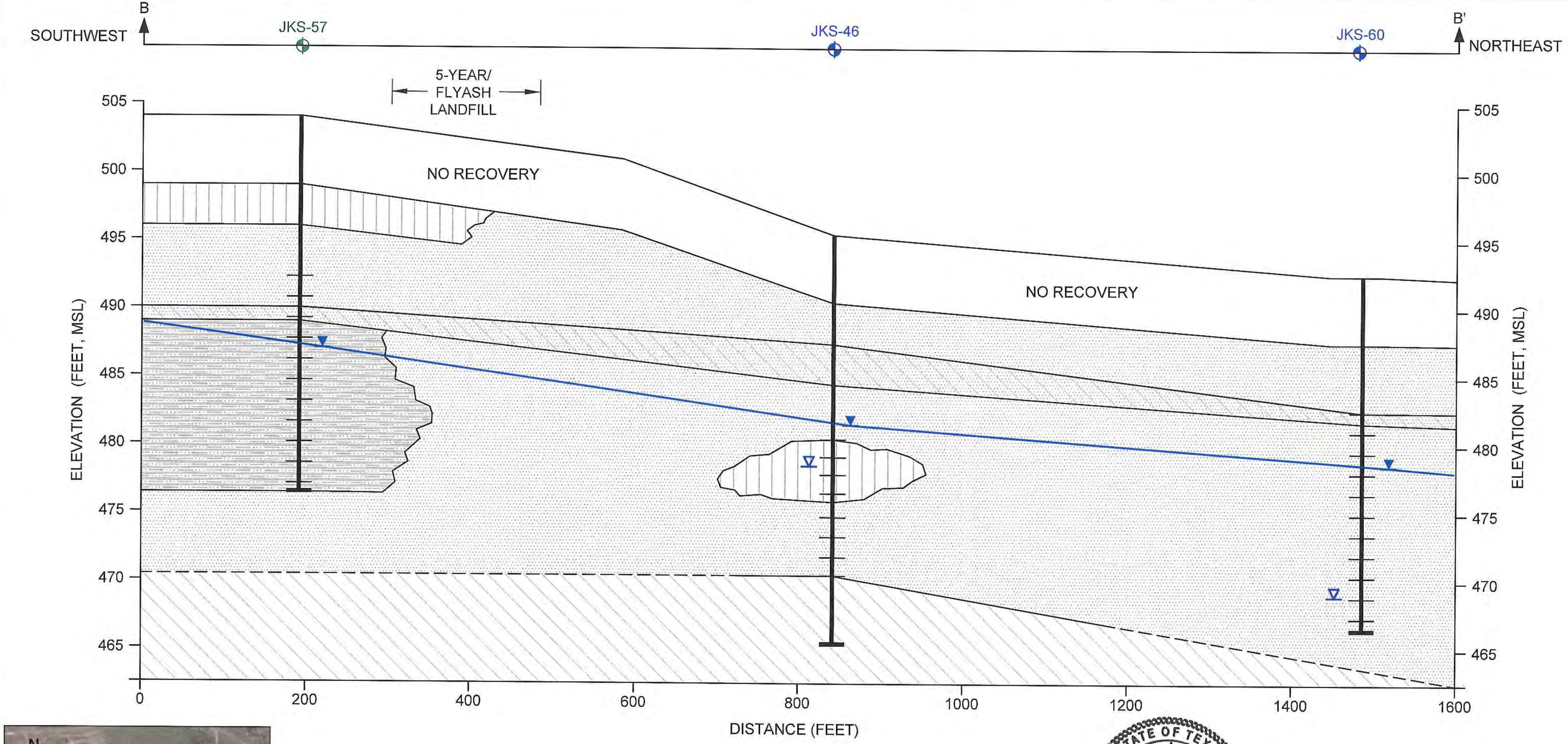
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

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-Southwest, Inc. TX PE Firm No. 2393



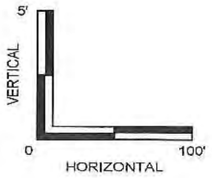
LEGEND

▨	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)
⊕	DOWNGRADIENT MONITOR WELL
⊕	BACKGROUND MONITOR WELL

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

MELISSA BOYSUN
GEOLOGY
No. 11387

10/13/2017



Notes:
1. Approximate ground surface elevation interpolated from surveyed elevations.
2. Aerial Source: ESRI.

Environmental Resources Management

Figure 4B
Stratigraphic Cross Section B-B'

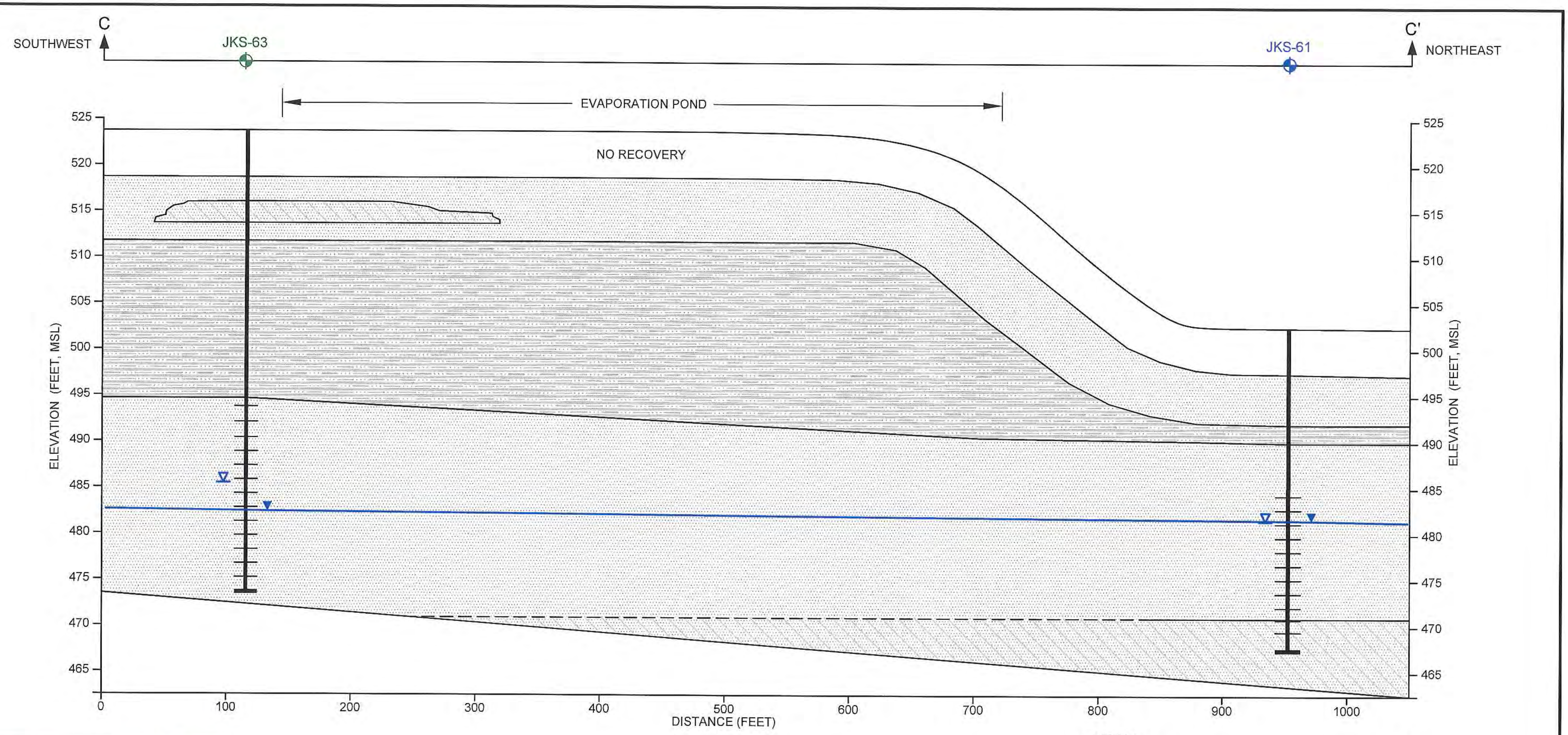
CPS Energy - Calaveras Power Station
San Antonio, Texas

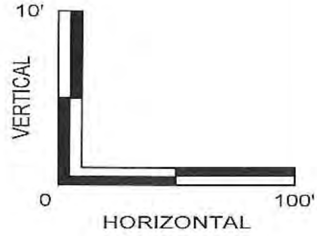
DESIGN: NH	DRAWN: RLM	CHKD.:
DATE: 1/10/2017	SCALE: AS SHOWN	REV.:

W.O.NO.: T:\DWG\AutoCAD\dwg\0366643\0366643_xsecs_v4.dwg, 1/10/2017 4:54:16 PM

ERM

ERM-Southwest, Inc. TX PE Firm No. 2393





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

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)
- ⊕ DOWNGRADIENT MONITOR WELL
- ⊕ BACKGROUND MONITOR WELL

MELISSA BOYSUN
GEOLOGY
No. 11387

10/13/2017

Notes:
1. Approximate ground surface elevation interpolated from surveyed elevations.
2. Aerial Source: ESRI.

Environmental Resources Management

Figure 4C
Stratigraphic Cross Section C-C'

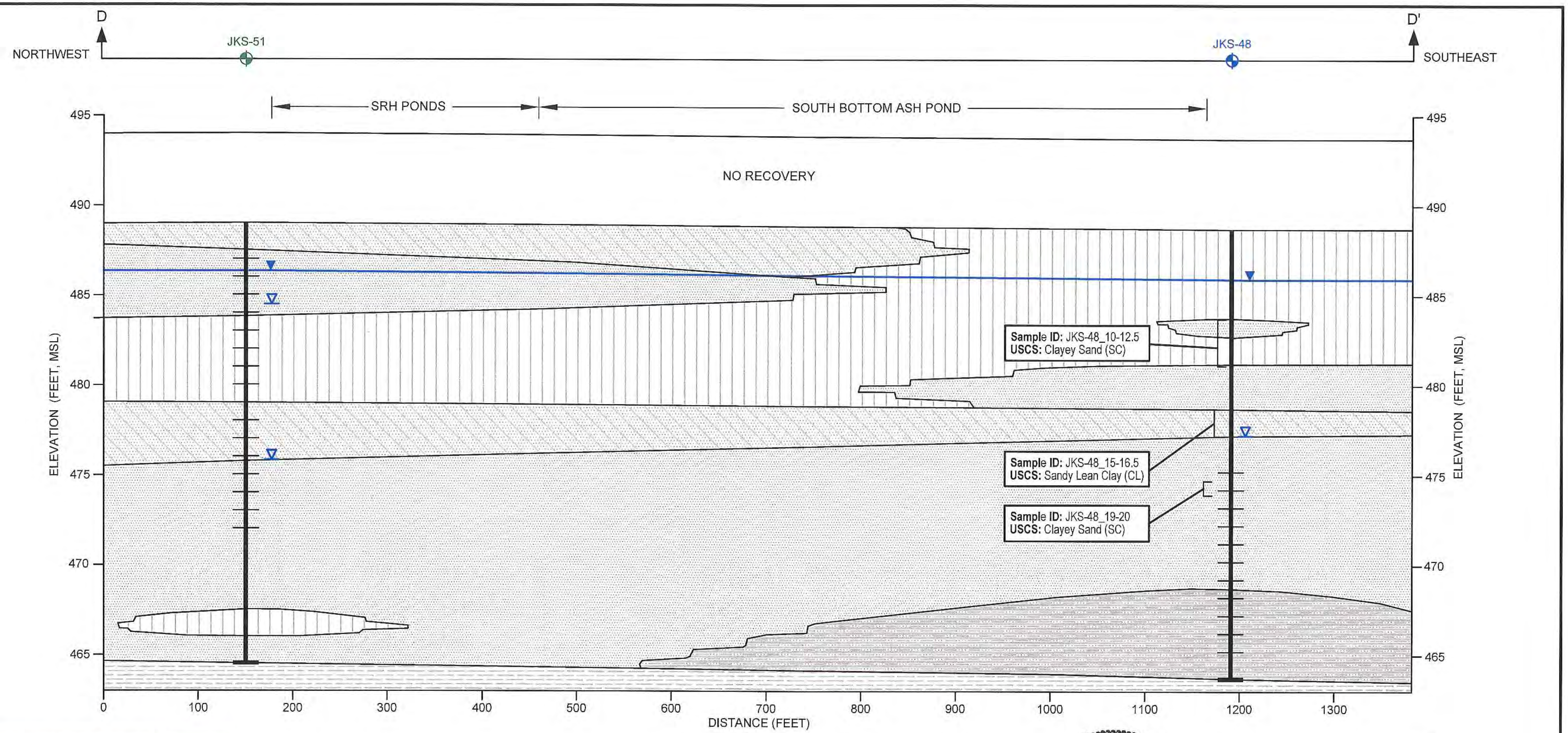
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

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

ERM-Southwest, Inc. TX PE Firm No. 2393



Sample ID: JKS-48_10-12.5
USCS: Clayey Sand (SC)

Sample ID: JKS-48_15-16.5
USCS: Sandy Lean Clay (CL)

Sample ID: JKS-48_19-20
USCS: Clayey Sand (SC)

▒ 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

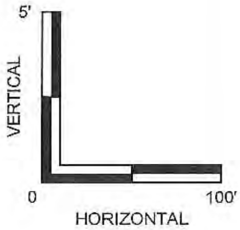
╪ MONITOR WELL (SCREENED INTERVAL DASHED)

⊕ DOWNGRADIENT MONITOR WELL

⊕ BACKGROUND MONITOR WELL

MELISSA BOYSUN
GEOLOGY
No. 11387

10/13/2017



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

Notes:
1. Approximate ground surface elevation interpolated from surveyed elevations.
2. Aerial Source: ESRI.

Environmental Resources Management

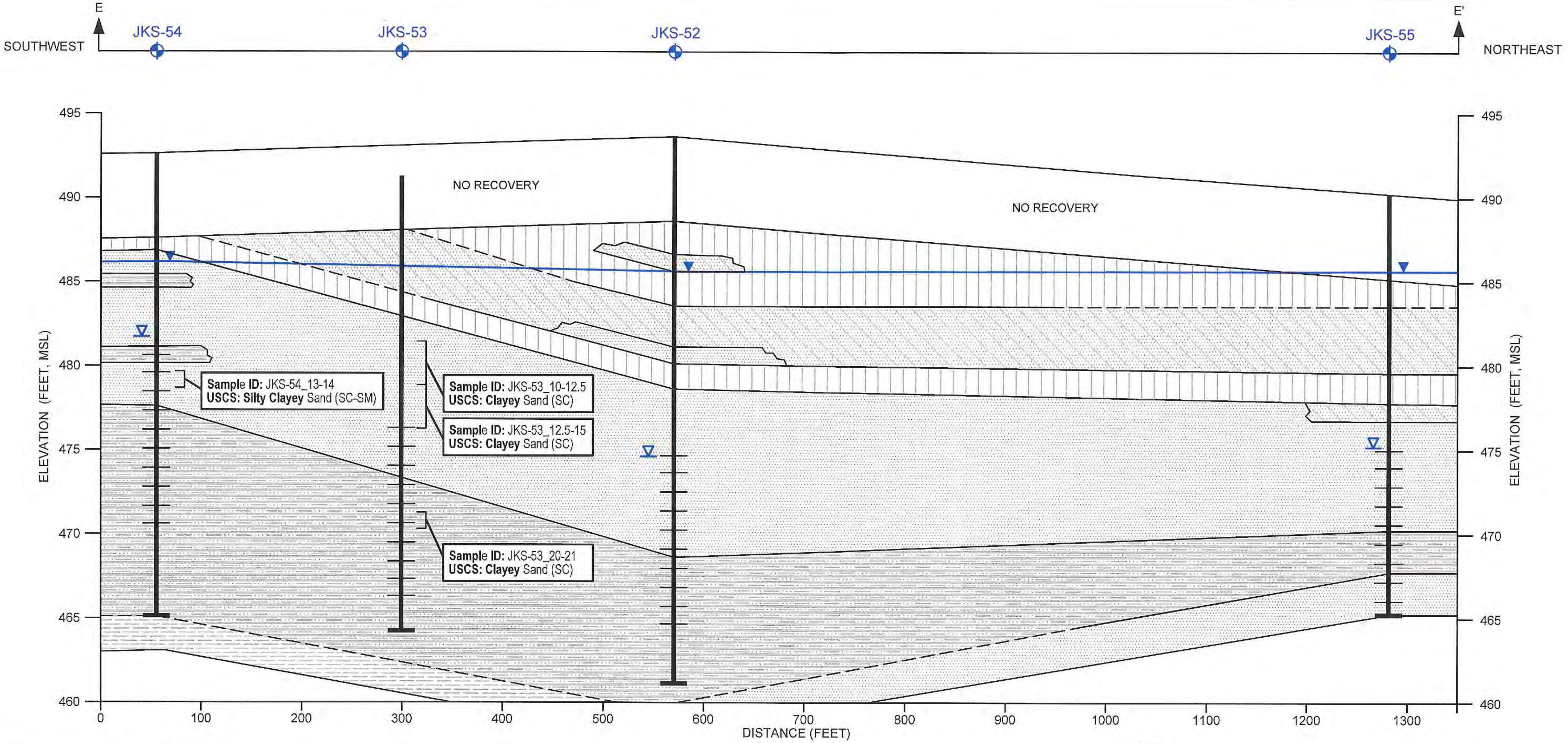
Figure 4D
Stratigraphic Cross Section D-D'

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

ERM-Southwest, Inc. TX PE Firm No. 2393



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, SILT, 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

SOIL TEST DATA KEY

Sample ID
USCS Soil Classification

MELISSA BOYSUN
GEOLOGY
No. 11387

10/13/2017

5'
VERTICAL
0
100'
HORIZONTAL

Notes:
1. Approximate ground surface elevation interpolated from surveyed elevations.
2. Aerial Source: ESRI.

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

ERM-Southwest, Inc. TX PE Firm No. 2393

Environmental Resources Management

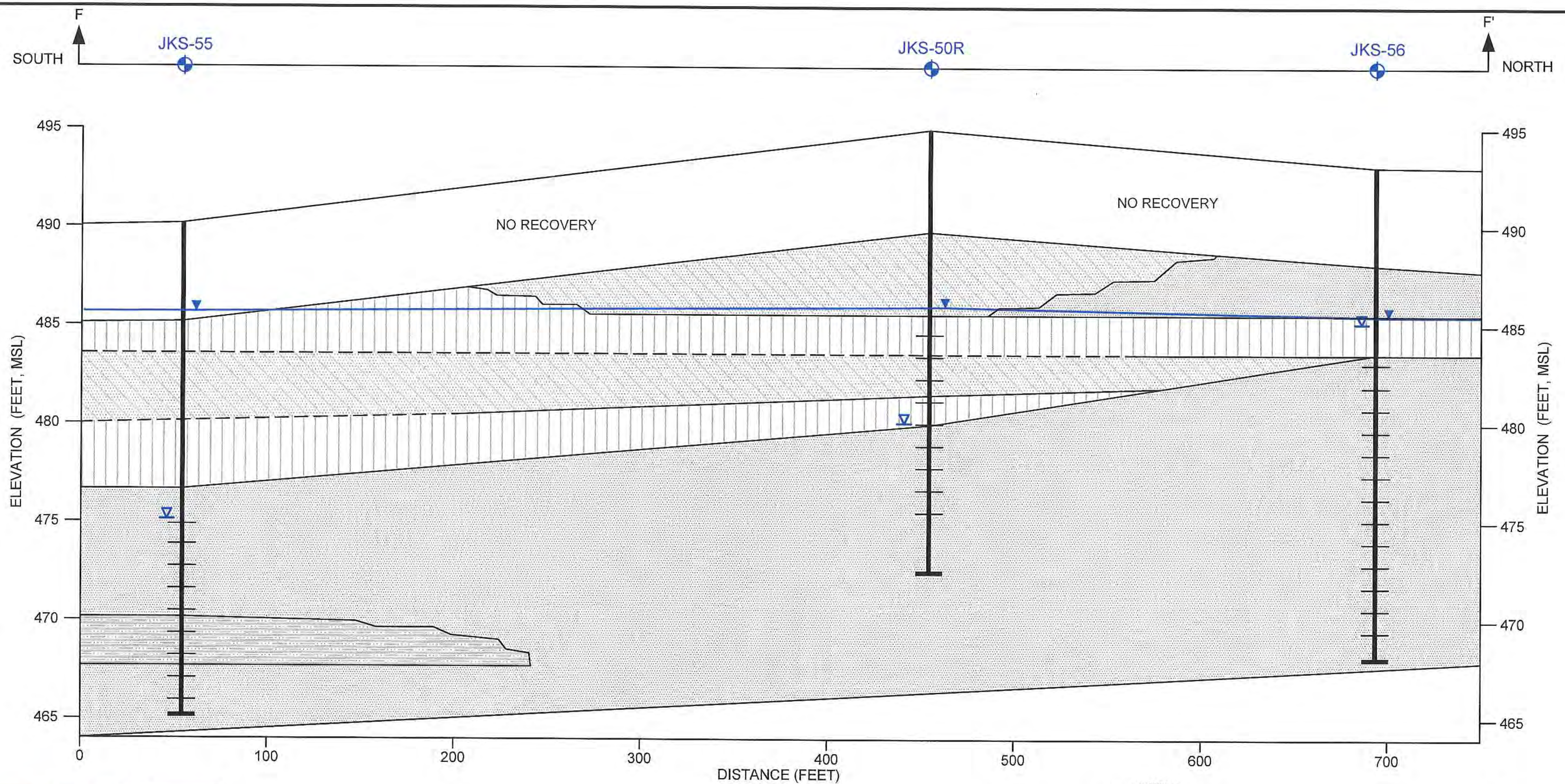
Figure 4E
Stratigraphic Cross Section E-E'

CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

DESIGN: NH	DRAWN: RLM	CHKD.: WZ
DATE: 2/16/2017	SCALE: AS SHOWN	REV.: 1

W.O.NO.: T:\DWG\AutoCAD\dwg\0366643\0366643_xsecs_v4.dwg, 2/16/2017 4:12:06 PM

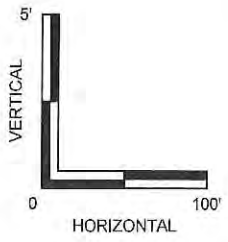


LEGEND

⬚	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

MELISSA BOYSUN
GEOLOGY
No. 11387

10/13/2017



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

Notes:
1. Approximate ground surface elevation interpolated from surveyed elevations.
2. Aerial Source: ESRI.

Environmental Resources Management

Figure 4F
Stratigraphic Cross Section F-F'

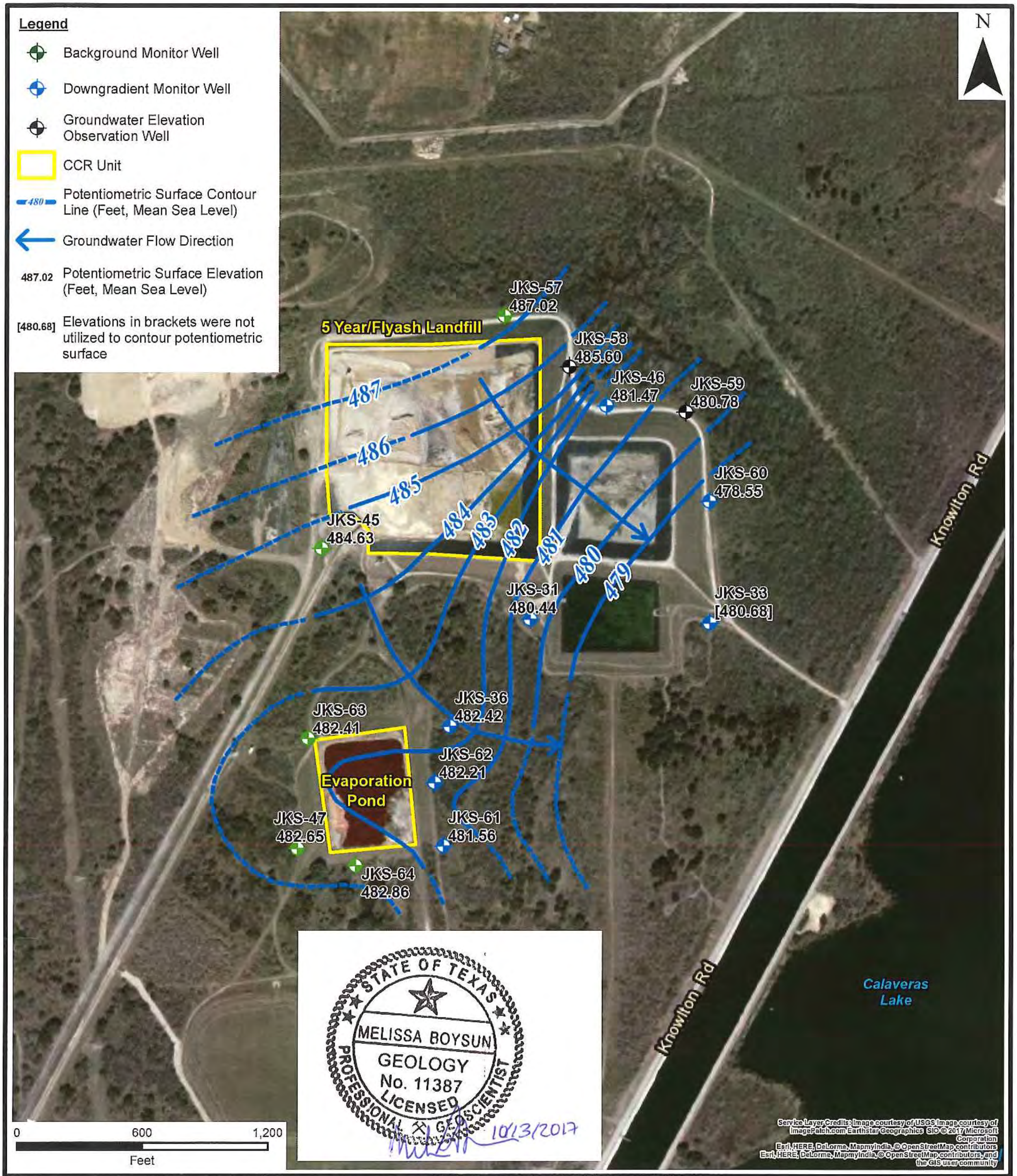
CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

DESIGN: NH	DRAWN: EFC	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 4:54:21 PM

ERM-Southwest, Inc. TX PE Firm No. 2393



Service Layer Credits: Image courtesy of USGS Image courtesy of ImagePatch.com Earthstar Geographics SIO © 2017 Microsoft Corporation
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

MELISSA BOYSUN
GEOLOGY
No. 11387

10/13/2017

Environmental Resources Management

DESIGN:	NH/AH	DRAWN:	EFC	CHKD.:	WZ
DATE:	2/28/2017	SCALE:	AS SHOWN	REVISION:	1

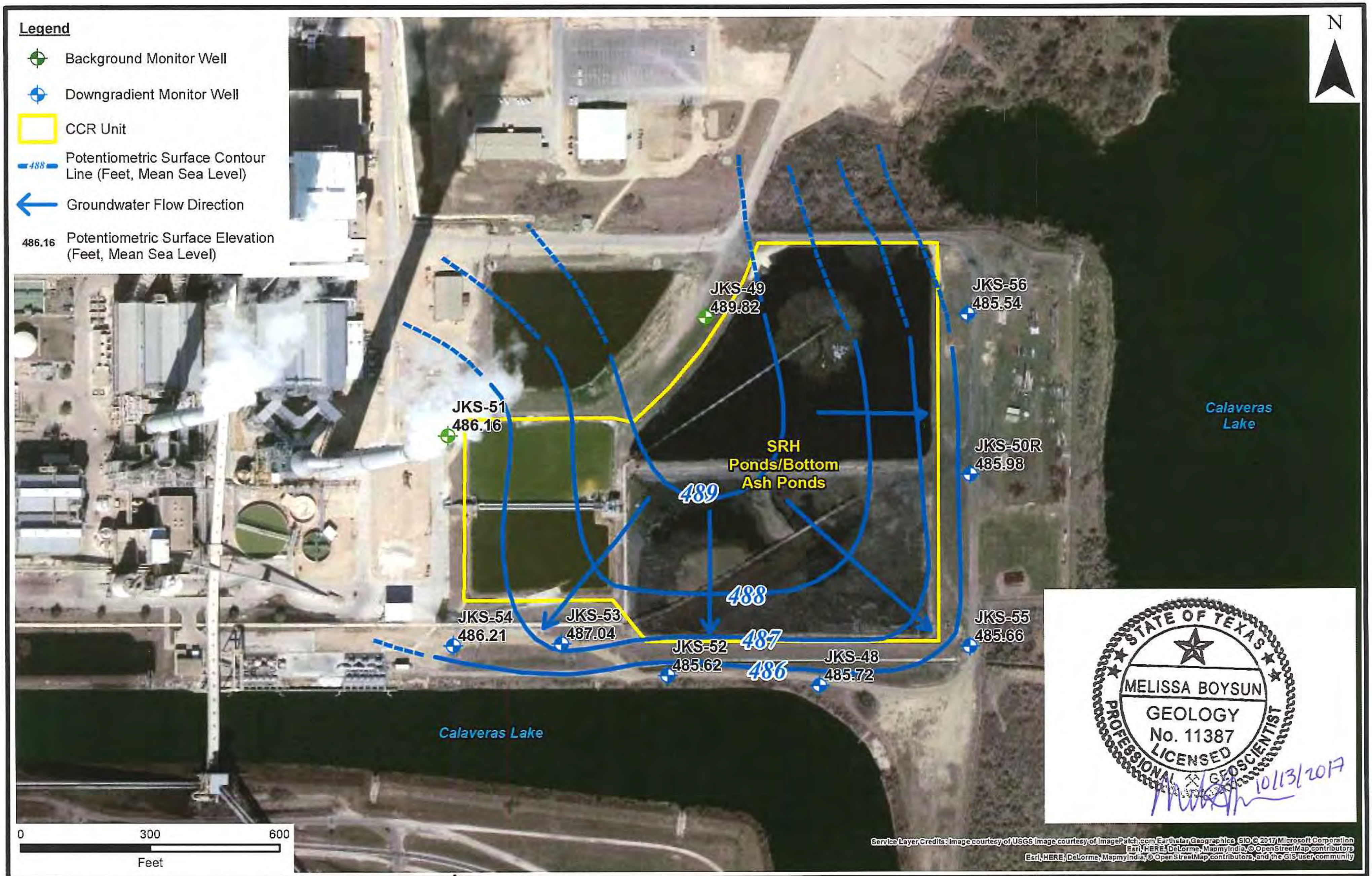
W.O.NO.: P:\Projects\0366643 CPS Energy Calaveras CCR Well Network.WZ\GIS\MXD\HydroInv CPSCalv_pmapN_6dec2016.mxd

FIGURE 5A
POTENTIOMETRIC SURFACE MAP -
DECEMBER 6, 2016
NORTHERN CCR UNITS

CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

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



MELISSA BOYSUN
GEOLOGY
No. 11387

10/13/2017

Environmental Resources Management

DESIGN: NH/AH	DRAWN: EFC	CHKD.: WZ
DATE: 1/10/2017	SCALE: AS SHOWN	REVISION: 1

W.O.NO.: P:\Projects\0366643 CPS Energy Calaveras CCR Well Network.WZ\GIS\MXD\HydroInv CPSCalv_pmapS_6dec2016.mxd

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

FIGURE 5B
POTENTIOMETRIC SURFACE MAP -
DECEMBER 6, 2016
SOUTHERN CCR UNITS

CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

Soil Boring Logs, Well Completion Logs, and State Well Reports

Appendix A

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, Texas 78701
(512) 459-4700

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

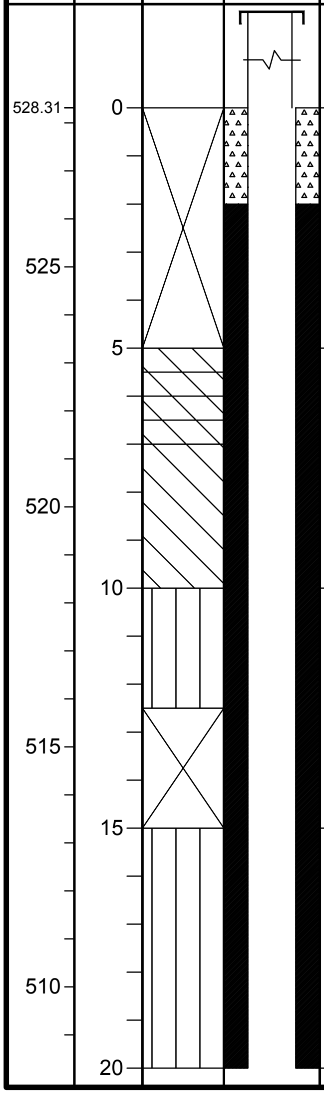
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 40.00 ' Sump Length 0 '
Top of Casing Elevation 531.46 ' Stickup 3.15 '
Depth to Water: 1. Ft. btoc 47.19 (2016-05-31) 2. Ft. ____ (____)

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.
	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. At 6' bgs: White silt lens.
						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.
	10			50		10-12.5	SILT: Alternating light grey and yellowish brown, stratified with orange, yellow, and red; damp; loose; non-plastic.
						12.5-15	NO RECOVERY.
	15			75		15-22	SILT: Brownish light grey; damp; loose to medium dense; non-plastic; 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

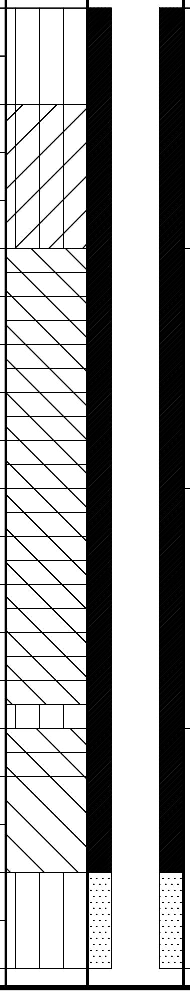
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 40.00 ' Sump Length 0 '
Top of Casing Elevation 531.46 ' Stickup 3.15 '
Depth to Water: 1. Ft. btoc 47.19 (2016-05-31) 2. Ft. ( )

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)	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	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.
505					
	25			25-34.5	SILTY CLAY: Dark reddish brown; dry to damp; medium stiff; low plasticity; fractures along planar surfaces.
					At 25.5' bgs: Light grey silt lens (2" thick).
		100			
500			JKS-45_28-30 **USCS:** Fat Clay (CH) **AL:** 61 / 22 / 39 **-200 Sieve:** 91.6		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.
	30				
					At 31.5' bgs: Dry; yellow silt stringers; abundant yellowish orange silt stringers to 32' bgs.
		100			
495					At 33.5' bgs: Trace gypsum crystals.
				34.5-35	SILT: Dark pinkish brown laminated with greyish brown; dry; dense; non-plastic; some clay content.
	35			35-36	SILTY CLAY: Very dark reddish brown; damp to moist; medium stiff; low plasticity; trace yellow silt; minor gypsum crystals; brownish black band (2" thick) at 35' bgs.
		100	JKS-45_36-38 **USCS:** Fat Clay (CH) **AL:** 67 / 24 / 43 **-200 Sieve:** 90.5	36-38	CLAY: Pinkish grey; dry; very stiff to hard; very high plasticity (fat). Non-cohesive grab sample collected from 36'-38' bgs. At 36.5' bgs: Yellow and orange silt stringers to 37.5' bgs.
490					
				38-43	SILT: Orangish brown; dry to damp; medium dense to dense; slight plasticity; slight clay content.
	40				

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

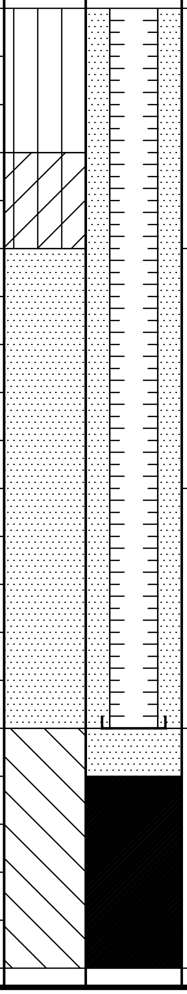
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 40.00 ' Sump Length 0 '
Top of Casing Elevation 531.46 ' Stickup 3.15 '
Depth to Water: 1. Ft. btoc 47.19 (2016-05-31) 2. Ft. ( )

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)
	40			80			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.
485						43-45	CLAYEY SILT: Dark reddish brown; damp; medium dense; slight plasticity; orange silt stringers throughout. At 44.5' bgs: Trace fine-grained sand content.
	45			50		45-55	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; non-plastic; minor clay lenses (1/16" to 1/8" thick).
480							At 48' bgs: Color change to orangish brown with orange laminations; no clay content. At 49.5' bgs: Intermixed red color to 50' bgs.
	50			50	JKS-45_50-52 **USCS:** Silty Sand (SM) **AL:** Non-plastic **-200 Sieve:** 12.6		At 50' bgs: Color change to pinkish brown. Non-cohesive grab sample collected from 50'-52' bgs.
475							At 54.5' bgs: Brownish orange band (2" thick).
	55			100	JKS-45_55-57 **USCS:** Fat Clay (CH) **AL:** 75 / 28 / 47 **-200 Sieve:** 97	55-62	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.
470							
	60						

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)
	60	▨	■	100	JKS-45_60-62 **USCS:** Fat Clay (CH) **AL:** 75 / 26 / 49 **-200 Sieve:** 86.4 **k:** 1.82×10^{-8}		Cohesive sample (Shelby tube) collected from 60'-62' bgs.
							Boring terminated at 62' bgs.
465							
	65						
460							
	70						
455							
	75						
450							
	80						

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

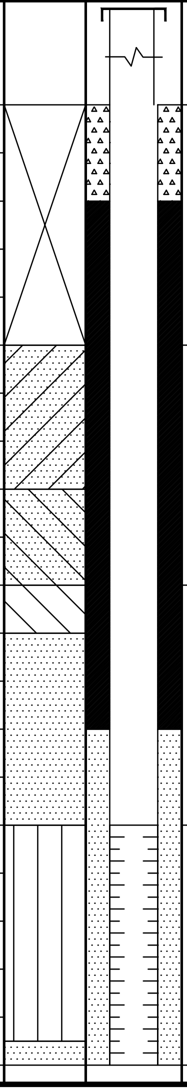
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Sump Length 0 '
Top of Casing Elevation 499.08 ' Stickup 3.33 '
Depth to Water: 1. Ft. btoc 19.38 (2016-05-31) 2. Ft. ____ (____)

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)	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
495.75	0	0	No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
495					
490	5	100		5-8	CLAYEY SAND: Reddish orange; damp to moist; fine-grained; sub-round; well-sorted; medium dense; slight to low plasticity; some silt content. At 7.5' bgs: Dense grey clay lenses (1/2" thick).
				8-10	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. At 9.5' bgs: Increased silt content.
	10	75		10-11	CLAY: Grey; dry; stiff; medium plasticity; minor silt content; fractures along tan silt to fine-grained sand stringers.
485				11-15	SAND: Tan; damp; fine-grained; sub-round, well sorted; loose; non-plastic. At 13' bgs: Striated with pink and orange. At 14' bgs: Color change to reddish orange; some silt content; occasional clay lenses. At 14.75' bgs: Orange silt lens.
480	15	85		15-19.5	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. 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; non-plastic; minor silt and trace clay; orange and yellow silt stringers.

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

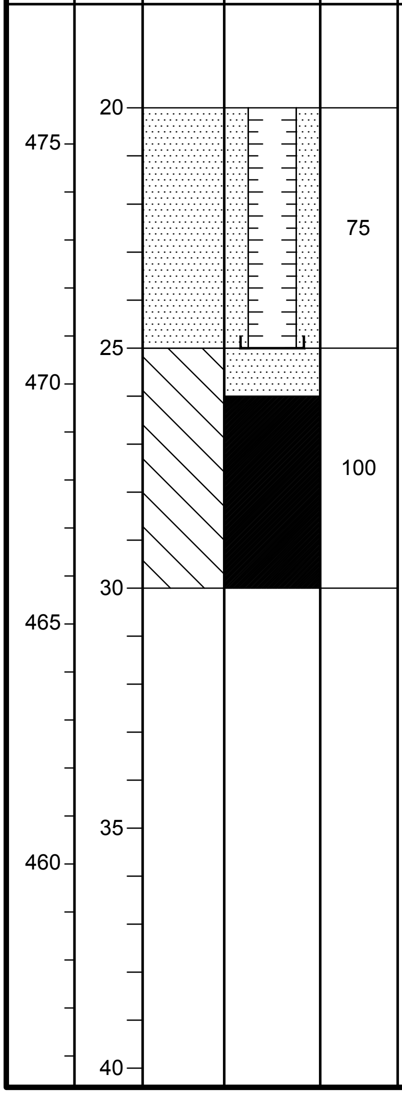
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Sump Length 0 '
Top of Casing Elevation 499.08 ' Stickup 3.33 '
Depth to Water: 1. Ft. btoc 19.38 (2016-05-31) 2. Ft. ( )

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)
	20–25			75	No Samples Collected		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.
	25–30			100		25-30	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.

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. ____ (____)

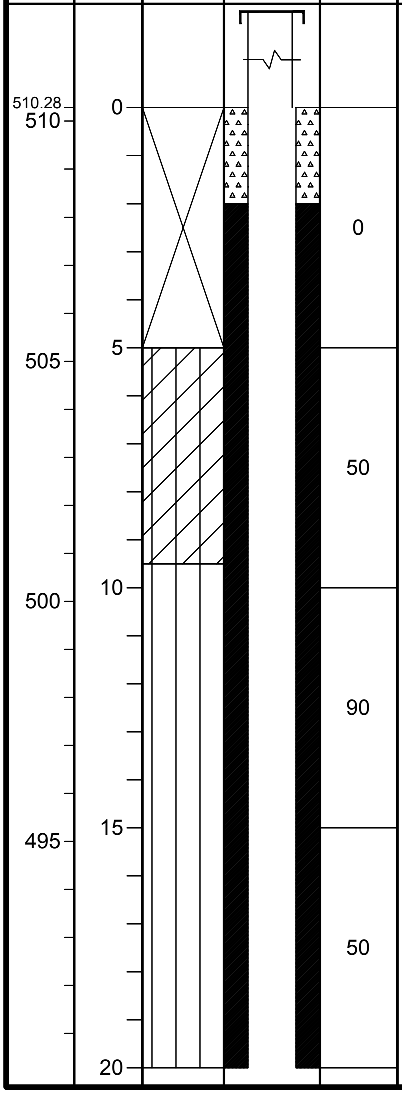
Drilling Company Strata Core Services, LLC Driller Joseph Ray

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)	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
510.28	0	0	No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
505	5	50		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). At 9.25' bgs: Clay lens (2" thick).
500	10	90		9.5-20	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. At 12.5' bgs: No clay content. At 13' bgs: Color change to tan; dry; yellow and orange silt stringers.
495	15	50			
	20				

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. ( )

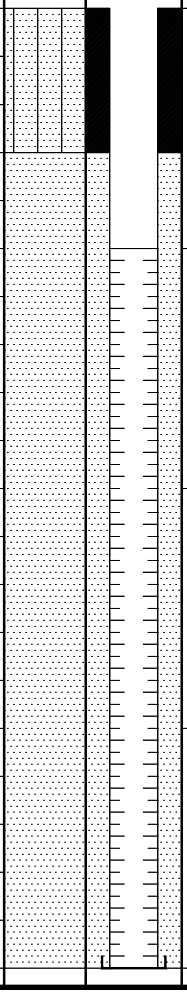
Drilling Company Strata Core Services, LLC Driller Joseph Ray

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)
490	20				No Samples Collected	20-23	At 20' bgs: Whitish tan striated with yellow; minor fine-grained sand content. SANDY SILT: Whitish tan; dry; loose; non-plastic; occasional yellow and orange silt stringers, occurrence increases with depth.
				75		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.
485	25						At 25' bgs: Color change to tannish brown; very moist.
				50			
480	30						At 30' bgs: Saturated; Orange band (1" thick) at 30.25' bgs.
				100			
							At 34' bgs: Orange striations to 35' bgs.
475	35						At 35' bgs: Trace orange silt stringers.
				50			
	40						

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 '

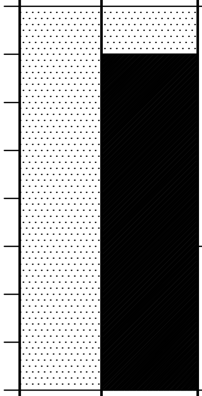
Depth to Water: 1. Ft. btoc 31.37 (2016-05-31) 2. Ft. ____ (____)

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)	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	100			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. Boring terminated at 48’ bgs.
460	50				
455	55				
	60				

ERM Environmental Resources Management

JKS-48
DRILLING LOG

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. ( )

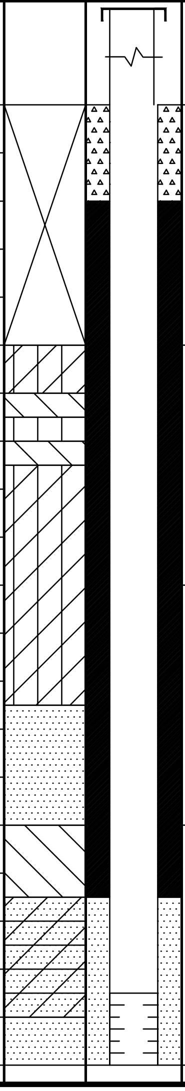
Drilling Company Strata Core Services, LLC Driller Joseph Ray

Drilling Method Hollow-Stem Auger Log By Nick Houtchens

SKETCH MAP

NOTES

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



Elevation (Ft MSL)	Depth (Feet)	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.
				6-6.5	SILTY CLAY: Orangish brown heavily mottled with grey and orange; damp; stiff; medium plasticity; occasional grey and orange silt stringers.
				6.5-7	SILT: Brownish tan with grey and orange; damp; medium dense; slight plasticity; trace clay.
				7-7.5	SILTY CLAY: Orangish brown heavily mottled with grey and orange; damp; stiff; medium plasticity; occasional grey and orange silt stringers.
485				7.5-12.5	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).
	10	75	JKS-48_10-12.5 **USCS:** Clayey Sand (SC) **AL:** 35 / 16 / 19 **-200 Sieve:** 44.6		
480				12.5-15	SAND: Brownish grey; damp to moist; fine-grained; sub-angular; moderately sorted; loose; non-plastic; minor silt content. At 13.5' bgs: Dense clay lens (1" thick). At 14.5' bgs: Color change to dark brown.
	15	80	JKS-48_15-16.5 **USCS:** Sandy Lean Clay (CL) **AL:** 48 / 19 / 29 **-200 Sieve:** 58.9	15-16.5	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.
				16.5-19	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			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; non-plastic; minor silt content, decreases with depth; laminated with light grey clay to 19.25' bgs. Non-cohesive grab sample collected from 19'-20' bgs.
	20				

ERM Environmental Resources Management

JKS-48
DRILLING LOG

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. ( )

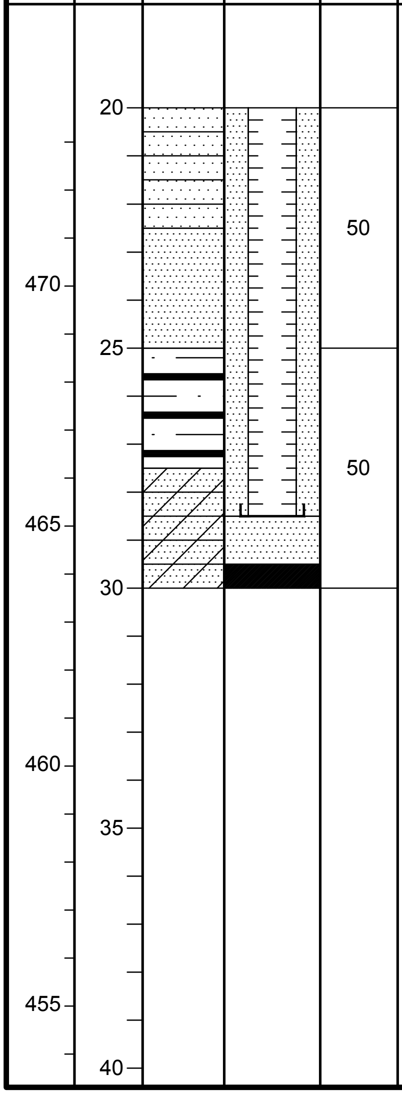
Drilling Company Strata Core Services, LLC Driller Joseph Ray

Drilling Method Hollow-Stem Auger Log By Nick Houtchens

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)
	20			50		20-22.5	SILTY SAND: Orangish brown; saturated; fine to very-fine grained; sub-angular, poorly sorted; loose; non-plastic; 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; non-plastic; some silt content; orange silt stringers. At 24.5' bgs: Orange silt lens to 24.75' bgs.
	25			50		25-27.5	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.
						27.5-30	CLAYEY SILTY SAND: Tannish grey; saturated; loose; slight plasticity; orange 1/16" thick silt laminations throughout. At 29.5' bgs: Pinkish brown (1/16" thick) clay laminations to 30' bgs. Refusal (bedrock) enountered at 30’ bgs.

ERM Environmental Resources Management

JKS-49
DRILLING LOG

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. ____ (____)

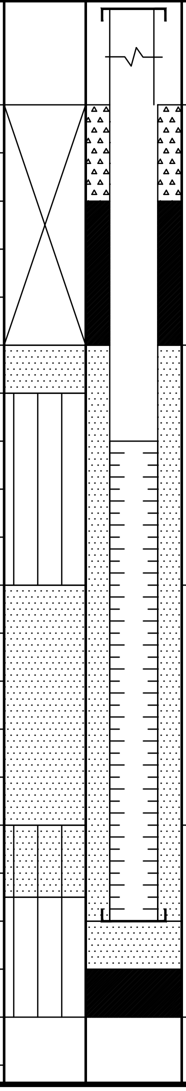
Drilling Company Strata Core Services, LLC Driller Joseph Ray

Drilling Method Hollow-Stem Auger Log By Nick Houtchens

SKETCH MAP

NOTES

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



Elevation (Ft MSL)	Depth (Feet)	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; non-plastic; orange silt stringers.
				6-10	SILT: Greyish tan; very moist; loose; non-plastic; minor fine-grained sand; occasional yellow silt stringers. At 9.5' bgs: Color change to light brown; wet; orange silt stringers.
485	10	100		10-15	SAND: Light brown; wet; fine-grained; sub-angular; moderately sorted; loose to medium dense; non-plastic; 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. At 14' bgs: Color change to greyish tan.
480	15	100		15-16.5	SANDY SILT: Light brown; wet to saturated; loose; non-plastic; occasional orange silt stringers. At 16.5' bgs: Pinkish brown clay lens (3/16" thick).
				16.5-19	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) enountered at 19' bgs.
475	20				

Environmental Resources Management

JKS-50
DRILLING LOG

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

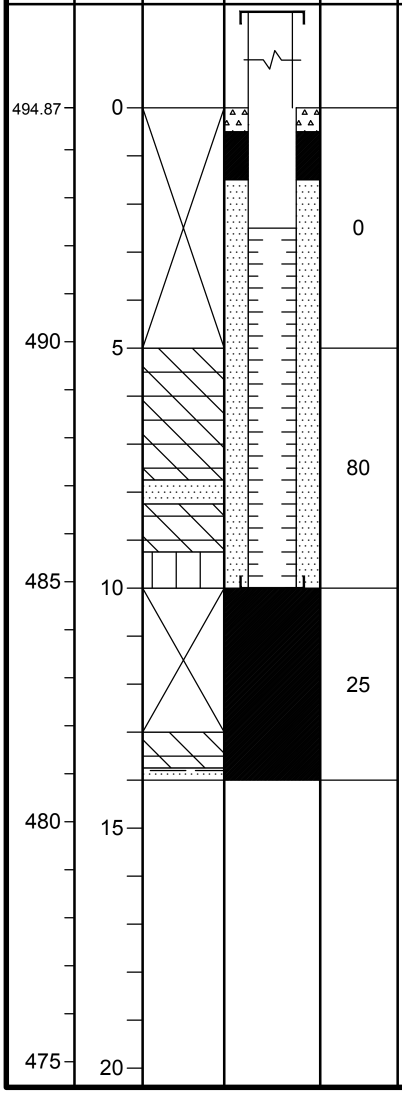
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 7.50 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 2.50 ' Sump Length 0 '
Top of Casing Elevation 498.20 ' Stickup 3.33 '
Depth to Water: 1. Ft. btoc 11.76 (2016-05-31) 2. Ft. ( )

Drilling Company Strata Core Services, LLC Driller Joseph Ray
Drilling Method Hollow-Stem Auger Log By Nick Houtchens

SKETCH MAP

NOTES

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



Elevation (Ft MSL)	Depth (Feet)	Recovery (%)	Lab Sample Data
494.87	0-5	0	No Samples Collected
	5-10	80	
	10-14	25	

Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0-5	NO RECOVERY: Previously excavated by hydrovac truck.
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). At 7.5' bgs: Color change to brownish orange; minor fine-grained sand content.
7.75-8.25	SAND: Tan; damp; fine-grained, sub-angular; moderately sorted; dense; non-plastic; minor silt content; occasional orange silt stringers.
8.25-9.25	SILTY CLAY: Orangish brown mottled with grey, brown, red and occasional yellow; damp; stiff; medium plasticity; orange silt stringers throughout.
9.25-10	SILT: Tan; moist; loose; non-plastic; trace orange silt stringers. At 9.75' bgs: Soft clay lens (3/16" thick).
10-13	NO RECOVERY.
13-13.75	SILTY CLAY: Brown; saturated; loose; low plasticity; orange silt stringers; sandstone pieces (3/8" thick) near 13.75' bgs.
13.75-14	SANDSTONE: Brownish orange laminated with orange, tan, and dark brown. Refusal (bedrock) enountered at 14’ bgs.

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. ____ (____)

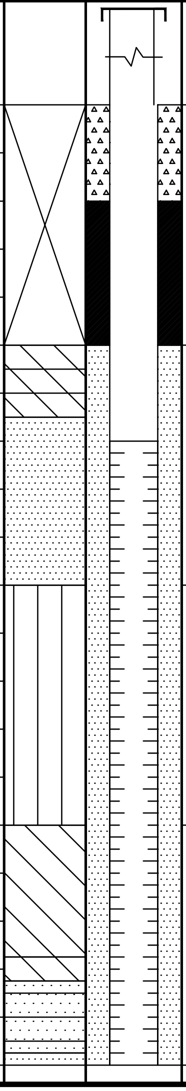
Drilling Company Strata Core Services, LLC Driller Joseph Ray

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					5-6.5	SILTY CLAY: Light brown with occasional orange mottling; wet; soft; low plasticity; occasional gravel (1/16" thick).
				60		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.
						17.75-18.25	CLAY: Grey; moist; medium stiff; low plasticity; trace silt content; abundant orange silt stringers.
						18.25-19.75	SILTY SAND: Light brown; wet to saturated; very fine to fine-grained; sub-angular; poorly sorted; loose; non-plastic. At 19.25' bgs: Pinkish grey clay lens (2" thick); thin red silt lens below clay; occasional orange silt stringers.
475							
	20					19.75-26.5	SAND: Light grey; wet; fine-grained; sub-angular; moderately sorted; loose; non-plastic; occasional orange silt stringers.

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. ( )

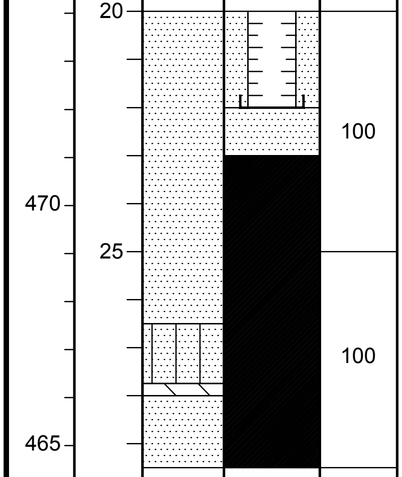
Drilling Company Strata Core Services, LLC Driller Joseph Ray
Drilling Method Hollow-Stem Auger Log By Nick Houtchens

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)



No Samples Collected

At 21.25' bgs: Red silt lens (1/16" thick); abundant orange silt stringers.

At 24' bgs: Minor silt and trace clay content.

At 26.25' bgs: Reddish orange silt lens (1/16" thick).

26.5-27.75 SANDY SILT: Tannish light grey; wet; loose; slight plasticity; occasional yellow and orange silt stringers.
At 27.5' bgs: Trace clay content.

27.75-28 CLAY: Dark brown mottled with tannish brown; moist; stiff; very high plasticity (fat); brown silt stringers throughout.

28-29.5 SAND: Tannish light grey; wet; fine-grained; sub-angular; moderately sorted; loose; non-plastic; trace silt, occurrence decreases with depth; abundant orange silt stringers.
At 29.25' bgs: Color change to light brown; occasional orange silt stringers.

Refusal (bedrock) enountered at 29.5’ bgs.

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**
		Longitude:	**098° 18' 08" W**
Well County:	**Bexar**	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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**62**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
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**

	Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Plug Information:	**Bentonite**	**52**	**62**

	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: **Joseph Ray**

License Number: **58794**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	5	Ash
5	8	Lt brn sandy clay
8	14	lt gry sandy clay
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

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	Riser	New Plastic (PVC)	40	0	40
2	Screen	New Plastic (PVC)	40 10	40	55

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

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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**30**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
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**

	Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Plug Information:	**Bentonite**	**26**	**30**

	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: **Joseph Ray** License Number: **58794**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**5**	**ASH**
5	**8**	**LT BRN SANDY CLAY**
8	**14**	**LT GRY CLAY**
14	**28**	**LT GRY SAND**
28	**30**	**BRN CLAY**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**15**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**15**	**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) 463-7880

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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**48**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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**

	Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Plug Information:	**Bentonite**	**41**	**48**

	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: **Joseph Ray**

License Number: **58794**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	5	ASH
5	8	LT BRN SANDY CLAY
8	14	LT GRAY SANDY CLAY
14	20	LT GRAY SAND
20	40	BRN SILTY CLAY
40	48	LT GRAY SAND

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	Riser	New Plastic (PVC)	40	0	25
2	Screen	New Plastic (PVC)	40 10	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) 463-7880

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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**30**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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**

	Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Plug Information:	**Bentonite**	**29.5**	**30**

	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: **Joseph Ray**

License Number: **58794**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**5**	**ASH**
5	**8**	**LT BRN CLAY**
8	**14**	**LT GRAY CLAY**
14	**20**	**LT GRAY SAND**
20	**30**	**BRN SILTY CLAY**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**18.5**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**18.5**	**28.5**

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

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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**19**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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**

	Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Plug Information:	**Bentonite**	**18**	**19**

	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: **Joseph Ray** License Number: **58794**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**5**	**ASH**
5	**8**	**LT BRN CLAY**
8	**14**	**LT GRAY CLAY**
14	**19**	**LT GRAY SAND**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**7**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**7**	**17**

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

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**

	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
Borehole:	**8.25**	**0**	**14**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
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**

	Description (number of sacks & material)	Top Depth (ft.)	Bottom Depth (ft.)
Plug Information:	**Bentonite**	**10**	**14**

	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: **Joseph Ray** License Number: **58794**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**5**	**ASH**
5	**8**	**LT BRN CLAY**
8	**14**	**LT GRAY CLAY**
14	**15**	**LT GRAY SAND**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**2.5**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**2.5**	**10**

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

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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**29.5**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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**

	Description (number of sacks & material)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Plug Information:	**Bentonite**	**23**	**29.5**

	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: **Joseph Ray**

License Number: **58794**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**5**	**ASH**
5	**8**	**LT BRN CLAY**
8	**14**	**LT GRAY CLAY**
14	**20**	**LT GRAY SAND**
20	**24**	**BRN SITY CLAY**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**7**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**7**	**22**

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-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. 186841.92' 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. ____ (____)

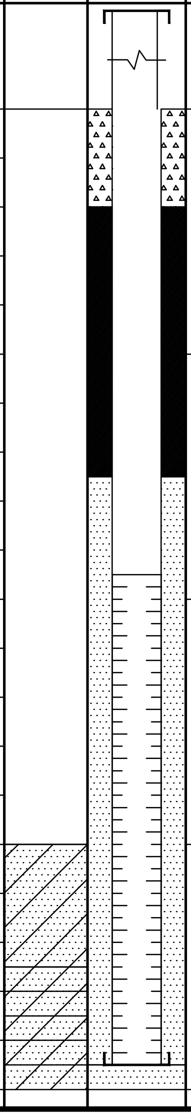
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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				No Samples Collected	0-15	See boring log JKS-50 from 4/6/16.
				0			
490	5						
				0			
485	10						
				0			
480	15					15-17.5	CLAYEY SAND: Light brown; wet; loose; trace dark gray sandy clay content; very coarse gravel (2" diam.) present.
				50		17.5-22.5	CLAYEY SILTY SAND: Light brown; saturated; loose; light gray pieces of clay; few large (2" diam.) very coarse (2" diam.) angular rocks present.
475	20						

ERM 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. 186841.92'
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)
	20	▨	░	50		22-22.5	CLAYEY SAND: Brownish gray; dry to damp; loose. Boring terminated at 22.5' bgs.
470	25						
465	30						
460	35						
455	40						

ERM 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. ( )

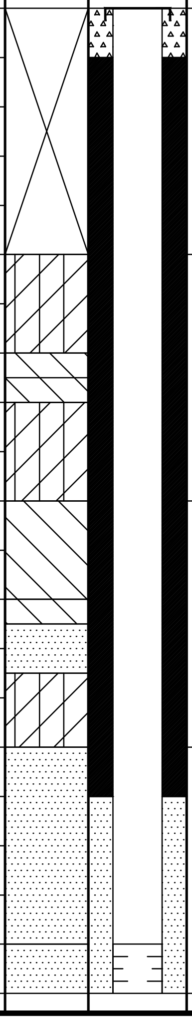
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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)
493.56	0			0	No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490							
	5			100		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 lense (1" thick). At 5.8' bgs: Light gray clay lensee.
						7-8	SILTY CLAY: Tan; damp.
485						8-10	CLAYEY SILT: Gray with light gray and tan streaks; damp.
	10			100		10-12	CLAY: Dark gray to brownish gray, mottled with light gray and bluish gray; damp; medium dense; slight plasticity.
						12-12.5	SILTY CLAY: Dark gray.
						12.5-13.5	SAND: Tan with light brownish gray; damp; loose; layered with iron-oxide staining, (1/4" thick).
480						13.5-15	CLAYEY SILT: Tan with light brownish gray; damp; medium dense; non-plastic.
	15			100		15-19	SAND: Tan with gray clay stringers; damp; loose.
475							
						19-20	SAND: Light tan; saturated; loose.
	20						

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

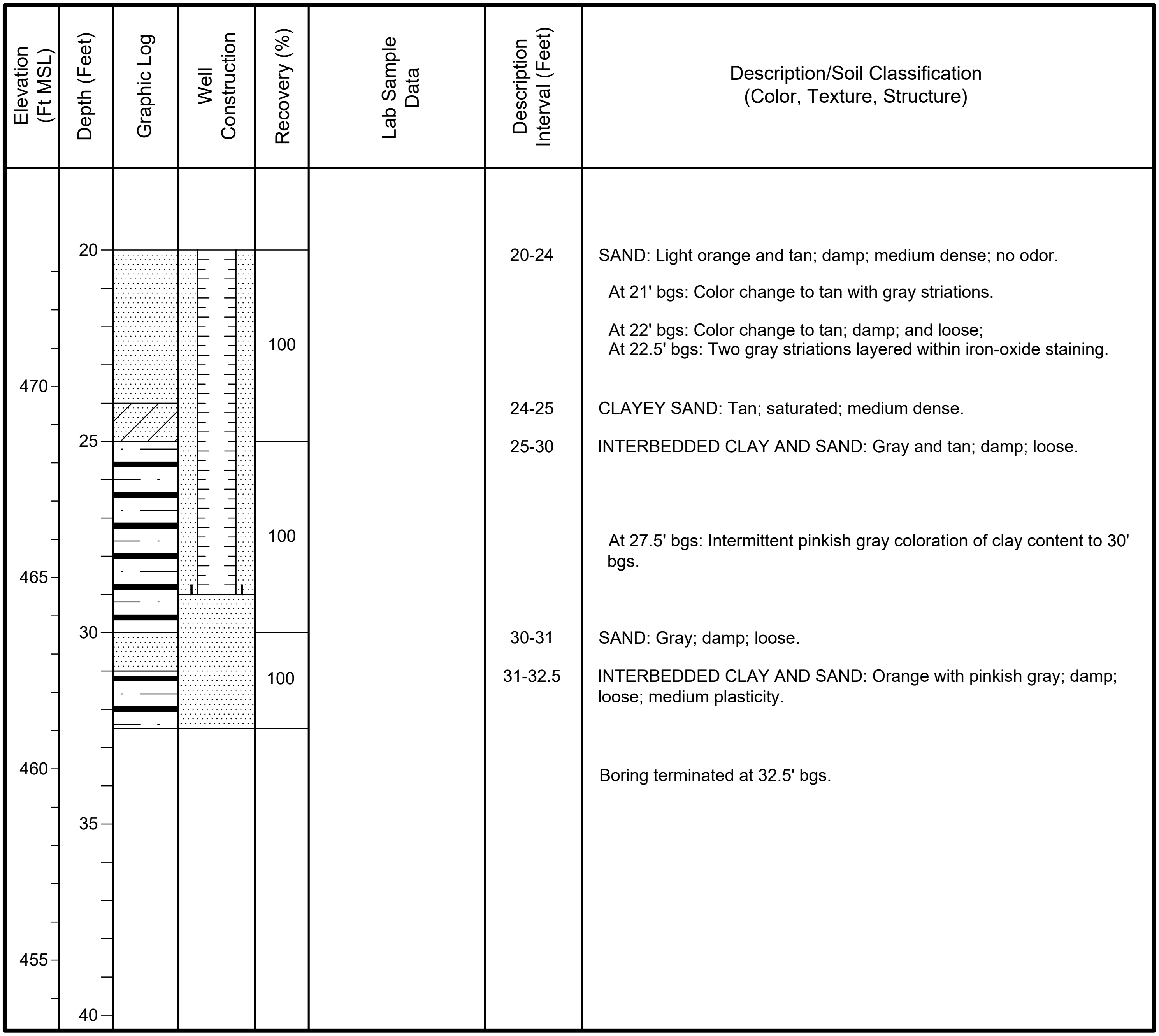
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 19.00 ' Sump Length 0 '
Top of Casing Elevation 493.15 ' Stickup -0.41'
Depth to Water: 1. Ft. btoc 7.30 (2016-05-21) 2. Ft. ( )

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.



Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
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.
24-25	CLAYEY SAND: Tan; saturated; medium dense.
25-30	INTERBEDDED CLAY AND SAND: Gray and tan; damp; loose. At 27.5' bgs: Intermittent pinkish gray coloration of clay content to 30' bgs.
30-31	SAND: Gray; damp; loose.
31-32.5	INTERBEDDED CLAY AND SAND: Orange with pinkish gray; damp; loose; medium plasticity.
	Boring terminated at 32.5' bgs.

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

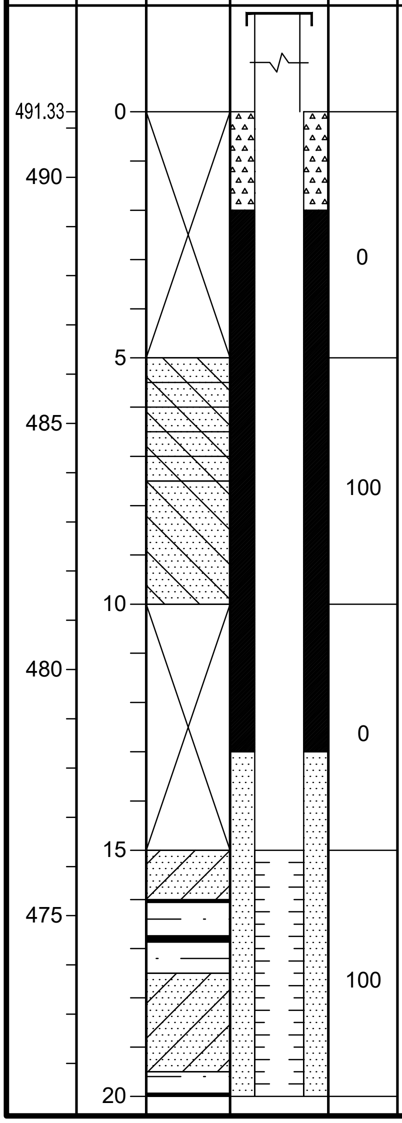
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Sump Length 0 '
Top of Casing Elevation 494.74 ' Stickup 3.41 '
Depth to Water: 1. Ft. btoc 8.50 (2016-05-21) 2. Ft. ____ (____)

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.



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

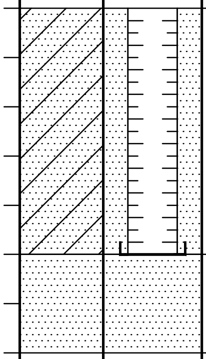
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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-plastic. 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; non-plastic; dry and crumbly with depth. Boring terminated at 27' bgs.
460	30						
455	35						
	40						

Environmental Resources Management

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

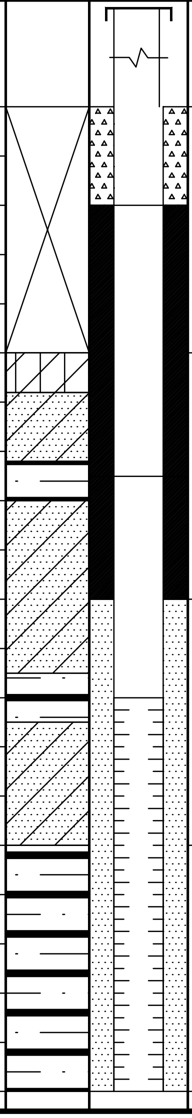
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 12.00 ' Sump Length 0 '
Top of Casing Elevation 496.40 ' Stickup 3.71 '
Depth to Water: 1. Ft. btoc 10.79 (2016-05-21) 2. Ft. ( )

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. CLAYEY SAND: Light brown to tan; damp.
						7.2-8	INTERBEDDED CLAY AND SAND: Gray clay laminations (1" thick).
485				100		8-11.5	CLAYEY SAND: Orangish brown; medium dense; non-plastic.
	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-plastic. Non-cohseive grab sample collected from 13'-14' bgs. At 13.2-14.2' bgs: Saturated.
	15					15-27.5	At 14.9' bgs: Single thin (1" thick) clay layer. INTERBEDDED CLAY AND SAND: Tan fine grained sand and light pinkish gray clay; damp.
475				100			
	20						

ERM Environmental Resources Management

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. ( )

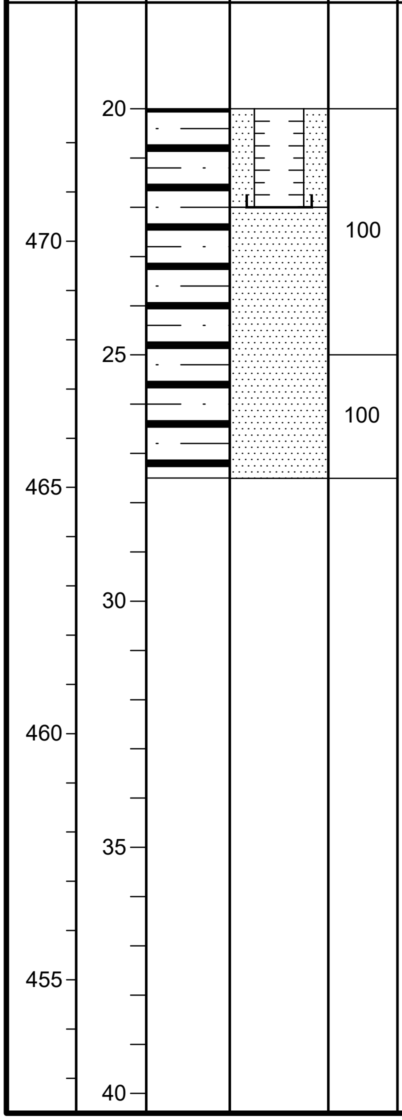
Drilling Company Strata Core Services, LLC Driller Ryan Spaust
Drilling Method Hollow-Stem Auger Log By Andrew Henry

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)



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.

Refusal encountered at 28' bgs.

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. ____ (____)

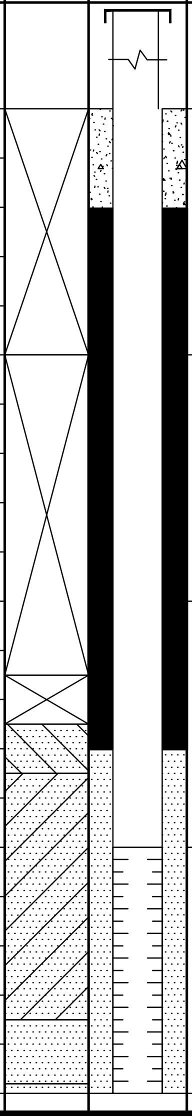
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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)	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
490.13	0	0	No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
485	5	0		5-11.5	NO RECOVERY: Moderately to highly cemented sand.
480	10				
				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.
				13.5-18.5	CLAYEY SAND: Tannish gray with trace iron-oxide staining; damp; loose; non-plastic.
475	15				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).
		100			At 17.5' bgs: White chalky layer (1/2" thick). At 17.5-18.5' bgs: Saturated; tan clayey sand with trace gravel.
				18.5-19.8	SAND: Gray; wet; fine grained.
	20			19.8-20	SAND: Gray; very dense; moderately to highly cemented.

ERM 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

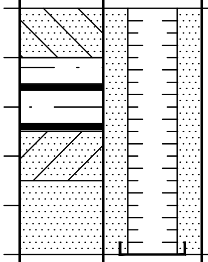
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Sump Length 0 '
Top of Casing Elevation 493.81 ' Stickup 3.68 '
Depth to Water: 1. Ft. btoc 8.36 (2016-05-21) 2. Ft. ( )

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)	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				
	40				

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

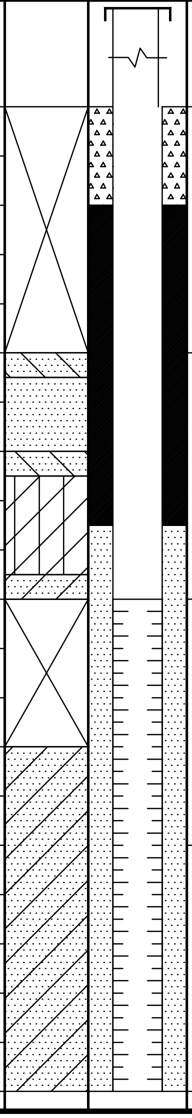
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Sump Length 0 '
Top of Casing Elevation 496.66 ' Stickup 3.59 '
Depth to Water: 1. Ft. btoc 11.20 (2016-05-21) 2. Ft. ( )

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)	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		0			
	5			5-5.5	SANDY CLAY: Reddish gray; damp; stiff; non-plastic. At 5.5' bgs: Gray sandstone piece (>1" thick).
				5.5-7	SAND: Light orangish brown; fine grained; damp; loose. At 6.25' bgs: Color changes to tannish gray with some orangish brown.
				7-7.5	SANDY CLAY: Orange; damp; stiff to very stiff; non-plastic.
485		100	0	7.5-9.5	CLAYEY SILT: Orangish tan; saturated; loose; non-plastic; mixed with some gravel and trace pockets of gray, fine grained sand.
				9.5-10	CLAYEY SILTY SAND: Orangish tan; saturated; loose; non-plastic.
	10			10-13	NO RECOVERY
480		15		13-22.5	CLAYEY SAND: Tan; fine grained; saturated; loose; non-plastic.
	15				At 15' bgs: Small pocket of gray, fine grained, loose sand (1" thick).
					At 16' bgs: Coarse, angular gravel layer (~1-2" thick)
475		50			
	20				

ERM 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

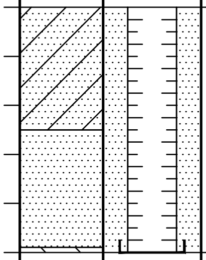
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Sump Length 0 '
Top of Casing Elevation 496.66 ' Stickup 3.59 '
Depth to Water: 1. Ft. btoc 11.20 (2016-05-21) 2. Ft. ( )

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)
	20						At 20' bgs: Course, angular gravel layer (~1-2" thick)
470				50		22.5-24.9	SAND: Brownish gray; fine grained; saturated; trace clay content.
	25					24.9-25	SANDY CLAY: Reddish brown; saturated; very soft. Boring terminated at 25' bgs.
465							
	30						
460							
	35						
455							
	40						

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

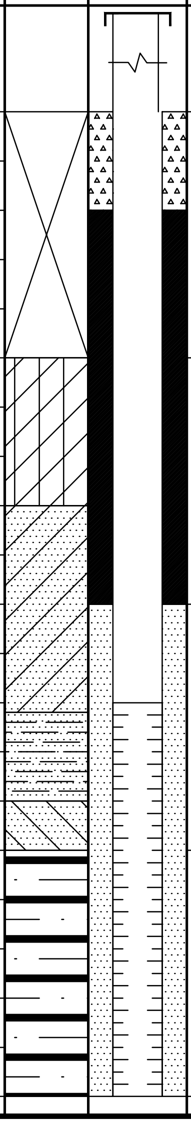
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 12.00 ' Sump Length 0 '
Top of Casing Elevation 506.91 ' Stickup 3.08 '
Depth to Water: 1. Ft. btoc 20.07 (2016-05-21) 2. Ft. ( )

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)	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
503.83	0	0	No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
500					
	5	100		5-8	CLAYEY SILT: Dark brown; damp; loose to medium dense; very slight plasticity; rootlets present.
				8-12.2	CLAYEY SAND: Orangish brown with trace gray and iron-oxide staining; damp; loose to medium dense; slight plasticity; rootlets present.
495					
	10	100			At 10' bgs: Color becomes grayish tan mottled with yellow iron-oxide staining.
				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.
490					
				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.
	15	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.
485					
	20				

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

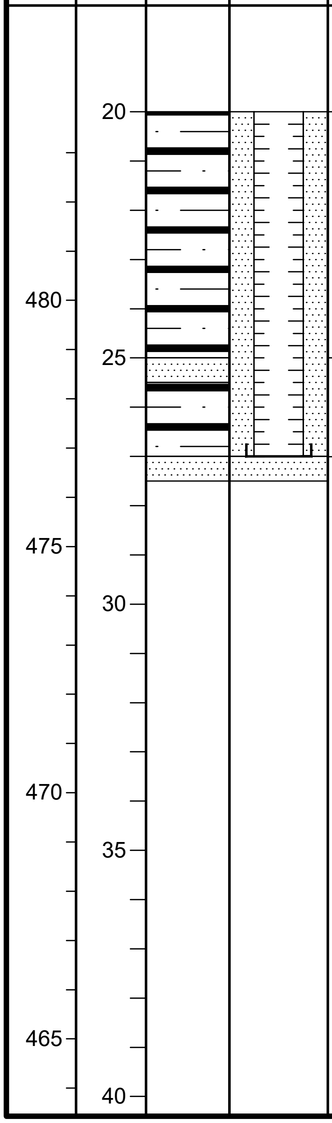
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 12.00 ' Sump Length 0 '
Top of Casing Elevation 506.91 ' Stickup 3.08 '
Depth to Water: 1. Ft. btoc 20.07 (2016-05-21) 2. Ft. ( )

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.



Depth (Feet)	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20-25	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; At 24-25' bgs: Color is brownish gray with redox stippling.
25-27	100		25-25.5	SAND: Gray; fine grained; dry; medium dense; low plasticity. At 25.5' bgs: Very thin (1/8" thick) brownish red coloration.
			25.5-27	INTERBEDDED CLAY AND SAND: Brownish gray clay interbedded with fine grained sand; dense; hard-packed. At 26.6' bgs: Thin, tan, dry, very fine grained, sand.
27-27.5			27-27.5	SAND: Highly cemented; reddish brown nodules present. Refusal encountered at 27.5' bgs.

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. ____ (____)

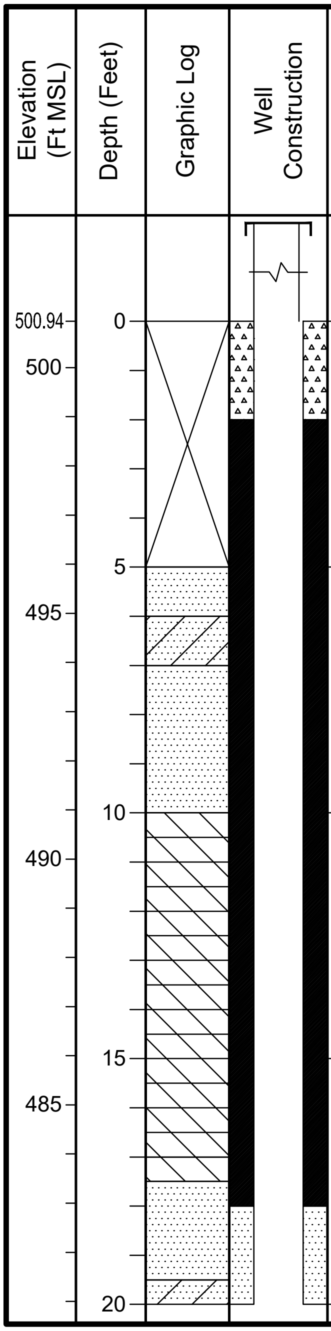
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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.



Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0		0-5	NO RECOVERY: Previously excavated by hydrovac truck.
100		5-6	SAND: Brown; fine grained; moist; very loose.
		6-7	CLAYEY SAND: Grayish brown with red; fine grained; damp; loose; non-plastic.
		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). At 9.8' bgs: Color change to dark gray. At 10' bgs: Hard, sandstone, iron ore piece (>1" thick).
100		10-17	SILTY CLAY: Gray with alternating yellow and orange layers; dry; dense; slight plasticity. At 12.2' bgs: Brown sand seam (3" thick). At 16-16.5' bgs: Brownish tan sandy clay. At 16.5-17' bgs: Gray clay has fractured texture.
100		17-17.5	CLAY: Gray; damp; mixed with coarse grained sand.
		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.

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. ______ (______)

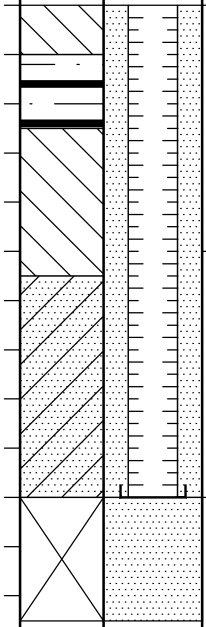
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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)
	20					20-21	CLAY: Gray; dry; stiff; small, tan sandy clay pockets present.
480						21-22.5	INTERBEDDED CLAY AND SAND: Gray and orangish tan; damp; clay is pinkish gray interbedded with thing orange sand layers.
				100		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.
	25						
475				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.
	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.
470							
	35						
465							
	40						

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

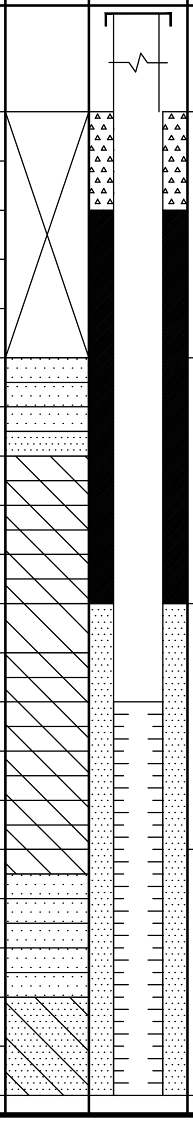
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 12.00 ' Sump Length 0 '
Top of Casing Elevation 496.45 ' Stickup 2.92 '
Depth to Water: 1. Ft. btoc 15.49 (2016-05-21) 2. Ft. ______ (______)

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)
493.53 490	0			0	No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
	5			100		5-6.5	SILTY SAND: Brown; damp; loose.
						6.5-7	SAND: Tan; damp; loose.
485						7-10	SILTY CLAY: Dark brown; damp; soft; slight plasticity. At 9-10' bgs: Decreasing silt content; increasing stiffness; some iron-oxide stained nodules observed.
	10			100		10-11	CLAY: Dark brown; damp; medium stiff; low to medium plasticity.
480						11-15	SILTY CLAY: Dark orangish brown to orangish brown; damp; soft; increasing silt content with depth; increasing gray streaks/fissures with depth.
	15			100		15-15.5	CLAY: Dark brown to brown; damp; medium stiff to stiff; low plasticity.
						15.5-18	SILTY SAND: Tan; saturated; loose. At 16' bgs: Wet; crumbly; trace clay content. At 17.5' bgs: Saturated.
475	20					18-20	SANDY CLAY: Light bluish gray mottled with orange iron-oxide and black staining; moist; medium stiff; slight plasticity.

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

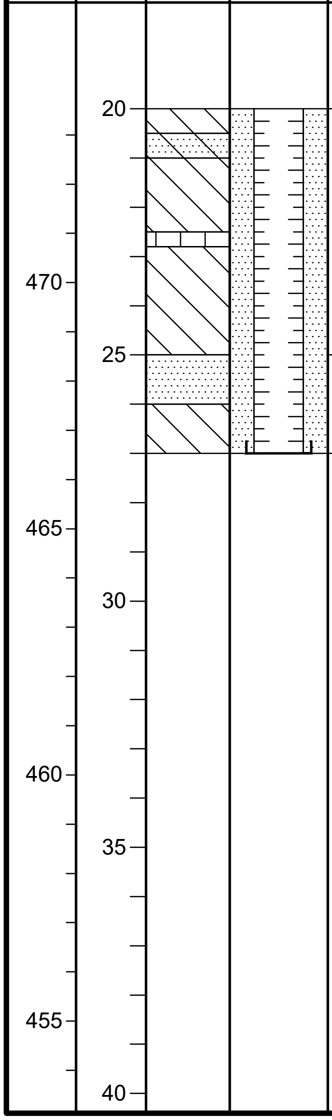
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 12.00 ' Sump Length 0 '
Top of Casing Elevation 496.45 ' Stickup 2.92 '
Depth to Water: 1. Ft. btoc 15.49 (2016-05-21) 2. Ft. ______ (______)

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.



Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
100		20-20.5	CLAY: Brown to light brown; damp; medium stiff to stiff; low plasticity.
		20.5-21	SANDY CLAY: Light gray mottled with orangish iron-oxide staining; moist; medium stiff; slight plasticity.
		21-22.5	CLAY: Dark pinkish gray; moist; soft; layered with very thin orange/iron-oxide stained silty sand.
		22.5-22.8	SILT: Tan; saturated; very loose.
		22.8-25	CLAY: Dark pinkish gray; soft; layered with very thin orange/iron-oxide stained silty sand.
100		25-26	SAND: Gray with orange staining; fine grained; saturated; loose.
		26-27	CLAY: Gray; saturated; very soft; high plasticity.

Boring terminated at 27' bgs.

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

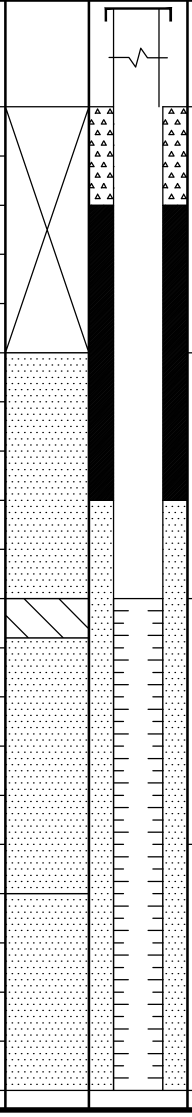
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Sump Length 0 '
Top of Casing Elevation 495.70 ' Stickup 3.02 '
Depth to Water: 1. Ft. btoc 17.40 (2016-05-21) 2. Ft. ____ (____)

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				0			
	5					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.
485				100			At 7.5' bgs: Color change to light gray with trace orange and yellow.
	10					10-10.8	CLAY: Dark gray; moist; soft; slight plasticity.
						10.8-16	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				100			
	15						At 15' bgs: Thin reddish orange stringer. At 15-16' bgs: Moist.
						16-23.5	SAND: Light orange; very fine grained; damp; very dense; unable to collect soil core, soil descriptions based on observation of auger cuttings.
475				0			At 18-23.5' bgs: Color change to pale yellow.
	20						

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

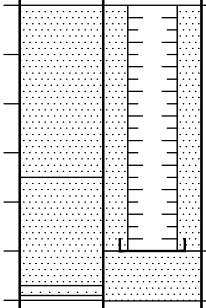
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 10.00 ' Sump Length 0 '
Top of Casing Elevation 495.70 ' Stickup 3.02 '
Depth to Water: 1. Ft. btoc 17.40 (2016-05-21) 2. Ft. ( )

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)
	20						
							At 22' bgs: Moisture content increases to wet.
470				0			
						23.5-25.7	SAND: Tan; fine grained; saturated; loose.
	25						
				100			At 25.5' bgs: Color change to white with brown; medium grained.
						25.7-25.9	SILTY SAND: Dark reddish staining; saturated.
						25.9-26	CLAY-SHALE: Shaley clay; tan; wet; dense; non-plastic. Boring terminated at 26' bgs.
465							
	30						
460							
	35						
455							
	40						

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

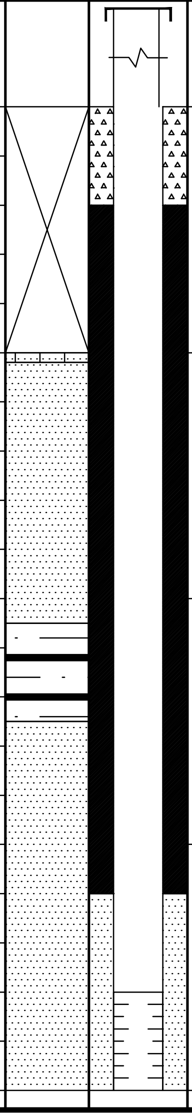
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 18.00 ' Sump Length 0 '
Top of Casing Elevation 505.51 ' Stickup 2.99 '
Depth to Water: 1. Ft. btoc 24.46 (2016-05-21) 2. Ft. ______ (______)

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)
502.52	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated with hydrovac truck.
500				0			
	5					5-5.2 5.2-10.5	SANDY SILT: Dark brown; damp; loose; contains rootlets. SAND: Light tannish orange; damp; fine grained; loose.
495				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. At 10.5' bgs: Pinkish gray clay layer (1" thick).
490				100		12.5-20	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						

ERM 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

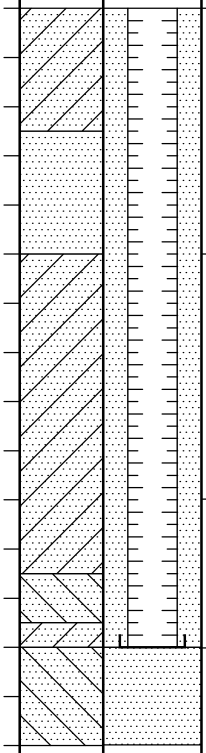
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 18.00 ' Sump Length 0 '
Top of Casing Elevation 505.51 ' Stickup 2.99 '
Depth to Water: 1. Ft. btoc 24.46 (2016-05-21) 2. Ft. ( )

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)
	20					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).
480				100		22.5-25	SAND: Gray with orange, tan, and yellow; fine grained; wet; loose.
	25					25-31.5	CLAYEY SAND: Gray; fine grained; wet to saturated; loose. At 25-25.8' bgs: Saturated.
475				100			At 27.5-28.5' bgs: Saturated.
	30						At 30-31' bgs: Saturated.
				100			At 31-32.5' bgs: Wet.
						31.5-32.5	SANDY CLAY: Pinkish gray; damp; medium dense; non-plastic to plastic; very thin sand stringers throughout (1/10" thick).
470						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						

ERM 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. ( )

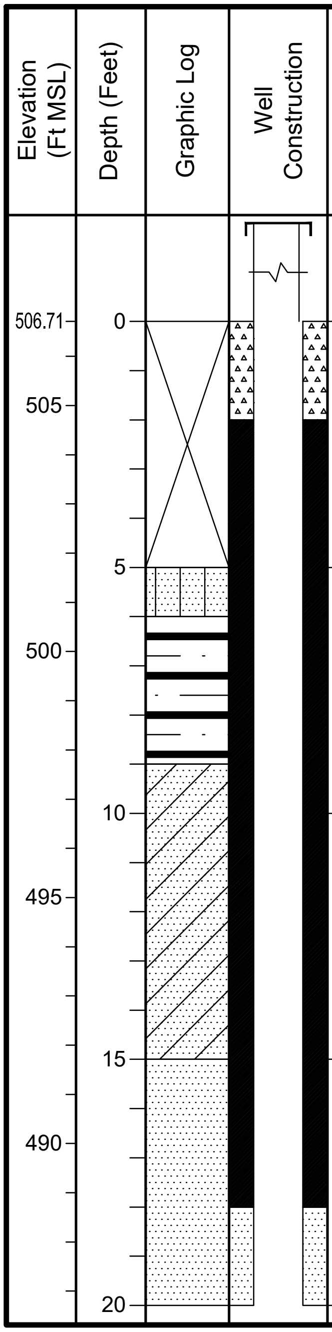
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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.



Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0		0-5	NO RECOVERY: Previously excavated with hydrovac truck.
100		5-6	SANDY SILT: Dark brown; damp; very loose; slight to low plasticity; trace rootlets.
		6-9	INTERBEDDED CLAY AND SAND: Light gray; dry; sand content fine grained, loose; clay content is pinkish gray with slight to low plasticity.
100		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 and non-plastic. At 11' bgs: Color change to white/light gray and tan, clay is darker gray; moisture content decreases to dry; very dense; crumbles easily.
50		15-20	SAND: White; dry; dense but crumbles easily.

ERM 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. ( )

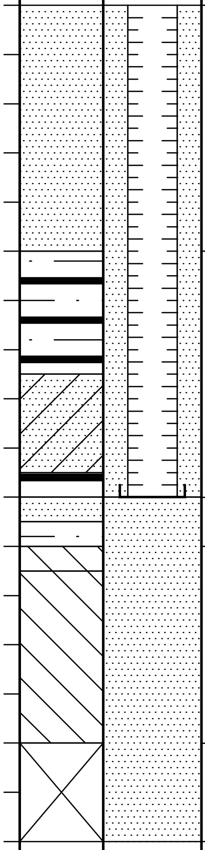
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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)	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.
				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.
				29.5-30	INTERBEDDED CLAY AND SAND: Pinkish gray; damp; medium dense; slight plasticity.
	30			30-30.5	SAND: Gray; fine grained; damp.
				30.5-31	INTERBEDDED CLAY AND SAND: Orange, fine grained, moist sand; gray, low plasticity clay; loose to medium dense.
		0		31-31.5	CLAY: Brown; moist; loose to medium dense; non plastic. At 31.5 bgs: Thin reddish brown nodule layer (1/4" thick).
475				31.5-35	CLAY: Brown; damp; soft; high plasticity; unable to collect soil core; descriptions based on observation of auger cuttings.
470	35	0	JKS-62_35-37 **USCS:** Clayey Sand (SC) **AL:** 38 / 17 / 21 **- #200:** 32.3 **k:** 6.63x10^{-7}	35-37	NO RECOVERY: Cohesive sample (Shelby tube) collected from 35'-37' bgs. Boring terminated at 35' bgs.
	40				

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. ( )

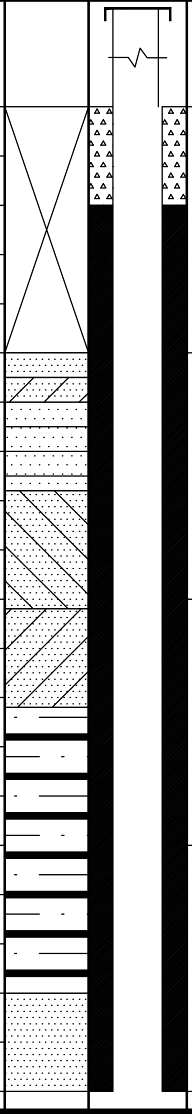
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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

ERM 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. ________ (________)

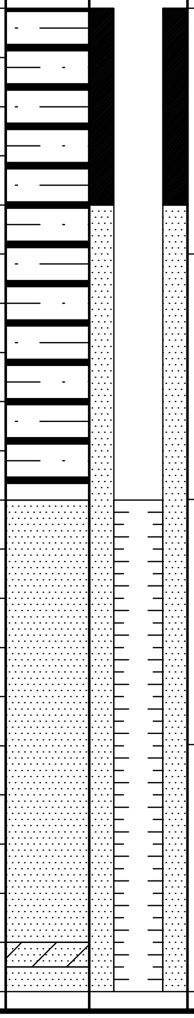
Drilling Company Strata Core Services, LLC Driller Ryan Spaust

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)
	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.
500							
	25			80			
495							
	30			80		30-39	SAND: Gray; dry to saturated; fine-grained; very hard packed; crumbles easily.
							At 32.5' bgs: Medium-grained.
490							
	35			80			
							At 38-39' bgs: Saturated.
485							
						39-39.5	CLAYEY SAND: Dark reddish brown; wet; loose.
						39.5-50	SAND: Gray; wet; fine-grained; loose.
	40						

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

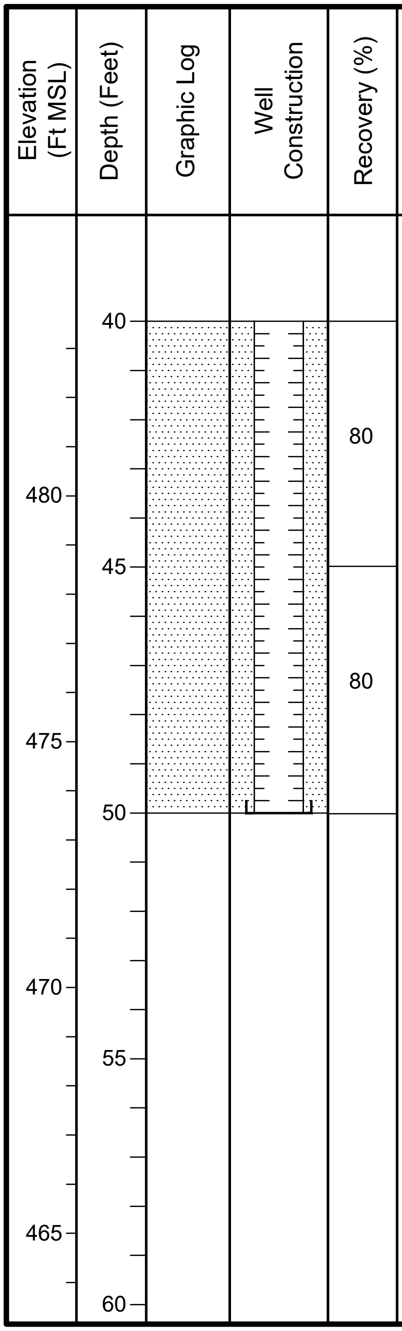
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 20.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 30.00 ' Sump Length 0 '
Top of Casing Elevation 526.86 ' Stickup 3.31 '
Depth to Water: 1. Ft. btoc 44.70 (2016-05-21) 2. Ft. ____ (____)

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.



Lab Sample Data

Description Interval (Feet)

Description/Soil Classification
(Color, Texture, Structure)

At 45' bgs: Moisture content increases to saturated; trace iron-oxide staining.

Boring terminated at 50' bgs.

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

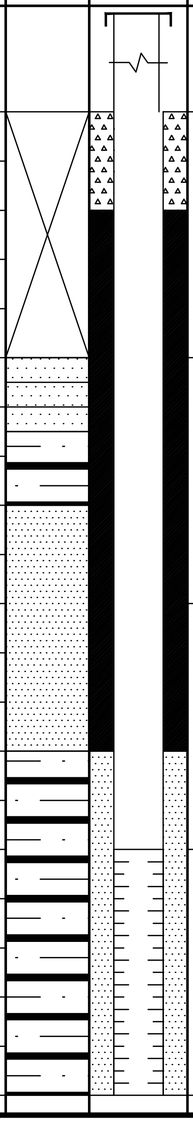
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Sump Length 0 '
Top of Casing Elevation 507.84 ' Stickup 3.46 '
Depth to Water: 1. Ft. btoc 25.06 (2016-05-21) 2. Ft. ( )

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		0-5	NO RECOVERY: Previously excavated with hydrovac truck.
500	5			100		5-6.5	SILTY SAND: Brown; moist; loose.
						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.
						8-13	SAND: Light gray and pale yellow; dry; very fine-grained; dense; very hard-packed; trace clay content; layered appearance.
495	10			100			
						13-22.5	INTERBEDDED CLAY AND SAND: Light gray and pale yellow, fine-grained sand; dark gray, slightly plastic, medium stiff clay.
490	15			100			
							At 17' bgs: Thickness of clay layers increases (1-2" thick); low plasticity.
485	20						

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

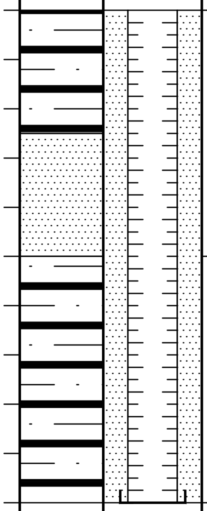
Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
Casing: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Sump Length 0 '
Top of Casing Elevation 507.84 ' Stickup 3.46 '
Depth to Water: 1. Ft. btoc 25.06 (2016-05-21) 2. Ft. ( )

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

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**19.5**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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**

	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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**17.5**	**Clayey sand -light brown**
17.5	**19.5**	**Clayey silty sand - light brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**9.5**
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

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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**29**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Filter Material*	*Size*
Filter Pack Intervals:	**7.5**	**19.5**	**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**

	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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**24**	**Sand - light orange and tan**
24	**29**	**Clayey sand - tan**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**19**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**19**	**29**

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

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**
		Latitude:	**29° 18' 28.4" N**
Well Location:	**12940 US 181 San Antonio, TX 78223**	Longitude:	**098° 19' 01.91" W**
Well County:	**Bexar**	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**

	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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**25**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**15**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**15**	**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) 463-7880

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**
		Longitude:	**098° 19' 01.91" W**
Well County:	**Bexar**	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**	**22**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**22**	**Sand - light orange and tan**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**12**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**12**	**22**

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

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**
		Longitude:	**098° 19' 01.91" W**
Well County:	**Bexar**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

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

	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:	**12**	**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	**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*
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

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**25**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**15**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**15**	**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) 463-7880

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**
		Latitude:	**29° 18' 28.4" N**
Well Location:	**12940 US 181** **San Antonio, TX 78223**	Longitude:	**098° 19' 01.91" W**
Well County:	**Bexar**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

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

	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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**25**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**10**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**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) 463-7880

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**
		Latitude:	**29° 18' 28.4" N**
Well Location:	**12940 US 181** **San Antonio, TX 78223**	Longitude:	**098° 19' 01.91" W**
Well County:	**Bexar**	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**	**27**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**27**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**12**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**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) 463-7880

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**
		Longitude:	**098° 19' 01.91" W**
Well County:	**Bexar**	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**	**30**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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**

	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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**30**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**20**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**20**	**30**

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

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**
		Latitude:	**29° 18' 28.4" N**
Well Location:	**12940 US 181 San Antonio, TX 78223**	Longitude:	**098° 19' 01.91" W**
Well County:	**Bexar**	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**	**27**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**27**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**12**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**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) 463-7880

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**
		Longitude:	**098° 19' 01.91" W**
Well County:	**Bexar**	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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**25**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**10**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**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) 463-7880

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**
		Latitude:	**29° 18' 28.4" N**
Well Location:	**12940 US 181** **San Antonio, TX 78223**	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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**33**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**33**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**18**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**18**	**33**

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

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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**30**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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**

	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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**30**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**20**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**20**	**30**

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

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**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**50**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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**

	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:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**50**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**30**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**30**	**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) 463-7880

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**
		Longitude:	**098° 19' 01.91" W**
Well County:	**Bexar**	Elevation:	**No Data**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

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

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8.25**	**0**	**30**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

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

	Top Depth (ft.)	*Bottom Depth (ft.)*	*Description (number of sacks & material)*
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*
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

Top (ft.)	*Bottom (ft.)*	*Description*
0	**7**	**Clayey silt - orangish brown**
7	**15**	**Clayey silty - gray to brown**
15	**19**	**Sand - tan with gray**
19	**23**	**Sand - light orange and tan**
23	**30**	**Sand - reddish brown**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	*Type*	*Material*	*Sch./Gage*	*Top (ft.)*	*Bottom (ft.)*
2	**Riser**	**New Plastic (PVC)**	**40**	**0**	**15**
2	**Screen**	**New Plastic (PVC)**	**40 10**	**15**	**30**

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

Laboratory Results

Appendix B

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, Texas 78701
(512) 459-4700

HTS, INC.
Consultants

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 (%)	Coeffificent of Permeability, k (cm/sec)	Solids Specific Gravity	Remarks
					LL	PL	PI				
JKS-45	28-30	Fat Clay (CH)	24.3		61	22	39	91.6*			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	120.9	75	26	49	86.4*	1.82^{-08}	2.696	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

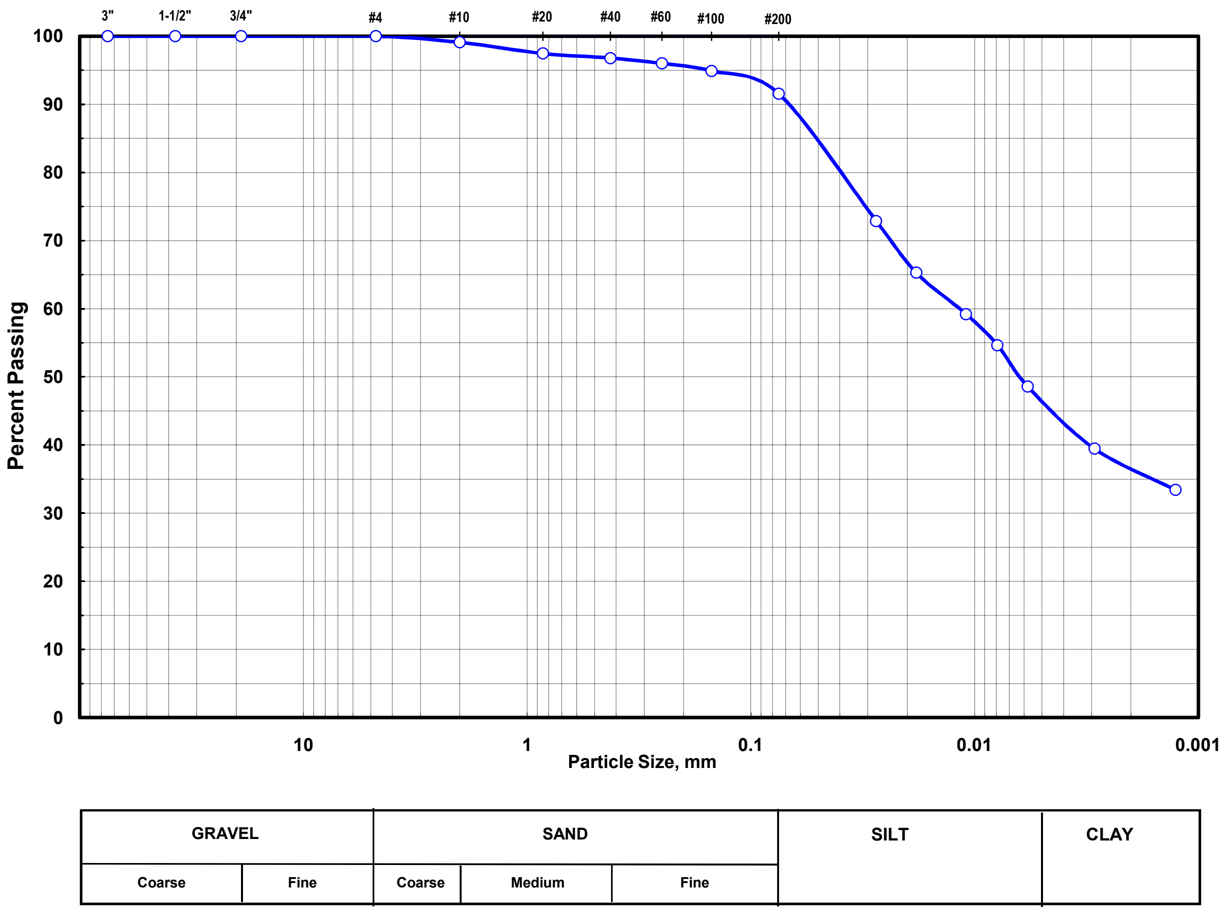
Date	Time	Elapsed Time (sec)	Temp (C)	Pressure Diff. (psi)	Head Rdg (cc)	Tail Rdg (cc)	Head Change (cm)	Tail Change (cm)	Total Head (cm)	Permeability Kt (cm/sec)	Permeability K_{20} (cm/sec)
5/2/2016	9:15a	0	21.9	2.0	2.00	20.00	0.000	0.000	158.76	0.00E+00	0.00E+00
5/2/2016	12:15p	10800	21.9	2.0	2.20	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)



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.
STARTING DRY WEIGHT: **64.63** gms.
(corrected for hygroscopic moisture)

Container ID: F
Container + Soil : 29.35 gms.
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

Particle Size Analysis of Soils (ASTM D-422)

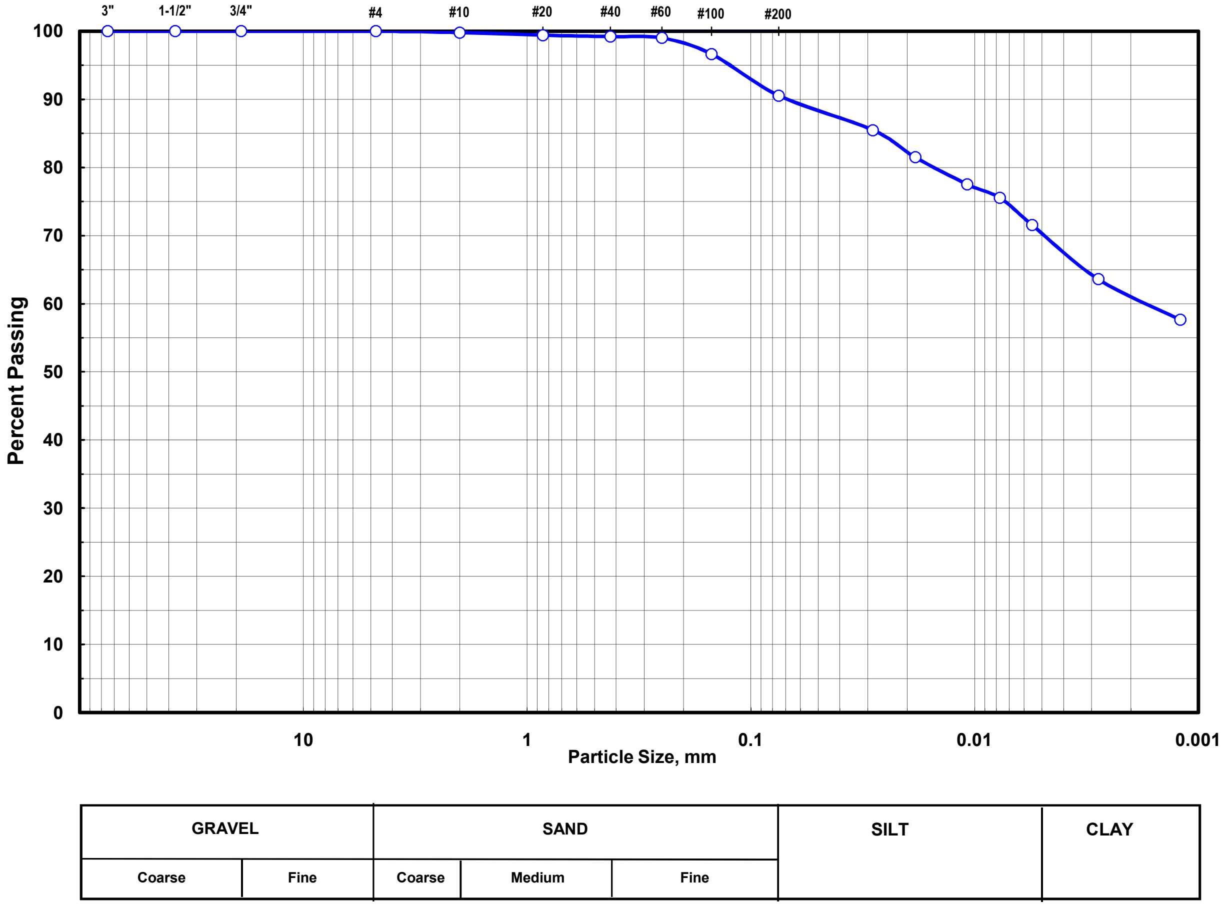
HTS, INC. Consultants

HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE

(ASTM D-422)



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
Container + Soil : 29.35 gms.
Container + Dry Soil : 29.25 gms.
Wt. of Container: 14.32 gms.
Hygroscopic Moisture: **0.67** %

STARTING DRY WEIGHT: **49.71** gms.
(corrected for hygroscopic moisture)

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)

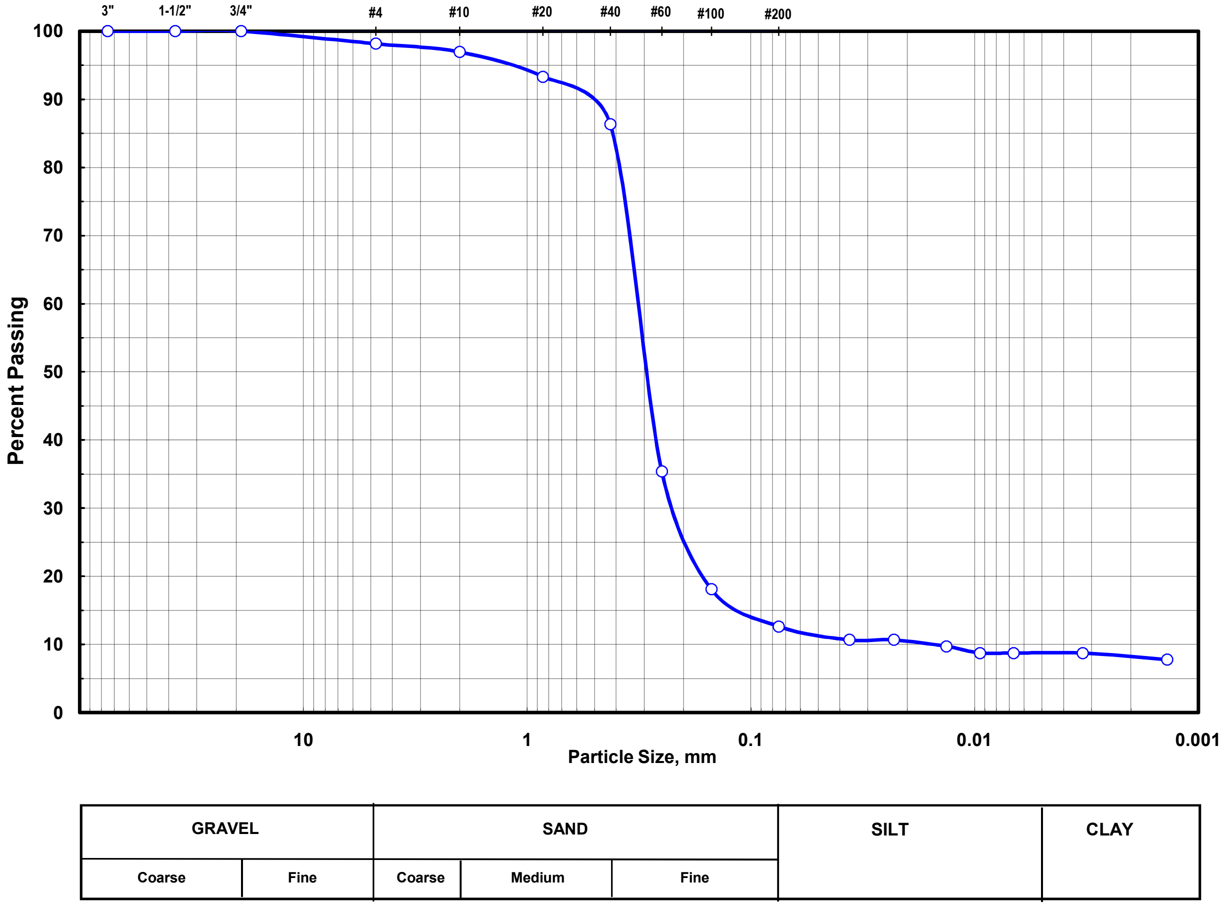
HTS, INC.
Consultants

HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373   Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE

(ASTM D-422)



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

Container + Soil : 29.49 gms.

Container + Dry Soil : 29.47 gms.

Wt. of Container: 14.42 gms.

Hygroscopic Moisture: **0.13** %

STARTING DRY WEIGHT: **99.89** gms.

(corrected for hygroscopic moisture)

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

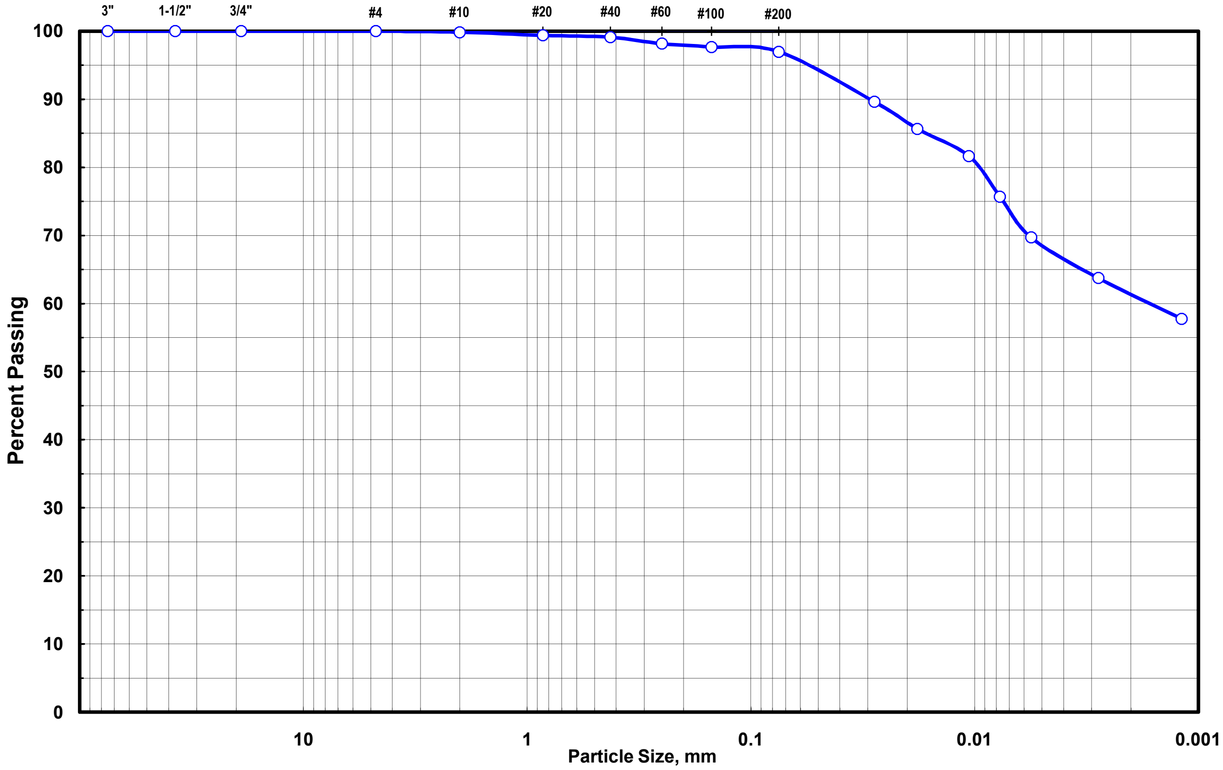
Particle Size Analysis of Soils (ASTM D-422)

HTS, INC. Consultants

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
Container + Soil : 29.20 gms.
Container + Dry Soil : 29.08 gms.
Wt. of Container: 14.19 gms.
Hygroscopic Moisture: 0.81 %

STARTING DRY WEIGHT: 49.62 gms.
(corrected for hygroscopic moisture)

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)

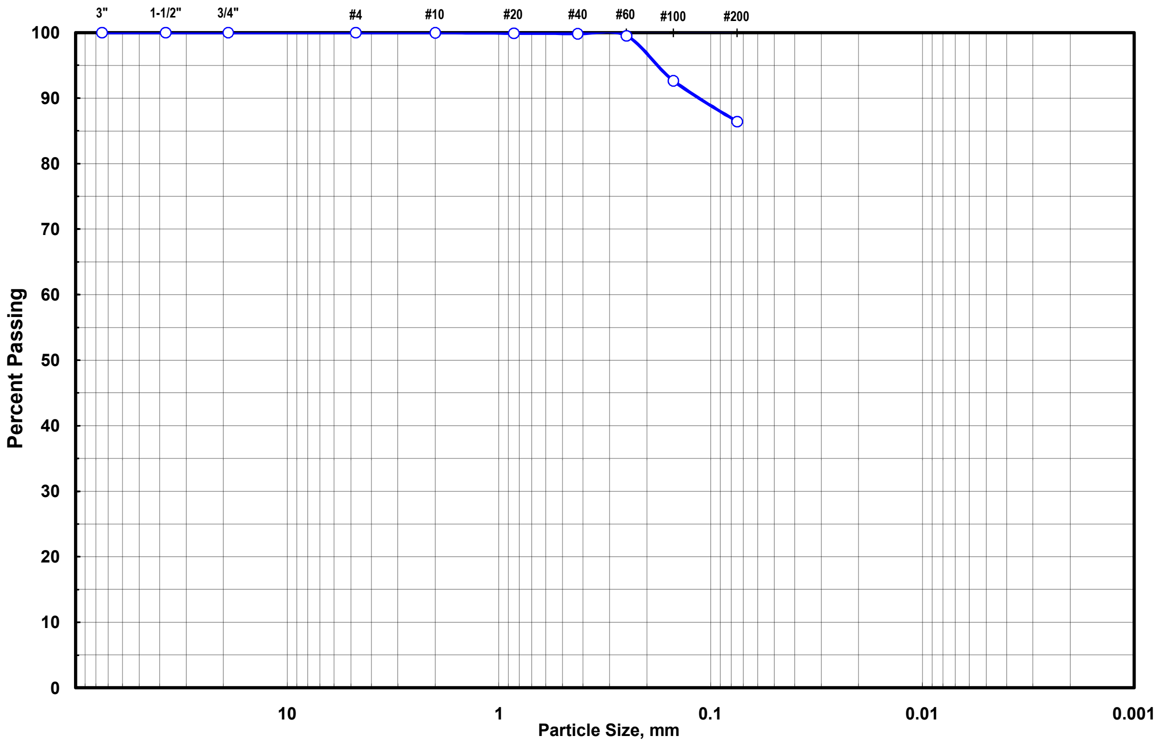
HTS, INC.
Consultants

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

Container + Soil : 527.07 gms.

Container + Dry Soil : 527.07 gms.

Wt. of Container: 365.51 gms.

Hygroscopic Moisture: **0.00** %

STARTING DRY WEIGHT: **220.50** gms.

(corrected for hygroscopic moisture)

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

Particle Size Analysis of Soils (ASTM D-421)

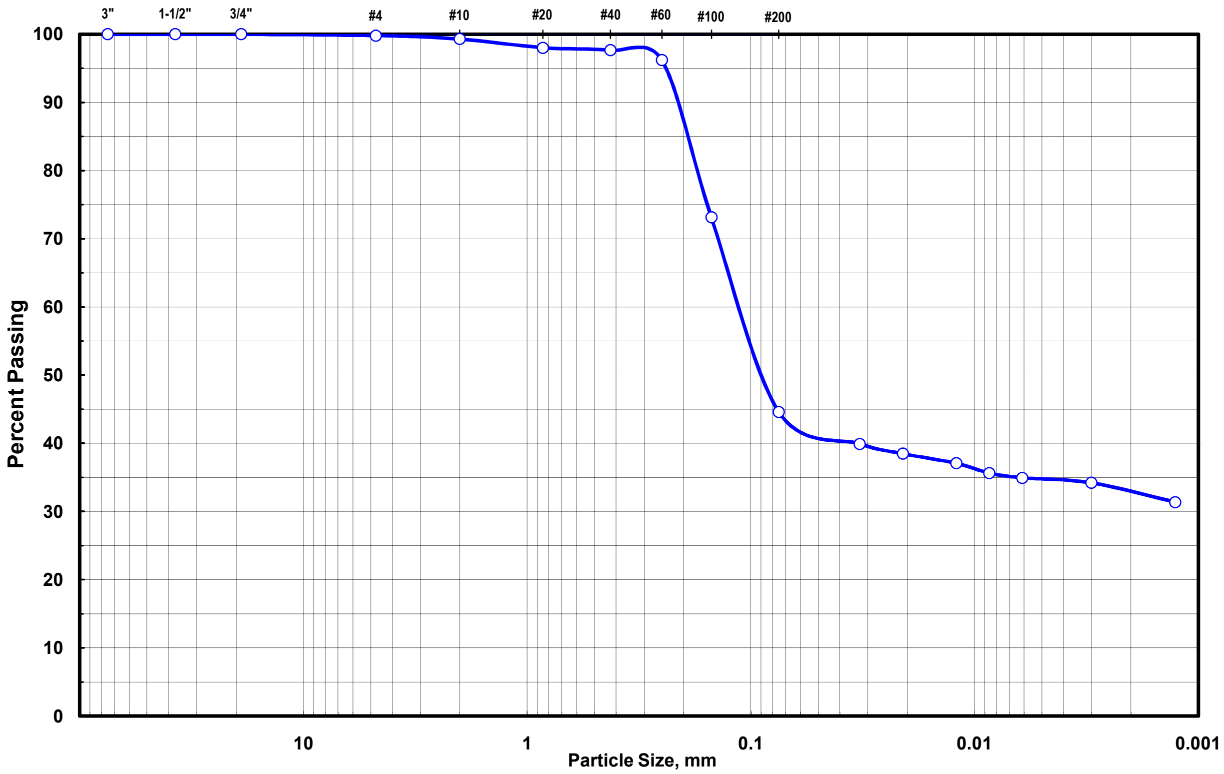
HTS, INC.
Consultants

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

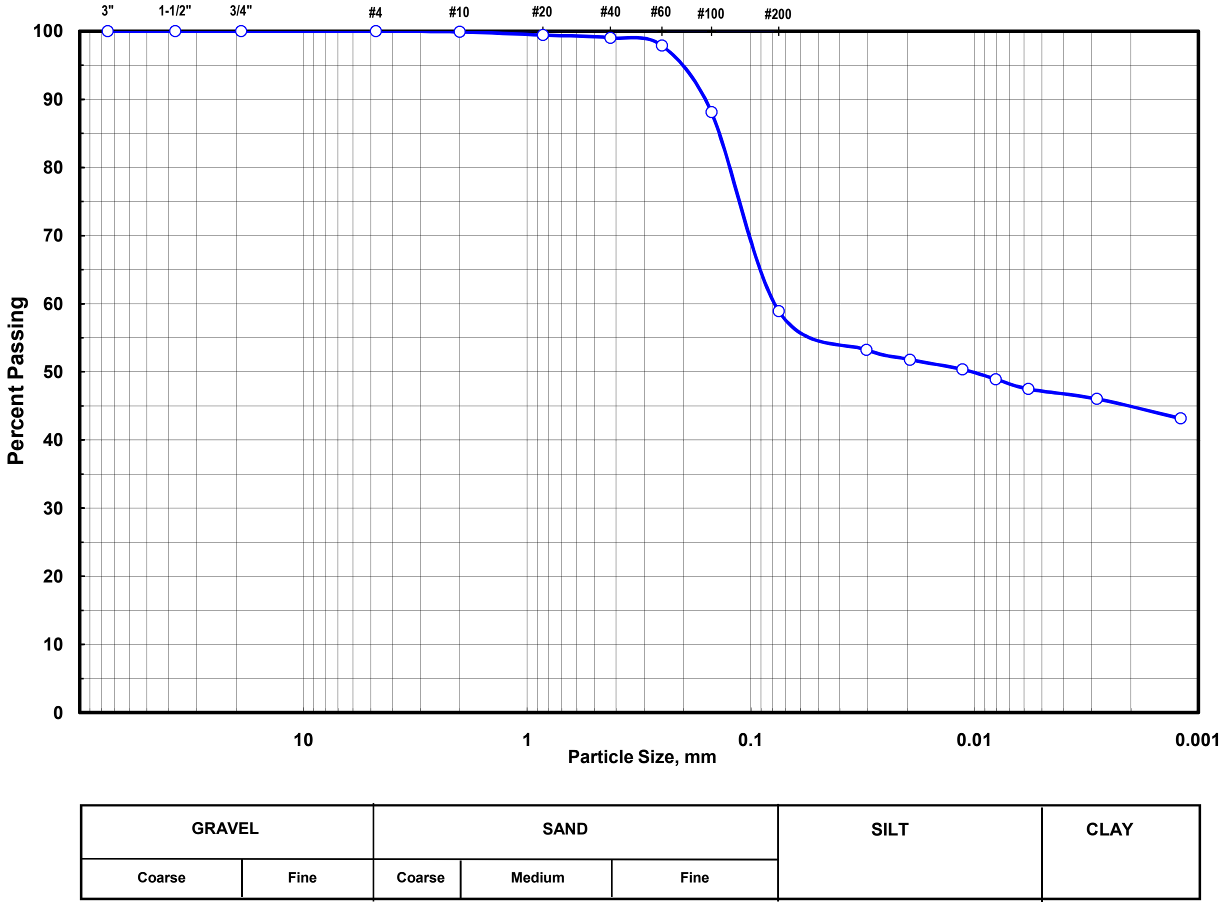
Particle Size Analysis of Soils (ASTM D-422)

HTS, INC.
Consultants

HTS, Inc. Consultants
416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE

(ASTM D-422)



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
Container + Soil : 29.39 gms.
Container + Dry Soil : 29.26 gms.
Wt. of Container: 14.34 gms.
Hygroscopic Moisture: **0.87** %

STARTING DRY WEIGHT: **69.43** gms.
(corrected for hygroscopic moisture)

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

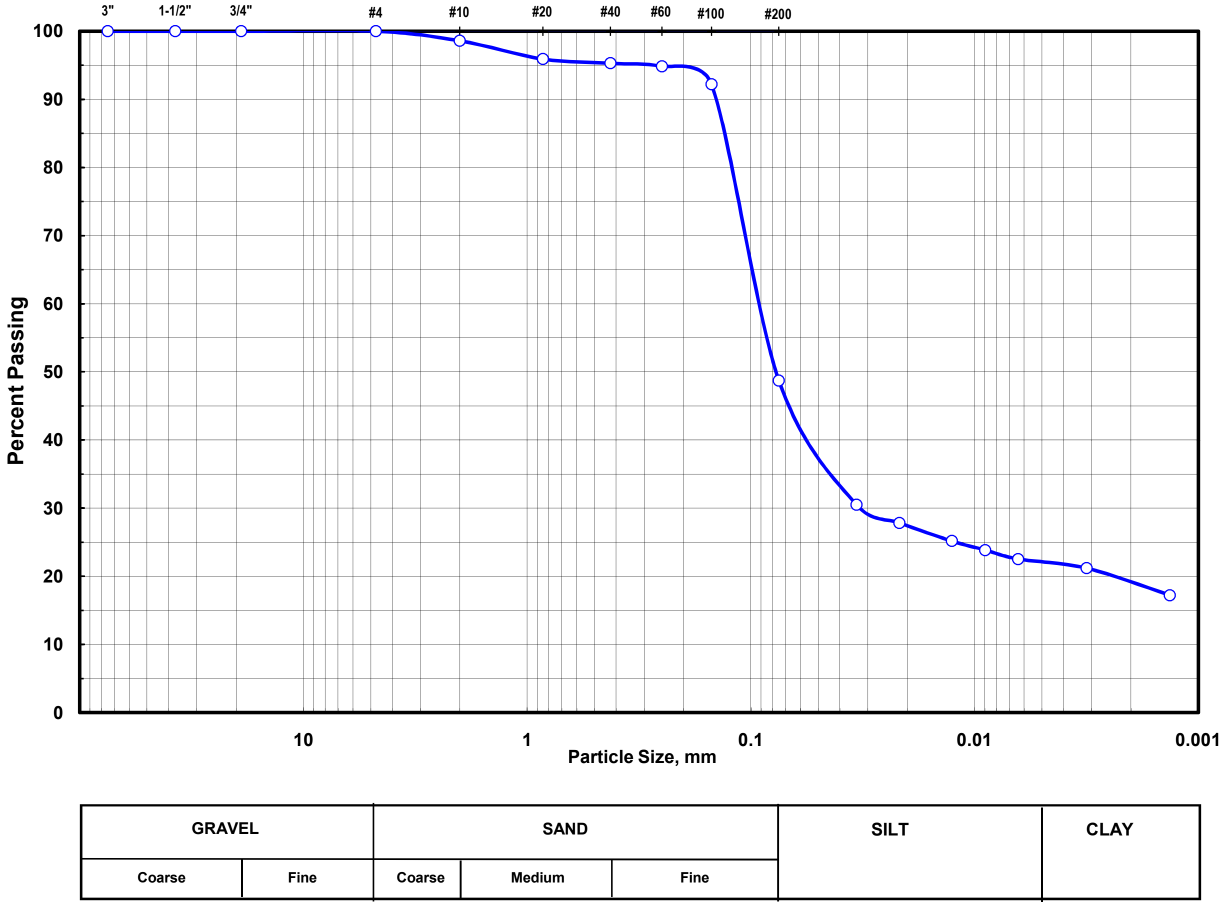
HYDROMETER ANALYSIS CALCULATION.XLS

Particle Size Analysis of Soils (ASTM D-422)

HTS, INC.
Consultants

HTS, Inc. Consultants
416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373   Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE
(ASTM D-422)



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

Container + Soil : 29.36 gms.

Container + Dry Soil : 29.23 gms.

Wt. of Container: 14.32 gms.

Hygroscopic Moisture: **0.87** %

STARTING DRY WEIGHT: **74.37** gms.

(corrected for hygroscopic moisture)

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

Particle Size Analysis of Soils (ASTM D-422)

HTS, INC. Consultants

TABLE 1

LABORATORY TEST SUMMARY

PAGE 1 OF 1

PROJECT: **Phase II - CCR Well Network Installation**
CPS Calaveras Power Station
LOCATION: **San Antonio, Texas**

HTS PROJECT NO.: 16-S-370

CLIENT: **Environmental Resources Management**

ERM PROJECT #: 0366643

Sample ID	Sample Depth (feet)	Type of Material	Moisture Content (%)	Bulk Density (pcf)	Atterberg Limits (%)			-200 Sieve* (%)	Coefficent 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

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

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

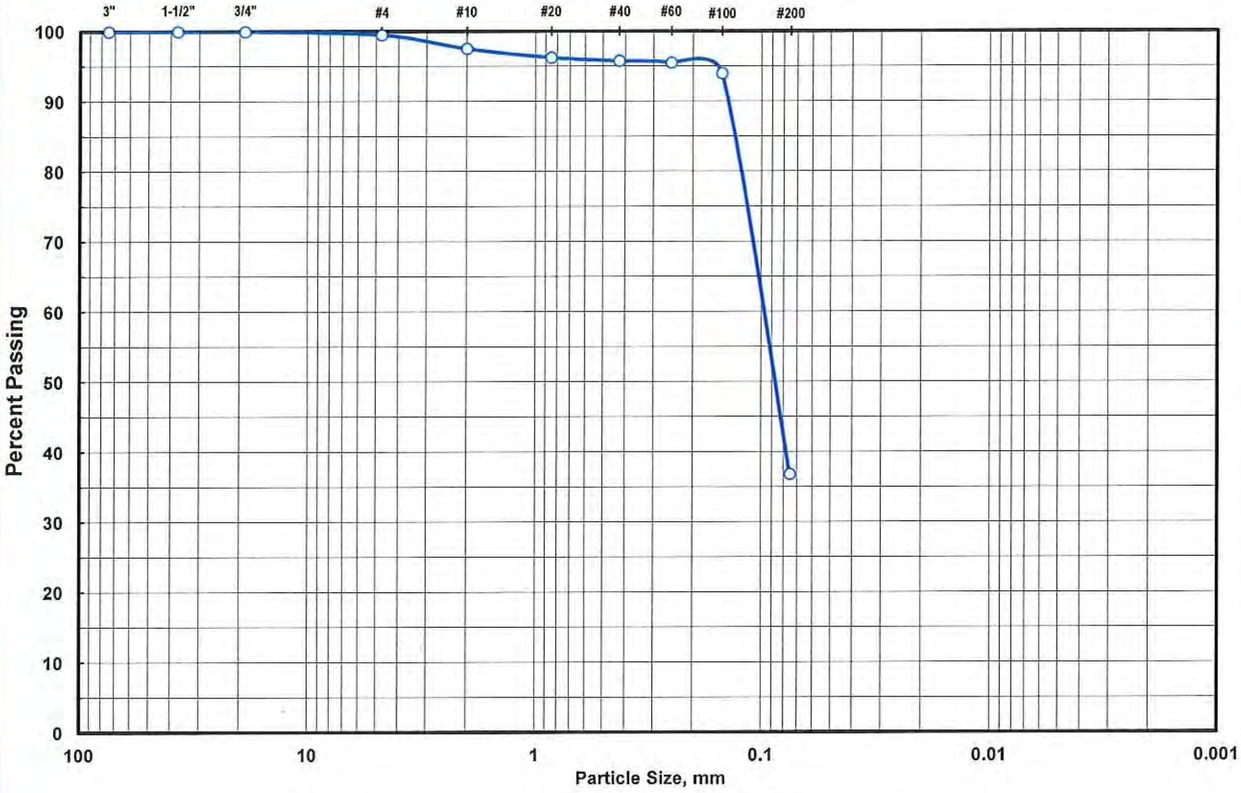
Coefficient of Permeability, k = **6.63E-07** cm/sec

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)



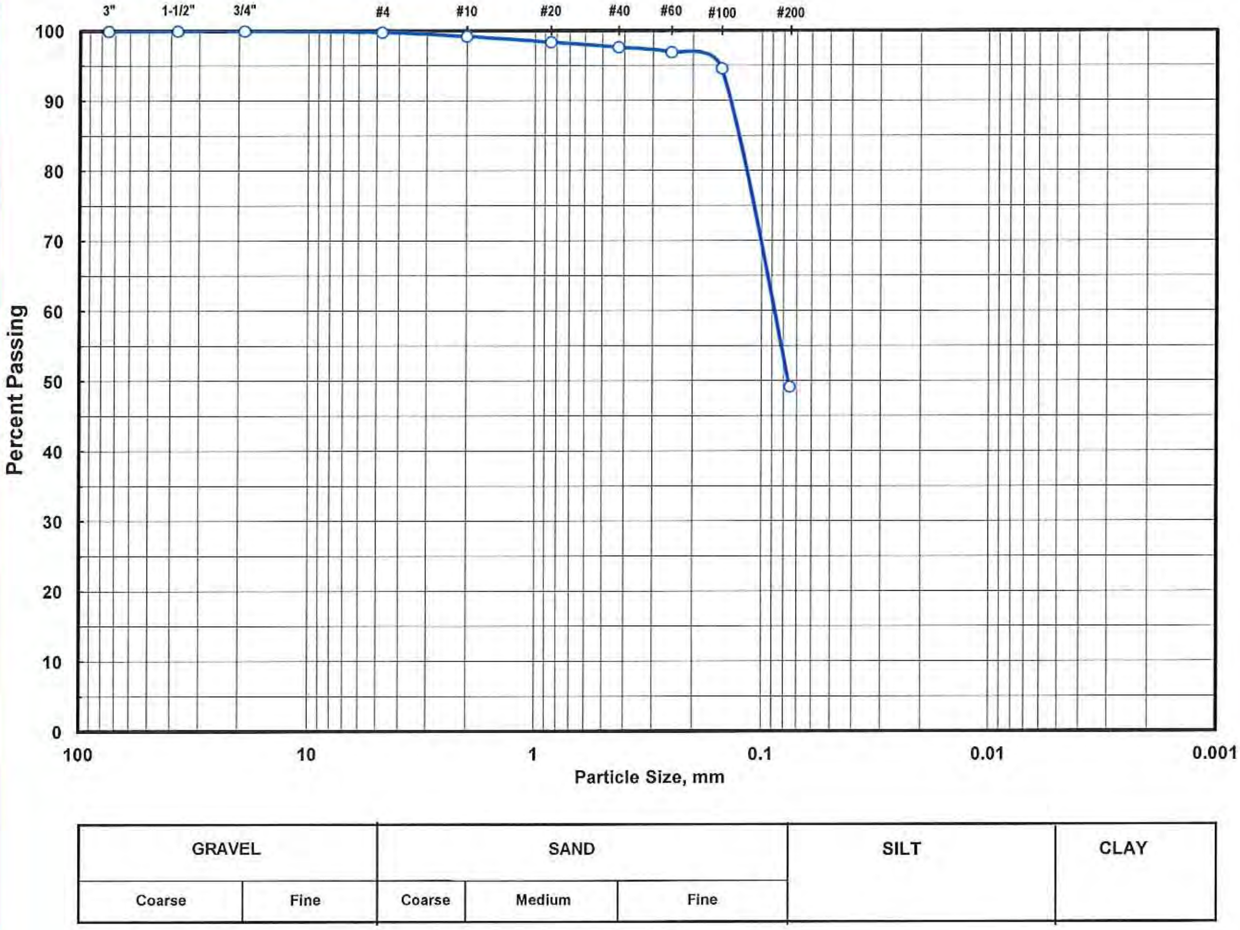
GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

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**		

PARTICLE SIZE DISTRIBUTION CURVE

(ASTM D-421)



ASTM D-2487 SOIL CLASSIFICATION

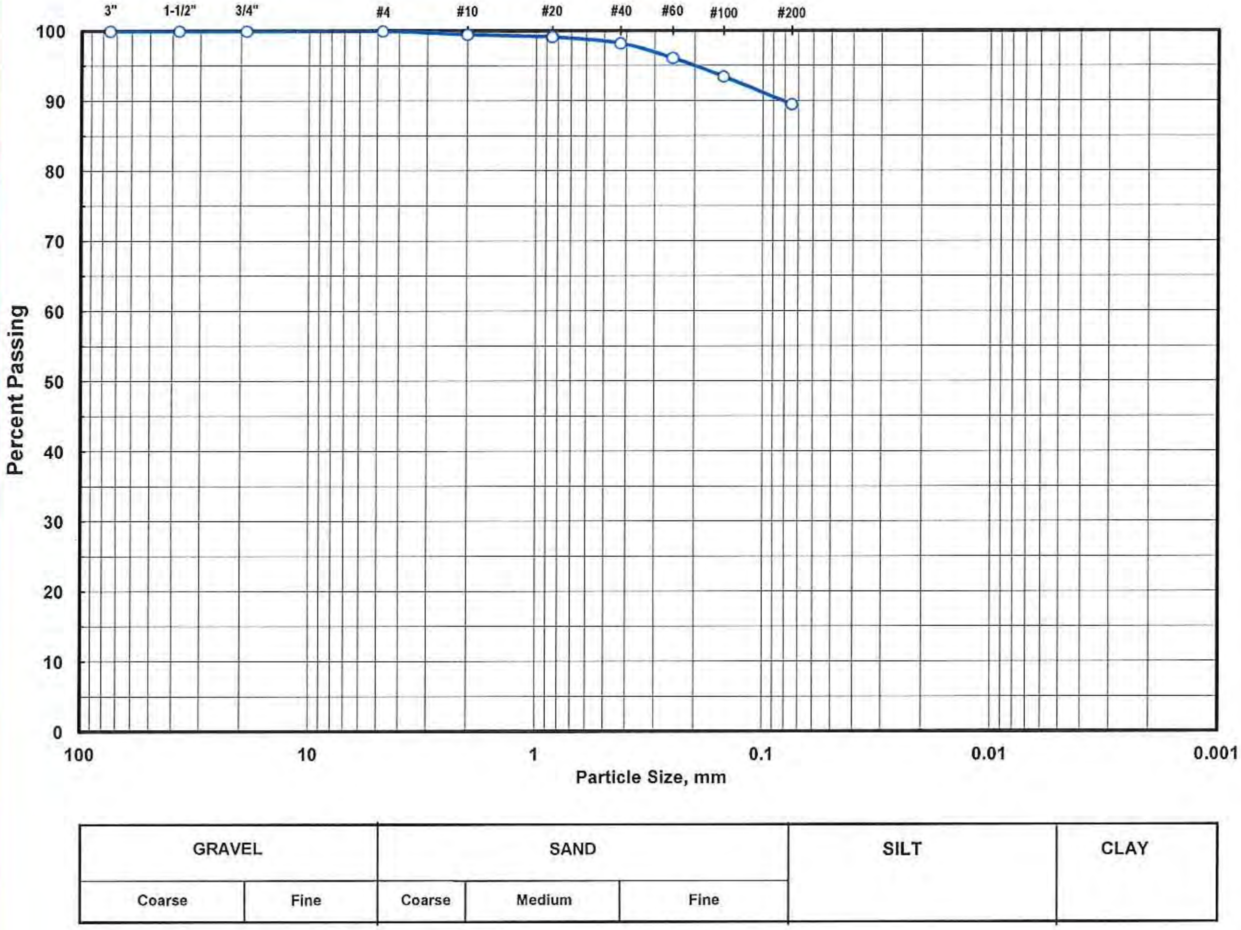
Project:	**Phase II - CCR Well Network Installation, CPS Calaveras Power Station**	Liquid Limit:	**29**	% Pass No. 200:	**49.2**
Client:	**Environmental Resources Management**	Plastic Limit:	**15**	% Moisture:	**23.6**
Project No.:	**16-S-370**	Plasticity Index:	**14**	Test Method:	**ASTM D-421**
Sample 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)



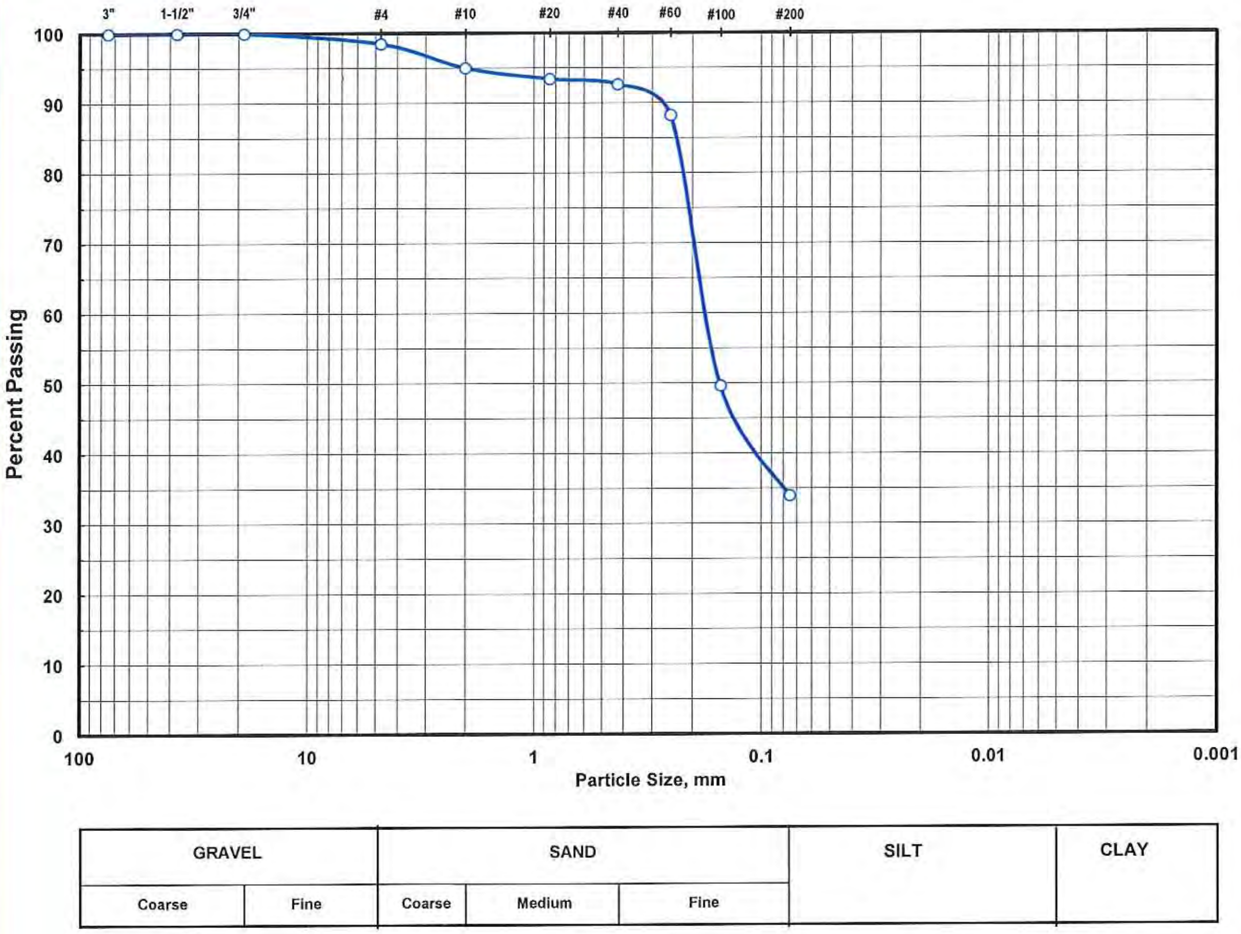
ASTM D-2487 SOIL CLASSIFICATION

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)

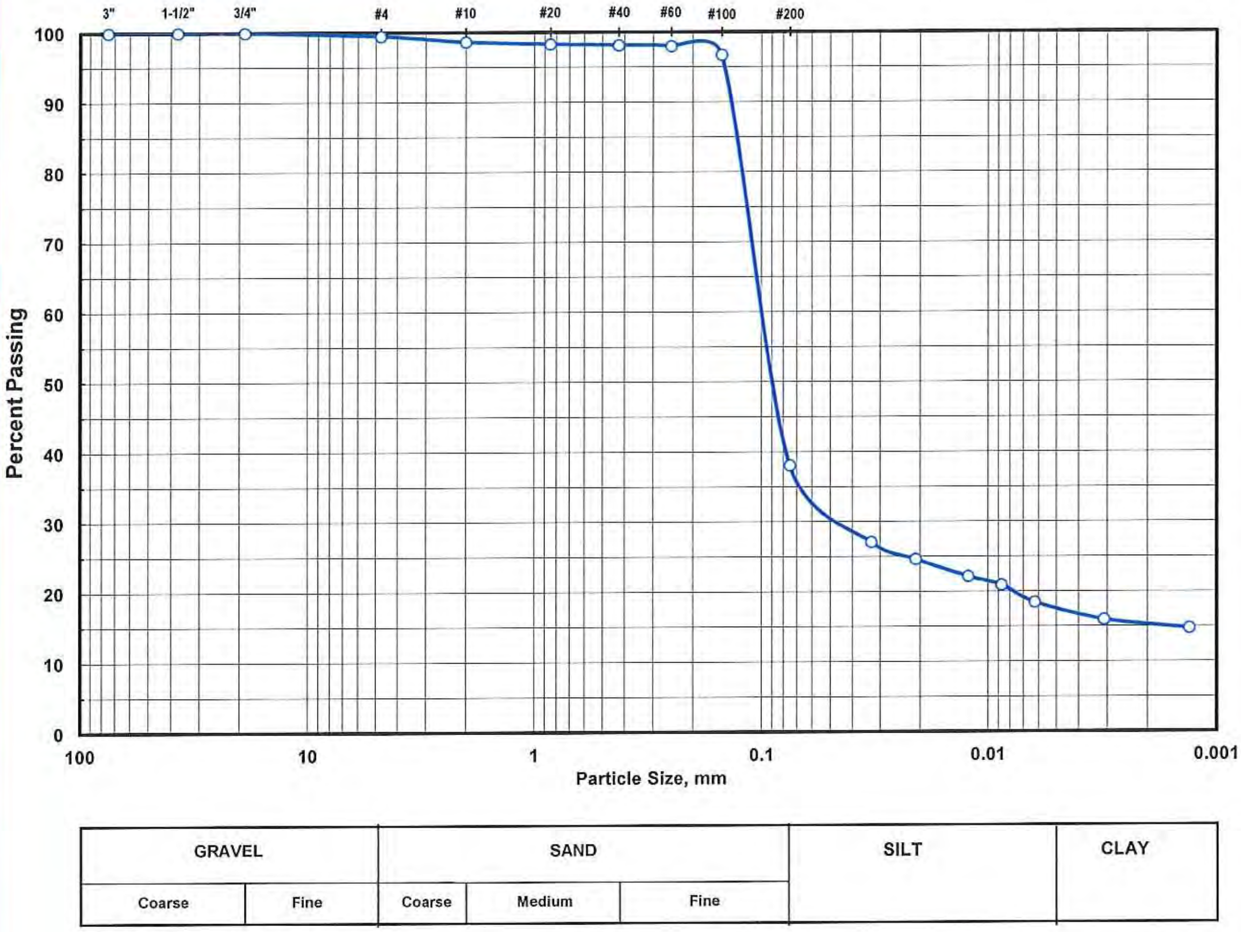


ASTM D-2487 SOIL CLASSIFICATION

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)

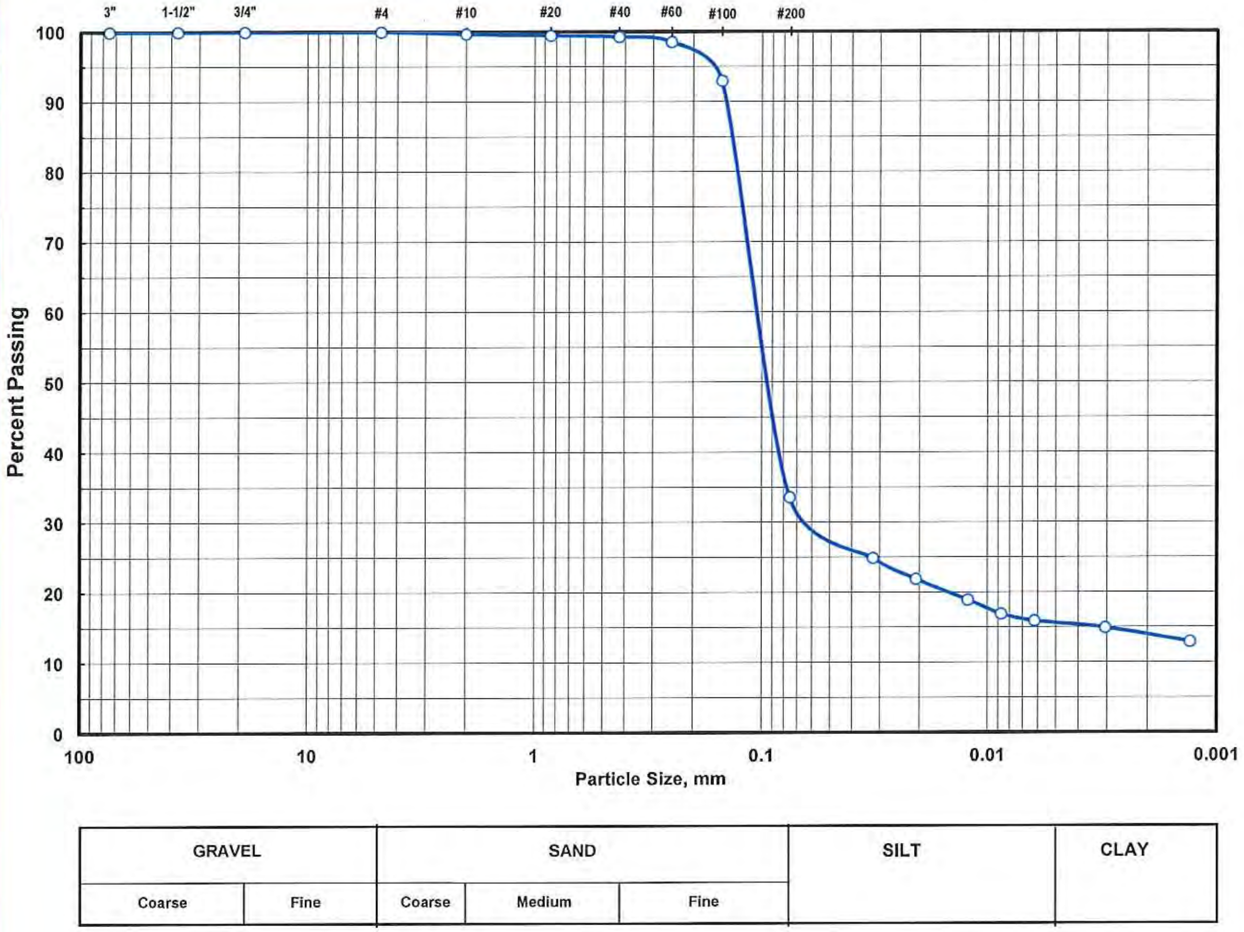


ASTM D-2487 SOIL CLASSIFICATION

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)



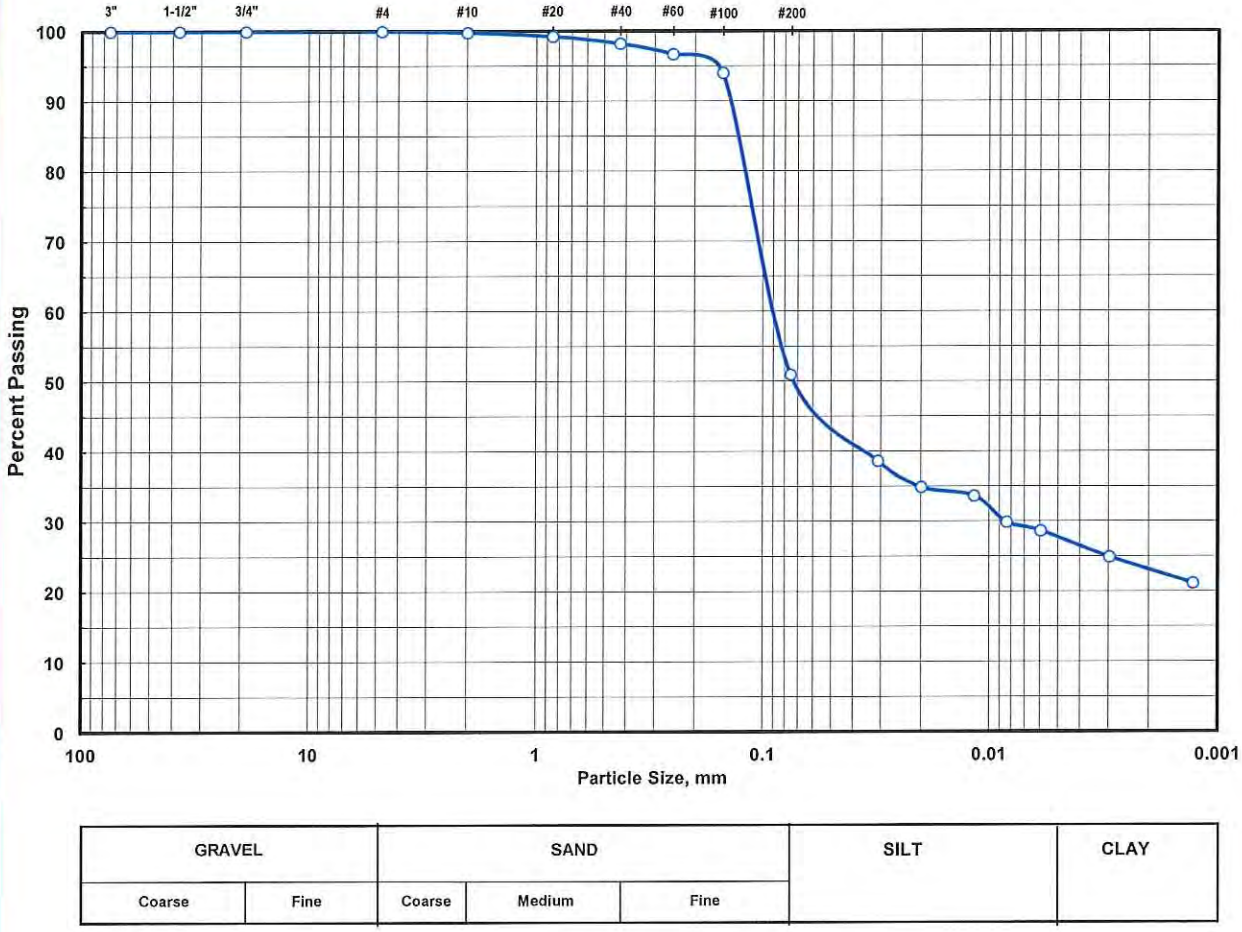
ASTM D-2487 SOIL CLASSIFICATION

Project:	**Phase II - CCR Well Network Installation, CPS Calaveras Power Station**	Liquid Limit:	**22**	% Pass No. 200:	**33.6**
Client:	**Environmental Resources Management**	Plastic Limit:	**15**	% Moisture:	**25.5**
Project No.:	**16-S-370**	Plasticity Index:	**7**	Test Method:	**ASTM D-422**
Sample ID:	**JKS- 54 , Depth = 13' - 14'**	Tested By:	**MC**	Date Tested:	**10/4/2016**
Remarks:		Checked By:	**BHA**		
Description:	**Light brown and tan SILTY CLAYEY SAND (SC-SM)**	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)

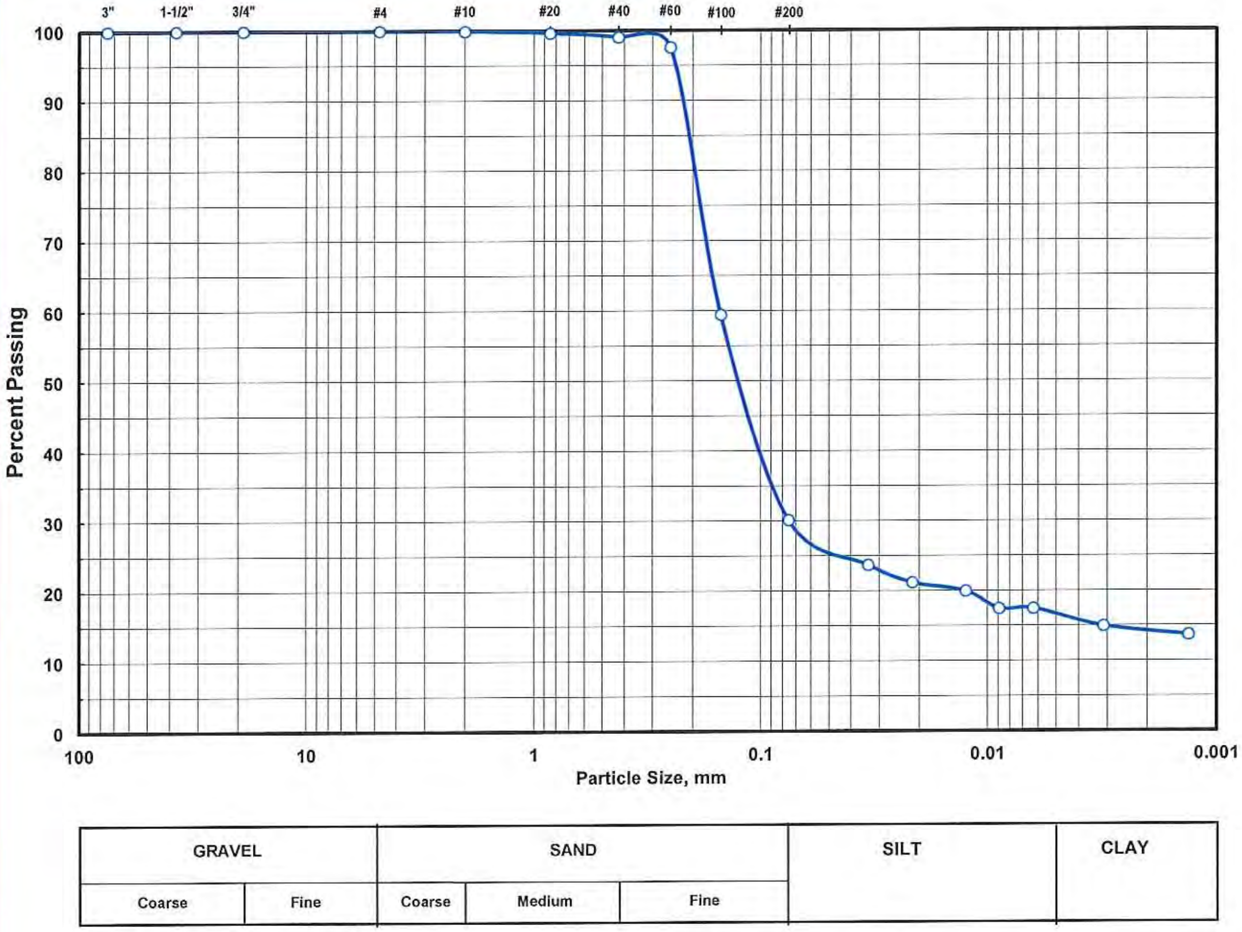


ASTM D-2487 SOIL CLASSIFICATION

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)



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		

Groundwater Monitoring System Certification
Appendix C

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, Texas 78701
(512) 459-4700

GROUNDWATER MONITORING SYSTEM CERTIFICATION
40 CFR §257.91(f)
Calaveras Power Station
San Antonio, Texas
CPS Energy

The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of 40 CFR §257.91.

According to 40 CFR §257.91(a), the groundwater monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that:

1. Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit; and
2. Accurately represent the quality of groundwater passing the waste boundary of the CCR unit.

40 CFR §257.91(b) states that the number, spacing, and depths of groundwater monitoring system must be determined based upon site-specific technical information that must include a characterization of:

(1) Aquifer thickness, groundwater flow rate, groundwater flow direction; and

(2) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer.

CERTIFICATION

I hereby certify that the groundwater monitoring systems for the CCR units located at the Calaveras Power Station have been designed and constructed to meet the requirements of 40 CFR §257.91.

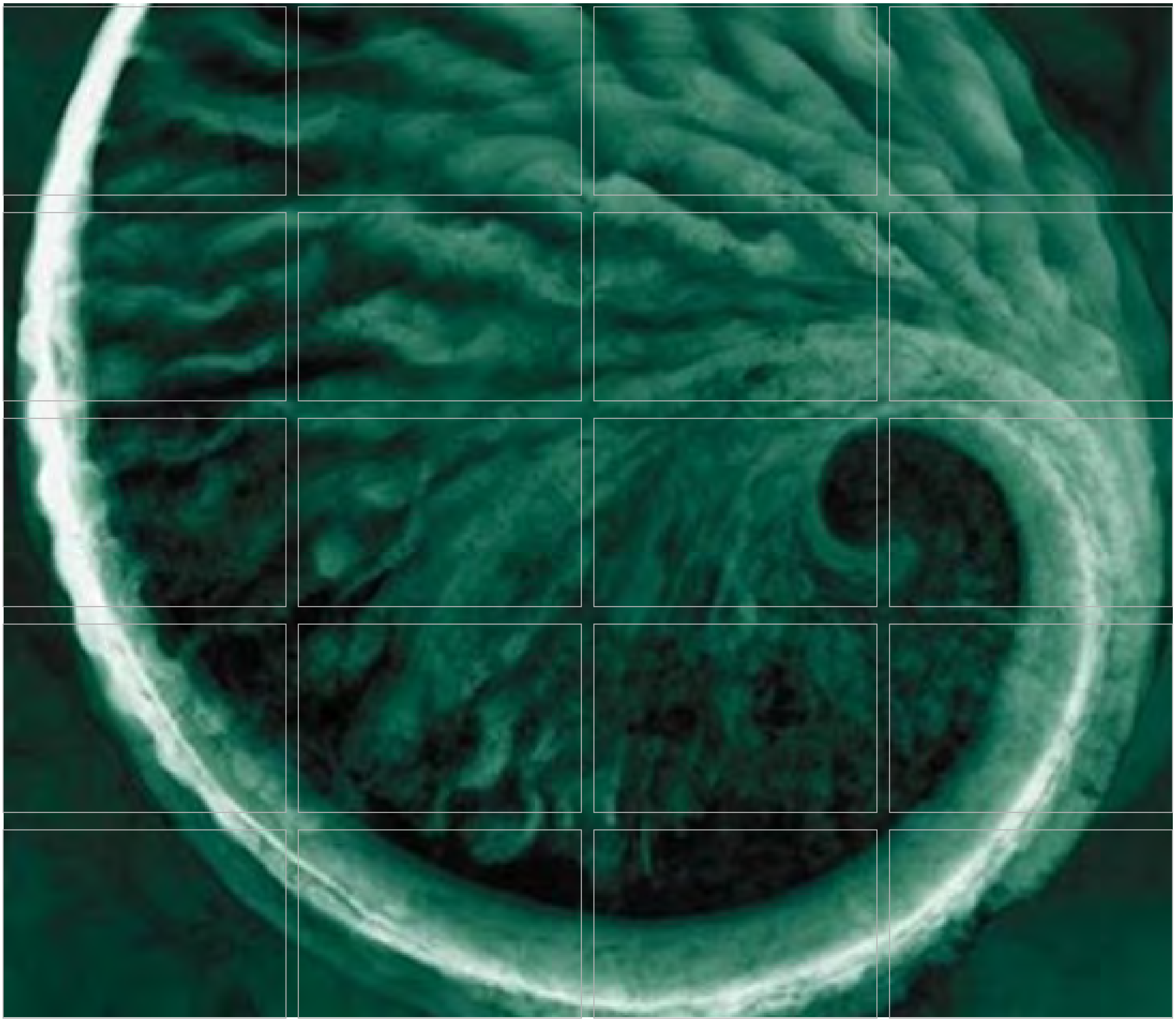
Jeffery L. Bauguss, P.E.

Texas Licensed Professional Engineer No. 86195

JEFFERY L. BAUGUSS
86195

10/16/17

Attachment 18   Groundwater Sampling and Analysis Program



Groundwater Sampling and Analysis Program

CPS Energy
Calaveras Power Station
San Antonio, Texas

October 2017
Updated January 2022

www.erm.com

ERM

The business of sustainability

Calaveras Power Station

Groundwater Sampling and Analysis Program

October 2017
Updated January 2022

Project No. 0337367
San Antonio, Texas

Jeffery L. Bauguss, P.E.
Partner-in-Charge

Walton Zverina

Wally Zverina
Project Manager

Nick Houtchens
Project Consultant

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, TX 78701
T: 512-459-4700
F: 512-597-8368

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

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

List of Forms

List of Tables

List of Figures

APPENDICES

January 2022 Updates only included revisions to:
Form 1, Form 2, Form 3, Table 1, Figure 1, and Appendix B

1.0 INTRODUCTION

CPS Energy owns and operates the Calaveras Power Station which consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) (a.k.a. the CCR Rule). The Power Station is located in unincorporated Bexar County, Texas, approximately 13 miles southeast of San Antonio. Currently, CPS Energy operates five CCR units at the Power Station which are subject to the CCR Rule:

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

This Sampling and Analysis Program (SAP) describes the methods and procedures to be used for conducting groundwater monitoring at the Calaveras Power Station CCR Units. This SAP is subject to periodic revision as circumstances and/or new regulations dictate. Revisions to the SAP must be approved by a qualified professional engineer before placed in effect. The most up-to-date version of the SAP shall be kept in the Operating Records for use by CPS Energy and subcontractor personnel.

For the purposes of this SAP, the SRH Pond and BAPs are termed the Southern CCR Units and the EP and FAL are termed the Northern CCR Units. Even though the SRH Pond and the BAPs are in close proximity, two separate monitor well networks will be used to monitor the groundwater in the vicinity of these two Southern CCR Units. Due to the horizontal distance between the EP and FAL, two separate monitor well networks will be used to monitor groundwater in the vicinity of these two Northern CCR Units.

1.1 OBJECTIVES AND PURPOSE

The objective of the groundwater monitoring program is to provide analytical data for groundwater collected from monitor wells as required by the CCR Rule (40 CFR §257.90-257.98). The SAP describes the procedures and techniques associated with the following:

- Pre-field activities,
- Record keeping and chain-of-custody,
- Well assessment prior to purging,
- Groundwater sampling procedures,
- Decontamination and waste management,
- Sample packing and shipping,

- Analytical procedures, and
- Quality assurance.

The purpose of the sampling protocol described herein is to provide the basis for sampling consistency and scientific credibility in obtaining the desired analyses. Groundwater sampling will be conducted in general accordance with applicable procedures established in the *RCRA Groundwater Monitoring: Technical Enforcement Guidance Document* (*TEGD*) (EPA 530-R-93-001, November 1992 and subsequent updates).

1.2 GROUNDWATER MONITOR WELL NETWORKS

Monitor well networks have been installed for all the CCR Units as required by 40 CFR §257.91. Even though the SRH Pond and the BAPs are in close proximity, two separate monitor well networks will be used to monitor the groundwater in the vicinity of these two Southern CCR Units. Due to the horizontal distance between the EP and FAL, two separate monitor well networks will be used to monitor groundwater in the vicinity of these two units. Each monitor well network includes a sufficient number of wells installed in the uppermost aquifer to represent the quality of background groundwater quality (upgradient of the CCR Units), and a sufficient number of wells downgradient of the CCR Units capable of yielding samples representative of constituents passing the waste boundaries.

The locations of monitor well networks are provided in **Figure 1**. Well function information is provided in **Table 1**.

In addition to groundwater monitor wells that comprise the monitor well networks, there are several wells at the Power Station that will be utilized as water level wells to assess groundwater elevations only.

1.3 SAMPLING FREQUENCY AND MONITORING PROGRAMS

Initial Monitoring Period (Prior to October 17, 2017)
Per the CCR Rule, for existing CCR landfills and surface impoundments, CPS Energy must provide analytical data from a minimum of eight independent samples from each background (upgradient) and downgradient well no later than October 17, 2017. Samples must be analyzed for the constituents listed in Appendix III *(Detection Monitoring Constituents*) and Appendix IV (*Assessment Monitoring Constituents*) of the CCR Rule. Detection Monitoring Constituents and Assessment Monitoring Constituents are identified in **Table 2** and **Table 3**, respectively.

Detection Monitoring
A Detection Monitoring Program must be implemented consistent with 40 CFR §257.94. After the initial monitoring period, at a minimum, the Detection Monitoring Program sampling events will be conducted on a semi-annual basis, for the constituents listed in **Table 2** (Detection Monitoring Constituents). This

sampling is done during the active life of the CCR Units and the post-closure period, if applicable.

Assessment Monitoring
After the initial monitoring period, Assessment Monitoring is required whenever a statistically significant increase over background constituent concentrations has been determined for one or more of the constituents listed in **Table 2** (Detection Monitoring Constituents). Sampling must be conducted within 90 days of triggering an Assessment Monitoring Program for the constituents listed in **Table 3 (**Assessment Monitoring Constituents). Within 90 days of receiving the results, and on a semiannual basis thereafter, all wells must be sampled for the constituents listed in **Table 2** and **Table 3**. Groundwater protection standards must also be established of all constituents detected.

Corrective Actions
If any constituent listed in **Table 3** is detected at a statistically significant concentration exceeding the groundwater protection standard defined in 40 CFR §257.95 (or immediately upon detection of a release from a CCR unit), an assessment of corrective action measures consistent with 40 CFR 257.96 must be undertaken.

1.4 STATISTICAL METHOD SELECTION

In accordance with 40 CFR §257.93(f), an appropriate statistical method must be selected to evaluate analytical results. Potential methods that could be selected to evaluate analytical results are as follows:

1. A parametric analysis of variance followed by multiple comparison procedures to identify statistically-significant evidence of contamination (this method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent).
2. An analysis of variance based on ranks followed by multiple comparison procedures to identify statistically-significant evidence of contamination (this method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent).
3. A tolerance or prediction interval (PI) procedure in which an interval for each constituent is established from the distribution of the background data and the level of each constituent in each compliance well is compared to the upper tolerance or upper prediction limit (UPL).
4. A control chart approach that gives control limits for each constituent.
5. Another statistical method that meets the performance standards of 40 CFR §257.93, paragraph (g).

For the evaluation of these CCR units, a PI approach will be used. This approach is consistent with all of the requirements in the CCR Rule and the USEPA Unified Guidance (2009). The PI approach is the most strongly recommended because it allows the analyst to establish an acceptable site-wide false positive rate and provides a retesting strategy to minimize false positive results.

A decision framework was developed to optimize the PI approach and to guide stakeholders through the analytical process and to ensure that all the performance criteria are met. The decision framework is provided as **Figure 2**. The primary components of the decision framework include 1) establishing the background (upgradient) dataset and calculating an UPL for the downgradient dataset.

1) Concentrations measured in background wells are used as a basis for comparison to support decisions related to whether the CCR unit is impacting groundwater. This background dataset will be established after reviewing the statistical assumptions for UPLs including:
    - Statistically independent measurements,
    - Spatial stationarity,
    - Verification of detection rate and data distribution for each data set,
    - Accounting for possible outliers, and
    - Temporal stationarity.
2) Background data are used to construct a concentration limit which is then compared to one or more observations from a compliance point (downgradient) population. The acceptable range of concentrations includes all values greater than the prediction limit. To meet performance criteria, UPLs will be constructed with 95% confidence, a 1-of-2 retesting scheme, and an annual site-wide false positive rate of 0.1.

In the final stage of the approach, the background UPL is compared to each downgradient well concentration. Each sampling event will provide downgradient well concentrations that will be compared to the calculated UPLs. If the most recent downgradient well concentration is below the UPL, the test is complete and no further samples need to be collected. If the most recent concentration exceeds the calculated UPL, then the following options may be executed to determine whether a statistically significant increase has occurred:

- Examination of outside factors influencing the concentrations, and
- Resampling and retesting.

Certification from a qualified professional engineer stating that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR units is provided in **Appendix A**.

2.0 PRE-FIELD ACTIVITIES

At the beginning of each groundwater monitoring event, the necessary field equipment will be obtained. An example equipment list is provided in **Appendix B**.

Sampling personnel (CPS Energy personnel and/or subcontractors) must comply with all safety and health guidelines for the Power Station.

The levels of personal protective equipment (PPE) to be used for work tasks will be selected based on known or anticipated physical hazards, as well as the types, concentrations and exposure routes of contaminants that may be encountered on site. Currently, it is anticipated that work will be initially conducted in Level D PPE. PPE levels will be upgraded or downgraded based on a change in site conditions. Hazards will be reassessed when a significant change in site conditions occurs.

3.0 RECORD KEEPING AND CHAIN-OF-CUSTODY

This section of the SAP provides information on field recording, field instrument calibration, and chain-of-custody procedures.

3.1 FIELD RECORDING

Documentation of activities associated with groundwater monitoring events will be recorded each day in a bound field logbook with hard cover, water resistant paper, and sequentially numbered pages. Documentation will be completed in waterproof, black or blue ink and written errors will be crossed out with a single line, initialed, and dated. The logbooks will remain on-site during use and then will be stored off-site. Entries in the logbook will be chronological and will include, where applicable and appropriate, such information as the following:

- Date and times,
- Locations of particular events,
- Instrument calibrations,
- Weather (temperature and wind direction) and significant changes in climatic conditions that may affect monitoring activities or results, and
- Other information/observations pertinent to the well inspection, well gauging, and sampling event.

Each page of the field logbook will be signed by the person(s) making entries in the logbook.

Three separate field report forms have been developed as an extension to the field logbook. These include the following:

- Monitor Well Inspection Record (**Form 1**),
- Monitor Well Gauging Record (**Form 2**), and
- Monitor Well Sampling Record (**Form 3**).

These forms (or equivalent) may be used for recording water level data, well purging volumes, and sampling data. The field report forms or logbook may include, but not be limited to the following:

- Names of members of the gauging or sampling team,
- Date and time,
- Specific activity being performed,
- Well identification,
- Sample identification number,
- Sample volume,
- Sampling method,

- Preservative type,
- Analyses to be performed, and
- Measured field water quality parameters and readings (when applicable).

3.2 FIELD INSTRUMENT CALIBRATION

The following meters/probes will be used to analyze groundwater samples in the field:

- Temperature and pH,
- Specific conductance (SC),
- Oxidation-reduction potential (ORP),
- Dissolved oxygen (DO), and
- Turbidity.

The quality of data generated by these measurements will be verified through qualitative means, such as regular calibrations, compliance with operating instructions, and decontamination between uses. A calibration procedure establishes the relationship between a known calibration standard and the accuracy of a measurement made by an instrument according to that standard. Calibration indicates absolute physical or electronic calibration and is not to be confused with chemical standardization.

The calibration for field monitoring equipment will be checked in accordance with manufacturer's specifications, but at least daily. Instrument calibration may be checked prior to entering the site or in the field prior to use. The time, date, and location of instrument calibration and verification will be recorded in the field logbook. If an instrument is out of calibration, then the calibration will be performed as needed.

3.3 CHAIN-OF-CUSTODY

Possession of samples will be traceable from the time of sample collection through check-in at the laboratory. Documentation begins immediately following sample collection and proper labeling and is accomplished using a standard chain-of-custody form. This document traces possession of each sample from the time of collection through time of analysis. For the purpose of these procedures, a sample is considered in custody if it is:

- In sampler's physical possession;
- In view, after being in physical possession;
- Locked to prevent tampering, after having been in physical possession; or
- In a secured area, restricted to authorized personnel.

The chain-of-custody form contains the following information:

- Project number, site name, and company address;
- Number of samples;
- Preservatives used for sample collection;
- Sample description (*e.g.*, water, etc.);
- Sample ID number;
- Date and time of sample collection;
- Number of containers for the sample;
- Name of sampler responsible for sample transmittal;
- Signatures of all persons involved in the chain-of-custody;
- Type of analysis requested;
- Requested turnaround time and level of quality control documentation; and
- Pertinent comments about sample or sample conditions.

This information is entered onto the chain-of-custody form. Upon receipt of samples, the analytical laboratory will initiate its own chain-of-custody procedures.

The sampler shall be responsible for properly packaging and dispatching samples to the analytical laboratory (see Section 6.0). When transferring samples, the sampler shall sign and record the date and time on the first *Relinquished By* line on the chain-of-custody form. The person to whom custody is being transferred shall sign on the first *Accepted By* line of the chain-of-custody form, indicating that custody is being accepted by that person for all the samples listed on the sheet. When samples are shipped via courier, the chain-of-custody form is attached to the inside of the shipping container and the shipping container is sealed using tape. For subsequent transfers of custody, the succeeding *Relinquish* and *Receipt* lines are used. To reduce custody records, the number of custodians in the chain-of-custody is minimized.

The following record keeping items will supplement the chain-of-custody form:

- Field Logbook,
- Monitor Well Sampling Record, and
- Sample Receipt Checklist (typically provided by the laboratory).

4.0 WELL ASSESSMENT PRIOR TO PURGING

This section of the SAP provides information about inspecting monitor wells, gauging fluid levels, and weather conditions. To reduce potential cross-contamination during fluid level measurements, one of the following two options are recommended:

1. Activities begin at the upgradient wells and then proceed to downgradient wells, with water that is *potentially affected*; or
2. Each well sampling team carries dedicated well gauging equipment (one set for *potentially affected* wells and one set for non-affected wells). The determination as to which equipment is used at a particular well should be based on historical data.

As required, PPE will be worn at all times during the performance of the described procedures.

4.1 MONITOR WELL INSPECTION

The sampling team shall perform a visual inspection of each monitor well and record the results in the field logbook or on a Monitor Well Inspection Record (**Form 1**). The inspection of each well will include the following:

- Inspecting the casing and cap for cracks, signs of deterioration, or tampering;
- Verifying the identification information on the well is correct and clearly visible;
- Determining whether the cap and monitor well are secure (via locks, bolted vault covers, in addition to general facility security);
- Inspecting the well pad for cracks, signs of deterioration, erosion, settling, and/or animal and insect burrowing; and
- Where appropriate, inspecting any dedicated equipment for signs of cleanliness, structural integrity, and deterioration.

4.2 WATER LEVEL AND TOTAL DEPTH INFORMATION

The depth to groundwater (DTW) and total depth (TD) in each well will be measured at the beginning of each sampling event before undertaking any purging or sampling activities and will be recorded in the field log book or on a Monitor Well Gauging Record (**Form 2**). The distance from the designated measuring point at the top-of-casing (TOC) to the water surface will be measured to the nearest 0.01-foot with an electric water level indicator. The designated measuring point is typically a notched "V" cut or black square on the PVC casing. In the event that a measuring point has not been designated, measurements including DTW and TD will be taken from the TOC on the true north side of the well.

Total well depth will be measured by allowing the probe to drop to the bottom of the well and determining the depth where the tape becomes slack. The reading will be recorded to the nearest 0.01-foot. These measurements will be compared with previous measurements and the original well depth to determine if sediment has accumulated within the screened interval, (*i.e.,* "silted in"). Wells which have sediment in the screened interval will be redeveloped.

See Section 9.0 for equipment decontamination procedures, investigation-derived waste (IDW) management, and IDW sampling.

4.3 WEATHER CONDITIONS

Weather conditions at the time of gauging/sampling activities (*e.g.*, precipitation, temperature, wind speed and direction) will be recorded in the field logbook or the Monitor Well Sampling Record (**Form 3**).

5.0 GROUNDWATER SAMPLING PROCEDURES

This section of the SAP provides information about purging and sampling groundwater collected from monitor wells. During the last 10 years, the method of micropurging (*i.e.*, low-flow/minimal drawdown sampling) has gained favored status and acceptability in the regulated community. As a result, micropurging will be the preferred method of sampling for all the monitor wells at the Power Station.

For purging and sampling of groundwater it is recommended that activities begin at the upgradient wells and then proceed to downgradient wells, with water that are *potentially affected*. As required, PPE will be worn at all times during the performance of the described procedures.

5.1 MICROPURGING OF WELLS

To establish a common point of reference, low-flow refers to the flow rate at which water enters the pump intake and is the rate that is imparted to the formation pore water in the immediate vicinity of the well screen. The pump intake should be set:

1. Just above the mid-point of the screened interval if the transmissive zone is thicker than the screened section; or
2. Mid-point of the transmissive interval when the screened section is greater than the thickness of transmissive zone.

Water level drawdown provides the best indication of the stress (drawdown) imparted by a given flow rate for a given hydrogeological situation. Flow rates during low-flow purging will be used to regulate drawdown to less than 0.1 meter (0.3 feet). While these flow rates will typically range between 0.1 to 0.5 liter/minute (L/min), the flow rate for an individual well may vary due to site-specific hydrogeology. For example, sand channel lenses may support flow rates of up to 1 L/min without causing drawdown greater than 0.3 feet. Alternatively, wells that screen clayey, silty layers may not produce groundwater at 0.1 L/min without having drawdown greater than 0.3 feet.

For monitor wells with low water productivity that have drawdown greater than 0.3 feet, there are two possible situations:

- Drawdown is greater than 0.3 feet, but stabilizes at a level above the pump intake; or
- Drawdown continues to occur even at the slowest possible pumping rate (*e.g.,* using a peristaltic pump).

For these situations, the following purging and sampling procedures will be followed and documented on the sampling record.

- If drawdown is greater than 0.3 feet, but stabilizes at a level above the pump intake; record water levels in well and continue to monitor water quality indicator parameters until they stabilize. Collect groundwater sample upon stabilization of water quality indicator parameters.

- If drawdown is greater than 0.3 feet and continues to drop, then pump the well until the water level reaches the bottom of the screened interval. Stop pumping and allow recovery to a minimum of 80% of the original water level before collecting a groundwater sample using the same low flow rate. If the water level drops to the bottom of the screened section before all sample bottles have been filled, allow the well to recovery to a minimum of 80% of the original water level before continuing to fill the remaining sample bottles. If possible, the well should be sampled no more than 24 hours after the completion of purging, regardless of the recovery.

Groundwater samples will be collected from the monitor wells using the following low-flow (micropurge) procedures.

- Wells with DTW measurements less than 29 feet below TOC will be purged and sampled using a non-submersible peristaltic pump. Wells requiring a peristaltic pump for sample collection are listed in **Table 1.** Insert clean disposable polyethylene tubing into the well casing with the intake placed at the appropriate depth discussed above**.** Remember to include enough slack in tubing to allow for drawdown of the water level to the bottom of screen. Silicon tubing will be connected to the polyethylene tubing and threaded through the pumping apparatus on the peristaltic pump.
- Wells with DTW measurements greater than 29 feet below TOC will be purged and sampled using a submersible pump. Wells requiring a submersible pump for sample collection are listed in **Table 1.** The submersible pump should be fitted with clean disposable polyethylene tubing and the tubing inserted into the well with the intake placed at the appropriate depth discussed above.
- If dedicated polyethylene and silicon tubing were utilized and left in the monitor well from a previous groundwater sampling event, skip the first two bullets above. Before sampling, check tubing for any damage and replace as necessary using the above mentioned methodology.
- The selected pump will be used to purge groundwater at a low-flow rate, generally less than approximately 0.5 L/min (100-500 milliliter/min).
- The well should be pumped at a sustainable flow rate to allow the lowest drawdown of water level (see above) until water quality parameters stabilize or the water level drops below the bottom of the screened interval.
- Groundwater quality indicator parameters will be monitored during low-flow purging to determine stabilization. **Table 4** summaries the water quality indicator parameters to be monitored and their stability criteria.

Measurements of water quality indicator parameters will be recorded every 3 to 5 minutes until stabilization is achieved. These measurements, along with flow rate and depth to water, will be recorded be recorded in the field log book or on a Monitor Well Sampling Record (**Form 3**). Stabilization is achieved when at least 3 of the 5 parameters have stabilized for three successive readings. If the minimum three water quality indicator parameters do not stabilize within 45 minutes of low-flow purging, a groundwater analytical sample will be collected from the well.

See Section 9.0 for equipment decontamination procedures, IDW management, and IDW sampling.

5.2 SAMPLE COLLECTION

Groundwater will be collected from the well and transferred to the appropriate sampling containers in a manner that reduces the amount of exposure to the ambient environment. The sequence of sample collection will be as follows:

- Metals,
- Water Chemistry (cations, anions, TDS, pH, etc.), and
- Radioactive elements (if required).

All samples will be collected in clean, laboratory-supplied sample containers with the appropriate preservative for the analytical method.

Metals analysis will measure total recoverable metals, which captures both particulate and dissolved fractions. Groundwater samples **will not** be field-filtered prior to analysis. Samples will be collected and analyzed for constituents identified in a given groundwater monitoring program's list of analytes. Analytical parameter classes, container size and type, preservatives, and holding times (before which the analysis must be performed) are listed in **Table 5**. Any required preservatives will be added to the bottles by the laboratory prior to delivery to the sampling personnel.

A sample label will be affixed to each sample container. Complete the label on each sample container with the typical information:

- Project name,
- Sample identification (well ID),
- Date and time of collection,
- Sample type, requested analysis,
- Type of preservative (if any), and
- Sampler's initials.

Sampler shall record the sample ID, sampling procedure, date, and time of sample collection on the Monitor Well Sampling Record (**Form 3**) or field log book. Sampler shall record the sample ID (well ID), time and date of collection, sample media, and specified analyses to be conducted by the laboratory, if not already provided, on the chain-of-custody record. See Section 3.3 for details on sample custody information.

Sampler shall check that the sample container caps are tight; then place the filled sample containers into a sample cooler containing bagged ice in a manner to prevent breakage. The cooler will be packed with sufficient ice to maintain the proper preservation temperature. See Section 6.0 for details on sample packing and shipment.

After sampling is completed at a particular well, the tubing will be removed from the well and placed in an appropriate disposal container (See Section 9.0). The well will be secured before proceeding to the next well.

See Section 9.0 for equipment decontamination procedures, IDW management, and IDW sampling.

5.3 QUALITY CONTROL SAMPLING

Quality control (QC) and quality assurance (QA) samples will be collected and analyzed along with monitor well samples to assess the variability introduced in sampling, handling, shipping, and analysis. The analytical program for the QC samples will follow the analytical program for the associated investigative samples. The following sample types will be collected.

- **Blind Duplicate** - One duplicate sample will be collected at each CCR Unit for each sampling event; a total of three blind duplicates will be collected per event. The blind duplicate will be analyzed for identical parameters as the monitor well samples. The duplicate sample(s) will be collected from randomly selected wells; and will be labeled with an appropriate identification number other than the well number. The sample bottles for regular and duplicate analysis will be filled in alternate succession for each required analysis (e.g. fill the metals sample container, then the metals duplicate container). The identification number will be recorded in the field log book, or in a separate Monitor Well Sampling Record.
- **Matrix Spike/Matrix Spike Duplicates (MS/MSDs)** – One MS/MSD will be collected during each sampling event to test the potential effects of matrix interference on the laboratory results. To reduce the possible adverse impact to the laboratory equipment, wells selected for the MS/MSD samples will be those that historically have shown low or non-detect constituent concentrations (to the extent practical). The sample is collected as a triplicate (the original sample plus two additional sets). The matrix spike sample will be labeled with the well number followed by an "MS". Similarly, the matrix spike duplicate will be labeled with the well number followed by "MSD".
- **Field Blank** - One field blank sample will be collected at each CCR unit for each sampling event; a total of three field blanks will be collected per event. Field blank samples provide information about potential contamination of the samples during exposure to ambient conditions at the site during sample collection. Field blanks will be prepared at a specified well site by pouring commercially-available distilled water into sample bottles and vials in the

same quantities as the groundwater samples. The samples should be labeled appropriately and stored in the same manner as the groundwater samples.

- **Equipment Blank** – An equipment blank sample will be collected during the groundwater sampling event only if non-dedicated sampling equipment is used. After the non-dedicated equipment has been cleaned and rinsed (see Section 9.0 for decontamination procedures), distilled water will be passed over (*e.g.*, poured over) the decontaminated equipment and the water will be collected in appropriate sample containers. The equipment blanks will be analyzed for the same suite of parameters as the monitor well samples. Equipment blanks will not be collected if dedicated equipment is used for sample collection.

6.0 SAMPLE PACKING AND SHIPPING

Samples for chemical analyses will be placed into the correct laboratory-supplied sample containers, labeled appropriately, and immediately placed in a cooler with ice. The field sampler will document the appropriate information on the chain-of-custody form (see Section 3.3 for details). Prior to packing coolers and shipping to the laboratory, the outside surfaces of the sample containers will be cleaned if necessary (by wiping carefully with a paper towel) and repacked in the cooler. Sample containers will not be opened after they have been sealed. The containers will be placed inside a sealed plastic Ziploc-style bag and will then be placed in coolers containing sufficient ice (or packs of frozen gel) to maintain a sample temperature of approximately 4° C. Sample coolers should be lined with a new, large plastic trash bag to reduce the potential of melt water leaks. Care must be taken to avoid leakage of water from melted ice because overnight delivery service (*e.g.*, FedEx) will not accept leaking coolers.

The sampler will be responsible for properly packaging and dispatching samples to the analytical laboratory. This responsibility includes using the proper shipping container, shipping labels, shipping papers, and filling out, dating, and signing the appropriate portion of the chain-of-custody form. Samples will be packed with cushioning material sufficient to reduce the potential for breakage of glass sample containers during transport. The chain-of-custody form will be placed inside a sealed plastic Ziploc-style bag and the bag placed inside the cooler on top of the cushioning material.

If a laboratory with a local or nearby field-service center is contracted to perform analytical services, samples and coolers will be transported directly to the laboratory service-center or to a secure drop-off location by field personnel on the same day as sampling. The insulated coolers containing groundwater samples will be delivered to or picked-up by the laboratory and signed over to the laboratory personnel in accordance with chain of custody procedures for storage and analysis.

If a distant laboratory is contracted to perform analytical services, then samples and coolers will be shipped via overnight delivery service (*e.g.,* FedEx). Shipments will be accompanied by the chain-of-custody form and it will be sealed in an airtight, resealable plastic bag inside the cooler. The cooler will be taped shut with clear packaging tape and a tamper-evident custody seal will be attached across the lid. This seal will only be broken by the recipient at the laboratory.

7.0 ANALYTICAL PROCEDURES

Groundwater samples collected under the Detection Monitoring Program will be analyzed for the constituents specified in **Table 2**. Groundwater samples collected under the Assessment Monitoring Program will be analyzed for the constituents specified in **Table 2** and **Table 3**. IDW samples (further described in Section 9.0) will be analyzed for the constituents specified in **Table 6**. Analytical parameter classes, container size and type, preservatives, and holding times (before which the analysis must be performed) are listed in **Table 5** and **Table 7**. A NELAC-accredited laboratory will perform the groundwater analyses.

Groundwater analyses will be performed in accordance with the most recent edition of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (EPA SW 846), ASTM Standard Test Methods*, or other EPA-approved methods. Detection limits will be those recommended for the procedure and analytical instrument specified.

8.0 QUALITY ASSURANCE

This section briefly summarizes the quality assurance measures during field and laboratory activities associated with groundwater monitoring.

8.1 FIELD QUALITY ASSURANCE

Sample collection will be conducted according to the procedures outlined in Section 5.2. These procedures are designed to minimize potential sources of contamination and include the following key elements:

- Using dedicated or disposable tubing for each well to reduce the potential for cross-contamination between wells.
- Completing purging using low-flow (micropurge) sampling techniques. If the screened water-bearing unit has low hydraulic conductivity that results in drawdown greater than the guidelines for low-flow sampling, the well should be allowed to recover to at least 80 percent of the static water level prior to sampling.
- Using duplicates, matrix spikes, matrix spike duplicates, field blanks, and equipment blank samples to assess potential cross-contamination during sample collection, transport, and analysis as well as providing a check on the data quality from the laboratory (see Section 5.3).
- Handling samples, preservatives, and sample containers carefully to minimize exposure time and potential for evaporative loss and/or airborne contamination.
- Using containerized ice whenever possible to maintain 4°C sample temperatures during transit and cushioning materials to minimize breakage.

8.2 LABORATORY QUALITY ASSURANCE

The laboratory documentation system will comply with the requirements of the USEPA analytical protocols, as appropriate. The laboratory will perform internal QC checks for the analytical method. Depending on the analytical method, the QC checks may include analyzing sample spikes, surrogate spikes, reference samples, laboratory control samples, storage blanks, and/or method blanks.

The laboratory will document internally that instrument and analytical QC criteria have been met. The data package will contain all of the information required to evaluate compliance with the analytical methods' required and recommended QC checks, instrument tuning, calibration, and sample analysis. If errors or deficiencies are identified in an analytical system, corrective actions are implemented to return the system to normal operation.

8.3 DATA REVIEW AND EVALUATION

A data validation will be performed to assess whether the dataset meet the project requirements in terms of following the appropriate analytical methods, sample locations, and sampling procedures. All sample collection procedures and laboratory reports will be reviewed to verify that the field and laboratory QA/QC requirements have been met.

The final reportable data, laboratory checklist, associated exception report(s), laboratory quality control data, and chain-of-custody will be reviewed in accordance with applicable EPA guidance, including, but not limited to the *National Functional Guidelines for Inorganic Superfund Data Review* (EPA 540-R-013-001), August 2014. Data precision and accuracy will be assessed based on control limits of 70-130% for laboratory control samples (except for antimony which will be assessed based on control limits of 50-150%) and 75-125% for spike sample analysis. A control limit of 20% for the relative percent difference (RPD) shall be used for original and duplicate sample values.

9.0 DECONTAMINATION AND WASTE MANAGEMENT

This section of the SAP provides information about equipment cleaning procedures and management of IDW during monitoring events.

9.1 EQUIPMENT DECONTAMINATION PROCEDURES

The decontamination of sampling equipment is necessary to reduce the potential for the spread of constituents to clean areas, to reduce exposure of personnel to constituents of concern, and to reduce the potential cross-contamination when equipment is used more than once.

The water level tape and probe which have contact with groundwater in the well will be wiped clean with a disposable material (*e.g.*, paper towel), washed with solution of non-phosphate detergent (Liquinox® or equivalent) and distilled water, rinsed with distilled water, and wiped dry with a disposable material after use at each well.

To reduce the potential for cross-contamination between monitor wells during purging and sampling, well-dedicated or disposable equipment will be used to the extent practical. If non-dedicated pumps, discharge, and safety lines are used at a well, such equipment will be washed with non-phosphate detergent and distilled water solution, then rinsed with distilled water.

9.2 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Common IDW from the groundwater sampling events are purge water, decontamination water, and trash (i.e., non-reusable plastic tubing, nitrile gloves, paper towels, etc.).

Well purge water will be managed by CPS Energy. The purge water and decontamination water will be containerized in 55-gallon DOT-approved drums for management and disposal by CPS Energy personnel in accordance with CPS Energy procedures. Purge water from each well should be temporarily containerized at the wellhead in 5-gallon plastic buckets. Upon completion of sampling at each well, water from the 5-gallon bucket(s) should be transferred to a temporary DOT-approved 55-gallon drum(s). Drums should be labeled and secured by CPS Energy personnel.

Disposable equipment and supplies (i.e., domestic trash) will be placed in heavy-duty plastic bags and the full bags placed in Power Station-designated receptacles. If it becomes necessary to place affected materials in a 55-gallon DOT-approved drum(s), then the drums will be labeled and secured. Further management of the drums and containerized waste will be handled by CPS Energy.

9.3 INVESTIGATION-DERIVED WASTE SAMPLE COLLECTION

Following the transfer of purge water and decontamination wash water to a temporary DOT-approved 55-gallon drum(s), a sample will be collected in order to properly characterize and profile the liquid waste for proper disposal.

The IDW sample will be collected directly from the drum(s) using a disposable plastic bailer or similar disposable container (e.g., un-preserved laboratory container), and immediately placed in a clean, laboratory-supplied sample container with the appropriate preservative for the selected analytical method. If multiple drums are needed to containerize the liquid IDW, a representative amount of water should be collected from each drum, and placed into the laboratory-provided sampling container.

The IDW sample will be analyzed for the specified metals listed in **Table 6**. Analytical parameter classes, container size and type, preservatives, and holding times (before which the analysis must be performed) are listed in **Table 7**. Sample analyses will be performed in accordance with the procedures previously discussed in Section 7.0.

Samples will be labeled, handled, and packaged in accordance with the procedures described previously in Section 5.2. Sampler shall record the sample ID, sampling procedure, date, and time of sample collection in the fieldbook. Sample custody information will be recorded in accordance with the procedures described previously in Section 3.3.

Forms

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, Texas 78701
(512) 459-4700

FORM 1

MONITOR WELL GAUGING RECORD

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station
San Antonio, Texas

PROJECT INFORMATION	
Client:	CPS Energy - Calaveras Power Station
Site Loc.:	San Antonio, Texas
Purpose:	
Proj. ID.:	
Sampler(s):	
Date:	
Weather Conditions:	

GAUGING RECORD	
Measuring Point:	Top of Casing
Instrument ID:	

CCR Units	Well ID	DTW (Ft.)	TD (Ft.)	Notes
Fly Ash Landfill	JKS-31			
	JKS-33			
	JKS-45			
	JKS-46			
	JKS-57			
	JKS-58			
	JKS-59			
	JKS-60			
Evaporation Pond	JKS-36			
	JKS-47			
	JKS-61			
	JKS-62			
	JKS-63R			
	JKS-64			
SRH Ponds / Bottom Ash Ponds	JKS-48			
	JKS-49			
	JKS-50R			
	JKS-51			
	JKS-52			
	JKS-53			
	JKS-54			
	JKS-55			
	JKS-56			

FORM 2

MONITOR WELL INSPECTION RECORD

Groundwwater Sampling and Analysis Plan
CPS Energy – Calaveras Power Station
San Antonio, Texas

Client: CPS Energy - Calaveras Power Station	**Well ID:**
Site Location: San Antonio, Texas	
Unit (circle one): Fly Ash Landfill Evaporation Pond SRH Pond/Bottom Ash Ponds Future PDPs Future EPs Closed Landfills	
Date/Time:	**Stick-Up** ☐ **Flush-Mount** ☐
Is the well site clear of weeds and debris? *Comments*:	Yes No
Has the grass been mowed? *Comments:*	Yes No
Are there bollards or protective barriers around the well? *Comments:*	Yes No
Is the well identification clearly visible and in good condition? *Comments:*	Yes No
Is the outer casing (or vault) in good condition? *Comments:*	Yes No
Is the outer casing (or vault) equipped with a protective cap? *Comments:*	Yes No
Does the well have a concrete surface pad? *Comments:*	Yes No
If yes, what is the condition of the pad? *Comments:*	Good Cracked Broken
What is the condition of the inner casing? *Comments:*	Good Cracked Broken
Does the inner casing have a cap? *Comments:*	Yes No
Is the well locked? *Comments:*	Yes No
If yes, what is the condition of the lock? *Comments:*	Good Poor
Is the annulus between the inner and outer casing free of standing water? *Comments:*	Yes No
Is the survey measuring point marked on the TOC? *Comments:*	Yes No
Expected Depth of Well:	**Measured Depth of Well:**
General Observations:	

Name of Sampler:________________________________ **Signature:**______________________________________

Company:______________________________________ **Date:**____

FORM 3

MONITOR WELL SAMPLING RECORD

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station
San Antonio, Texas

PROJECT INFORMATION

Unit (circle one):	Fly Ash Landfill	Evaporation Pond	SRH Pond/Bottom Ash Ponds
	Future PDPs	Future EPs	Closed Landfills

Well ID:		**Client:**	CPS Energy - Calaveras Power Station
Well Diameter:		**Site Loc.:**	San Antonio, Texas
Date:		**Proj. ID.:**	
Weather Conditions:		**Sampler(s):**	

INITIAL MEASUREMENTS

Measuring Point:	Top of Casing	**Water Column Ht. (H1 = D2-D1):**	
Measuring Point Elevation:		**Max. Drawdown (D1 + 0.33 ft.):**	
Depth to Water (D1):		**DTW at 80% Rec. (D2 - (0.80*H1)):**	
Total Well Depth (D2):		**Tubing Intake Depth:**	

PURGING RECORD

Purge Method:

Instrument ID:

Time (Hr:Min)	**Pump Rate** (mL/min)	**DTW** (ft. btoc)	**Temp.** (°C)	**pH** (Std Units)	**ORP** (mV)	**SC** (mS/cm2)	**DO** (mg/L)	**Turbidity** (NTU)
Stabilization Criteria:		± 0.3 Ft.	--	± 0.1 Units	± 10 mV	± 3%	± 10%	± 10%

Total groundwater purged (gallons):

SAMPLING RECORD

Analysis Requested	**Container/Preservative**

Sample Date/Time:

Sampling Remarks:

Tables

TABLE 1

WELL INFORMATION SUMMARY

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station San Antonio, Texas

CCR Unit	Well ID	Top of Casing Elevation (feet msl)	Well Diameter (inches)	Approximate Screen Interval (feet btoc)	Required Pump for Sample Collection
Fly Ash Landfill	JKS-31	507.45	2.0	57.2 - 67.2	Submersible
	JKS-33	498.71	2.0	20 - 30	Peristaltic
	JKS-45	531.46	2.0	43.2 - 58.2	Submersible
	JKS-46	499.08	2.0	18.3 - 28.3	Peristaltic
	JKS-57	506.91	2.0	15.1 - 30.1	Peristaltic
	JKS-58	504.45	2.0	23.5 - 33.5	*Not Sampled*
	JKS-59	496.45	2.0	14.9 - 29.9	*Not Sampled*
	JKS-60	495.70	2.0	13 - 28	Peristaltic
Evaporation Pond	JKS-36	508.41	2.0	41.5 - 51.5	Peristaltic
	JKS-47	513.63	2.0	28.4 - 43.4	Submersible
	JKS-61	505.51	2.0	21 - 36	Peristaltic
	JKS-62	509.84	2.0	23.1 - 33.1	Peristaltic
	JKS-63R	522.27	2.0	38.1 - 53.1	Submersible
	JKS-64	507.84	2.0	18.5 - 33.5	Peristaltic
SRH Pond	JKS-51	496.92	2.0	9.9 - 24.9	Peristaltic
	JKS-52	493.15	2.0	18.6 - 28.6	Peristaltic
	JKS-53	494.74	2.0	18.4 - 28.4	Peristaltic
	JKS-54	496.40	2.0	15.7 - 25.7	Peristaltic
Bottom Ash Ponds	JKS-48	497.19	2.0	22 - 32	Peristaltic
	JKS-49	498.63	2.0	10.5 - 20.5	Peristaltic
	JKS-50R	498.48	2.0	13 - 23	Peristaltic
	JKS-52	493.15	2.0	18.6 - 28.6	Peristaltic
	JKS-55	493.81	2.0	18.7 - 28.7	Peristaltic
	JKS-56	496.66	2.0	13.6 - 28.6	Peristaltic

NOTES:

msl: mean sea level
btoc: below top of casing

TABLE 2

CONSTITUENTS FOR DETECTION MONITORING

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station
San Antonio, Texas

Constituents for Detection Monitoring
Boron
Calcium
Chloride
Fluoride
Sulfate
pH
Total Dissolved Solids (TDS)

NOTE:

From Appendix III to 40 CFR Part 257 - Constituents for Detection Monitoring

TABLE 3

CONSTITUENTS FOR ASSESSMENT MONITORING

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station
San Antonio, Texas

Constituents for Assessment Monitoring
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 & 228 (Combined)

NOTE:

From Appendix IV to 40 CFR Part 257 - Constituents for Detection Monitoring

TABLE 4

WATER QUALITY INDICATOR PARAMETERS

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station
San Antonio, Texas

Water Quality Indicator Parameters	Stabilization Ranges (Three successive readings)
Temperature	Not used for stabilization
pH	± 0.1 standard units
Specific Conductivity	± 3%
Dissolved Oxygen	± 10%
Oxidation Reduction Potential	± 10 millivolts
Turbidity	± 10 %

TABLE 5

SUMMARY OF GROUNDWATER SAMPLE CONSTITUENT GROUPS AND ANALYTICAL INFORMATION

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station
San Antonio, Texas

Laboratory Parameters	Lab Method	Parameter Group	Practical Quantitation Limit (PQL) mg/L	Container Size and Type	Preservative	Holding Time
Metals						
Antimony	SW-846 Method 6010B	Assessment Monitoring	0.01	1 - 500-mL HDPE (high density polyethylene)	HNO3 to pH<2; <6ºC	180 Days (a)
Arsenic	SW-846 Method 6010B	Assessment Monitoring	0.01			
Barium	SW-846 Method 6010B	Assessment Monitoring	0.01			
Beryllium	SW-846 Method 6010B	Assessment Monitoring	0.004			
Boron	SW-846 Method 6010B	Detection Monitoring	0.05			
Cadmium	SW-846 Method 6010B	Assessment Monitoring	0.005			
Calcium	SW-846 Method 6010B	Detection Monitoring	0.2			
Chromium	SW-846 Method 6010B	Assessment Monitoring	0.01			
Cobalt	SW-846 Method 6010B	Assessment Monitoring	0.01			
Lead	SW-846 Method 6010B	Assessment Monitoring	0.01			
Lithium	SW-846 Method 6010B	Assessment Monitoring	0.02			
Mercury	SW-846 Method 7470A	Assessment Monitoring	0.0002			
Molybdenum	SW-846 Method 6010B	Assessment Monitoring	0.01			
Selenium	SW-846 Method 6010B	Assessment Monitoring	0.02			
Thallium	SW-846 Method 6010B	Assessment Monitoring	0.02			
Radiochemistry						
Radium 226 & 228 (Combined)	EPA Method 903.0/904.0	Assessment Monitoring	Radium-226 by EPA 903.0 or 903.1: 1 pCi/L Radium-228 by EPA 904.0: 1 pCi/L	1 - Gallon Plastic	HNO3 to pH<2; <6ºC	180 Days
Anions						
Chloride	EPA Method 300.0	Detection Monitoring	0.5	1 - 250-mL HDPE	<6ºC	28 Days
Fluoride	EPA Method 300.0	Assessment/Detection Monitoring	0.5			
Sulfate	EPA Method 300.0	Detection Monitoring	0.5			
Other						
Total Dissolved Solids (TDS)	SM2540C	Detection Monitoring	5	1 - 1-L HDPE	<6ºC	7 Days
Field Parameters						
pH	Multiparameter probe	Detection Monitoring	(b)	(b)	(b)	(b)
Temperature	Multiparameter probe	(b)	(b)			
Oxidation-Reduction Potential	Multiparameter probe	(b)	(b)			
Dissolved Oxygen	Multiparameter probe	(b)	(b)			
Turbidity	Multiparameter probe	(b)	(b)			
Specific Conductance	Multiparameter probe	(b)	(b)			

NOTES:

(a) 180 days for all metals except mercury which is 28 days.
(b) Standard field measurement collected during sampling (no Parameter Group and no PQLs).
Actual PQLs reported by the laboratory may vary due to the nature of individual samples.
Methods may be updated or substituted by an appropriate EPA or TCEQ-approved method with comparable detection limits that meet action levels.

TABLE 6

CONSTITUENTS FOR IDW CHARACTERIZATION AND PROFILING

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station
San Antonio, Texas

Constituents for IDW Characterization and Profiling
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Lead
Mercury
Nickel
Selenium
Silver

TABLE 7

SUMMARY OF IDW SAMPLE CONSTITUENT GROUPS AND ANALYTICAL INFORMATION

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station
San Antonio, Texas

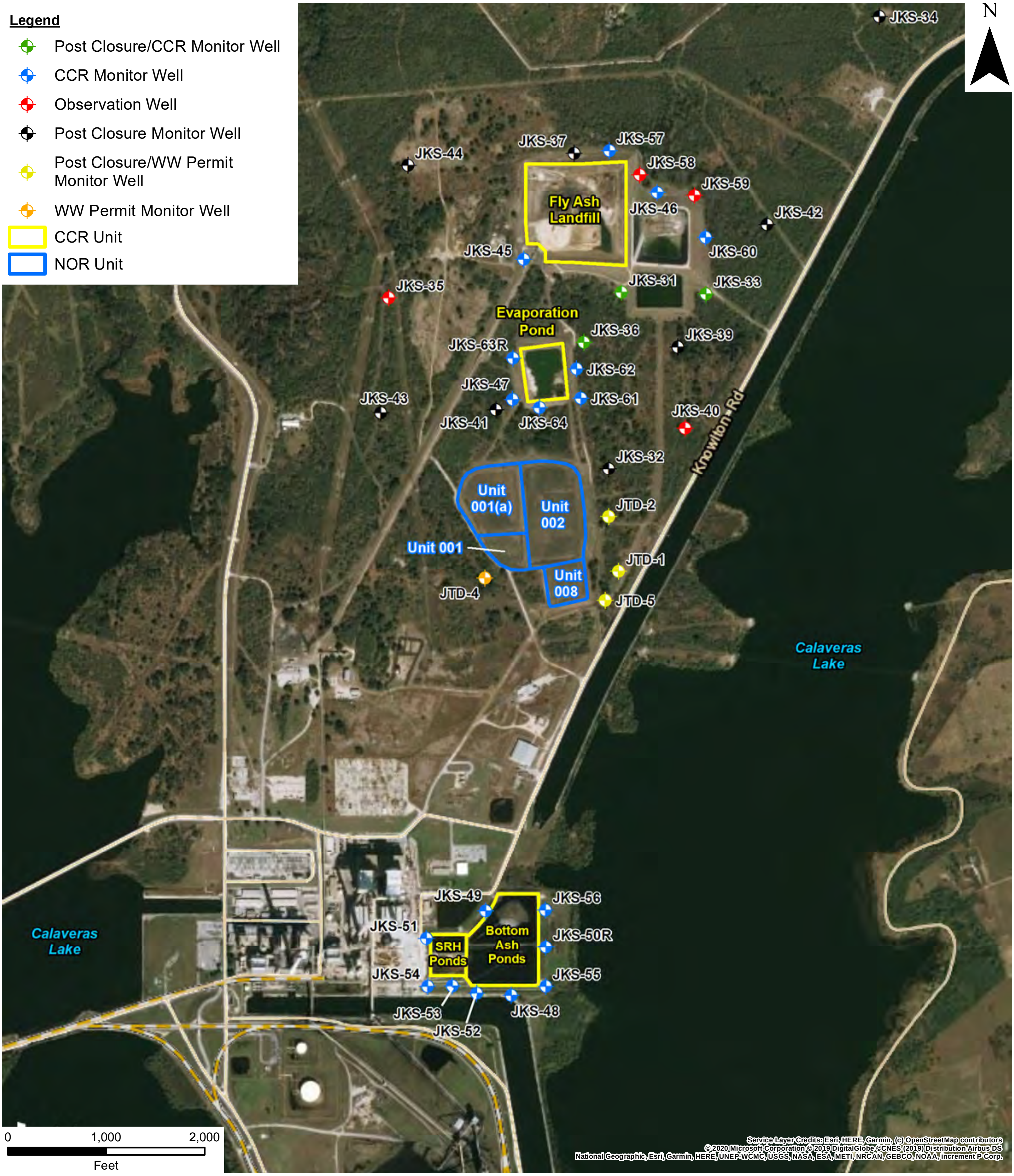
Laboratory Parameters	Lab Method	Parameter Group	Practical Quantitation Limit (PQL) mg/L	Container Size and Type	Preservative	Holding Time
Metals						
Antimony	SW-846 Method 6010B	Assessment Monitoring	0.01	1 - 500-mL HDPE (high density polyethylene)	HNO3 to pH<2; <6ºC	180 Days (a)
Arsenic	SW-846 Method 6010B	Assessment Monitoring	0.01			
Barium	SW-846 Method 6010B	Assessment Monitoring	0.01			
Beryllium	SW-846 Method 6010B	Assessment Monitoring	0.004			
Cadmium	SW-846 Method 6010B	Assessment Monitoring	0.005			
Chromium	SW-846 Method 6010B	Assessment Monitoring	0.01			
Lead	SW-846 Method 6010B	Assessment Monitoring	0.01			
Mercury	SW-846 Method 7470A	Assessment Monitoring	0.0002			
Nickel	SW-846 Method 6010B	Assessment Monitoring	0.002			
Selenium	SW-846 Method 6010B	Assessment Monitoring	0.02			
Silver	SW-846 Method 6010B	Assessment Monitoring	0.002			

NOTES:

(a) 180 days for all metals except mercury which is 28 days.
Actual PQLs reported by the laboratory may vary due to the nature of individual samples.
Methods may be updated or substituted by an appropriate EPA or TCEQ-approved method with comparable detection limits that meet action levels.

Figures

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, Texas 78701
(512) 459-4700



Environmental Resources Management

DESIGN:	NH	DRAWN:	EFC	CHKD.:	WZ
DATE:	1/28/2020	SCALE:	AS SHOWN	REVISION:	0

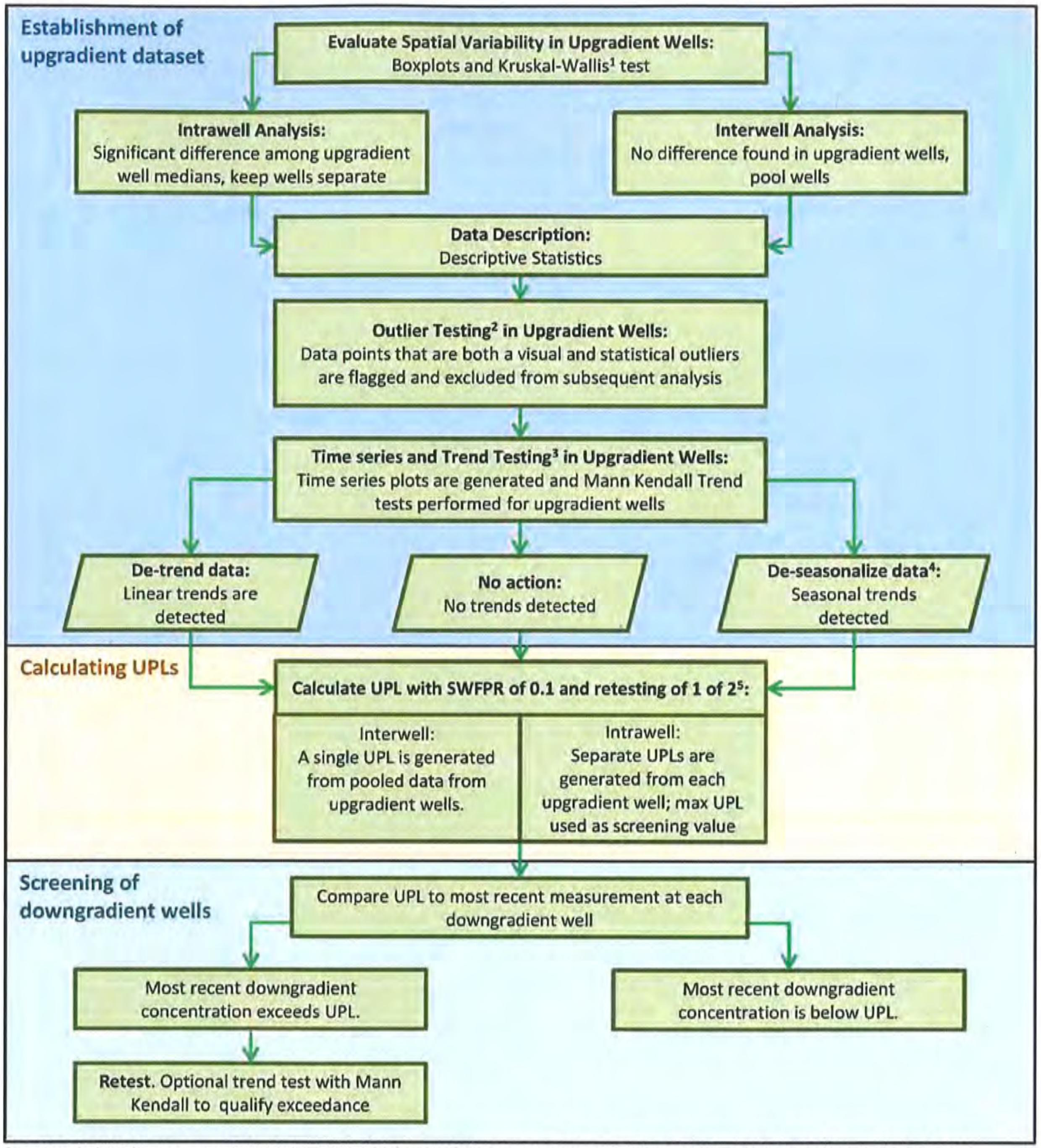
\\ushoufs01\Data\Houston\Projects\0503422 CPS Energy Calaveras 2019 CCR Tasks.WZ\GIS_CAD\MXD\WorkingFigures
fig1_0503422_CPSCalv_MonWellLocMap.mxd

FIGURE 1
MONITOR WELL LOCATION MAP

CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

T:\DWG\AutoCAD\dwg\0289614\0289614_PFD.dwg, 9/26/2017 9:37:22 AM



[1] For Kruskal-Wallis test, a $p<0.05$ indicates a significant difference among upgradient wells. A $p \geq 0.05$ indicates there is no difference. Boxplots provide a visual for the comparison.

[2] Test each upgradient dataset for outliers using Dixon's test if number of data points (N) is < 25 and Rosner's test if $N \geq 25$. Data points with outlier test results with $p < 0.05$, as well as visual outliers (using QQ plots) are excluded from subsequent analysis.

[3] For linear trend testing using Mann Kendall test, $p<0.05$ indicates a significant trend while $p>=0.05$ indicates no trend. Testing for seasonality requires at least three years of data and a seasonal Mann Kendall test.

[4] A minimum of five years of data are needed to perform season al trend tests

[5] UPL calculated with a 1 of 2 retesting scheme, site wide annual false positive rate of 0.1 and event site-wide false positive rate of 0.05. Calculate UPL using Sanitas with recommended SAP procedure (handling of <8 detected values, no detected values, bootstrapping, etc.)

Environmental Resources Management

DESIGN:	DRAWN: MH	CHKD.:
DATE: 9/26/2017	SCALE: AS SHOWN	REV.:

FIGURE 2
DECISION FRAMEWORK

CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

Statistical Method Certification

Appendix A

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, Texas 78701
(512) 459-4700

STATISTICAL METHOD CERTIFICATION
40 CFR §257.93(f)(6)
Calaveras Power Station
San Antonio, Texas
CPS Energy

CERTIFICATION

I hereby certify that the selected statistical method identified in this document is appropriate for evaluating groundwater monitoring data for the CCR units in accordance with the requirements of 40 CFR §257.93.

JEFFERY L. BAUGUSS
86195

10/16/17

Jeffery L. Bauguss, P.E.

Texas Licensed Professional Engineer No. 86195

Groundwater Sampling Field Equipment List

Appendix B

Environmental Resources Management
206 East 9th Street, Suite 1700
Austin, Texas 78701
(512) 459-4700

APPENDIX B
GROUNDWATER SAMPLING FIELD EQUIPMENT LIST

Groundwater Sampling and Analysis Plan
CPS Energy - Calaveras Power Station
San Antonio, Texas

Groundwater Sampling Equipment to be Rented from FARRWEST (or Other Preferred Vendor)

Quantity	Item	Equipment Models (Options)
2	Peristaltic pump (variable speed, DC) - with modular battery & battery connection clips	1. GeoTech GeoPump II
1	Stainless steel submersible pump – capable of reaching depths of ~60 ft. *(For wells w/ groundwater elevation approx. >29 ft. btoc, such as wells)*	1. Proactive SS Monsoon Sumbersible Pump *(request restrictor valve from FARRWEST)*
1	Low flow controller (use with submersible pump). *(For wells w/ groundwater elevation approx. >29 ft. btoc)*	1. Proactive Low Flow Power Booster 2 LCD Controller
1	**Bladder pump (0.75") - capable of reaching depths of ~70 ft. *(For JKS-44 that has broken and/or bent PVC joints)*	1. QED SamplePro Bladder Pump 0.75"
1	Bladder pump controller / air compressor combo	1. QED MP50 Controller/Compressor
1	Marine Battery 12v w/ charger *(OPTIONAL - can use vehicle as power source)*	1. DieHard Marine 12v
2	100 ft. portable water level indicator	1. Solinst Model 101 Water Level Meter 100'
2	Multi-parameter groundwater quality meter – capable of measuring dissolved oxygen, pH, specific conductivity, temperature, oxidation reduction potential, and turbidity (if possible) – with groundwater flow through cell & calibration standards	1. Horiba U-52 *(turbidity probe included)*; or 2. YSI 6920 V2 *(model used during ERM training, turbidity probe included)*; or 3. YSI 556 MPS *(**no turbdity probe, will need to rent separate turbidity meters**)*
2	Turbidity meter – with calibration standards *(**rent if using YSI 556 MPS**)*	1. LaMotte 2020we

Equipment quantities based on (2) sampling teams. Assumes each team has (1) submersible pump, and only one team is assigned to sample via peristaltic pump and bladder pump.
*** Not available from FARRWEST*

Consumeable Sampling Supplies to be Purchased from FARRWEST (or Other Preferred Vendor)

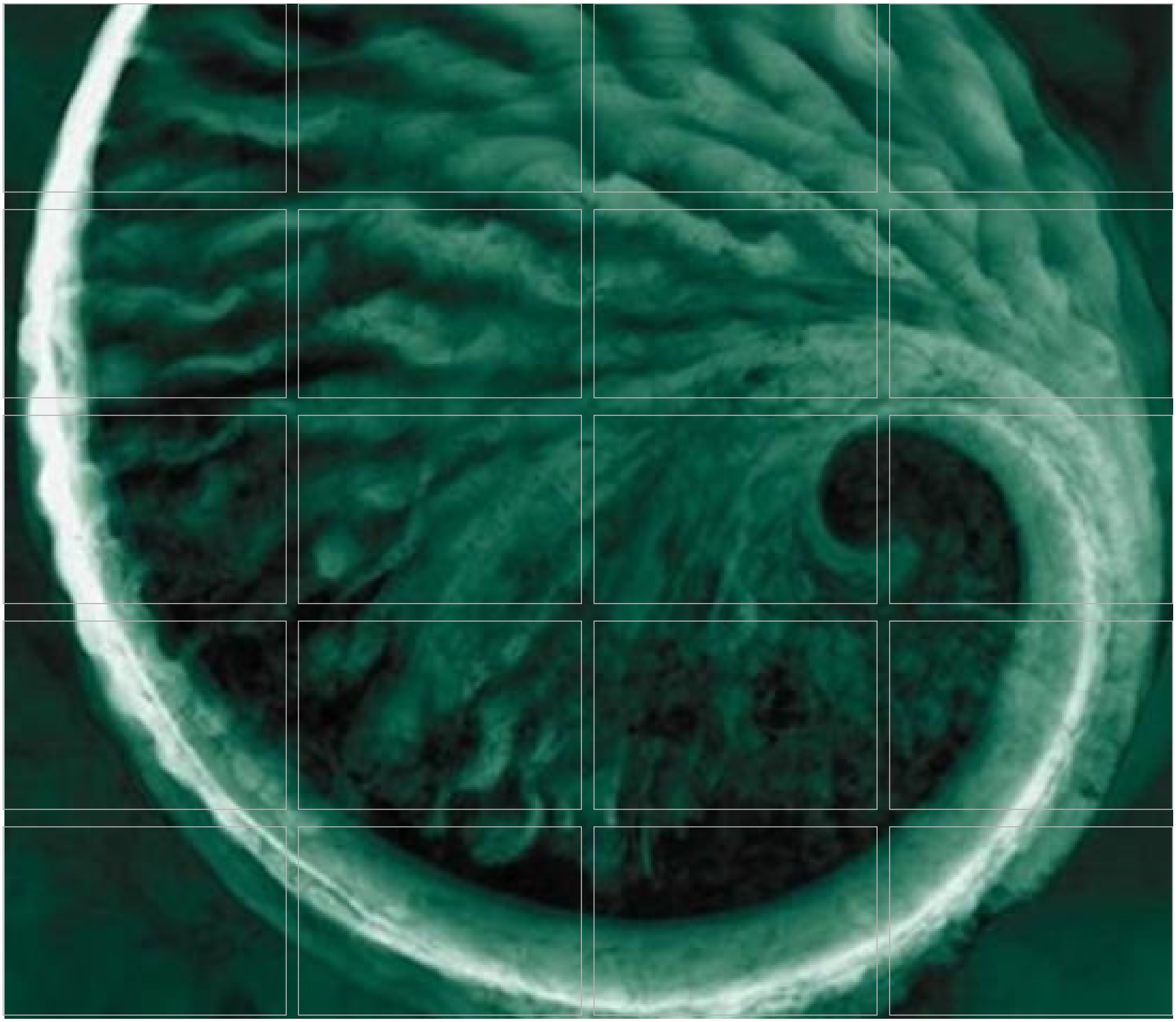
Quantity	Item	Notes
250 ft	Low-density polyethylene (LDPE) tubing (0.17” ID x 1/4" OD)	To be used with peristaltic pump; need approximately 50 ft of tubing to install into new Future PD Pond well (JKS-67). Suggest having an additional 200 ft on hand in case other well tubing needs to be replaced.
300 ft	LDPE tubing (3/8” ID x 1/2" OD) *(For wells w/ groundwater elevation approx. >29 ft. btoc)*	To be used with submersible pump; need approximately 100 ft of tubing to install into new Furture PDP wells (JKS-65 and -67). Suggest having an additional 200 ft on hand in case well tubing needs to be replaced, or if water level drops below peristaltic pumping range.
15 ft	Silicon tubing (3/16” ID x 3/8” OD)	To be used with peristaltic pump; suggest having 15 ft on hand in case well tubing needs to be replaced.
1	**0.75 Bladder Kit	To be used with bladder pump; includes 1 bladder, 1 grab plate, and replacement o-rings. After first kit purchased, you only need to purchase bladder(s) and grab plate(s) unless o-rings are used.
100 ft	**Bonded LDPE tubing (0.17" x 1/4" OD)	To be used with bladder pump; suggest having 100 ft on hand in case well tubing in JKS-44 needs to be replaced.
4 boxes	Nitrile, Powder-free gloves	4 boxes to be split amongst each sample team *(~1 box per person)*
0.5 L	Phosphate-free cleaner	Alconox or Liquinox *(verify what FARRWEST has available)*

Supply quantities suggested for each event.
*** Not available from FARRWEST*

Additional Supplies and Equipment

Quantity	Item
2	Tubing Cutters
2	Tubing Clamps
1	55-Gallon Drum
2	Graduated 5-Gallon Buckets
8	5-Gallon Buckets w/ lids for purge water
2	Graduated Cylinders – capable of reading up to 500mL
1	Scrub brush for decontamination of non-dedicated sampling equipment
4-6 Gallons	Distilled water for decontamination of non-dedicated sampling equipment
4	Multi-purpose spray bottles
4 Rolls	Paper Towels
1 Box	Large Plastic Trash Bags
1 Pkg	Ball-point Pens
1 Pkg	Waterproof Marking Pens

Attachment 19   Closure and Post-Closure Plan



CCR Unit Closure and Post-Closure Plan

CPS Energy
Calaveras Power Station
San Antonio, Texas

October 14, 2016
Amended December 14, 2020
Amended November 28, 2022

www.erm.com

ERM

The business of sustainability

CPS Energy

CCR Unit Closure and Post-Closure Plan

October 14, 2016
Amended December 14, 2020
Amended November 28, 2022

Calaveras Power Station
Project No. 0503422/0636109

Jeffery L. Bauguss, P.E.
Partner-in-Charge

Walter Zverina

Walter Zverina
Project Manager

Charles Johnson

Charles Johnson, P.E. (TX)
~~Project Consultant~~Senior Engineer

Environmental Resources Management
840 West Sam Houston Parkway North, Suite 600
Houston, Texas 77024
281-600-1000

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

TABLE OF CONTENTS

List of Figures

List of Tables

1.0 INTRODUCTION

CPS Energy owns and operates the Calaveras Power Station located in San Antonio, Texas. The Station generates coal combustion residuals (CCR) that are subject to regulation under Title 40, Code of Federal Regulations, Part 257 (40 CFR §257).

This document is the Closure Plan and Post-Closure Plan (CPC Plan) for the following four CCR surface impoundments and one CCR landfill at the Calaveras Power Station:

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

This CPC Plan describes the steps necessary to close all the CCR units at any point during the active life of the units by either removing the CCR or leaving CCR in place in accordance with 40 CFR §257.102(b).

This CPC Plan also describes post-closure inspection, maintenance and monitoring required for the CCR units closed with CCR left in place in accordance with 40 CFR §257.102(b).

CPS Energy will provide a Financial Assurance mechanism within 90 days of issuance of the CCR Registration. CPS Energy understands that Mark Stoebner (mark.stoebner@tceq.texas.gov) can be contacted for assistance with the Financial Assurance mechanism.

~~According to 40 CFR §257.102(b)(3)(i), CPS Energy may amend this closure plan at any time.~~

~~1.0.1 Closure Plan Amendment~~

~~Per 40 CFR §257.102(b)(3)(ii), CPS Energy must amend this closure plan whenever:~~

- ~~There is a change in operation of the CCR unit that would substantially affect the written closure plan in effect; or~~
- ~~Before or after closure activities have commenced, unanticipated events necessitate a revision of the written closure plan.~~

1.1 REQUIREMENTS

Regulations in 40 CFR §257.102 et seq. require the preparation, certification, posting on an internet site accessible by the public, and, on closure, implementation of a CPC Plan for each existing active CCR unit. A completed, certified copy of this CPC Plan must be maintained indefinitely in the Calaveras Power Station Operating Record. CPS Energy will issue notifications and implement recordkeeping in accordance with 40 CFR §257.105 and 40 CFR §257.106 (see Section 6).

The requirement to prepare and implement the CPC Plan is applicable to owners and operators of CCR units covered under the rule, including:

- New and existing landfills;
- New and existing surface impoundments;
- CCR units located off-site of the electric utilities' or independent power producers' facilities that receive CCR for disposal; and
- Certain inactive CCR surface impoundments if the CCR unit still contains CCR and liquids.

1.2 DEFINITIONS

This CPC Plan includes terms defined consistent with parts of 40 CFR §257 and associated editions of the Federal Register.

- **Active life or in operation** means the period of operation beginning with the initial placement of CCR in the CCR unit and ending at completion of closure activities in accordance with 40 CFR §257.102.
- **Closed** means placement of CCR in a CCR unit has ceased, and the owner or operator has completed closure of the CCR unit in accordance with 40 CFR §257.102 and has initiated post-closure care in accordance with §257.104.
- **Coal combustion residuals (CCR)** means fly ash, bottom ash, boiler slag and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers.
- **CCR landfill** means an area of land or an excavation that receives CCR and which is not a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground or surface coal mine, or a cave. For purposes of this subpart, a CCR landfill also includes sand and gravel pits and quarries that receive CCR, CCR piles, and any practice that does not meet the definition of a beneficial use of CCR.
- **CCR surface impoundment** means a natural topographic depression, manmade excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and the unit treats, stores, or disposes of CCR.
- **CCR unit** means any CCR landfill, CCR surface impoundment, or lateral expansion of a CCR unit, or a combination of more than one of these units, based on the context of the paragraph(s) in which it is used. This term includes both new and existing units, unless otherwise specified.

- **Facility** means all contiguous land, and structures, other appurtenances, and improvements on the land, used for treating, storing, disposing, or otherwise conducting solid waste management of CCR. A facility may consist of several treatment, storage, or disposal operational units (e.g. one or more landfills, surface impoundments, or combinations of them).
- **Inactive CCR surface impoundment** means a CCR surface impoundment that no longer receives CCR on or after October 19, 2015 and still contains both CCR and liquids on or after October 19, 2015.
- **Qualified professional engineer** means an individual who is licensed by a state as a Professional Engineer to practice one or more disciplines of engineering and who is qualified by education, technical knowledge and experience to make the specific technical certifications required under this subpart. Professional engineers making these certifications must be currently licensed in the state where the CCR unit(s) is located.

2.0 *CCR UNIT 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 Rule. The Calaveras Power Station is located in unincorporated Bexar County, Texas, approximately 13 miles southeast of San Antonio. The J.T. Deely Plant began operation in 1977 and ceased operation at the end of December 2018. The J.K. Spruce Plant Unit 1 began operation in 1992 and Unit 2 began operation in 2011 and are~~is~~ still in operation as of the date of this CPC Plan.

Currently, CPS Energy maintains five CCR units at the Calaveras Power Station which are subject to the CCR Rule:

- SRH Pond,
- North BAP,
- South BAP,
- Evaporation Pond (EP), and
- Fly Ash Landfill (FAL).

Of these five CCR units, CPS Energy currently only operates three units at the Calaveras Power Station: Evaporation Pond, Fly Ash Landfill, and the SRH Pond. Although the J.T. Deely Power Plant ceased operation at the end of December 2018 and sluiced bottom ash is no longer being received at the Bottom Ash Ponds (BAPs), the BAPs will continue to be monitored until the units have undergone closure. The location of each CCR unit is shown on Figure 1.

2.1 *SLUDGE RECYCLE HOLDING POND*

The SRH Pond contains CCR sludge from the air pollution control equipment from both plants. The SRH Pond was constructed as a single impoundment with a divider wall that separates the impoundment into the North and South Ponds. A gate present in the divider wall is closed during normal operating procedures, but can be opened. Each pond is approximately 1.5 acres in area and are located east of the plants, adjacent to the BAPs. The SRH Pond began receiving CCR before October 14, 2015 and is still in service. In accordance with 40 CFR §257.53, the SRH Pond is classified as an active existing CCR surface impoundment.

The interior slopes of the SRH Pond is reportedly constructed with a 10-oz. Geotextile and a 30-mil High Density Polyethylene (HDPE) geomembrane over prepared subgrade. The North Pond bottom liner consists of a six-inch layer of 4,000 psi concrete over one-foot of compacted sand overlying a 30-mil HDPE geomembrane. The South Pond bottom liner also has a six-inch layer of 4,000 psi concrete. Under the concrete is one-foot of compacted fill overlaying a 10-oz. Geotextile, a 30-mil HDPE geomembrane and another 10-oz. Geotextile. The SRH Pond is separated by a concrete divider wall with a sluice gate that allows the North Pond and South Pond to be isolated from each other. Water is pumped from the SRH Pond to clarifiers via two 18-inch steel pipes. Both ponds have eight-foot-wide concrete overflow chutes that discharge to the South BAP. These overflow chutes are at an approximate elevation of 499.5 feet MSL.

It is estimated that approximately 7 acre-feet is the maximum inventory of CCR to be on-site at one time over the active life of each pond. This estimate is based on a conservative assumption of both ponds being completely full of CCR up to the limits of the freeboard as allowed by the Inflow Flood Control Plan.

2.2 BOTTOM ASH PONDS

The North and South BAPs contain sluiced CCR from the wet feed process at the J.T. Deely Plant. The BAPs were constructed by CPS Energy in 1977 as part of the original plant construction. The North BAP is approximately 6.1 acres in area, while the South BAP is approximately 6.8 acres. They are located east of the plants, adjacent to the SRH Pond.

The BAPs began receiving CCR before October 14, 2015, however, the J.T. Deely Power Plant ceased operation at the end of December 2018 and sluiced bottom ash is no longer being received at the BAPs. In accordance with 40 CFR §257.53, the BAPs are classified as inactive CCR surface impoundments.

The BAPs share a common embankment that separates the ponds. The ponds are reportedly lined with clay, but the thickness and hydraulic conductivity of the clay are unknown. One 24-inch steel pipe in each pond allows water to be returned to the plant for reuse. Additionally, both ponds have two discharge points. The discharge points consist of an outlet structure with a horizontal 12-inch steel discharge pipe at an approximate elevation of 489 feet MSL (bottom drain used to empty the pond), and a vertical 12-inch steel overflow pipe at an approximate of elevation 499 feet MSL (normal operation level pool drain).

The outfall structure is in one corner of each pond (northeast for North BAP and southeast for South BAP) and is partially surrounded by steel sheet piling. The sheet piling and pond berms create an opening for water to reach the discharge pipes. This opening is typically protected by floating sorbent booms. Water from these outlets discharge to Calaveras Lake through a TPDES permitted outfall.

It is estimated that approximately 118 acre-feet is the maximum inventory of CCR to be on-site over the active life of the North and South BAPs. This estimate is based on a conservative assumption of the BAPs being completely full of CCR up to the limits of the freeboard as allowed by the Inflow Flood Control Plan.

2.3 EVAPORATION POND

The EP is located generally northeast of the plants. The EP side and bottom liner consist of a one-foot layer of cohesive soil overlying a 30-mil Polyvinylchloride geomembrane and an additional one-foot of cohesive soil when constructed as a landfill in 1990. The subgrade consists of two-feet of soil, with all large rock removed, and compacted to 90% density. The EP was converted to a fly ash impoundment in 1996.

The EP is a surface impoundment that was constructed and received CCR before October 14, 2015. The EP currently does not receive any CCR or ~~but continues to receive~~ non-CCR waste streams. In accordance with 40 CFR §257.53, the EP is classified as an inactive CCR surface impoundment.

The EP received ash washdown water from washing of the air pollution control system and other miscellaneous CCR washdown sources. That waste contained CCR as defined in 40 CFR §257.52.

There are no inlet or outlet structures to the EP. Liquid from ash washdown, boiler chemical cleanouts, and other authorized liquid wastes is trucked to the pond, where it is allowed to evaporate.

It is estimated that approximately 83 acre-feet is the maximum inventory of CCR to be on-site over the active life of the EP. This estimate is based on a conservative assumption of the EP being completely full of CCR up to the limits of the freeboard as allowed by the Inflow Flood Control Plan.

2.4 *FLY ASH LANDFILL*

The Fly Ash Landfill (FAL) is a Class 2 landfill constructed by CPS Energy in 1990 to increase the on-site disposal storage capacity of CCR wastes, prior to construction of the J.K. Spruce Plant. The FAL is located generally northeast of the plant.

It receives CCR wastes consisting of bottom ash, fly ash, scrubber solids, coal dust, gypsum, fly ash dust bags, and ion exchange resin waste generated by plant operations. Those wastes contain CCR as defined in 40 CFR §257.52.

The FAL has an approximate total area of 23 acres. According to as-built drawings provided by CPS Energy, the bottom of the landfill is lined with a 30-mil High Density Polyethylene (HDPE) with a geotextile cushion and sand drainage layer. A geocomposite drainage net covered by two feet of coarse CCR provides the drainage layer over the liner on the interior embankments of the landfill.

The FAL is a landfill that was constructed and received CCR before October 14, 2015. In addition, the FAL currently receives CCR. In accordance with 40 CFR §257.53, the FAL is classified as an active existing CCR landfill.

It is estimated that approximately 550 acre-feet is the maximum inventory of CCR to be on-site over the active life of the FAL. This estimate is based on a conservative assumption of the FAL being completely full of CCR up to the limits of the freeboard as allowed by the Run-on/Run-off Control Plan.

3.0 CCR UNIT CLOSURE PLAN

The closure concept for this closure plan is to close three surface impoundments (SRH Pond, North BAP, and South BAP) by removal of CCR. The closure procedures will comply with requirements in 40 CFR §257.102(c).

The closure concept for this closure plan is to close one surface impoundment (EP) and the FAL by leaving CCR in place. The closure procedures will comply with requirements in 40 CFR §257.102(d).

This section describes the steps necessary to close the CCR units at any point during the active life of the CCR units consistent with recognized and generally accepted good engineering practices and in accordance with 40 CFR §257.102(b). A written closure plan for each CCR unit is required by 40 CFR §256.102(b). The objectives of the closure activities are to close the CCR units such that they do not pose a threat to human health, the environment, or property.

Each closure plan for CCR units to be closed by removal of CCR is required to include the following:

- Closure performance standard;
- Narrative description of the closure;
- Description of the procedures to remove the CCR and decontaminate the CCR unit;
- Maximum CCR inventory; and
- Closure schedule.

Each closure plan for CCR units to be closed with CCR in place is required to include:

- Closure performance standard;
- Narrative description of the closure;
- Description of the final cover system;
- Maximum CCR inventory;
- Maximum area covered; and
- Closure schedule.

3.1 CLOSURE PERFORMANCE STANDARDS

The performance standards for closure of the CCR units in this closure plan are:

- For the SRH Pond and the North and South BAPs: Removing CCR and decontaminating each area affected by CCR releases for the CCR unit in accordance with 40 CFR §257.102(c)(closure by removal); and
- For the EP and the FAL: Leaving CCR in place in accordance with 40 CFR §257.102(d)(closure in place).

3.1.1 *Performance Standards for Closure by Removal*

CPS Energy may close any of the CCR units by removing CCR and decontaminating each area affected by releases (if any occurred) from that CCR unit in accordance with 40 CFR §257.102(c) (closure by removal).

CCR removal and decontamination of the CCR unit will be considered completed in accordance with 40 CFR §257.102(c) when each constituent concentration throughout the CCR unit and each area affected by releases from that CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established in 40 CFR §257.95(h) for each constituent listed in 40 CFR §257, Appendix IV.

~~In addition, requirements for closure of the CCR unit by removal of CCR may also include using the Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program (TRRP) in accordance with 30 Texas Administrative Code (TAC) §350 and/or the Industrial Solid Waste and Municipal Hazardous Waste rules in 30 TAC §335.~~

3.1.2 *Performance Standards for Closure in Place*

CPS Energy may close any of the CCR units by leaving CCR in place and constructing a final cover system in accordance with the performance standards stated in 40 CFR §257.102(d)(1):

(i) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;

(ii) Preclude the probability of future impoundment of water, sediment, or slurry;

(iii) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;

(iv) Minimize the need for further maintenance of the CCR unit; and

(v) Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.

~~In addition, closure of the FAL may follow the considerations provided in Technical Guideline No. 3 (Texas TG-3) published by the TCEQ. This document provides the general design approaches for landfill covers. In addition, if a potential release is determined to have occurred from the CCR landfill, then the release will be addressed under the TRRP in accordance with 30 TAC §350.~~

3.2 *NARRATIVE DESCRIPTION OF THE CLOSURE*

Closure of a CCR unit will be accomplished in steps related to the closure performance standard, the characteristics of the bottom liner, the CCR contained in the CCR unit, and the surrounding area.

This section describes a narrative description of closure of the CCR units by either:

- Closure by removal in accordance with 40 CFR §257.102(c); or
- Closure in place in accordance with 40 CFR §257.102(d).

~~In addition, requirements for closure of the CCR unit using the TRRP in accordance with 30 TAC §350 and/or the Industrial Solid Waste and Municipal Hazardous Waste rules in 30 TAC §335 may also be implemented for the selected closure.~~

3.2.1 *Description of Closure by Removal – SRH Pond*

The SRH Pond will be closed by removing and decontaminating each area affected by releases from the CCR units in accordance with 40 CFR §257.102(c) (closure by removal). The closure will be accomplished in steps as follows:

1. Dewater Impoundment: Free liquid in the impoundment will be drained and/or pumped through the permitted outfall until all free liquids have been removed.
2. Remove CCR: CCR and CCR-affected soil will be removed from the CCR unit and from each area affected by release of CCR from that CCR unit. Wet materials will be placed in windrows within the CCR unit ~~on an impermeable liner~~ to drain. After free liquids have drained such that the material will pass the paint filter test, recyclable material will be sent off-site for reuse. Any free liquids released from the wet materials will be collected and/or containerized and will be 1) discharged if the liquids meet the permitted limits, 2) treated to meet permitted limits and then discharged, or 3) disposed offsite at an approved disposal facility.
3. Demolition and Disposal: Non-recyclable material and the HDPE liner will be excavated and placed in the FAL. The concrete liner, overflow chute, and dividing wall will be demolished and disposed in the FAL.
4. Confirm CCR Removal and Decontamination: CCR removal and decontamination of the CCR unit will be confirmed complete by sampling and analytical testing of representative samples of potentially affected soil and ground water for CCR-related constituents throughout the CCR unit, and each area affected by release from that CCR unit. Completion will be achieved when the analytical results indicate all constituents have removed to the corresponding background concentration or applicable TRRP standards in effect at the time of closure, and ground water monitoring concentrations do not exceed the ground water protection standard established by CPS Energy in

accordance with §257.95(h) for each constituent listed in 40 CFR §257, Appendix IV.

5. Site Restoration: CPS Energy may utilize the SRH Pond as impoundments for storm water following removal of CCR. As a result, the impoundments will not be backfilled or graded to prevent ponding of water. New liners, inflow, and outfall structures may be constructed as needed to facilitate reuse of the impoundment. The design criteria for this reuse will be determined by CPS Energy based on regulatory requirements and engineering practices.
6. Completion Report: CPS Energy will prepare, submit to the TCEQ, and obtain TCEQ approval for closure of the CCR unit in accordance with the TRRP and related rules in 30 TAC §350 and/or the Industrial Solid Waste and Municipal Hazardous Waste rules in 30 TAC §335.

3.2.2 *Description of Closure by Removal – North and South BAPs*

The BAPs will be closed by removing and decontaminating each area affected by releases from the CCR units in accordance with 40 CFR §257.102(c) (closure by removal). The closure will be accomplished in steps as follows:

1. Dewater Impoundment: Free liquid in the impoundment will be drained and/or pumped through the permitted outfall until all free liquids have been removed.
2. Remove CCR: CCR and CCR-affected soil will be removed from the CCR unit and from each area affected by release of CCR from that CCR unit. Wet materials will be placed in windrows ~~on an impermeable liner~~with the CCR unit to drain. After free liquids have drained such that the material will pass the paint filter test, recyclable material will be sent off-site for reuse. Any free liquids released from the wet materials will be collected and/or containerized and will be 1) discharged if the liquids meet the permitted limits, 2) treated to meet permitted limits and then discharged, or 3) disposed offsite at an approved disposal facility.
3. Demolition and Disposal: Non-recyclable material will be excavated and placed in the FAL. All inlet and outfall structures will be demolished, with piping and sheet piling cut off at least six inches below ground surface, and capped or filled with concrete. Demolished materials will be placed in the FAL.
4. Confirm CCR Removal and Decontamination: CCR removal and decontamination of the CCR unit will be confirmed complete by sampling and analytical testing of representative samples of potentially affected soil and ground water for CCR related constituents throughout the CCR unit, and each area affected by release from that CCR unit. Completion will be achieved when the analytical results indicate all constituents have removed to the corresponding background concentration or applicable TRRP standards in effect at the time of closure, and ground water monitoring concentrations do not exceed the ground water protection standard established by CPS Energy in

accordance with §257.95(h) for each constituent listed in 40 CFR §257, Appendix IV.

5. Site Restoration: CPS Energy may utilize the BAPs as impoundments for storm water following removal of CCR. As a result, the impoundments will not be backfilled or graded to prevent ponding of water. New liners, inflow, and outfall structures may be constructed as needed to facilitate reuse of the impoundments. The design criteria for this reuse will be determined by CPS Energy based on regulatory requirements and engineering practices.
6. Completion Report: CPS Energy will prepare, submit to the TCEQ, and obtain TCEQ approval for closure of the CCR unit in accordance with the TRRP and related rules in 30 TAC §350 and/or the Industrial Solid Waste and Municipal Hazardous Waste rules in 30 TAC §335.

3.2.3 Description of Closure in Place – Evaporation Pond

The EP will be closed by leaving CCR in place (closure in place). The closure will be accomplished in steps as follows:

1. Remove Liquids: Free liquids will be eliminated by removing liquid wastes and/or solidifying the remaining CCR and CCR residues in the CCR unit.
2. Prepare Final Cover System Subgrade: The remaining CCR will be solidified, if necessary, sufficient to support the final cover system, and the surface will be graded and compacted as necessary to support the final cover system. Additional soil fill (i.e., attic fill) will be added if required to achieve subgrade elevations. If excess berm height exists, the extra berm soil may be used (i.e., berms reduced in height) as fill material to achieve the design slopes. Alternatively, interior drainage may be installed with one or more outlets to the unit perimeter.
3. Final Cover System: The final cover system will be constructed in place over the prepared subgrade to achieve the final cover system criteria in 40 CFR §257.102(d)(3) and may follow the guidelines of Texas TG-3.
4. Completion Report: CPS Energy will prepare, submit to the TCEQ, and obtain TCEQ approval for closure of the CCR unit in accordance with the TRRP and related rules in 30 TAC §350 and/or the Industrial Solid Waste and Municipal Hazardous Waste rules in 30 TAC §335.

3.2.4 Description of Closure in Place – Fly Ash Landfill

The FAL will be closed by leaving CCR in place (closure in place). The closure will be accomplished in steps as follows:

1. Remove Liquids: Free liquids will be eliminated by removing liquid wastes and/or solidifying the remaining CCR and CCR residues in the CCR unit.
2. Prepare Final Cover System Subgrade: The remaining CCR will be solidified, if necessary, sufficient to support the final cover system, and

the surface will be graded and compacted as necessary to support the final cover system. Additional soil fill (i.e., attic fill) will be added if required to achieve subgrade elevations. If excess berm height exists, the extra berm soil may be used (i.e., berms reduced in height) as fill material to achieve the design slopes. Alternatively, interior drainage may be installed with one or more outlets to the unit perimeter.

3. Final Cover System: The final cover system will be constructed in place over the prepared subgrade to achieve the final cover system criteria in 40 CFR §257.102(d)(3) and may follow the guidelines of Texas TG-3.
4. Completion Report: CPS Energy will prepare, submit to the TCEQ, and obtain TCEQ approval for closure of the CCR unit in accordance with the TRRP and related rules in 30 TAC §350 and/or the Industrial Solid Waste and Municipal Hazardous Waste rules in 30 TAC §335.

3.3 FINAL COVER SYSTEM – EVAPORATION POND AND FLY ASH LANDFILL

The final cover system for the EP and FAL will be as generally described in Section 3.3.1.

3.3.1 Final Cover System Design Criteria

The final cover system constructed for closure of the CCR units will achieve the final cover system design criteria specified in 40 CFR §102(d)(3)(i):

(A) *The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less.*

(B) *The infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material.*

(C) *The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.*

(D) *The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.*

Detailed design of the final cover system and associated drainage features will be prepared as part of overall closure design and planning process. The final cover materials, material thicknesses, and final grades will take into consideration the final volume of CCR to be contained within the unit, the waste properties, and the bottom liner materials and properties of each CCR unit. A Hydrologic Evaluation of Landfill Performance (HELP) Model ~~will~~may be utilized as part of detailed design to confirm the proposed final cover system meets the design criteria required in 40 CFR §102(d)(3)(i). The final cover systems for both the EP and FAL will likely consist of the following from top to bottom:

- Either an~~d~~ armored or vegetated top surface;
- An infiltration layer and/or drainage layer;

- A low permeability soil and/or flexible membrane layer; and
- A protective cushion layer supporting the above materials.

~~This Closure and Post Closure Plan will be amended w~~When detailed design of the final cover system (including slope stability analyses, geotechnical data, and material testing data) is complete, ~~and~~ a minor amendment will be submitted to update the TCEQ CCR Registration required under 30 TAC §352.131 and §305.62.

3.4 ALTERNATIVE FINAL COVER SYSTEM DESIGN CRITERIA

If CPS Energy chooses to construct an alternative final cover system for closure of a CCR unit, the final cover system will achieve the alternative final cover system design criteria specified in 40 CFR §257.102(d)(3)(ii):

(A) *The design of the final cover system must include an infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in [40 CFR §257.102](d)(3)(i)(A) and (B)* [i.e. the permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less; and the infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material].

(B) *The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in [40 CFR §257.102](d)(3)(i)(C)* [i.e. the erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth].

(C) *The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.*

3.4.1 Methods and Procedures Used to Install the Final Cover System

If CPS Energy chooses to implement the final cover system design criteria in 40 CFR §257.102(d)(3)(i) for closure of the FAL, the final cover system is anticipated to be as generally described below:

- Cap Topsoil Layer: The Cap Topsoil layer will be a 6-inch thick layer of topsoil suitable for seeding and establishment of cover vegetation and support of each stage of related cap construction and maintenance equipment and materials, with a surface slope of 3% to 5% graded to drain to relief, and with a substantially continuous stand of erosion-resistant native or adapted perennial shortgrass cover vegetation in accordance with 40 CFR §257.102(d) (3)(i)(C).
- Cap Soil Fill Layer: The Cap Soil Fill layer will be an 18-inch thick layer of soil fill suitable for supporting the Cap Topsoil layer and related cap construction and maintenance equipment and materials in accordance with 40 CFR §257.102(d)(3)(i)(B).

Alternate final cover systems that achieve the alternate final cover system performance requirements in 40 CFR §257.102(d)(3)(ii) may be substituted for the final cover system described above. If CPS Energy chooses to implement an alternate final cover system for closure of the EP, the final cover system is anticipated to be as generally described below:

- Cap Topsoil Layer: The Cap Topsoil layer will be a 6-inch thick layer of topsoil suitable for seeding and establishment of cover vegetation and support of each stage of related cap construction and maintenance equipment and materials, with a surface slope of ~~2~~3% to ~~1~~5% graded to drain to relief, and with a substantially continuous stand of erosion-resistant native or adapted perennial shortgrass cover vegetation in accordance with 40 CFR §257.102(d) (3)(ii)(~~C~~B).
- Cap Protective Cover Layer: The Cap Protective Cover Layer will be a 12-inch thick layer of general fill soil or bottom ash material to protect underlying geocomposite, compacted clay and Flexible Membrane Liner (FML) layers.
- Geocomposite Drainage Layer: The Geocomposite Drainage Layer will be a geonet heat bonded with a geotextile to convey infiltrated stormwater to the perimeter of the unit.
- Cap Compacted Clay Layer: The Cap Compacted Clay Layer will be a 12-inch thick layer of clay rich soil to limit infiltration and protect underlying FML layer.
- FML Layer: The Flexible Membrane Liner (FML) layer will be a 40-mil LLDPE to minimize infiltration of stormwater.

3.5 *CCR VOLUME ESTIMATE*

As required in 40 CFR §257.102(b)(1)(iv), the following are estimates of the maximum volume of CCR on-site during the active life of each of the CCR units.

- SRH Pond: 23,600 cubic yards of CCR, based on the maximum capacity of the pond while maintaining the freeboard required by the Inflow Flood Control Plan.
- North BAP: 89,600 cubic yards of CCR, based on the maximum capacity of the pond while maintaining the freeboard required by the Inflow Flood Control Plan.
- South BAP: 99,900 cubic yards of CCR, based on the maximum capacity of the pond while maintaining the freeboard required by the Inflow Flood Control Plan.
- EP: 133,700 cubic yards of CCR, based on the maximum capacity of the pond while maintaining the freeboard required by the Inflow Flood Control Plan.
- FAL: 887,300 cubic yards of CCR, based on the maximum capacity of the landfill while maintaining the freeboard required by the Run-on/Run-off Control Plan.

3.6 FINAL COVER AREA

As required in 40 CFR §257.102(b)(1)(v), an estimate of the largest area requiring a final cover in accordance with 40 CFR §257.102(d) (i.e. closure in place) at any time during the active life of a CCR unit is stated below:

- EP: 4.5 acres, based on the total area inside the interior top of bank.
- FAL: 23 acres, based on the total area inside of the interior top of bank.

3.7 CLOSURE SCHEDULE

As required in 40 CFR §257.102(b)(1)(vi), the estimated schedules for closure of the SRH Pond, BAPs, EP, and FAL are shown in Tables 1 through 4, respectively. In accordance with 40 CFR§ 257.102(b)(1)(vi), each of the schedules includes the sequential steps necessary to close the CCR unit, major milestones, and an estimate of the year in which closure activities will be completed.

Due to the anticipated permitting and construction schedule, CPS Energy expects to extend the closure period beyond the six month timeframe for completing closure of the FAL specified in 40 CFR §257.102(f)(1)(i). At the time of closure, CPS Energy will submit extension(s) when and if appropriate.

Owners/operators must commence closure within the following:

- 30 days of final receipt of CCR or non-CCR waste; or
- 30 days of final removal of the known final volume of CCR for beneficial use; and
- Within 2 years of the last receipt of CCR and non-CCR waste streams or the last removal of CCR material for beneficial use.

According to 40 CFR §257.102(e)(3) closure activities have commenced if the CCR unit has ceased receiving waste and owners/operators have:

(i) Taken any steps necessary to implement the written closure plan required by paragraph (b) of 40 CFR §257.102;

(ii) Submitted a completed application for any required state or agency permit or permit modification; or

(iii) Taken any steps necessary to comply with any state or other agency standards that are a prerequisite, or are otherwise applicable, to initiating or completing the closure of a CCR unit.

4.0 *CCR UNIT POST-CLOSURE CARE*

CPS Energy will implement post-closure care of each CCR unit closed with CCR in place in accordance with 40 CFR §257.104. ~~CPS Energy will also implement if applicable, activities required by the TRRP in accordance with 40 CFR §257 and 30 TAC §350. Goals~~ Objectives of the post-closure care are as follows:

- Maintain the integrity and effectiveness of the CCR unit final cover system, including making repairs as necessary to correct the effects of settling, subsidence, erosion, or other events [40 CFR §257.104(b)];
- Maintain the ground water monitoring system and implement each applicable monitoring requirements in 40 CFR §257.90 through 98; and
- Prevent storm water run-on and run-off from eroding or otherwise damaging the final cover [40 CFR §257.104(b)].

In order to achieve the objectives of post-closure care, CPS Energy will implement the following CCR unit post-closure activities:

- Inspection and maintenance of the CCR unit final cover system and associated groundwater monitoring wells. Inspection and maintenance of the final cover system will be conducted monthly for the first year of post-closure and semiannually thereafter. Inspection and maintenance of the groundwater monitoring wells will be conducted semiannually. Closed CCR units will be inspected by a qualified Professional Engineer once per year for the entire post-closure period;
- Ground water monitoring sampling, analysis, and reporting. Groundwater monitoring will be conducted semiannually with annual statistical analysis and reporting to the TCEQ~~concentrations are below applicable standards~~;
- Facility Operating Record recordkeeping and reporting posted on the ~~internet site~~CCR Website available to the public; and
- Deed recordation will be filed with the county upon closure of the CCR unit.

~~4.0.1 *Post-Closure Plan Amendment*~~

~~According to 40 CFR §257.104(d)(3)(i), CPS Energy may amend this written post-closure plan at any time.~~

~~Per 40 CFR §257.102(d)(3)(ii), CPS Energy must amend the post-closure plan whenever:~~

- ~~There is a change in operation of the CCR unit that would substantially affect the written post-closure plan in effect; or~~
- ~~After post-closure activities have commenced, unanticipated events necessitate a revision of the written post-closure plan.~~

4.1 POST-CLOSURE PERIOD

In accordance with 40 CFR §257.104(c), the post-closure care period for each CCR unit must be for a period of 30 years following CPS Energy certification of completion of closure of the CCR unit. If at the end of the post-closure care period the CCR unit is operating under assessment monitoring in accordance with 40 CFR §257.95, CPS Energy will continue post-closure care until the CCR unit returns to detection monitoring.

4.2 POST CLOSURE INSPECTION AND MAINTENANCE

CPS Energy will inspect and maintain the final cover system at each CCR unit, each associated ground water monitoring well, and each associated permanent benchmark throughout the post-closure period. The CCR unit post-closure care inspection and maintenance requirements are described below:

- Final cover system will be inspected for damage resulting from natural or unnatural causes. Maintenance activities may include repairing damage caused by settling or erosion; draining and filling areas collecting ponded water; and re-seeding areas with inadequate or inappropriate erosion-resistant cover vegetation as necessary to maintain the effectiveness of the final cover system.
- Storm water run-on and run-off control systems will be inspected for damage resulting from natural causes and non-routine facility operations. Storm water run-on and run-off control berms and drainage channels that drain the CCR unit will be maintained and, as necessary to maintain effectiveness, repaired.
- Ground water monitoring wells that are part of the CCR unit monitor well network will be inspected for condition necessary to provide adequate and representative ground water samples. Maintenance may include the repair or replacement of damaged, degraded, or missing well caps, identification signs, locking devices, perimeter grading, protective barriers, surface casing, surface pads, and, if necessary, the entire well.

CPS Energy will implement ground water monitoring during the CCR unit post-closure care period in accordance with 40 CFR §257.90 through §257.98.

4.3 CONTACT INFORMATION

The name, address, telephone number, and email address of the person to contact about the CCR units at the Calaveras Power Station during the post-closure care period is:

Michael Malone
CPS Energy
500 McCullough Ave.
San Antonio, Texas 78215
210-353-3625
mmmalone@cpsenergy.com

4.4 PLANNED CCR UNIT POST-CLOSURE PROPERTY USE

CPS Energy plans to use the closed SRH Pond~~,~~ and BAP areas as storm water retention/storage ponds, restoration of native plant life, or redevelopment. The areas will be limited to commercial or industrial use if closed under certain TRRP standards.

During the post-closure care period, CPS Energy plans to limit access to the CCR unit to reduce potential for damage of the final cover system and the associated ground water monitoring wells.

If the post-closure period of a CCR unit extends past the date the Calaveras Power Station is decommissioned, the CCR unit will remain closed to the public or limited to compatible commercial or industrial use.

5.0 *CCR UNIT CLOSURE AND POST-CLOSURE PLAN AMENDMENT*

According to 40 CFR §257.102(b)(3)(i), CPS Energy may amend this CPC Plan at any time.

As specified in 40 CFR §257.102(b)(3)(ii), CPS Energy must amend this CPC Plan for any of the following reasons:

- When there is a change in operation of the CCR unit that would substantially affect the written CPC Plan ~~then~~ in effect; or
- When an unanticipated event necessitates revision of the CPC Plan before or during CCR unit closure activities, or after the CCR unit post-closure care period has commenced.

In addition, as specified in 40 CFR §257.102(b)(3)(iii), CPS Energy must amend this CPC Plan within 60 days prior to a CPS Energy planned change in CCR unit operation or within 60 days after an unplanned CCR unit event (if the change occurs after CCR unit closure activities have been initiated, the CPC Plan must be amended within 30 days following the triggering event).

CPS Energy will provide written certification by a professional engineer that states that the amended CPC Plan meets the requirements of closure and post-closure care required in 40 CFR §257.102(b)(4).

6.0 NOTIFICATION AND RECORD KEEPING

CPS Energy will issue notifications and implement recordkeeping in accordance with 40 CFR §257.105 and 40 CFR §257.106.

6.1 NOTIFICATIONS

CPS Energy will notify the Executive Director of TCEQ, the State Director as defined in 40 CFR §257.105(d), and in accordance with 40 CFR §257.106(g)(1) and (2), when the following documents are made available in the CPS Energy Facility Operating Record:

- Initial CPC Plan;
- Each amendment to the CPC Plan;
- Written demonstration for a time extension for initiating closure;
- Each notice of intent to initiate CCR unit closure;
- Each notice of completion of CCR unit closure;
- Intent to comply with alternative closure requirements;
- Annual progress reports under alternative closure requirements;
- Each notification of completion of the CCR unit post-closure care period; and
- Each CCR unit deed notation.

In accordance with TCEQ instructions related to CCR units in Texas, CPS Energy will send each notification to the TCEQ via internet electronic mail to:

CCRNotify@tceq.texas.gov

6.2 CPS ENERGY CCR WEBSITE

CPS Energy will post the following documents on the CPS Energy Web~~internet~~ site accessible to the public in accordance with 40 CFR §257.107~~(g)(1) and (2)~~ within 30 days of placing the document in the Operating Record and for a period of five years thereafter:

- Initial CPC Plan;
- Each amendment to the CPC Plan;
- Written demonstration for a time extension for initiating closure;
- Each notice of intent to initiate CCR unit closure;
- Each notice of completion of CCR unit closure;
- Intent to comply with alternative closure requirements;
- Annual progress reports under alternative closure requirements;
- Each notification of completion of the CCR unit post-closure care period; and

- Each CCR unit deed notation.

6.3 *DEED NOTATION*

In~~For CCR units closed under TRRP for commercial or industrial land use, in~~ accordance with requirements specified in 30 TAC §352.1221~~0.111, Institutional Controls,~~ and in 40 CFR §257.102(i)~~, Deed Notations~~, CPS Energy will record in the permanent deed records of Bexar County, Texas, ~~the following information regarding~~ each CCR unit closure.~~:~~

~~Remedy Standard A, closure by removal to residential standards:~~

- ~~No deed notice/institutional controls required.~~

~~Remedy Standard A, closure by removal to commercial/industrial standards:~~

- ~~A deed notice that if any person desires to use the property for residential purposes, they must first notify the TCEQ at least 60 days in advance. Additional response action may be necessary before the property is to be approved for residential use.~~

~~Remedy Standard B, closure with CCR left in place:~~

- ~~A metes and bounds description and a plat map sealed by Registered Professional Land Surveyor licensed by the Texas Board of Professional Land Surveyors of the portion(s) of the tract(s) of land on which a CCR unit has been closed in place;~~
- ~~A statement describing the appropriate future land use and documenting any property use limitations;~~
- ~~The class(es) of waste that was disposed and the corresponding waste description(s); and~~
- ~~The name or permanent address of the person or persons operating the facility where more specific information on the wastes can be obtained.~~

Within 30 days of recording each deed notation, CPS Energy will place a corresponding notification that the notation has been recorded in the CPS Energy Facility Operating Record and the CPS Energy CCR Website~~Web S~~ite.

7.0 *PROFESSIONAL ENGINEER CERTIFICATION*

40 CFR §257.102 and 40 CFR §257.104 require that this CPC Plan meet those requirements. In addition, a professional engineer must certify that any amendments to the CPC Plan meet requirements of those rules, and that closure of the CCR unit has been achieved in accordance with those rules. Certification for this CPC Plan is provided below.

> *"I hereby certify that I have reviewed the CCR unit management practices for the Calaveras Power Station in Bexar County, Texas, and being familiar with the provisions of 40 CFR Part 257.102 and 40 CFR Part 257.104, attest that this CPC Plan has been prepared in accordance with good engineering practices."*

Seal:

Charles Johnson, P.E. (TX)
Printed Name of Licensed Professional Engineer

____
Signature of Licensed Professional Engineer

Date: _______________

128280
TBPE P.E. License No.

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

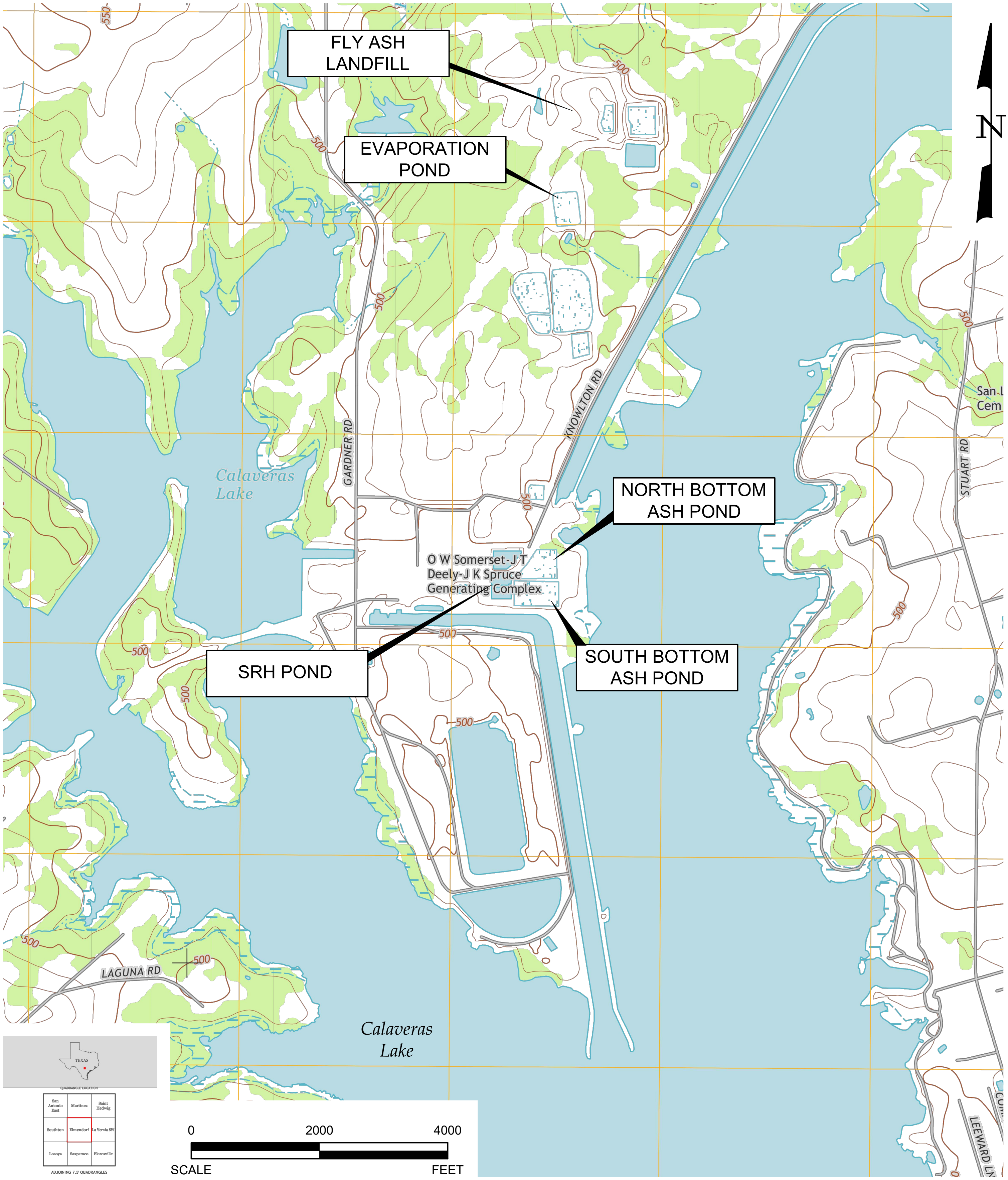
8.0 REFERENCES

Sources of information used in the preparation of this CPC Plan ae listed below:

CDM, 2014a	Assessment of Dam Safety of Coal Combustion Surface Impoundments Final Report, CPS Energy J.T. Deely Power Plant, San Antonio, Texas, CDM Smith, February 2014, revised May 2014 and June 2014.
CDM, 2014b	Assessment of Dam Safety of Coal Combustion Surface Impoundments Final Report, CPS Energy J.K. Spruce Power Plant, San Antonio, Texas, CDM Smith, February 2014, revised May 2014 and June 2014.
B&V, 1974	Railroad Turnout Coal Handling Service Area and Ash Disposal Area Drawing, San Antonio, Texas, Black & Veach Consulting Engineering, September 30, 1974.
CPS, 1990	Ash Disposal Pit #4 Elevation Views Drawing, San Antonio, Texas, City Public Service, July 16, 1990.

Figure

Environmental Resources Management
840 West Sam Houston Parkway North, Suite 600
Houston, Texas 77024
281-600-1000



ERM-Southwest, Inc. TX PE Firm No. 2393

Environmental Resources Management

DESIGN: CC
DRAWN: RLM
CHKD.: CC
DATE: 9/19/2018
SCALE: AS SHOWN
REV.:
W.O. NO.: T:\DWG\AutoCAD\dwg\0337367\0337367_CCRUnitLocs_topo.dwg

FIGURE 1
CCR UNIT LOCATION MAP

CPS Energy - Calaveras Power Station
San Antonio, Texas

ERM

Tables

Environmental Resources Management
840 West Sam Houston Parkway North, Suite 600
Houston, Texas 77024
281-600-1000

TABLE 1
Estimated Closure Schedule

SRH Pond
CCR Unit Closure and Post-Closure Plan
Calaveras Power Station
Bexar County, Texas

Event/Activity	Estimated Schedule[1]
Notification of intent to initiate closure of CCR Unit, per 40 CFR 257.106	**When decision is finalized to initiate closure**
Detailed design	12 months
Permitting[2]	6 months
Contractor bid, selection, and award	8 months
CCR removal[3]	2 months
Demolition, decontamination[4], finish grading, and site restoration	5 months
Prepare and submit closure certification report	3 months
Estimated Completion of Closure	**36 months from notification date**

NOTES:

1) Closure schedule is provided in months from notification of intent to initiate closure.

2) Closure activities have commenced when owners/operators have submitted applications for state or local permits per 40 CFR 257.102(e)(3).

3) Includes dewatering of pond, excavation and dewatering of CCR, and placement of dewatered CCR into Fly Ash Landfill.

4) Includes removal of associated infrastructure, excavation and disposal of concrete slab and one foot of subgrade liner, and confirmation soil sampling.

TABLE 2
Estimated Closure Schedule

North and South BAPs
CCR Unit Closure and Post-Closure Plan
Calaveras Power Station
Bexar County, Texas

Event/Activity	**Estimated Schedule(1)**
Notification of intent to initiate closure of CCR Unit, per 40 CFR 257.106	**June 21, 2020**
Detailed design	12 months
Permitting(2)	6 months
Contractor bid, selection, and award	8 months
CCR removal(3)	2 months
Demolition, decontamination(4), finish grading, and site restoration	5 months
Prepare and submit closure certification report	3 months
Estimated Completion of Closure	**June 2023**

NOTES:

1) Closure schedule is provided in months from notification of intent to initiate closure.

2) Closure activities have commenced when owners/operators have submitted applications for state or local permits per 40 CFR 257.102(e)(3).

3) Includes excavation and dewatering of CCR, and placement of dewatered CCR into Fly Ash Landfill.

4) Includes removal of associated infrastructure, excavation and disposal of one foot of subgrade liner, and confirmation soil sampling.

TABLE 3
Estimated Closure Schedule

Evaporation Pond
CCR Unit Closure and Post-Closure Plan
Calaveras Power Station
Bexar County, Texas

Event/Activity	Estimated Schedule[1]
Notification of intent to initiate closure of CCR Unit, per 40 CFR 257.106	**When decision is finalized to initiate closure**
Detailed design	12 months
Permitting[2]	6 months
Contractor bid, selection, and award	8 months
Prepare subgrade[3]	2 months
Construct landfill cap[4]	3 months
Prepare and submit closure certification report	3 months
Estimated Completion of Closure	**34 months from notification date**

NOTES:

1) Closure schedule is provided in months from notification of intent to initiate closure.

2) Closure activities have commenced when owners/operators have submitted applications for state or local permits per 40 CFR 257.102(e)(3).

3) Includes regrading waste, placing borrow fill as required to achieve design grades, and shaping perimeter drainage features.

4) Includes cap components, seeding, and final drainage component installation. Does not include time required for self-sustaining vegetative cover to be established.

TABLE 4
Estimated Closure Schedule

Fly Ash Landfill
CCR Unit Closure and Post-Closure Plan
Calaveras Power Station
Bexar County, Texas

Event/Activity	Estimated Schedule(1)
Notification of intent to initiate closure of CCR Unit, per 40 CFR 257.106	**When decision is finalized to initiate closure**
Detailed design	12 months
Permitting(2)	6 months
Contractor bid, selection, and award	10 months
Prepare subgrade(3)	3 months
Construct landfill cap(4)	4 months
Prepare and submit closure certification report	3 months
Estimated Completion of Closure	**38 months from notification date**

NOTES:

1) Closure schedule is provided in months from notification of intent to initiate closure.

2) Closure activities have commenced when owners/operators have submitted applications for state or local permits per 40 CFR 257.102(e)(3).

3) Includes regrading waste, placing borrow fill as required to achieve design grades, and shaping perimeter drainage features.

4) Includes cap components, seeding, and final drainage component installation. Does not include time required for self-sustaining vegetative cover to be established.

Attachment 20   Certifications

Attachment 20-1

Registration No.: XXXXX
Registrant: CPS Energy Calaveras Power Station

Signature Page

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Applicant Signature: ______________________ Date: __________

Name and Official Title (type or print): ______________________

Owner or Operator Signature: ______________________ Date: Jan 21, 2022

Name and Official Title (type or print): Curt D. Brockmann, VP, Compliance, Ethics & Facility Master Planning

To be completed by the owner or operator if the application is signed by an authorized representative for the operator

I, ______________________ hereby designate ______________________
(operator) (authorized representative)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a CCR waste management registration. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any registration which might be issued based upon this application.

____
Printed or Typed Name of Applicant or Principal Executive Officer

____
Signature

(Note: Application Must Bear Signature & Seal of Notary Public)

Subscribed and sworn to before me by the said Curt D. Brockmann on this 21st day of January, 2022.

My commission expires on the 4TH day of March, 2023

(Seal) Notary Public in and for Bexar County, Texas

HELEN C MONTOYA
NOTARY PUBLIC
ID# 4901681
State of Texas
Comm. Exp. 03-04-2023

Helen C. Montoya
Notary

Attachment 20-2

Registration No.:
Registrant: CPS Energy Calaveras Power Station

Surface Impoundments: Dike Construction

For each surface impoundment dike, complete the following information:

"I, Charles Johnson, Texas P.E. License Number 128280, of Registered Firm Environmental Resources Management (ERM), Registered Engineering Firm F-2393, certify under penalty of law that I have personally examined and am familiar with the design and construction of the dikes that are a portion of the North and South Bottom Ash Ponds.

I further certify that I have evaluated the dike design and materials of construction using accepted engineering procedures, and have determined that the dike, including the portion of the dike providing freeboard, has structural integrity, and is constructed in accordance with applicable surface impoundment criteria per the following:

__X__ Existing Diked Surface Impoundment – 40 CFR 257.73(a)(1) through (4) and 30 TAC Section 352.731.

______ New or Lateral Diked Surface Impoundment – 40 CFR 257.74(a)(1) through (4) and 30 TAC Section 352.741."

Date: January 20, 2022

PE Signature: Charles Johnson

CHARLES O. JOHNSON
128280

Charles Johnson 1/20/2022

Attachment 20-3

Registration No.:
Registrant: CPS Energy Calaveras Power Station

Surface Impoundments: Dike Construction

For each surface impoundment dike, complete the following information:

> "I, Charles Johnson, Texas P.E. License Number 128280, of Registered Firm Environmental Resources Management (ERM), Registered Engineering Firm F-2393, certify under penalty of law that I have personally examined and am familiar with the design and construction of the dikes that are a portion of the Evaporation Pond.
>
> I further certify that I have evaluated the dike design and materials of construction using accepted engineering procedures, and have determined that the dike, including the portion of the dike providing freeboard, has structural integrity, and is constructed in accordance with applicable surface impoundment criteria per the following:
>
> __X__ Existing Diked Surface Impoundment – <u>40 CFR 257.73(a)(1) through (4)</u> and <u>30 TAC Section 352.731.</u>
>
> ______ New or Lateral Diked Surface Impoundment – <u>40 CFR 257.74(a)(1) through (4)</u> and <u>30 TAC Section 352.741."</u>

Date: January 20, 2022

PE Signature: Charles Johnson

CHARLES O. JOHNSON
128280

Charles Johnson 1/20/2022

Attachment 20-4

Registration No.:
Registrant: CPS Energy Calaveras Power Station

Surface Impoundments: Dike Construction

For each surface impoundment dike, complete the following information:

"I, Charles Johnson, Texas P.E. License Number 128280, of Registered Firm Environmental Resources Management (ERM), Registered Engineering Firm F-2393, certify under penalty of law that I have personally examined and am familiar with the design and construction of the dikes that are a portion of the Sludge Recycle Holding (SRH) Pond.

I further certify that I have evaluated the dike design and materials of construction using accepted engineering procedures, and have determined that the dike, including the portion of the dike providing freeboard, has structural integrity, and is constructed in accordance with applicable surface impoundment criteria per the following:

__X__ Existing Diked Surface Impoundment – 40 CFR 257.73(a)(1) through (4) and 30 TAC Section 352.731.

______ New or Lateral Diked Surface Impoundment – 40 CFR 257.74(a)(1) through (4) and 30 TAC Section 352.741."

Date: January 20, 2022

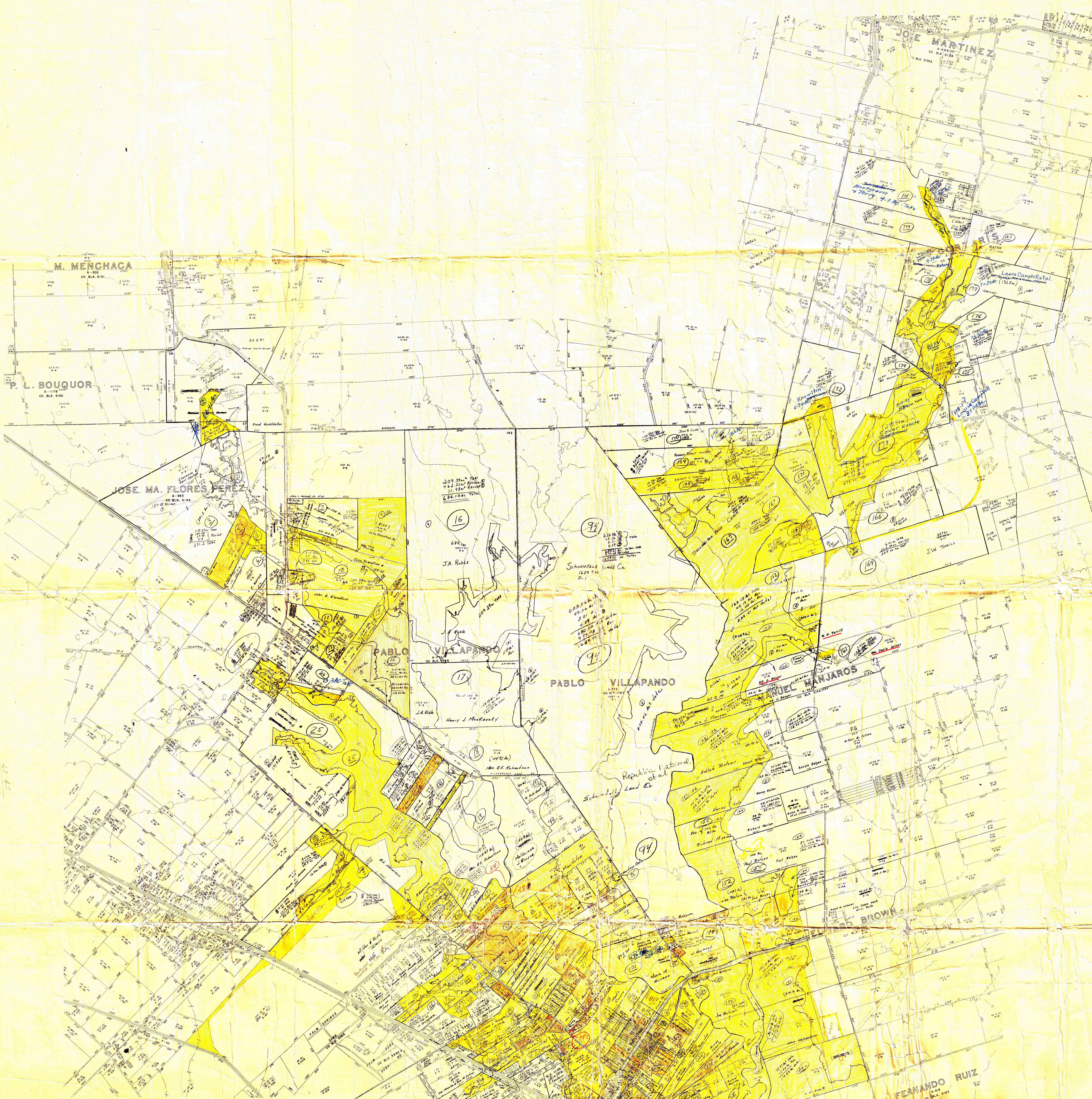
PE Signature: Charles Johnson

CHARLES O. JOHNSON
128280

Charles Johnson 1/20/2022

Attachment 21   Plat Survey – Metes and Bounds – Property Owner Affidavit

Attachment 21-1



CPSB
REAL ESTATE
SECTION
COPY

CALAVERAS PROJECT
OWNERSHIP

OFFice
Copy

Attachment 21-2

FIELD NOTE DESCRIPTION OF CALAVERAS LAKE

All that certain tract of land lying and situate about twelve miles in a Southeasterly direction from San Antonio, in Bexar County, Texas, said tract of land containing 7459.256 acres, more or less, and being out of the following surveys:

SURVEY	ORIGINAL GRANTEE	ABSTRACT	COUNTY BLOCK
121	Fernando Ruiz	619	5165
4	Jose De La Garza	4	4008
6	Juan Montez	11	4007
57	Jose Ma.Flores Perez	583	5149
5	Miguel Gortaris	252	5192
142	Pablo Villapando	772	5148
141	Pablo Villapando	773	5147
7	Miguel Gortaris	256	5140
6	Manuel Manjaros	463	5146
120	Edward Brown	58	5164

being more particularly described as follows, TO-WIT:

Beginning at a point in the Northwest right of way line of F.M. Road 1518, in the Fernando Ruiz Survey No. 121, Abstract No. 619, County Block 5165 in Bexar County, Texas; said point of beginning being 71.63 feet South 07° 39' 32" West along the Northwest right of way line of F.M. Road 1518 from its intersection with the Southwest right of way line of Stuart Road;

Thence with the Northwest right of way line of F.M. Road 1518 as follows:

South 07° 39' 32" West, 42.44 feet, to an angle point, which point is left 50.00 feet from and at a right angle to the centerline of said Road at Survey Station 173+53.61;

South 41° 34' 37" West, 3712.74 feet, parallel to the centerline of said Road, to a point in the centerline of Calaveras Creek;

Thence leaving said right of way line and with the centerline of Calaveras Creek upstream as follows:

North 61° 33' 30" West, 48.20 feet;
North 48° 20' 40" West, 117.10 feet;
North 67° 50' 25" West, 34.70 feet;
North 49° 42' 40" West, 60.40 feet;
North 56° 12' 02" West, 189.00 feet;
North 51° 24' 30" West, 64.62 feet;
North 46° 30' 00" West, 115.00 feet;
North 68° 07' 52" West, 67.00 feet;

Thence, leaving the centerline of Calaveras Creek, South 66° 28' 00" West, 2355.00 feet, to the Northeast right of way line of the Laguna Road;

Thence with the Northeast right of way line of the Laguna Road as follows:

North 53° 04' 00" West, 1161.40 feet;
North 53° 29' 00" West, 235.60 feet;
North 53° 25' 00" West, 235.60 feet, to a corner of Laguna Road;
South 60° 38' 27" West, 45.32 feet, with the edge of Laguna Road, to the Southeast right of way line of Laguna Road;

Thence leaving said right of way line, South 65° 15' 18" West, 262.34 feet;

Thence South 66° 18' 09" West, 597.66 feet to a 3/4 inch iron pin for corner of this tract;

Thence North 52° 43' 39" West, 349.50 feet to a 3/4 inch iron pin in fence line;

Thence North 55° 47' 39" West, 300.34 feet to a 3/4 inch iron pin for corner;

Thence North 34° 40'00" East, 399.68 feet to a 3/4 inch iron pin;

Thence North 34° 33' 00" East, 199.80 feet to a 1/2 inch iron pin;

Thence North 56° 35' 24" West, 63.00 feet to a 1/2 inch iron pin in the Southeast right of way line of Adkins-Elmendorf Road;

Thence North 56° 35' 09" West, 36.30 feet with edge of Adkins-Elmendorf Road to a 3/4 inch iron pin in the Northwest right of way line of said Road;

Thence, leaving said Road, North 09° 03' 51" East, 549.30 feet to a 3/4 inch pin in the abandoned Southwest right of way line of Laguna Road;

Thence North 54° 35' 35" West, 89.66 feet to a point on the East right of way line of Kilowatt Road (formerly F.M. Road 1518);

Thence North 63° 39' 21" West, 151.91 feet across the end of said Road, to a point on the West right of way line of said Road;

Thence, leaving said Road, South 59° 00' 02" West, 302.40 feet to a 3/4 inch iron pin for an interior corner;

Thence South 19° 19' 30" West, 607.50 feet to a 3/4 inch iron pin in the Northwest right of way line of Kilowatt Road ;

Thence with said right of way line as follows:

South 34° 27' 49" West, 59.78 feet;

South 33° 40' 27" West, 621.86 feet to the East flare corner of the intersection of Kilowatt Road and U.S. Highway No. 181;

South 73° 34' 16" West, 149.07 feet to the West flare corner of the intersection of Kilowatt Road and U.S. Highway No. 181;

Thence South 28° 30' 00" West, 250.00 feet across U.S. Highway No. 181 to the West flare corner of the intersection of Kilowatt Road and U.S. Highway No. 181;

Thence South 13° 50' 33" East, 103.19 feet to the East flare corner of the intersection of Kilowatt Road and U.S. Highway No. 181;

Thence with the Northwest right of way line of Kilowatt Road South 33° 45' 55" West, 634.99 feet to a corner;

Thence North 12° 33' 29" West, 878.90 feet to an iron pin in the Southwest right of way line of U.S. Highway No. 181;

Thence North 43° 15' 00" East, 259.00 feet across U.S. Highway No. 181 to a corner in the Northeast right of way line of said Highway;

Thence, leaving said Highway, North 02° 55' 23" East, 218.25 feet to an interior corner;

Thence North 62° 04' 23" West, 150.00 feet to a point;

Thence North 62° 10' 00" West, 201.25 feet to a point;

Thence North 62° 04' 23" West, 206.43 feet to a corner;

Thence North 12° 44' 02" West, 318.40 feet to a corner;

Thence North 58° 53' 58" East, 165.00 feet to a point;

Thence North 59° 22' 00" East, 266.33 feet to an interior corner;

Thence North 33° 08' 15" West, 640.28 feet to a corner;

Thence North 58° 32' 41" East, 64.01 feet to an iron pin;

Thence North 56° 57' 00" East, 10.99 feet to an interior corner;

Thence North 31° 23' 22" West, 140.74 feet to an interior corner;

Thence South 58° 35' 43" West, 172.99 feet to an iron pipe for corner;

Thence North 58° 57' 45" West, 471.00 feet to an interior corner;

Thence South 58° 48' 36" West, 538.21 feet to an interior corner;

Thence South 31° 58' 29" East, 97.39 feet to a corner;

Thence South 58° 42' 18" West, 360.00 feet to a corner;

Thence North 31° 58' 29" West, 98.05 feet to a 3/4 inch iron pin;

Thence North 34° 06' 57" West, 231.76 feet to a 3/4 inch iron pin for an interior corner;

Thence South 58° 14' 23" West, 670.90 feet to a 3/4 inch iron pin on the Northeast right of way line of U.S. Highway No. 181;

Thence South 04° 11' 00" West, 265.00 feet across U.S. Highway No. 181 to a 3/4 inch iron pin on the Southwest right of way line of said Highway;

Thence, leaving said Highway, South 58° 45' 59" West, 1339.11 feet to a 3/4 inch iron pin for corner;

Thence North 31° 12' 40" West, 542.91 feet to a 3/4 inch iron pin for corner;

Thence North 57° 48' 05" East, 335.25 feet;

Thence North 58° 20' 43" East, 248.12 feet;

Thence North 59° 30' 47" East, 430.17 feet to a 1/2 inch iron pin on the Southwest right of way of U.S. Highway No. 181;

Thence continuing North 59° 30' 47" East, 280.00 feet across U.S. Highway No. 181 to a 1/2 inch iron pin on the Northeast right of way line of said Highway;

Thence with the Northeast right of way line of U.S. Highway No. 181 as follows:

North 62° 16' 10" West, 243.62 feet to a point;

North 62° 24' 07" West, 386.71 feet to a 4 inch iron pin for corner;

Thence leaving said Highway, North 57° 53' 53" East, 241.12 feet to a 3/4 inch iron pin for an interior corner;

Thence North 51° 31' 04" West, 84.59 feet to a 3/4 inch iron pin;

Thence North 69° 49' 04" West, 127.68 feet to a 3/4 inch iron pin;

Thence North 61° 50' 00" West, 489.00 feet to an interior corner;

Thence South 60° 00' 00" West, 248.39 feet to corner in the Northeast right of way line of U.S. Highway No. 181;

Thence with the Northeast right of way line of said Highway North 61° 50' 00" West, 380.12 feet to a corner;

Thence leaving said Highway North 60° 00' 00" East, 1188.00 feet to an iron pin for an interior corner;

Thence North 29° 42' 41" West, 444.94 feet to an interior corner;

Thence South 58° 33' 50" West, 274.13 feet to a 3/4 inch iron pin for corner;

Thence North 63° 57' 34" West, 655.00 feet to a 3/4 inch iron pin for an interior corner;

Thence South 52° 33' 50" West, 258.22 feet to a corner;

Thence North 38° 23' 29" West, 495.00 feet to a 3/4 inch iron pin for an interior corner;

Thence South 52° 28' 14" West, 1056.34 feet to a 3/4 inch iron pin in the Northeast right of way line of U.S. Highway No. 181 for corner;

Thence with said right of way line North 62° 28' 05" West, 350.57 feet to a 1/2 inch iron pin for corner;

Thence, leaving said Highway, North 51° 29' 19" East, 341.06 feet to a 3/4 inch iron pin for an interior corner;

Thence North 38° 24' 10" West, 414.89 feet to a 3/4 inch iron pin for corner;

Thence North 51° 35' 50" East, 1006.50 feet to a 3/4 inch iron pin for corner;

Thence South 50° 26' 04" East, 94.90 feet to a point for an interior corner;

Thence North 50° 29' 30" East, 799.36 feet to a 3/4 inch iron pin for an interior corner;

Thence North 13° 30' 01" East, 600.08 feet to a 3/4 inch iron pin for corner;

Thence South 82° 29' 17" East, 884.46 feet to a 3/4 inch iron pin in the Southwest right of way line of Laguna Road;

Thence North 82° 40' 00" East, 80.00 feet with the edge of Laguna Road to the Northeast right of way line of said Road;

Thence, leaving said Road, North 70° 28' 20" East, 542.00 feet to an iron pin for corner;

Thence South 60° 28' 35" East, 128.02 feet to an iron pin for an interior corner;

Thence North 10° 35' 58" East, 486.02 feet to an iron pin for an interior corner;

Thence North 81° 58' 48" West, 162.00 feet to an iron pin for corner;

Thence North 28° 55' 16" West, 290.01 feet to an iron pin for an interior corner;

Thence South 44° 40' 39" West, 551.20 feet to a point;

Thence South 44° 55' 12" West, 384.99 feet for corner in the Northeast right of way line of Laguna Road;

Thence North 48° 51' 06" West, 136.95 feet with the Northeast right of way line of Laguna Road to a corner;

Thence, leaving said Road, North 44° 24' 16" East, 1000.22 feet for an interior corner;

Thence North 24° 04' 51" West, 74.58 feet for an interior corner;

Thence South 44° 20' 50" West, 84.42 feet to a corner;

Thence North 45° 42' 39" West, 69.34 feet to a corner;

Thence North 44° 17' 21" East, 89.84 feet for an interior corner;
Thence North 41° 14' 44" West, 127.35 feet for an interior corner;
Thence South 44° 19' 18" West, 130.09 feet to a point;
Thence South 46° 34' 07" West, 74.39 feet to a point;
Thence South 36° 44' 59" West, 18.13 feet to a point;
Thence South 45° 05' 28" West, 445.12 feet to a point;
Thence South 44° 42' 46" West, 390.56 feet to a corner on the Northeast right of way line of Laguna Road;
Thence North 47° 06' 32" West, 774.56 feet to a point;
Thence North 46° 54' 00" West, 289.70 feet to an iron pipe found at the intersection of the Southeast right of way line of Cassiano Road with the Northeast right of way line of Cassiano Road where said Road changes direction from Northeast to Northwest;
Thence continuing North 46° 54' 00" West, 13.08 feet with the Northeast right of way line of Cassiano Road to a corner;
Thence, leaving said Road, North 45° 21' 17" East, 853.02 feet to an iron pin for an interior corner;
Thence North 77° 41' 22" West, 337.91 feet to an iron pin for an interior corner;
Thence South 45° 25' 49" West, 679.94 feet to an iron pin found on the Northeast right of way line of Cassiano Road;
Thence with the edge of Cassiano Road South 18° 20' 02" West, 30.52 feet to the Southwest right of way line of said Road;
Thence with the Southwest right of way line of Cassiano Road, South 48° 03' 40" East, 238.43 feet to the intersection of the Southwest right of way line of Cassiano Road with the Northwest right of way line of Cassiano Road where said road changes direction from Southeast to Southwest;
Thence with the Northwest right of way line of said road, South 48° 05' 58" West, 481.52 feet to a 3/4 inch iron pin for corner;
Thence, leaving said Road, North 36° 07' 22" West, 106.90 feet to a 3/4 inch iron pin for an interior corner;
Thence North 83° 01' 32" West, 1,302.94 feet to a 3/4 inch iron pin for corner;
Thence North 57° 01' 22" East, 896.99 feet to a 3/4 inch iron pin for an interior corner;
Thence North 15° 35' 17" West, 199.99 feet to a 3/4 inch iron pin for an interior corner;
Thence North 26° 21' 02" West, 675.66 feet to a 3/4 inch iron pin for an interior corner;
Thence North 48° 10' 51" West, 137.31 feet to a point;
Thence North 48° 30' 10" West, 604.00 feet to a 3/4 inch iron pin for an interior corner;
Thence South 44° 07' 28" West, 2,638.52 feet to a 3/4 inch iron pin for corner;
Thence South 49° 16' 24" West, 1,685.93 feet to a 3/4 inch iron pin in the Northeast right of way line of U.S. Highway No. 181;
Thence South 74° 00' 00" West, 330.00 feet across U.S. Highway No. 181, to a 3/4 inch iron pin in the Southeast right of way line of said Highway;
Thence leaving said Highway, South 54° 20' 01" West, 1,000.26 feet to a 3/4 inch iron pin for an interior corner;
Thence South 43° 30' 45" West, 1,810.03 feet to a 3/4 inch iron pin for an interior corner;
Thence South 03° 28' 51" East, 890.06 feet to a 3/4 inch iron pin for an interior corner;
Thence South 53° 06' 52" East, 627.60 feet to a 1/2 inch iron pin in the Northeast right of way line of the Southern Pacific Railroad for corner;
Thence with said right of way line of the Southern Pacific Railroad as follows:
North 55° 18' 12" West, 51.95 feet to a point;
North 56° 31' 48" West, 102.56 feet to a point;
North 59° 29' 43" West, 102.72 feet to a point;

North 62° 43' 58" West, 102.54 feet to a point;

North 65° 34' 35" West, 137.03 feet to a point;

North 69° 01' 12" West, 967.51 feet to a 3/4 inch iron pin for corner;

Thence leaving said right of way line of the Southern Pacific Railroad, North 43° 27' 00" East, 888.23 feet to a 1-1/4 inch iron pipe;

Thence North 43° 22' 57" East, 1,199.65 feet to a 1-1/4 inch iron pipe;

Thence North 43° 38' 10" East, 191.89 feet to a 1-1/4 inch iron pipe;

Thence North 43° 36' 48" East, 1,457.84 feet to a 1/2 inch iron pin in the Southeast right of way line of U.S. Highway No. 181;

Thence North 42° 21' 00" East, 245.00 feet across U.S. Highway No. 181, to a 3/4 inch iron pin in the Northeast right of way line of U.S. Highway No. 181;

Thence leaving said Highway, North 42° 30' 44" East, 1595.46 feet to a 3/4 inch iron pin for an interior corner;

Thence North 47° 23' 22" West, 327.92 feet to a 3/4 inch iron pin for corner;

Thence North 27° 10' 09" East, 708.64 feet to a 3/4 inch iron pin for corner;

Thence North 59° 43' 13" East, 979.81 feet to a 3/4 inch iron pin for an interior corner;

Thence North 24° 09' 00" East, 383.65 feet to a 3/4 inch iron pin for an interior corner;

Thence North 45° 47' 32" West, 395.89 feet to a 3/4 inch iron pin;

Thence North 45° 47' 28" West, 804.09 feet to a 3/4 inch iron pin for corner;

Thence North 45° 24' 13" East, 800.08 feet to a 3/4 inch iron pin for corner;

Thence North 81° 29' 13" East, 999.76 feet to a 3/4 inch iron pin for an interior corner;

Thence North 00° 30' 32" West, 1,449.44 feet to a 3/4 inch iron pin for an interior corner;

Thence North 83° 59' 54" West, 1,200.28 feet to a 3/4 inch iron pin for corner;

Thence North 42° 30' 42" West, 1,199.88 feet to a 3/4 inch iron pin for an interior corner;

Thence South 83° 30' 22" West, 755.19 feet to a 3/4 inch iron pin for corner;

Thence North 03° 00' 14" East, 599.77 feet to a 3/4 inch iron pin for corner;

Thence South 85° 59' 32" East, 899.79 feet to a 3/4 inch iron pin for corner;

Thence South 63° 28' 35" East, 1,499.83 feet to a 3/4 inch pin for an interior corner;

Thence North 52° 31' 01" East, 399.88 feet to a 3/4 inch iron pin for an interior corner;

Thence North 28° 29' 55" West, 399.91 feet to a 3/4 inch iron pin for an interior corner;

Thence North 56° 29' 42" West, 1,500.06 feet to a 3/4 inch iron pin for an interior corner;

Thence North 65° 45' 09" West, 992.73 feet to a 3/4 inch iron pin for corner;

Thence North 48° 56' 08" West, 1,105.27 feet to a 1/2 inch iron pin in the Southeast right of way line of Foster Road for corner;

Thence with said right of way line of Foster Road, North 35° 44' 53" East, 468.66 feet to a 3/4 inch iron pin for corner;

Thence leaving said road, South 54° 17' 35" East, 200.02 feet to a 3/4 inch iron pin for an interior corner;

Thence North 35° 43' 05" East, 100.00 feet to a 3/4 inch iron pin for corner;

Thence South 54° 24' 43" East, 899.47 feet to a 3/4 inch iron pin for an interior corner;

Thence South 71° 24' 26" East, 1,844.02 feet to a 1/2 inch iron pin for an interior corner;

Thence North 35° 23' 20" East, 520.30 feet to the Southwest right of way of Hildebrandt Road;

Thence with the edge of Hildebrandt Road, North 43° 26' 22" East, 49.07 feet to the Northeast right of way line of said road for an interior corner;

Thence with the said Northeast right of way line of Hildebrandt Road, North 54° 05' 00" West, 1816.77 feet to a corner;

Thence leaving said road, North 36° 25' 04" East, 808.78 feet to a 3/4 inch iron pin for an interior corner;

Thence North 41° 37' 21" West, 1,055.46 feet to a 3/4 inch iron pin for corner;

Thence North 00° 47' 34" West, 699.50 feet to a 3/4 inch iron pin for an interior corner;

Thence South 80° 06' 48" West, 400.18 feet to a corner in the East right of way line of Foster Road;

Thence with the east right of way line of Foster Road North 00° 04' 54" West, 565.00 feet to a point;

Thence West, 95.00 feet across Foster Road to a 3/4 inch iron pin in the West right of way line of said road;

Thence, leaving said Road, North 65° 24' 13" West, 720.67 feet to a corner;

Thence North 51° 14' 31" West, 1526.83 feet to a 3/4 inch iron pin for corner;

Thence North 41° 14' 41" West, 1,580.04 feet to a 3/4 inch iron pin for corner;

Thence North 03° 09' 19" East, 1,615.74 feet to a 1/2 inch iron pin for an interior corner;

Thence North 06° 24' 17" West, 1,531.85 feet to a 3/4 inch iron pin for corner;

Thence North 46° 51' 34" East, 499.93 feet to a 3/4 inch iron pin for corner;

Thence South 66° 50' 12" East, 299.96 feet to a 3/4 inch iron pin for corner;

Thence South 19° 07' 58" West, 478.46 feet to a 3/4 inch iron pin for an interior corner;

Thence South 08° 16' 11" East, 189.18 feet to a 3/4 inch iron pin for an interior corner;

Thence South 57° 27' 03" East, 1,139.91 feet to a 3/4 inch iron pin for corner;

Thence South 10° 27' 28" East, 2098.58 feet to a 3/4 inch iron pin for an interior corner;

Thence South 51° 27' 20" East, 1,424.90 feet to a 3/4 inch iron pin in the West right of way line of Foster Road;

Thence East 95.00 feet across Foster Road to the East right of way line of said Road;

Thence with the East right of way line of Foster Road North 00° 04' 54" West, 580.00 feet to a corner;

Thence, leaving said Road, South 84° 11' 00" East, 544.55 feet for an interior corner;

Thence North 00° 11' 00" East, 183.80 feet to a corner;

Thence East, 3,444.80 feet to a corner;

Thence South 00° 15' 00" East, 3,755.00 feet to a 3/4 inch iron pin for an interior corner;

Thence South 50° 26' 39" East, 399.94 feet to a 3/4 inch iron pin for corner;

Thence South 01° 27' 42" East, 575.11 feet to a 3/4 inch iron pin for an interior corner;

Thence South 71° 56' 57" East, 898.54 feet to a 3/4 inch iron pin for an interior corner;

Thence North 00° 27' 34" West, 1,379.65 feet to a 3/4 inch iron pin for corner;

Thence North 84° 32' 20" East, 469.57 feet to a 3/4 inch iron pin for an interior corner;

Thence North 01° 32' 37" East, 939.96 feet to a 3/4 inch iron pin for corner;

Thence North 89° 32' 47" East, 500.35 feet to a 3/4 inch iron pin for corner;

Thence South 00° 57' 00" East, 724.91 feet to a 3/4 inch iron pin for an interior corner;

Thence North 52° 31' 53" East, 789.54 feet to a 3/4 inch iron pin for an interior corner;

Thence North 08° 27' 14" West, 1,149.71 feet to a 3/4 inch iron pin for corner;

Thence North 21° 32' 26" East, 749.61 feet to a 3/4 inch iron pin for corner;

Thence South 61° 17' 54" East, 203.44 feet to a 3/4 inch iron pin for corner;

Thence South 43° 24' 19" West, 149.92 feet to a 3/4 inch iron pin for an interior corner;

Thence South 15° 52' 20" West, 100.00 feet to a 3/4 inch iron pin for corner;

Thence South 29° 37' 49" West, 159.91 feet to a 3/4 inch iron pin for an interior corner;

Thence South 72° 24' 16" East, 209.37 feet to a 3/4 inch iron pin for corner;

Thence South 49° 25' 58" East, 805.93 feet to a 3/4 inch iron pin in the West right of way line of Gardner Road;

Thence with the edge of Gardner Road, North 89° 16' 42" East, 50.00 feet to the East right of way line of said Road;

Thence with the East right of way line of Gardner Road, North 00° 33' 00" West, 4,165.00 feet to a corner;

Thence leaving said Road, North 89° 09' 00" East, 2,277.00 feet to a corner;

Thence South 37° 45' 00" East, 2,905.00 feet to a 3/4 inch iron pin for an interior corner;

Thence North 51° 37' 03" East, 1,050.60 feet to a 3/4 inch iron pin to a point;

Thence North 51° 36' 50" East, 1,463.65 feet to a point;

Thence North 51° 30' 21" East, 52.71 feet to a corner;

Thence North 88° 26' 49" East, 406.59 feet to a 1/2 inch iron pin for an interior corner;

Thence North 00° 32' 25" West, 656.35 feet to a corner;

Thence North 89° 27' 39" East, 1,250.00 feet to a 1/2 inch iron pin for corner;

Thence South 01° 33' 16" East, 634.12 feet to a 1/2 inch iron pin for an interior corner;

Thence North 88° 26' 49" East, 973.77 feet to a 1/2 inch iron pin in the Northwest right of way line of Knowlton Road (formerly Stuart Road);

Thence with the Northwest right of way line of Knowlton Road, South 12° 24' 28" West, 201.35 feet for an interior corner of this tract and a corner of said Road;

Thence with the edge of Knowlton Road, South 77° 24' 17" East, 50.95 feet to a 1/2 inch iron pin in the Southeast right of way line of said Road;

Thence leaving said Road, North 73° 14' 36" East, 1,147.75 feet to a 1/2 inch iron pin for an interior corner;

Thence North 16° 16' 08" West, 800.00 feet to an interior corner;

Thence South 73° 14' 36" West, 708.79 feet to a corner in the Southeast right of way line of Knowlton Road;

Thence with said Southeast right of way line, North 12° 53' 35" East, 46.02 feet to an iron pin set in a 4"x4" concrete monument for corner;

Thence leaving said Road, North 73° 14' 34" East, 686.36 feet to an interior corner;

Thence North 36° 17' 24" East, 672.25 feet to a 3/4 inch iron pin for corner;

Thence North 74° 32' 58" East, 474.95 feet to a 3/4 inch iron pin for corner;

Thence South 11° 26' 54" East, 400.03 feet to a 3/4 inch iron pin;

Thence South 11° 27' 01" East, 1,600.15 feet to a 3/4 inch iron pin for an interior corner;

Thence North 28° 49' 40" East, 1,667.04 feet to a 3/4 inch iron pin for corner;

Thence South 87° 52' 27" East, 780.94 feet to a 3/4 inch iron pin for an interior corner;

Thence North 00° 12' 29" East, 669.91 feet to a 1/2 inch iron pin for corner;

Thence South 89° 47' 29" East, 30.00 feet to a 1/2 inch iron pin for an interior corner;

Thence North 00° 12' 31" East, 268.70 feet to a 1/2 inch iron pin for corner;

Thence North 41° 26' 15" East, 937.91 feet to a 1/2 inch iron pin in the Southwest right of way line of Sulphur Springs Road;

Thence with said right of way line of Sulphur Springs Road as follows:

South 58° 12' 30" East, 110.47 feet to a point;

South 56° 22' 59" East, 128.08 feet to a point;

South 52° 05' 51" East, 200.01 feet to a point;

Thence North 26° 31' 00" East, 73.00 feet across Sulphur Springs Road to a 3/4 inch iron pin in the Northeast right of way line of said Road;

Thence, leaving said Road, North 14° 05' 32" East, 300.02 feet to a 3/4 inch iron pin for an interior corner;

Thence North 23° 17' 58" West, 615.82 feet to a 3/4 inch iron pin for an interior corner;

Thence North 77° 13' 35" West, 624.11 feet to a 3/4 inch iron pin for corner;

Thence North 14° 06' 44" East, 859.23 feet to a 3/4 inch iron pin for corner;

Thence South 65° 40' 34" East, 253.20 feet to a 3/4 inch iron pin for an interior corner;

Thence North 41° 59' 18" East, 628.54 feet to a 3/4 inch iron pin;

Thence North 41° 59' 14" East, 1,445.47 feet to a 3/4 inch iron pin for an interior corner;

Thence North 14° 12' 14" East, 535.03 feet to a 3/4 inch iron pin for an interior corner;

Thence North 34° 10' 08" West, 1424.05 feet to a 3/4 inch iron pin for corner;

Thence North 15° 25' 57" West, 1,016.42 feet to a 3/4 inch iron pin for corner;

Thence South 77° 30' 43" East, 299.85 feet to a 3/4 inch iron pin for corner;

Thence South 26° 00' 41" East, 676.48 feet to a 3/4 inch iron pin;

Thence South 26° 00' 37" East, 1,751.39 feet to a 3/4 inch iron pin for an interior corner;

Thence South 76° 30' 50" East, 389.05 feet to a 3/4 inch iron pin for an interior corner;

Thence North 09° 58' 59" East, 585.21 feet to a 3/4 inch iron pin for corner;

Thence South 78° 13' 09" East, 199.98 feet to a 3/4 inch iron pin for corner;

Thence South 07° 47' 36" West, 669.99 feet to a 3/4 inch iron pin for corner;

Thence South 17° 40' 45" West, 1,343.20 feet to a 3/4 inch iron pin for corner;

Thence South 77° 08' 02" West, 432.03 feet to a 3/4 inch iron pin for an interior corner;

Thence South 36° 05' 50" West, 799.99 feet to a 3/4 inch iron pin for an interior corner;

Thence South 79° 38' 40" East, 749.85 feet to a 3/4 inch iron pin for corner;

Thence South 20° 51' 23" West, 699.89 feet to a 3/4 inch iron pin for an interior corner;

Thence South 04° 24' 49" East, 26.77 feet to a point;

Thence South 04° 24' 06" East, 743.33 feet to a 3/4 inch iron pin for corner;

Thence South 45° 16' 17" West, 388.14 feet to a 3/4 inch iron pin for an interior corner;

Thence South 20° 35' 46" West, 275.15 feet to a 3/4 inch iron pin for an interior corner;

Thence South 01° 15' 58" East, 120.84 feet to a 3/4 inch iron pin in the Northeast right of way line of Sulphur Springs Road;

Thence South 11° 05' 00" West, 120.00 feet across Sulphur Springs Road to a 3/4 inch iron pin in the Southwest right of way line of said Road;

Thence, leaving said Road, South 14° 34' 33" West, 530.08 feet to a 3/4 inch iron pin for corner;

Thence South 60° 01' 54" West, 290.04 feet to a 3/4 inch iron pin for an interior corner;

Thence South 16° 28' 56" West, 410.83 feet to a 3/4 inch iron pin for corner;

Thence South 52° 12' 30" West, 202.03 feet to a 3/4 inch iron pin for an interior corner;

Thence South 16° 18' 17" East, 393.74 feet to a 3/4 inch iron pin for corner;

Thence South 73° 28' 12" West, 580.70 feet to a 3/4 inch iron pin for an interior corner;

Thence South 19° 42' 29" East, 709.79 feet to a 3/4 inch iron pin for corner;

Thence South 83° 03' 09" West, 1,000.32 feet to a 3/4 inch iron pin for an interior corner;

Thence South 45° 23' 28" West, 689.06 feet to a 3/4 inch iron pin for an interior corner;

Thence South 08° 57' 13" West, 581.74 feet to a 3/4 inch iron pin for corner;

Thence South 80° 26' 58" West, 350.05 feet to a 3/4 inch iron pin for an interior corner;

Thence South 11° 56' 42" West, 1,000.07 feet to a 3/4 inch iron pin for an interior corner;

Thence South 29° 33' 33" East, 282.01 feet to a 3/4 inch iron pin in the Northwest right of way line of the relocated Stuart Road;

Thence continuing South 29° 33' 33" East, 101.00 feet across Stuart Road to a point in the Southwest right of way line of said Road;

Thence leaving said Road and continuing South 29° 33' 33" East, 315.39 feet to an iron pin for corner;

Thence South 60° 41' 31" West, 555.07 feet to an iron pin for corner;

Thence North 33° 19' 41" West, 430.78 feet to a point in the Southeast right of way line of the relocated Stuart Road;

Thence continuing North 33° 19' 41" West, 101.00 feet across Stuart Road to a point in the Northwest right of way line of said Road;

Thence leaving said Road and continuing North 33° 19' 41" West, 19.16 feet to an iron pin for an interior corner;

Thence South 73° 09' 18" West, 1781.31 feet to a 3/4 inch iron pin for an interior corner;

Thence South 31° 39' 08" East, 250.02 feet to a 3/4 inch iron pin for corner;

Thence South 06° 16' 23" West, 1480.49 feet to a 3/4 inch iron pin for an interior corner;

Thence South 39° 43' 45" East, 620.55 feet to a 3/4 inch iron pin for an interior corner;

Thence North 74° 01' 48" East, 564.92 feet to a 3/4 inch iron pin in the Northwest right of way line of Stuart Road;

Thence with the Northwest right of way line of Stuart Road as follows:

South 03° 59' 34" West, 842.14 feet to a point;

South 50° 25' 23" West, 14.44 feet to a point;

Thence South 31° 15' 00" East, 99.00 feet across Stuart Road to a 3/4 inch iron pin in the Southwest right of way line of said Road;

Thence leaving said Road, South 70° 17' 11" East, 784.46 feet to a 3/4 inch iron pin for corner;

Thence South 06° 47' 03" West, 386.65 feet to a corner;

Thence South 73° 39' 42" West, 892.22 feet to a corner in the Southeast right of way line of Stuart Road;

Sold - See Attached Notes

Thence with the Southeast right of way line of Stuart Road North 06° 44' 57" East, 198.69 feet to the most westerly corner of the San Lorenzo Cemetery;

Thence South 82° 59' 00" East, with the Southwest line of said Cemetery, 208.40 feet to an interior corner of herein described tract;

Thence North 09° 44' 31" East, 310.79 feet to an interior corner;

Thence North 83° 38' 04" West, 203.70 feet to a 3/4 inch iron pin in the Southeast right of way line of Stuart Road;

Thence North 29° 37' 00" West, 98.00 feet across Stuart Road to a 3/4 inch iron pin in the Northwest right of way line of said Road;

Thence, leaving said Road, North 60° 10' 32" West, 496.41 feet to a 3/4 inch iron pin for an interior corner;

Thence South 73° 43' 26" West, 1100.50 feet to a 3/4 inch iron pin;

Thence South 73° 43' 14" West, 200.02 feet to a 3/4 inch iron pin for an interior corner;

Thence South 33° 59' 04" West, 1,284.12 feet to a 3/4 inch iron pin for an interior corner;

Thence South 85° 28' 15" East, 499.95 feet to a 3/4 inch iron pin for corner;

Thence South 75° 26' 46" East, 470.25 feet to a 3/4 inch iron pin for corner;

Thence South 16° 27' 24" East, 199.98 feet to a 3/4 inch iron pin for corner;

Thence South 73° 36' 13" West, 329.18 feet to a 3/4 inch iron pin for an interior corner;

Thence South 36° 28' 22" West, 390.09 feet to a 3/4 inch iron pin for corner;

Thence South 52° 05' 07" West, 710.51 feet to a 3/4 inch iron pin for an interior corner;

Thence South 14° 38' 41" West, 253.97 feet to a 3/4 inch iron pin for an interior corner;

Thence North 72° 13' 53" East, 207.98 feet to a 3/4 inch iron pin for an interior corner;

Thence North 49° 15' 01" East, 216.10 feet to a 3/4 inch iron pin for corner;

Thence South 59° 24' 32" East, 233.38 feet to a 3/4 inch iron pin for corner;

Thence South 35° 55' 04" East, 639.90 feet to a 3/4 inch iron pin for corner;

Thence South 17° 12' 18" East, 336.66 feet to a 3/4 inch iron pin for corner;

Thence South 49° 07' 15" West, 1,646.47 feet to a 3/4 inch iron pin for an interior corner;

Thence South 00° 49' 14" West, 599.92 feet to a 3/4 inch iron pin for corner;

Thence South 37° 50' 21" West, 599.97 feet to a 3/4 inch iron pin for an interior corner;

Thence South 51° 10' 32" East, 703.38 feet to a 3/4 inch iron pin for an interior corner;

Thence North 76° 53' 51" East, 595.12 feet to a 1/2 inch iron pin for an interior corner;

Thence North 16° 59' 08" West, 37.76 feet to a 1/2 inch iron pin for corner;

Thence North 73° 36' 03" East, 187.70 feet to a 3/4 inch iron pin for corner;

Thence South 16° 51' 43" East, 723.49 feet to a 3/4 inch iron pin for corner;

Thence South 15° 42' 06" East, 695.28 feet to a 3/4 inch iron pin for an interior corner;

Thence North 74° 18' 06" East, 379.66 feet to a point;

Thence North 74° 03' 50" East, 412.33 feet to a 3/4 inch iron pin for corner;

Thence South 01° 46' 16" East, 1,509.97 feet to a 3/4 inch iron pin for an interior corner;

Thence South 17° 06' 48" East, 973.42 feet to a 3/4 inch iron pin in the Northwest right of way line of Bernhardt Road (formerly F.M. Road 1518);

Thence with the edge of Bernhardt Road South 12° 47' 15" East, 80.12 feet to a 3/4 inch iron pin in the Southeast right of way line of said Road;

Thence, leaving said Road, South 13° 11' 27" East, 674.93 feet to a 3/4 inch iron pin for corner;

Thence South 50° 35' 24" West, 416.09 feet to a 3/4 inch iron pin for an interior corner;

Thence South 14° 55' 13" East, 1,730.73 feet to a 3/4 inch iron pin for an interior corner;

Thence North 71° 45' 42" East, 60.77 feet to a corner;

Thence South 16° 20' 18" East, 800.00 feet to a 3/4 inch iron pin for an interior corner;

Thence North 73° 48' 51" East, 996.15 feet to the Point of Beginning. LESS AND EXCEPT 10.08 acres, more or less, for U.S. Highway No. 181; 3.46 acres, more or less, for Foster Road; 2.29 acres, more or less, for Sulphur Springs Road; and 1.91 acres, more or less, for Stuart Road.

Containing 7,459.256 acres of land, more or less.

STATE OF TEXAS
MERRITT W. KEEL
11601
REGISTERED PROFESSIONAL ENGINEER

I certify that this description as represented by survey notes was prepared under my direction.

Merritt W. Keel, P.E.

Attachment 21-3

CPS ENERGY

Property Owner Affidavit

"I, Benjamin Ethridge, Executive Vice President of Energy Supply, as authorized signatory for CPS Energy.

Acknowledge that the State of Texas may hold the property owner of record either jointly or severally responsible for the operation, maintenance, and closure and post-closure care of the facility. I further acknowledge that I or the operator and the State of Texas shall have access to the property during the active life and post-closure care period, if required, after closure for the purpose of inspection and maintenance."

------------------------------------ 11/14/2022

(Property Owner's Signature) (Date)

Attachment 22   Verification of Legal Status

Ralph W. [illegible]
[illegible] M. Rutledge

#4

ORDINANCE AND INDENTURE

Authorizing Issuance of

CITY OF SAN ANTONIO

ELECTRIC AND GAS REVENUE BONDS

IN THE SUM OF $35,000,000

Ordinance Passed on July 25, 1942
As Amended on October 23, 1942
Including Indenture As Amended

THE CLEGG CO. · SAN ANTONIO

ORDINANCE AND INDENTURE

Authorizing Issuance of

City of San Antonio
Electric and Gas Revenue Bonds

in the sum of $35,000,000

San Antonio, Texas
July 25, 1942

Pursuant to ordinance adopted on July 10, 1942, the Commissioners of the City of San Antonio met in regular adjourned session at the regular meeting place of the Board in the City Hall, in the City of San Antonio, Texas, at ten o'clock, A. M., on July 25, 1942. There were present Mayor C. K. Quin and the following Commissioners:

Henry F. Hein
Paul E. Steffler
P. L. Anderson
Absent: C. Ray Davis

There were also present James Simpson, City Clerk, and Victor Keller, City Attorney.

After the meeting had been duly called to order and the roll called, the Mayor announced that one of the purposes of the meeting was the adoption of an ordinance authorizing revenue bonds of the city pursuant to notice of intention directed by ordinance adopted on July 10, 1942. The City Clerk presented a publisher's affidavit evidencing publication of the notice of intention prescribed by said ordinance in the San Antonio Light, a newspaper published and having general circulation in the City of San Antonio, on July 10, 1942, and July 17, 1942. The affidavit was approved by the Commissioners and ordered recorded in the minutes of the meeting.

Thereupon, the following ordinance was introduced in writing by C. K. Quin and was read in full. It was then moved by

Henry F. Hein and seconded by Paul E. Steffler that the ordinance as read be adopted and, after due discussion, the motion was voted upon and carried by the following vote:

Aye: C. K. Quin
Henry F. Hein
Paul E. Steffler
P. L. Anderson
Nay: None.

The ordinance was thereupon declared adopted, was approved and signed in open meeting by the Mayor and was ordered recorded by the City Clerk. The ordinance is as follows:

> "**AN ORDINANCE** authorizing the acquisition by the City of San Antonio of an electric light and power plant and system and a gas distribution system serving the City of San Antonio and its inhabitants and territory adjacent to said city, authorizing the issuance of the revenue bonds of said city for the purpose of paying the cost thereof, fixing the details and providing for the payment and security of such bonds, approving and ratifying the notice of intention to issue such bonds heretofore given, authorizing and providing for the execution of a mortgage on said plant and systems as security for the payment of such bonds, granting a franchise to any purchaser of said properties at any sale which may be held for the enforcement of such mortgage, providing for the management of said plant and systems, entering into certain covenants and agreements in connection with such acquisition and such bonds, and declaring an emergency."

WHEREAS, on the 10th day of July, 1942, the Commissioners of the City of San Antonio adopted an ordinance entitled "An Ordinance directing the City Clerk to give notice of intention to purchase gas and electric properties now serving the City of San Antonio and surrounding territory and to issue electric and gas revenue bonds therefor"; and

WHEREAS, pursuant to the provisions of said ordinance and to the provisions of the "Bond and Warrant Law of 1931," being Article 2368(a) of the Texas Civil Statutes, there was duly published in the San Antonio Light, a newspaper published and having general circulation in the City of San Antonio, on July 10 and July 17, 1942, a notice apprising the qualified electors of the city and all other persons interested of the intention of the

Commissioners of the City of San Antonio at a meeting to be held at ten o'clock, A.M., on July 25, 1942, to pass such ordinances and take such action as might be deemed necessary to authorize the issuance of Thirty-five Million Dollars ($35,000,000) revenue bonds of said city for the purpose of acquiring an electric light and power plant and system and a gas distribution system serving the City of San Antonio and its inhabitants and territory adjacent to said city; and

WHEREAS, more than fourteen days have expired since the first publication of said notice and no petition has been filed requesting that the question of the issuance of bonds for such purpose be submitted to a referendum vote; and

WHEREAS, it is the opinion of the Commissioners that it is necessary and essential to the welfare of the inhabitants of the city that an electric light and power plant and system and a gas distribution system be acquired by the city immediately in the manner for which provision is hereinafter made, and that the revenue bonds of the city be authorized, sold and issued for the purpose of obtaining funds to pay the cost of such acquisition;

NOW, THEREFORE, Be It Ordained by the Commissioners of the City of San Antonio:

SECTION 1. That the ordinance of July 10, 1942, described in the preamble hereto, and the act of the City Clerk in publishing the notice described in said preamble, be and are hereby ratified, approved and confirmed, and that it is hereby formally found by the Commissioners that said notice was given and published in all respects as required by the Bond and Warrant Law of 1931, and that there has not been filed any petition requesting a referendum vote on the question of the issuance of such bonds.

SECTION 2. That the City of San Antonio shall acquire a complete electric light and power plant and system and gas distribution system serving the City of San Antonio and its inhabitants and territory adjacent to said city, such acquisition to be effected through the acquisition of all of the electric and gas properties owned by San Antonio Public Service Company on the date of the acquisition of such properties by the city, excepting only the electric distribution systems owned by said company and located within the corporate limits of municipal corporations other than the City of San Antonio and such distribution facilities immediately contiguous to such other municipal corporations as form an integral part of such systems, and through the making of repairs, improvements and extensions to such plant and systems. All properties of every nature of San Antonio Public Service Company acquired by the City of San Antonio hereunder, real, personal and incorporeal, including contracts, franchises, leases and choses in action, together with all improvements, additions and extensions which may hereafter be made to said properties while any of the bonds herein authorized remain outstanding, either from the proceeds of such bonds or from any other source, are hereinafter in this ordinance referred to as "the system."

SECTION 3. That in order to pay the cost of acquisition of such electric light and power plant and system and gas distribution system in the manner hereinbefore set out, including the payment of all legal, engineering, accounting, fiscal agents, and other incidental costs and fees incurred in connection with such acquisition and the authorization and issuance of the bonds, there be borrowed upon the credit of the income and revenues of the system the sum of Thirty-five Million Dollars ($35,000,000), and that in evidence thereof there be issued the revenue bonds of the City of San Antonio, under authority of Articles 1111 et seq. of the Texas Revised Civil Statutes, 1925, as amended, which bonds shall be payable as to both principal and interest solely from the revenues of the system and secured by mortgage on the system, all as more specifically hereinafter provided. Such part of the proceeds of the sale of such bonds, other than accrued interest and premium, as is not used to pay the cost of the acquisition of the properties of San Antonio Public Service Company, including the payment of incidental costs and fees as above provided, and any funds which may be received by the city from other sources simultaneously with or subsequent to the issuance of the bonds and by reason of the issuance thereof, shall be used for the purpose of making repairs, improvements and extensions to such properties, in order that the city may have a complete and effective gas and electric system.

SECTION 4. That such bonds shall be denominated "Electric and Gas Revenue Bonds," shall be dated August 1, 1942, shall be in the denomination of $1,000 each, shall be numbered 1 to 35,000, inclusive, shall bear interest until paid at such rate or rates not greater than three and one-half per cent (3½%) per annum, as may prove to be the lowest rate or rates specified in the bids for the purchase of said bonds pursuant to which said bonds shall hereafter be sold by the Commissioners, which interest shall be payable semi-annually on the first days of February and August of each year, shall be payable as to both principal and interest in lawful money of the United States of America at Chemical Bank & Trust Company in the City of New

York, New York, and shall mature serially in numerical order on August 1 of each year as follows:

Year	Amount	Bond Numbers
1944	$ 775,000	1 to 775
1945	800,000	776 to 1575
1946	825,000	1576 to 2400
1947	850,000	2401 to 3250
1948	875,000	3251 to 4125
1949	900,000	4126 to 5025
1950	925,000	5026 to 5950
1951	955,000	5951 to 6905
1952	985,000	6906 to 7890
1953	1,010,000	7891 to 8900
1954	1,040,000	8901 to 9940
1955	1,070,000	9941 to 11010
1956	1,105,000	11011 to 12115
1957	1,140,000	12116 to 13255
1958	1,170,000	13256 to 14425
1959	1,205,000	14426 to 15630
1960	1,240,000	15631 to 16870
1961	1,280,000	16871 to 18150
1962	1,315,000	18151 to 19465
1963	1,355,000	19466 to 20820
1964	1,395,000	20821 to 22215
1965	1,440,000	22216 to 23655
1966	1,480,000	23656 to 25135
1967	1,525,000	25136 to 26660
1968	1,570,000	26661 to 28230
1969	1,620,000	28231 to 29850
1970	1,665,000	29851 to 31515
1971	1,715,000	31516 to 33230
1972	1,770,000	33231 to 35000

Such bonds shall be subject to redemption at the option of the City of San Antonio, to be evidenced by appropriate resolution passed by the Commissioners of the City of San Antonio and approved by the Board of Trustees in charge of the operation of the city's gas and electric properties, either in whole, or in part in inverse numerical order, bonds numbered 33231 to 35000, inclusive, on any interest payment date, and bonds numbered 3251 to 33230, inclusive, on August 1, 1947 and on any interest payment date thereafter, all at the principal amount thereof and accrued interest to the date fixed for redemption, plus such premium not greater than fifty dollars for each bond redeemed as will be equivalent to two dollars fifty cents for each year or fraction thereof intervening between the date fixed for redemption and the stated maturity date of such bond. Notice of redemption is to be given not less than thirty days prior to the date fixed for redemption by registered mail to the registered owner of each bond called for redemption, mailed to the address of such owner shown on the Registrar's registration books. If any bond called for redemption is not at the time registered as to principal, thirty days notice of redemption shall also be given by publication of an appropriate notice at least once in a newspaper published and having general circulation in the City of San Antonio and in a financial newspaper or journal published in the City of New York, New York.

SECTION 5. That each of such bonds shall be signed by the Mayor of the City of San Antonio, shall be attested by the City Clerk, shall have the corporate seal of the city impressed thereon, and shall be authenticated by the Trustee in the manner provided in the trust indenture for which provision is hereinafter made. Interest falling due on and prior to maturity shall be represented by appropriate interest coupons to be attached to such bonds, which coupons shall be signed by the facsimile signatures of said Mayor and City Clerk and said officials, by the execution of such bonds, shall adopt as and for their own proper signatures their respective facsimile signatures appearing on said coupons.

SECTION 6. That such bonds shall be registerable as to principal in the manner for which provision is made in the aforesaid trust indenture.

VII

SECTION 7. That such bonds, the coupons to be thereto attached, and the endorsements to appear on the back thereof, shall be in substantially the following form:

(Form of Bond)

UNITED STATES OF AMERICA
STATE OF TEXAS
COUNTY OF BEXAR

CITY OF SAN ANTONIO
ELECTRIC AND GAS REVENUE BOND

Number................ $1,000

The City of San Antonio, a lawfully created and existing municipal corporation in Bexar County, Texas, solely from the special fund hereinafter specified and from no other source, for value received hereby promises to pay to bearer, or if this bond be registered as to principal then to the registered owner hereof, on the first day of August, 19 .., the principal sum of One Thousand Dollars ($1,000), and to pay, solely from said special fund, interest thereon at the rate of ....per cent (......%) per annum, semi-annually on the first days of February and August in each year until payment of the principal amount hereof. Both principal of and interest on this bond are payable in lawful money of the United States of America at Chemical Bank & Trust Company in the City of New York, New York. Interest falling due on and prior to maturity is payable only upon presentation and surrender of the interest coupons hereto attached as they severally become due.

This bond is one of a duly authorized issue of bonds of like date and tenor, except as to interest rate and maturity, issued or to be issued to provide funds for paying in whole or in part the cost of the acquisition of a complete electric light and power plant and system and gas distribution system serving the City of San Antonio and the territory adjacent thereto, pursuant to ordinance adopted by the Commissioners of the City of San Antonio on July 25, 1942, and pursuant to a trust indenture of even date herewith by and between the City of San Antonio and Harris Trust and Savings Bank of Chicago, Illinois (hereinafter referred to as the "corporate trustee"), and Harold Eckhart of Evanston, Illinois, as trustees, an original of which indenture is on file in the office of said corporate trustee in the City of Chicago, Illinois, reference to which ordinance and indenture is hereby made for a description of the funds charged with and pledged to the payment of the interest on and the principal of the bonds of said issue, the nature and extent of the security thereof, and a statement of the rights, duties and obligations of the city and the trustees and the rights of the holders of the bonds, to all the provisions of which indenture the holder hereof by the acceptance of this bond assents.

This bond shall not be deemed to constitute a debt of the City of San Antonio or a pledge of its faith and credit, but shall be payable as to principal and interest solely from the net revenues derived from the operation of said electric light and power plant and system and said gas distribution system, including all additions, extensions and improvements thereto which may hereafter be made, and the holder hereof shall never have the right to demand payment of this obligation out of any funds raised or to be raised by taxation.

This bond is issued and the above mentioned indenture was made and entered into under and pursuant to the Constitution and Laws of the State of Texas, including particularly Articles 1111 et seq., Texas Revised Civil Statutes, 1925, as amended, and it is required by said laws, and the City of San Antonio hereby covenants and agrees, that it will make and collect rates and charges for all gas, electricity and services supplied by said plant and systems fully sufficient to pay the expenses of operating and maintaining said plant and systems, to provide an adequate depreciation and replacement fund and to pay principal of and interest on all indebtedness payable from such revenues, including this bond and the series of which it is a part.

The bonds of the issue of which this is one may be redeemed at the option of the City of San Antonio, to be evidenced by appropriate resolution passed by the Commissioners of the City of San Antonio and approved by the Board of Trustees in charge of the operation of the city's gas and electric properties, either in whole, or in part in inverse numerical order, bonds numbered 33231 to 35000, inclusive, on any interest payment date, and bonds numbered 3251 to 33230, inclusive, on August 1, 1947, and on any interest payment date thereafter, all at the principal amount thereof and accrued interest to the date fixed for redemption plus such premium not greater than fifty dollars for each bond redeemed as will be equivalent to two dollars fifty cents for each year or fraction thereof intervening between the date fixed for redemption and the stated maturity date of such bond. Notice of the intended redemption of this bond is to be given not less than thirty days prior to the date fixed for redemption by registered mail to the registered owner hereof, mailed to the address of such owner shown on Registrar's registration books. If this bond is not at the time registered as to principal, thirty days notice of redemption is to be given by publication of an appropriate notice at least once in a newspaper published and having general circulation in the City of San Antonio and in a financial newspaper or journal published in the City of New York, New York. On the date so designated for redemption (unless default shall be made in payment of the redemption price) interest on the bonds so called for redemption shall cease to accrue.

This bond may be registered as to principal in accordance with the provisions endorsed hereon.

Each successive holder of this bond during such time as it is payable to bearer, and each successive holder of each of the coupons hereto attached, is conclusively presumed to forego and renounce his equities in favor of subsequent holders for value without notice, and to agree that this bond while so payable to bearer, and each of the coupons hereto attached, may be negotiated by delivery by any person having possession thereof, howsoever such possession may have been acquired, and that any holder who shall have taken this bond or any of the coupons from any person for value and without notice, thereby has acquired absolute title thereto, free from any defenses enforceable against any prior holder and free from all equities and claims of ownership of any such prior holder. The City of San Antonio and its officials and the hereinabove referred to paying agent and trustees shall not be affected by any notice to the contrary.

To the extent permitted by the aforesaid indenture, modifications or alterations of the indenture and any indenture supplemental thereto may be made, with the consent of the Commissioners of the City of San Antonio and the holders of at least seventy-five per cent in principal amount of the bonds then outstanding, but such modification or alteration is not permitted to affect the maturity, amount or rate of interest of any such outstanding bond.

It is hereby certified and recited that all acts and things required by the Constitution and Laws of the State of Texas and the charter of the City of San Antonio to happen, exist and be performed precedent to and in the issuance of this bond and the adoption of said ordinance and the execution of said trust indenture, have happened, exist and have been performed as so required.

This bond shall not be entitled to any benefit under said trust indenture or become valid or obligatory for any purpose until it shall have been authenticated by the execution by the corporate trustee of the certificate hereon endorsed.

IN WITNESS WHEREOF, the City of San Antonio has caused this bond to be signed by its Mayor and attested by its City Clerk and the corporate seal of said city to be impressed hereon, and has caused the coupons hereto attached to be executed with the facsimile signatures of said officials, all as of this first day of August, 1942.

Attest: .... Mayor

....

City Clerk

(Form of Coupon)

Number.................... $....................

On.................................1, 19......., the City of San Antonio, Bexar County, Texas, will pay to bearer at Chemical Bank & Trust Company in the City of New York, New York, the sum of ....Dollars ($.......................) in lawful money of the United States of America, solely from the special fund referred to in and for the semi-annual interest then due on its Electric and Gas Revenue Bond dated August 1, 1942, and numbered............, unless said bond shall have been called for previous redemption as therein provided and provision for the redemption thereof made. The holder of this coupon shall never have the right to demand payment thereof out of any funds raised or to be raised by taxation.

Attest: .... Mayor

....

City Clerk

(Form of Trustee's Certificate)

This bond is one of the bonds described in the within mentioned trust indenture.

HARRIS TRUST AND SAVINGS BANK

By..

Authorized Officer

(Form of Registration Endorsement)

This bond may be registered as to principal on books kept by the corporate trustee under the within mentioned trust indenture as Bond Registrar, upon presentation hereof to such Bond Registrar, who shall make notation of such registration in the registration blank below, and this bond may thereafter be transferred only upon a written assignment of the registered owner or his attorney thereunto duly authorized, duly acknowledged or proved, such transfer to be made on such books and endorsed hereon by the Bond Registrar. If so registered this bond may thereafter be transferred to bearer and thereby transferability by delivery shall be restored, but this bond shall again be subject to successive registrations and transfers as before. The principal of this bond, if registered, unless registered to bearer, shall be payable only to the registered owner or his legal representatives. Notwithstanding the registration of this bond as to principal, the coupons shall remain payable to bearer and shall continue to be transferable by delivery:

Date of Registration	Name of Registered Owner	Signature of Bond Registrar

(Form of State Comptroller's Certificate)

Office of Comptroller
State of Texas Register Number....................

I hereby certify that there is on file and of record in my office a certificate of the Attorney General of the State of Texas to the effect that this bond has been examined by him as required by law, and that he finds that it has been issued in conformity with the Constitution and Laws of the State of Texas, and that it is a valid and binding special obligation of the City of San Antonio, Texas, payable from the revenues pledged to its payment by and in the ordinance authorizing same, and said bond has this day been registered by me.

WITNESS my hand and seal of office at Austin, Texas, this....................day of....................................., 1942.

....

Comptroller of Public Accounts of the State of Texas.

SECTION 8. That after the acquisition of the system or any part thereof, the system or part thereof so acquired shall be operated by the City of San Antonio and the revenues thereof shall be applied and the bonds herein authorized shall be paid in the manner set out and provided in the trust indenture (herein sometimes called the "indenture" and sometimes the "trust indenture") which is hereinafter in this ordinance set out in full, and all of the provisions of said trust indenture shall be effective and shall be applicable to the authorization, issuance and payment of the bonds herein authorized with like force and effect as though all of said provisions were otherwise separately set out in this ordinance.

SECTION 9. That of the bonds herein authorized, there shall be presently sold by the Commissioners of the City of San Antonio bonds to the amount of Thirty-three Million Nine Hundred Fifty Dollars ($33,950,000), of such numbers as may be hereafter fixed by resolution, and after their preparation and execution and approval by the Attorney General and registration by the State Comptroller, the bonds so sold, and sold from time to time hereafter, shall be delivered to the corporate trustee to be authenticated and turned over to the city official who is then performing the duties of City Treasurer, for delivery to the purchaser aforesaid upon payment therefor to be made in accordance with the terms of sale.

SECTION 10. That as soon as may be after the adoption of this ordinance it shall be the duty of the Mayor and City Attorney to submit a complete transcript of proceedings had in connection with the authorization of said bonds, and to submit the printed bonds, to the Attorney General of the State of Texas for his approval and for registration of such bonds by the State Comptroller after they have been so approved. Thereafter, said bonds shall be delivered to the corporate trustee for authentication, after which they shall be delivered to the purchasers as aforesaid.

SECTION 11. That for the purpose of securing the payment of the bonds herein authorized, and for the purpose of providing for and fixing in more detail the rights of the holders thereof, and of the city and of the trustees, and for the purpose of making effective the mortgage lien on the system and the lien of said bonds on the revenues of the system, a trust indenture in the following form and language is hereby authorized to be executed in behalf of the City of San Antonio by the Mayor and City Clerk, after which said indenture shall be recorded in the mortgage records of each county in which any part of the system is located and authenticated copies shall be filed with the corporate trustee and with the City Clerk:

TRUST INDENTURE

THIS INDENTURE, dated the first day of August, 1942, by and between the City of San Antonio, a municipal corporation duly organized and existing under and by virtue of the laws of the State of Texas (for brevity hereinafter called the "city"), acting through its Mayor and City Clerk thereunto duly authorized, party of the first part, and Harris Trust and Savings Bank, a corporation duly organized and existing under the laws of the State of Illinois, and having its principal office in the City of Chicago, Illinois (hereinafter called the "Trustee"), and Harold Eckhart, of the City of Evanston, Illinois (hereinafter called the "Individual Trustee"), parties of the second part, as trustees (the Trustee and Individual Trustee being hereinafter together referred to as the "trustees"),

WITNESSETH:

WHEREAS the city, in order to obtain funds for the purpose of acquiring an electric light and power plant and system and a gas distribution system serving said city and the territory adjacent thereto, has determined to issue a series of bonds under the authority of the Constitution and Laws of the State of Texas, and particularly Articles 1111 et seq., Texas Revised Civil Statutes, 1925, as amended (which bonds are hereinafter sometimes referred to as the "bonds"); and

XVIII

WHEREAS the Commissioners of the City of San Antonio, by ordinance duly adopted on July 25, 1942, have provided for the issuance of bonds for said purpose in the total amount of $35,000,000, which bonds are designated as "Electric and Gas Revenue Bonds," are dated August 1, 1942, are in the denomination of $1,000, are numbered 1 to 35000, inclusive, are to bear interest at such rate or rates as may be determined at the time said bonds are sold, which rate or rates shall be specified and made definite by appropriate instrument in writing to be executed by the City Clerk and filed with the Trustee after the sale of said bonds, are payable as to both principal and interest in lawful money of the United States of America at Chemical Bank & Trust Company in the City of New York, New York, are registerable as to principal at the option of the holder, mature serially in numerical order on August 1 of each year as follows:

Amount	Year
$ 775,000	1944
800,000	1945
825,000	1946
850,000	1947
875,000	1948
900,000	1949
925,000	1950
955,000	1951
985,000	1952
1,010,000	1953
1,040,000	1954
1,070,000	1955
1,105,000	1956
1,140,000	1957
1,170,000	1958
1,205,000	1959
1,240,000	1960
1,280,000	1961
1,315,000	1962
1,355,000	1963
1,395,000	1964
1,440,000	1965
1,480,000	1966
1,525,000	1967
1,570,000	1968
1,620,000	1969
1,665,000	1970
1,715,000	1971
1,770,000	1972

and, together with the endorsements to appear thereon, are to be in substantially the following form, and executed as therein indicated:

(Form of Bond)

UNITED STATES OF AMERICA
STATE OF TEXAS
COUNTY OF BEXAR

CITY OF SAN ANTONIO
ELECTRIC AND GAS REVENUE BOND

Number.................... $1,000

The City of San Antonio, a lawfully created and existing municipal corporation in Bexar County, Texas, solely from the special fund hereinafter specified and from no other source, for value received hereby promises to pay to bearer, or if this bond be registered as to principal then to the registered owner hereof, on the first day of August, 19...., the principal sum of One Thousand Dollars ($1,000), and to pay, solely from said special fund, interest thereon at the rate of .... per cent (......%) per annum, semi-annually on the first days of February and August in each year until payment of the principal amount hereof. Both principal of and interest on this bond are payable in lawful money of the United States of America at Chemical Bank & Trust Company in the City of New York, New York. Interest falling due on and prior to maturity is payable only upon presentation and surrender of the interest coupons hereto attached as they severally become due.

This bond is one of a duly authorized issue of bonds of like date and tenor, except as to interest rate and maturity, issued or to be issued to provide funds for paying in whole or in part the cost of the acquisition of a complete electric light and power plant and system and gas distribution system serving the City of San Antonio and the territory adjacent thereto, pursuant to ordinance adopted by the Commissioners of the City of San Antonio on July 25, 1942, and pursuant to a trust indenture of even date herewith by and between the City of San Antonio and Harris Trust and Savings Bank of Chicago, Illinois (hereinafter referred to as the "corporate trustee"), and Harold Eckhart of Evanston, Illinois, as trustees, an original of which indenture is on file in the office of said corporate trustee in the City of Chicago, Illinois, reference to which ordinance and indenture is hereby made for a description of the funds charged with and pledged to the payment of the interest on and the principal of the bonds of said issue, the nature and extent of the security thereof, and a statement of the rights, duties and obligations of the city and the trustees and the rights of the holders of the bonds, to all the provisions of which indenture the holder hereof by the acceptance of this bond assents.

This bond shall not be deemed to constitute a debt of the City of San Antonio or a pledge of its faith and credit, but shall be payable as to principal and interest solely from the net revenues derived from the operation of said electric light and power plant and system and said gas distribution system, including all additions, extensions and improvements thereto which may hereafter be made, and the holder hereof shall never have the right to demand payment of this obligation out of any funds raised or to be raised by taxation.

This bond is issued and the above mentioned indenture was made and entered into under and pursuant to the Constitution and Laws of the State of Texas, including particularly Articles 1111 et seq., Texas Revised Civil Statutes, 1925, as amended, and it is required by said laws, and the City of San Antonio hereby covenants and agrees, that it will make and collect rates and charges for all gas, electricity and services supplied by said plant and systems fully sufficient to pay the expenses of operating and maintaining said plant and systems, to provide an adequate depreciation and replacement fund and to pay principal of and interest on all indebtedness payable from such revenues, including this bond and the series of which it is a part.

The bonds of the issue of which this is one may be redeemed at the option of the City of San Antonio, to be evidenced by appropriate resolution passed by the Commissioners of the City of San Antonio and approved by the Board of Trustees in charge of the operation of the city's gas and electric properties, either in whole, or in part in inverse numerical order, bonds numbered 33231 to 35000, inclusive, on any interest payment date, and bonds numbered 3251 to 33230, inclusive, on August 1, 1947, and on any interest payment date thereafter, all at the principal amount thereof and accrued interest to the date fixed for redemption plus such premium not greater than fifty dollars for each bond redeemed as will be equivalent to two dollars fifty cents for each year or fraction thereof intervening between the date fixed for redemption and the stated maturity date of such bond. Notice of the intended redemption of this bond is to be given not less than thirty days prior to the date fixed for redemption by registered mail to the registered owner hereof, mailed to the address of such owner shown on Registrar's registration books. If this bond is not at the time registered as to principal, thirty days notice of redemption is to be given by publication of an appropriate notice at least once in a newspaper published and having general circulation in the City of San Antonio and in a financial newspaper or journal published in the City of New York, New York. On the date so designated for redemption (unless default shall be made in payment of the redemption price) interest on the bonds so called for redemption shall cease to accrue.

This bond may be registered as to principal in accordance with the provisions endorsed hereon.

Each successive holder of this bond during such time as it is payable to bearer, and each successive holder of each of the coupons hereto attached, is conclusively presumed to forego and renounce his equities in favor of subsequent holders for value without notice, and to agree that this bond while so payable to bearer, and each of the coupons hereto attached, may be negotiated by delivery by any person having possession thereof, howsoever such possession may have been acquired, and that any holder who shall have taken this bond or any of the coupons from any person for value and without notice, thereby has acquired absolute title thereto, free from any defenses enforceable against any prior holder and free from all equities and claims of ownership of any such prior holder. The City of San Antonio and its officials and the hereinabove referred to paying agent and trustees shall not be affected by any notice to the contrary.

To the extent permitted by the aforesaid indenture, modifications or alterations of the indenture and any indenture supplemental thereto may be made, with the consent of the Commissioners of the City of San Antonio and the holders of at least seventy-five per cent in principal amount of the bonds then outstanding, but such modification or alteration is not permitted to affect the maturity, amount or rate of interest of any such outstanding bond.

It is hereby certified and recited that all acts and things required by the Constitution and Laws of the State of Texas and the charter of the City of San Antonio to happen, exist and be performed precedent to and in the issuance of this bond and the adoption of said ordinance and the execution of said trust indenture, have happened, exist and have been performed as so required.

This bond shall not be entitled to any benefit under said trust indenture or become valid or obligatory for any purpose until it shall have been authenticated by the execution by the corporate trustee of the certificate hereon endorsed.

IN WITNESS WHEREOF, the City of San Antonio has caused this bond to be signed by its Mayor and attested by its City Clerk and the corporate seal of said city to be impressed hereon, and has caused the coupons hereto attached to be executed with the facsimile signatures of said officials, all as of this first day of August, 1942.

Attest:

.... Mayor

....
City Clerk

(Form of Coupon)

Number.................... $....................

On..............................1, 19....., the City of San Antonio, Bexar County, Texas, will pay to bearer at Chemical Bank & Trust Company in the City of New York, New York, the sum of .... Dollars ($....................) in lawful money of the United States of America, solely from the special fund referred to in and for the semi-annual interest then due on its Electric and Gas Revenue Bond dated August 1, 1942, and numbered........, unless said bond shall have been called for previous redemption as therein provided and provision for the redemption thereof made. The holder of this coupon shall never have the right to demand payment thereof out of any funds raised or to be raised by taxation.

Attest:

....
City Clerk Mayor

(Form of Trustee's Certificate)

This bond is one of the bonds described in the within mentioned trust indenture.

HARRIS TRUST AND SAVINGS BANK
By..
Authorized Officer

(Form of Registration Endorsement)

This bond may be registered as to principal on books kept by the corporate trustee under the within mentioned trust indenture as Bond Registrar, upon presentation hereof to such Bond Registrar, who shall make notation of such registration in the registration blank below, and this bond may thereafter be transferred only upon a written assignment of the registered owner or his attorney thereunto duly authorized, duly acknowledged or proved, such transfer to be made on such books and endorsed hereon by the Bond Registrar. If so registered this bond may thereafter be transferred to bearer and thereby transferability by delivery shall be restored, but this bond shall again be subject to successive registrations and transfers as before. The principal of this bond, if registered, unless registered to bearer, shall be payable only to the registered owner or his legal representatives. Notwithstanding the registration of this bond as to principal, the coupons shall remain payable to bearer and shall continue to be transferable by delivery:

Date of Registration	Name of Registered Owner	Signature of Bond Registrar

(Form of State Comptroller's Certificate)

Office of Comptroller
State of Texas Register Number..................

I hereby certify that there is on file and of record in my office a certificate of the Attorney General of the State of Texas to the effect that this bond has been examined by him as required by law, and that he finds that it has been issued in conformity with the Constitution and Laws of the State of Texas, and that it is a valid and binding special obligation of the City of San Antonio, Texas, payable from the revenues pledged to its payment by and in the ordinance authorizing the same, and said bond has this day been registered by me.

WITNESS my hand and seal of office at Austin, Texas, this ....day of..., 1942.

....
Comptroller of Public Accounts of the State of Texas.

and

WHEREAS the execution and delivery of this indenture have been duly authorized by the Commissioners of the City of San Antonio and all acts and things required to be done precedent to and in the execution of this indenture and precedent to and in the execution of said bonds, have been done and performed in regular and due time, form and manner as required by the Constitution and Laws of the State of Texas, and the ordinance hereinbefore mentioned;

NOW, THEREFORE, in order to secure the payment of principal of and interest on the bonds issued under this indenture according to their tenor and effect and the terms of this indenture, and to secure the performance of the covenants and obligations herein contained, and in consideration of the acceptance by the trustees of the trust hereby created, of the purchase and acceptance of the said bonds by the holders thereof, and of one dollar in hand paid by the trustees to the city upon the execution and delivery of this indenture, the receipt whereof is hereby acknowledged, the city has executed and delivered this indenture and has granted, bargained, sold, conveyed, assigned, transferred, warranted, mortgaged, pledged and set over, and by these presents does grant, bargain, sell, convey, assign, transfer, warrant, mortgage, pledge and set over unto the trustees and their successors in said trust forever, subject to the terms of this indenture, the following property (herein sometimes referred to as the "trust estate"), all and singular, its property rights, privileges, franchises and contracts of every kind and description:

Subject to the exceptions hereinafter set out, all property heretofore owned by San Antonio Public Service Company and now owned by the city, and all property, rights, privileges, franchises and contracts of every kind and description, whether now owned or hereafter acquired by the city, and used or useful in connection with the operation of the city's electric light and power plant and system and the city's gas distribution system, including particularly the following (but reference to or enumeration of any particular kinds, classes or items of property shall not be deemed to exclude, except as otherwise herein expressly provided, from operation of this indenture any kind, class or item not so referred to or enumerated):

ITEM I.

ELECTRIC LIGHT & POWER PLANT & SYSTEM

All lands, rights-of-way, roads, power houses, buildings, dams, waterways, water rights, and other structures, and all office buildings and the contents thereof; all machinery, engines, boilers, turbines, dynamos, electrical machinery, regulators, motors, transformers, generators, meters, electrical and mechanical appliances, condensers, water wheels, overhead and underground conduits, cables, pipes, pole and transmission lines, wires, crossarms, insulators, service sub-stations and sub-structures, generating, distributing and transmitting equipment, tools, implements, apparatus, supplies and all of the electric transmission and distribution systems heretofore owned by San Antonio Public Service Company and located in the City of San Antonio, Texas, and the cities, towns, villages and unincorporated areas of Bexar County, Atascosa County, Caldwell County, Comal County, Guadalupe County, Karnes County, Kendall County, Medina County, Uvalde County, Bandera County and Wilson County, all in the State of Texas.

ITEM II.

GAS SYSTEM.

All gas plants, stations, sub-stations, offices, repair shops, buildings, structures, sub-structures, regulators, holders, purifiers, scrubbers, tanks, retorts, boilers, machinery, engines, pumps, fixtures, apparatus, equipment, dams, instruments, appliances, implements, overhead and underground construction, pipes, mains, conduits, service meters, supplies and appurtenances, and the gas transmission and distribution systems heretofore owned by the San Antonio Public Service Company, located in the City of San Antonio and the City of Alamo Heights and the suburban areas adjacent to the City of San Antonio and the City of Alamo Heights, all in Bexar County, Texas.

ITEM III.

REAL ESTATE.

All and singular the real estate heretofore owned by the San Antonio Public Service Company situated in the State of Texas in the counties hereinafter mentioned (except as hereinafter specifically excepted and excluded from the lien hereof) and more particularly described as follows:

MAIN OFFICE BUILDING.

That certain piece or parcel of land, situated in the corporate limits of the City of San Antonio, Bexar County, Texas, fronting on the west side of St. Mary's Street, and more particularly described as follows: Being that portion of what is known as the Twohig Homestead, which was set apart to Columbus Upson, Oscar Bergstrom and Thos. H. Franklin by decree of the District Court of Bexar County, Texas, partitioning the Estate of John Twohig, on the 16th day of February, 1894, in cause No. 644, styled Upson and Bergstrom vs. T. L. Johnston, et al., District Court of Bexar County, 37th Judicial District; said decree appearing in the minutes of said Court, Book Q, page 369, et seq., said property being bounded on the north by the portion of the Twohig Homestead set aside by said decree to J. C. Neraz, Catholic Bishop of San Antonio; east by St. Mary's Street, and south and west by the San Antonio River, 4 feet off the north margin of said property having been dedicated by D. J. Woodward and L. Ward as a permanent alley, as set out and fully described and explained in an agreement between Missionary Society of Oblate Fathers of Texas, and D. J. Woodward and L. Ward, of record in Bexar County, in Volume 274, page 394, Deed Records of said county, filed October 12, 1910.

STATION "A" PLANT.

All that parcel of land situated in the City of San Antonio, County of Bexar, State of Texas, known as Lots Nos. 1, 2, 3, 4, of N. C. B. No. 124; bounded on the north by the San Antonio River; on the east by an alley for a distance of 166 feet 8 inches, more or less; on the south by Villita Street for a distance of 250 feet 4 inches, more or less; on the west by Presa Street for a distance of 171 feet 8 inches, more or less.

STATION "B" PLANT.

(a) A parcel of land containing 8 acres, more or less, situated in the City of San Antonio, County of Bexar, and State of Texas, on the east side of the San Antonio River, more particularly described as follows: Beginning at a point on the east bank of the San Antonio River where an extension of the south line of Survey of Lot No. 3, according to the plat recorded in Volume VI, page 118, of Bexar County Deed Records, intersects with the said east bank of the San Antonio River, said point being also the intersection of the north side of the right-of-way of the S. A. & A. P. Ry. with the San Antonio River; thence in a southeasterly course along the said S. A. & A. P. right-of-way to the west side of Conception Road; thence in a northeasterly course along the west side of the Conception Road to the San Antonio River opposite the Edmonds Homestead where the river changes its course from south to west; thence meandering along the river to the place of beginning.

(b) A parcel of land containing 12 acres, more or less, situated in the City of San Antonio, County of Bexar, State of Texas, on the west side of San Antonio River, more particularly described as follows: Beginning at a point on the west bank of the San Antonio River where the said west bank intersects with the north boundary line of the San Antonio and Aransas Pass Railroad; thence in a northwesterly direction along the boundary line of the said right-of-way to a point where the said boundary line intersects with the south boundary of the land formerly owned by Henry Elmendorf; thence east with the boundary of the said land owned by said Henry Elmendorf to the San Antonio River; thence in a southerly direction with the meanderings of the San Antonio River to the place of beginning.

TENTH STREET MATERIAL STORAGE.

(a) That parcel of land situated in the City of San Antonio, County of Bexar and State of Texas, being a part of Block "C," or N. C. B. No. 516, and described as follows: Beginning on the south line of Tenth Street at a point 294 feet 7 inches from Austin Street; thence 56 degrees, 45 minutes east with Tenth Street for 76 feet and 10 inches; thence south 32 degrees, 50 minutes west for 308 feet and 4 inches; thence north 57 degrees west for 117 feet to the Alamo Ditch; thence in a northeasterly direction along the Alamo Ditch to the back line of Somer's property; thence south 56 degrees, 45 minutes east along the back of F. Somer's property for 60½ feet; thence north 32 degrees, 50 minutes east for 153 feet and 1 inch to point of beginning.

(b) All that portion of Lot No. 4, Block "C," in the City of San Antonio, and more particularly described as follows, viz.: Beginning at a point 121 feet east of the west line of the property formerly belonging to the San Antonio Street Railway Company, where it intersects the northwest corner of Lot No. 3; thence east 16 feet to a corner; thence north 16 feet to corner; thence west 16 feet to a corner; thence south 16 feet to the place of beginning.

(c) All that certain tract or parcel of land situated, lying and being in the City limits of San Antonio, County of Bexar, State of Texas, and being the western part of Lot "C" in Block "C," City Block No. 516, on the north side of Ninth Street, said part having a frontage of about 29 feet, together with all and singular, the rights, hereditaments, and appurtenances to the same in any manner belonging.

(d) All that certain piece, parcel or tract of land lying and being situated within the corporate limits of the City of San Antonio, County of Bexar and State of Texas, and more particularly described as follows: Being the western 29 varas, more or less, of Lots 1 and 2 in Block "C" (or 31) on the north side of Ninth Street, said Block "C" (or 31) being now known as City Block 516. Said land herein conveyed begins at a point 85 varas, more or less, west of southeast corner of Lot 1, corner of Ninth and Austin Streets, being the southwest corner of Mrs. M. Schilling's property; thence west along Ninth Street 29 varas, more or less, to property of Wm. Herpel; thence north along said Wm. Herpel's property line to southwest corner of Lot 3 in said block; thence east along the south line of said Lot 3, 32 varas, more or less; thence south 37¾ varas to the place of beginning.

(e) All that certain lot or parcel of land situated in the City of San Antonio, Bexar County, Texas, and described as follows, to-wit: A part of what is known as N. C. B. No. 516; beginning at a point in the southern line of Tenth Street north 57 degrees west, 61 varas from the intersection of the western line of Austin Street with the south line of Tenth Street; thence north 57 degrees west, along with the southern line of said Tenth Street, a distance of 18 varas or 50 feet, for northwest corner of this tract; thence south 33 degrees west, a distance of 52 varas or 144 feet and 5⅓ inches, more or less, to reach what is known as the property of Mrs. A. de V. Dane, for the southwest corner of these premises; thence south 57 degrees east, 18 varas or 50 feet, for the southeast corner of this tract; thence north 33 degrees east, 54 varas or 144 feet and 5⅓ inches, more or less, to the point of beginning in the southern line of Tenth Street, being the same property conveyed by Geo. F. and Anna E. Blesse, by deed as appears of record in Volume 437, page 82, Deed Records of Bexar County, Texas, to which reference is here made for a more complete description of said property.

NINTH STREET SUBSTATION.

All that certain tract or parcel of land lying and being situated within the corporate limits of the City of San Antonio, Bexar County, Texas, and being the eastern 72 feet of Lots Nos. 1 and 2, Block 31, New City Block No. 453, on the north side of Ninth Street, and more particularly described as follows: Beginning at a point on the north side of Ninth Street at a fence located 174 feet and 2 inches from a line between two city monuments located near the northeast corner of the intersection of Ninth Street and Avenue D, and near the southeast corner of the intersection of Ninth Street and Avenue D, said line being approximately 3 feet west of the property line of Avenue D; thence with said fence in a northerly direction 97.3 feet to another fence; thence with said second fence in an easterly direction 42 feet and 7 inches to the west property line of the property of the San Antonio Public Service Company; thence in a southerly direction with the property line of the San Antonio Public Service Company 102 feet and 4 inches to the intersection of said property line with the north property line of Ninth Street; thence westerly along the north property line of Ninth Street a distance of 72 feet to the place of beginning.

BEACON HILL SUBSTATION.

All that certain lot or parcel of land situated in the City of San Antonio, County of Bexar, State of Texas, described as follows, to-wit:

Being all of Lots Nos. 1 and 8 in Block 37 of Laurel Heights Addition, said block being also known as New City Block 1867.

EAST END SUBSTATION.

All that certain tract or parcel of land situated within the corporate limits of the City of San Antonio, County of Bexar, State of Texas, and described as follows, to-wit:

Lots Nos. 1, 2, 3 and 4, in Block No. 3, Rifle Range Addition, and in New City Block No. 2796, fronting on the south side of Wyoming Street.

ELECTRIC DISTRIBUTION OFFICE.

That certain property situated in San Antonio, Bexar County, Texas, bounded as follows:

Commencing at the intersection of Camden Street and Jones Avenue; thence in a northeasterly direction along the southeast line of Camden Street to the San Antonio River; thence down the San Antonio River to its intersection with the northwest line of the tract of land conveyed by the San Antonio Loan and Trust Company to R. W. Morrison and W. S. McCall, recorded in Book 763, page 480, Deed Records of Bexar County, Texas; thence in a southwesterly direction along the northwest boundary of the said property so conveyed to said Morrison and McCall, and continuing along the northwestern line of the property conveyed to said Morrison and McCall by E. A. DuBose, Receiver of the Lone Star Cotton Mills, by deed recorded in Volume 702, page 544, Deed Records of Bexar County, Texas, to its intersection with Jones Avenue; thence in a northwesterly direction along Jones Avenue to the place of beginning; said property bounded on the northwest by Camden Street, on the northeast by the San Antonio River, on the southeast by the property conveyed to the said Morrison and McCall, and on the southwest by Jones Avenue; being the same property conveyed by San Antonio Loan and Trust Company to San Antonio Public Service Company, by deed recorded on June 3, 1925, in the records of Deeds of said county, in Volume 828, on pages 49-50.

OLMOS SUBSTATION.

All that certain triangular tract or parcel of land lying north of the City of San Antonio, in Bexar County, Texas, out of the Herff and Dittmar land, and out of original City Lot No. 36 in County Block 5248, and Lot No. 38 in County Block 5250, all in Range 3, District 3, bounded as follows: On the north by the Contour Road along a line at elevation of 728 feet above sea level, on the southeast side by the right-of-way of the I. & G. N. Railway Company, and on the west side by the Herff and Dittmar County Road, containing 6½ acres of land, more or less; being the same property conveyed by F. Herff and Adolph Herff individually and as independent executors of the Estate of Dr. F. Herff, Deceased, Chas. H. Herff, August A. Herff, Wm. L. Herff and John B. Herff, and Emmy Dittmar, a feme sole, individually and as independent executrix of the Estate of Albert Dittmar, Deceased, and San Antonio Loan and Trust Company, a corporation, as trustee, all of the County of Bexar and State of Texas, to San Antonio Public Service Company, by deed recorded November 10, 1926, in the records of Deeds of said county, in Volume 919, on pages 43-44.

CITY VIEW SUBSTATION.

That certain tract of land and parcel of real estate lying and being situate in Bexar County, Texas, and being known, described and designated as Lot or Tract No. 19, Block No. 18 of the Lady of the Lake Gardens, per plat and map thereof duly filed and of record in the Deed Records of Bexar County, Texas, in Book 368, page 143, to which said map and plat and the record thereof reference is here specially made for further and more definite description of said property, said lot containing 1 acre; being the same property conveyed by the Lady of the Lake Gardens Company to Standard Trust Company, by deed dated June 29, 1925, and conveyed by Standard Trust Company to San Antonio Public Service Company by deed dated December 13, 1927.

ALAMO HEIGHTS SUBSTATION.

The following described property, lying and being situated in Bexar County, Texas, and being out of the Wm. E. Howth Survey, more particularly described as follows: A plot of land approximately .89 of an acre in size, and bounded as follows: Beginning at a point on the west side of Broadway, 685 feet and 1 inch south of the intersection of west side of Broadway and east side of Nacogdoches Road; thence south along west side of Broadway 30 feet; thence along a line north 89 degrees, 30 minutes west, 514 feet to east side of Nacogdoches Road; thence northeast along east side of Nacogdoches Road 217 feet; thence along a line south 89 degrees, 30 minutes east, 102 feet and 11 inches; thence along a line south no degrees, 3 minutes east, 160 feet; thence along a line south 89 degrees, 30 minutes east, to starting point on west side of Broadway; being the same property conveyed by Katherine Schuh, a feme sole, to San Antonio Public Service Company, by deed recorded August 19, 1927, in Volume 969, on page 447.

WOODLAWN HILLS SUBSTATION.

One acre of land lying southwest of the Babcock Road, out of a 235-acre tract of land located approximately 5 miles northwest from the center of the City of San Antonio, being a portion of Survey No. 332, Section No. 4, in the name of Cesario Carmona, and being the same tract of land conveyed by deed of L. J. Gembler and Eliza Gembler to A. Fiensilber, October 26, 1903, said deed being recorded in Volume 223, page 126, of the Deed Records of Bexar County, Texas, said 1 acre of land being described by metes and bounds as follows: Beginning at a point on the Callahan Road at the northwest corner of said 235-acre tract of land owned by A. Fiensilber, at a stake; thence north 42 degrees east, 208.71 feet to a stake, turn interior angle 91 degrees; thence south 48 degrees east, 208.71 feet to a stake, turn interior angle 89 degrees; thence south 42 degrees west, 208.71 feet to a stake, turn interior angle 91 degrees; thence north 40 degrees west, 208.71 feet to the place of beginning, and containing 1 acre, less a strip of land approximately 11 feet wide off of the northwest side of said tract, conveyed to Bexar County for roadway by deed dated September 14, 1928; being the same property conveyed by A. Fiensilber and Sophia Fiensilber to San Antonio Public Service Company, by deed recorded on June 28, 1927, in the records of Deeds of Bexar County, in Book 964, page 82.

OLD GRANDVIEW SUBSTATION.

All those certain lots or parcels of land situate partly within and partly without the City of San Antonio, County of Bexar, State of Texas, described as follows, to-wit: Being Lots Nos. 8 to 19, inclusive, and Lots Nos. 21 to 34, inclusive, New City Block 1564, said block being also known as Block 7, Section 2, Grandview Addition.

Plat of said Grandview Addition is recorded in Volume 72, page 519, Bexar County Records; being the same property conveyed by W. C. Sullivan to Standard Trust Company, by deed dated July 8, 1925, and conveyed by Standard Trust Company to San Antonio Public Service Company, by deed dated December 13, 1927.

ELMENDORF SUBSTATION.

That certain tract of land out of a 120-acre tract of land, out of Survey No. 7, Jose de la Garza grant, conveyed to Mrs. Lena Koehler by Fred Hildebrandt, et al., by deed dated November 19, 1896, and recorded in Volume 162, page 331, Deed Records of Bexar County, Texas, being described by metes and bounds as follows: Beginning at a stake at the southeast corner of said 120 acres of land; thence north 67 degrees, 12 minutes east, 204.3 feet along the line dividing the property of the said Lena Koehler from the west property line of the Westfall property, a stake; thence north 53 degrees, 30 minutes west, 244.4 feet to the

Elmendorf Road; thence south 4 degrees, 14 minutes, 30 seconds east, 100 feet along the north side of said road to the intersection of said road with the high line of the Comal Power Company; thence south 4 degrees, 14 minutes, 30 seconds east, 131.8 feet to the place of beginning; being the same property conveyed by Oscar Koehler and Lena Koehler, husband and wife, to Comal Power Company, by deed recorded July 13, 1927, in the records of Deeds of said county, in Volume 964, on pages 81 and 82, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

GRANDVIEW SUBSTATION NO. 1.

Lots Nos. 1 to 13, inclusive, and 25 to 27, inclusive, Block 8, Section 2, Grandview Addition, said lots comprising the northern part of said block, said Block 8 lying between "I" Street and "J" Street and between Cora Avenue and James Avenue; Lots Nos. 1, 2, 3, 7, 8, 9 and 10, Block 19, Section 5, Grandview Addition, said lots constituting the northern part of said block and said block lying between "I" Street and "J" Street and between James Avenue and Aurelia Avenue; Lots Nos. 1 to 12, inclusive, Block 18, Section 5, Grandview Addition, said lots constituting the northern part of said block, and said

Plat of said Grandview Addition is recorded in Volume 72, page 519, Bexar County Records; being the same property conveyed by W. C. Sullivan to Comal Power Company, by deed recorded July 14, 1925, in the records of Deeds of said county, in Volume 831, on pages 389-90, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

GRANDVIEW SUBSTATION NO. 2.

All that certain parcel or tract of land lying in the County of Bexar, Texas, and in Grandview Addition to the City of San Antonio, but wholly outside of the corporate limits of the said city, particularly described as follows: The north 105 feet of Lot 3, in Garden Block 8, of said Grandview Addition, a map and plat of which is of record in the Deed Records of Bexar County, in the County Clerk's office, to which reference is hereby made for further description. The said north 60 feet of said Lot No. 3, in said Garden Block 8, is described by metes and bounds as follows, to-wit: Beginning at the northeast corner of Lot No. 3, Aurelia Avenue and Amanda Avenue.

Garden Block 8, which corner is also the southeast corner of Lot No. 1, same Garden Block, and also is the northwest corner block lying between "I" Street and "J" Street and between of Lot No. 4, same Garden Block, and also is the southwest corner of Lot No. 2, of said Garden Block 8; thence south along the eastern boundary line of said Lot No. 3, Garden Block 8, 60 feet to a point in said boundary line for the southeast corner of this tract being conveyed; thence west 630 feet to a point in the west boundary of said Lot No. 3, Garden Block 8, for the southwest corner of this tract; thence north along the west boundary line of said Lot No. 3, Garden Block 8, to the northwest corner of said Lot No. 3, for the northwest corner of this tract; thence east along the north boundary line of said Lot No. 3, 630 feet to the place of beginning; being the same property conveyed by John Alexander James to Comal Power Company, by deed recorded September 2, 1925, in the records of Deeds of said county, in Volume 844, on pages 67-68, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928, and by deeds recorded in Volume 944, pages 85-86, and Volume 1397, pages 250-251, of the Deed Records of Bexar County, Texas.

LEHR SAND PIT SUBSTATION.

All that certain tract of land described as follows, to-wit: 1,000 square feet of land out of 565.64-acre tract located approximately one mile from the county line between Bexar and Atascosa Counties, on the Pleasanton Road, in Bexar County, Texas, out of Survey No. 1386½, and being the same tract of land conveyed by deed of the Texas State Bank, July 28, 1926, to J. B. Couric, said deed being recorded in Volume 905, page 152, Deed Records of Bexar County, Texas, said 1,000 square feet of land being described by metes and bounds as follows: Beginning at a stake on the property line between Lots Nos. 4 and 5 of the said Couric property, at a point 1126 feet due west of the west side of the Pleasanton Road and 60 feet due east of a point at the intersection of the high line of the Comal Power Company from San Antonio to Pleasanton and the property line between Lots Nos. 4 and 5 of the said Couric property; thence due south 76 feet and 6 inches to a stake; thence due west 60 feet to the said high line of the Comal Power Company; thence due west 40 feet to a stake; thence due north 76 feet and 6 inches to the property line between Lots Nos. 4 and 5 of the said Couric property; thence due north 23 feet and 6 inches to a stake; thence due east 40 feet to the said high line of the said Comal Power Company; thence due east 60 feet to a stake; thence due south 20 feet and 6 inches, to the place of beginning, and containing 1,000 square feet; being the same property conveyed by J. B. Couric to Comal Power Company, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

LYTLE SUBSTATION.

All that certain tract or parcel of land lying and being situated in the County of Bexar, State of Texas, and more particularly described as follows, to-wit:

Two and three-hundredths acres of land in Bexar County, Texas, part of John Garner Survey No. 435, described by metes and bounds as follows: Beginning at a point in the north line of a 100-acre tract conveyed by Roy L. Gillette, et al., to C. H. Kearny, Trustee, by deed recorded in Volume A-47, page 462, Deed Records of Medina County, Texas, said point being at the intersection of the east property line of the road on the Bexar-Medina County line and the south property line of the old Frio City Road; thence in a southerly direction along the east property line of the road on the Bexar-Medina County line, 275 feet, more or less, to the intersection with the Bexar-Atascosa County line; thence south 68 degrees, 18 minutes east, along the Bexar-Atascosa County line, 290.6 feet to a point; thence north 375.15 feet on a line parallel to, and 270 feet east of, the east property line of the road along the Bexar-Medina County Line to a point on the south property line of the old Frio City Road; thence north 88 degrees, 27 minutes west, along the south property line of the old Frio City Road, 270.07 feet, more or less, to the point of beginning; being the same property conveyed by Roy C. Osgood, James D. Armstrong, Charles W. McNear, L. Marquard Forster and George W. Morgan, as Trustees of the Trust known as the "San Antonio Trust," by deed recorded April 29, 1926, in the records of Deeds of said county, in Volume 889, on pages 182-4, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

PLEASANTON SUBSTATION.

Beginning at the point where the west side of the Pleasanton-San Antonio Highway crosses the Bexar County-Atascosa County line; thence along the west side of the said highway 1010 feet to the center of the electric transmission line of said Comal Power Company, where the said transmission line crosses the said west side of said road; thence north 66 degrees west, along the center of said electric transmission line, 409 feet, which last mentioned point is the beginning point to the described land hereby conveyed; thence to the right, at approximately a right angle with said transmission line, 19 feet and 10 inches; thence in approximately a right angle to the left, 22 feet and 10 inches; thence in approximately a right angle to the left, 38 feet and 10 inches; thence in approximately a right angle to the left, 22 feet and 10 inches; thence in approximately a right angle to the left, 19 feet to the center of said transmission line and to the place of beginning of the description of the property hereby conveyed; being part of the same property conveyed by deed recorded in Atascosa County Deed Records in Book E No. 1, pages 477-478, to which reference is hereby made; the land hereby conveyed being inclosed by a fence; being the same property conveyed by T. L. Haiduk to Comal Power Company, by deed recorded October 4, 1926, in the records of Deeds of Bexar County, Texas, in Volume 911, on pages 593-594, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

SOMERSET SUBSTATION.

All that certain tract of land described, except the oil and mineral rights therein, out of 4.67-acre tract of land, out of Survey 48, Francisco Rolen grant, conveyed to August F. Ernst and wife by F. M. Hagner, by deed dated December 3, 1917, said deed being recorded in Volume 522, page 310, of the Deed Records of Bexar County, Texas, being described by metes and bounds as follows: Beginning at a stake on the west side of the Somerset Road at a point where the high line of the Comal Power Company crosses the said Somerset Road; thence south 30 degrees, 33 minutes west, 25 feet to a stake on said road; thence south 88 degrees west, 45 feet and 8 inches to a stake; thence north 2 degrees west, 44 feet to a stake; thence north 88 degrees east, 49 feet to the Somerset Road to a stake; thence south 30 degrees, 33 minutes west, 25 feet along the Somerset Road to the place of beginning; provided, however, that all oil and mineral rights in said land are expressly reserved; being the same property conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

ELECTRIC DISTRIBUTION OFFICE ADDITION.

All that certain tract or parcel of land lying and being stiuated in Bexar County, Texas, and within the corporate limits of the City of San Antonio, and described as follows, to-wit: Beginning at a stake on the east bank of the San Antonio River for the northwest corner of F. Velton's 6-acre tract, where his north fence intersects the San Antonio River; thence east with said fence and on a line parallel with Newell Street at 248 feet, center line of the railroad track of the Texas Transportation Company, at 265 feet to a stake, 38 feet south 15 degrees, 40 minutes west, of the north line of Newell Street, and 1137.2 feet west of the west line of River Avenue; thence south 15 degrees, 40 minutes west, 157.5 feet to a stake on bank of San Antonio River; thence up said river with its meanders north 74 degrees, 20 minutes west, at 140 feet, river, 40 feet to left, at 200 feet, river; thence north 16 degrees, 33 minutes west, 102 feet to place of beginning; being the same property conveyed by Texas Transportation Company to San Antonio Public Service Company, by deed recorded in the record of Deeds of Bexar County, August 14, 1928, in Volume 1045, pages 399-400.

PLEASANTON METER STATION.

All that certain tract or parcel of land situated in Bexar County, Texas, and containing 1 acre, more or less, being described by metes and bounds as follows: Beginning at a point where the east side of the Pleasanton-San Antonio Highway crosses the Bexar County-Atascosa County line; thence along the east side of said highway in a northerly direction, a distance of approximately 1010 feet to the center of the electric transmission line of the San Antonio Public Service Company to a stake, as the beginning point of land to be conveyed; thence north 1 degree, 45 minutes west, 56.2 feet to a corner stake; turn interior angle 67 degrees, 15 minutes; thence south 65 degrees, 30 minutes east, 408.7 feet to a corner stake; turn interior angle 122 degrees, 34 minutes; thence south 8 degrees, 4 minutes east, 123.1 feet to a corner stake; turn interior angle 57 degrees, 26 minutes; thence north 65 degrees, 30 minutes west, 431.7 feet to a corner stake; turn interior angle 112 degrees, 45 minutes; thence north 1 degree, 45 minutes west, 56.2 feet to the electric transmission line and place of beginning, and containing 1 acre, more or less; being part of the same property conveyed by deed recorded in Atascosa County Deed Records, in Book E No. 1, pages 477-478, to which reference is hereby made, and being out of Survey 709, in the name of S. A. Mex. Gulf Ry. Co.; the land hereby conveyed being enclosed by a fence and being located in Bexar County, Texas; being the same property conveyed by T. L. Haiduk to San Antonio Public Service Company by deed recorded in the record of Deeds of Bexar County, August 15, 1927, in Volume 1045, pages 423-424.

SOUTH SAN ANTONIO SUBSTATION NO. 1.

All that certain lot, tract or parcel of land situated in the County of Bexar, State of Texas, and more particularly described as north ½ of Lot No. 41, and the south ½ of Lot No. 40, out of what is known as the Factory Sites of the town of South San Antonio, Bexar County, Texas, as per and as shown on the plat of Fifth Filing of the said town of South San Antonio, Texas, of record in the office of the County Clerk of said Bexar County, Texas, in Volume 368, page 216, maps and plats records.

Being the same property conveyed by South San Antonio Industrial Company to San Antonio Public Service Company, by deed recorded in the record of Deeds of said Bexar County, on May 23, 1929, in Volume 1121, page 10, and by deed dated August 14, 1923, recorded in Volume 733, pages 314-15, of the Deed Records of Bexar County, Texas.

SOUTH SAN ANTONIO SUBSTATION NO. 2.

All those certain lots, tracts, or parcels of land in Bexar County, Texas, described as follows: Lots Nos. 1, 2, 3 and 4, in Block No. 337, in San Jose Townsite Addition, according to map or plat thereof duly recorded in the records of Deeds and Plats of Bexar County, Texas; being the same property conveyed by Harlandale Properties, Inc., to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Bexar County, on June 14, 1929, in Volume 1117, pages 555-6.

FRATT SUBSTATION.

The following described property: All those certain 2 acres of land out of original Survey No. 309 in the name of Francisco Villereal, approximately 14 miles northeast of the City of San Antonio and being out of a 166.66-acre tract of land conveyed by Oscar Fey and wife, Pearly Fey, to Holland B. Lowndes and Lee Jones, Jr., by deed dated December 17, 1927, and recorded in Volume 997, pages 496-7, Deed Records of Bexar County, Texas, to which deed and record reference is hereby made; said 2 acres being described by metes and bounds as follows: Beginning at the northwest corner of this tract at a stake, which stake is south 63 degrees west, 15 feet from a point on the present northeast boundary line of the Miller Road, which said point on the present northeast boundary line of the Miller Road is north 27 degrees west, 75 feet from the point where the center line of the San Antonio-New Braunfels high line No. 1 passes the present northeast boundary line of the Miller Road; from said stake north 63 degrees east, 250 feet to a stake for the northeast corner of this 2-acre tract; thence south 27 degrees east, 348.48 feet to a stake for the southeast corner of this 2-acre tract; thence south 63 degrees west, 250 feet to a stake set for the southwest corner of this 2-acre tract, said southwest corner being situated north 63 degrees east, 15 feet from the present northeast boundary line of the Miller Road; thence north 27 degrees west, parallel to, and 15 feet from the present northeast boundary line of the Miller Road 348.48 feet, to the place of beginning, said tract of land containing 2 acres of land, more or less; being the same property conveyed by Holland B. Lowndes and wife, Evelyn Lowndes, and Lee Jones, Jr., and wife, Nan Jones, to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Bexar County, March 27, 1929, in Volume 1101, pages 83-84.

RANDOLPH FIELD METERING STATION.

That certain tract or parcel of land, lying in the County of Bexar and State of Texas, described as follows, to-wit: Being the east 12 feet of Lot No. 7 and the west 13 feet of Lot No. 8, in Block No. 47, of the Universal City Subdivision, as per the map or plat of said Subdivision of record in the Map and Plat Records of Bexar County, Texas; being the same property conveyed by Commercial Loan and Trust Company, Trustee, to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Bexar County, January 26, 1932, in Volume 1287, on pages 513-514.

HIGHLAND PARK SUBSTATION.

All that certain lot or parcel of land situated in the City of San Antonio, County of Bexar, State of Texas, described as follows, to-wit: Lots Nos. 37, 38, 39 and 40, Block No. 3 New City Block No. 6216, in Highland Terrace Addition, in the City of San Antonio, Bexar County, Texas; being the same property conveyed by N. F. S. Vittrup and wife, Bennie Vittrup, to San Antonio Public Service Company, by deed recorded in the records of Deeds, of said Bexar County, Texas, October 22, 1932, in Volume 1329, on page 336.

JEFFERSON SUBSTATION.

All those certain lots or parcels of land situate in the County of Bexar, State of Texas, described as follows, to-wit: Being Lots Nos. 73, 74, 75 and 76, Block No. 19, in Jefferson Manor Addition to the City of San Antonio, according to plat thereof recorded in Volume 980, page 303, Deed and Plat Records of Bexar County, Texas; being the same property conveyed by Jefferson Manor Company, to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Bexar County, January 26, 1934, in Volume 1381, on pages 140-141.

Comal Plant.

That property conveyed by Landa Milling Company, et al., to Comal Power Company, by deed dated August 17, 1925, and therein described as follows: "All those certain lots, tracts or parcels of land out of the Juan Martin Veramendi Two-League grant, Survey No. 1, Abstract No. 2, lying and being situated within the corporate limits of the City of New Braunfels, in Comal County, Texas, more particularly described as follows, to-wit:

"Tract No. 1: Beginning at a stake at the northeast corner of the intersection of the Seguin Road and the Fredericksburg Road; thence north 18 degrees, 1 minute west, 1,112.61 feet to a stake set on the east line of the Fredericksburg Road; thence north 69 degrees, 10 minutes east, 1,000.91 feet to a stake; thence south 29 degrees, 49 minutes east, 150.64 feet to a stake; thence south 44 degrees, 27 minutes east, 146.63 feet to a stake; thence south 33 degrees, 37 minutes east, 41.54 feet to a stake; thence south 20 degrees, 36 minutes east, 194.82 feet to a stake; thence south 14 degrees, 21 minutes east, 144.79 feet to a stake; thence south 24 degrees 20 minutes east, 202.08 feet to a stake; thence south 20 degrees, 8 minutes east, 245.70 feet to a stake; thence south 35 degrees, 44 minutes east, 30.10 feet to a stake; thence south 35 degrees, 44 minutes east, 45.42 feet to a stake; thence south 25 degrees, 58 minutes east, 62.42 feet to a stake; thence south 3 degrees, 7 minutes east, 128.51 feet to a stake; thence south 7 degrees, 57 minutes east, 169.51 feet to a stake in the north property line of Seguin Street; thence north 89 degrees, 39 minutes west, 1,165.82 feet to the stake at the point of beginning.

"Tract No. 2: Beginning at a stake set on the north line of Seguin Street at the southeast corner of Tract No. 1; thence north 7 degrees, 57 minutes west, 169.51 feet to a stake; thence north 3 degrees, 7 minutes west, 128.51 feet to a stake; thence north 25 degrees, 58 minutes west, 62.42 feet to a stake; thence north 35 degrees, 44 minutes west, 45.42 feet to a stake; thence south 83 degrees, 54 minutes east, 94.17 feet to a stake; thence north 6 degrees, 49 minutes east, 244.60 feet to a stake; thence south 83 degrees, 9 minutes west, 404.62 feet to a stake; thence south 22 degrees, 50 minutes east, 140.41 feet to a stake; thence south 24 degrees, 24 minutes east, 161.30 feet to a stake; thence north 83 degrees, 9 minutes west, 150 feet to a stake; thence south 73 degrees, 49 minutes west, 141.18 feet to a stake; thence north 87 degrees, 10 minutes west, 16.54 feet to a stake; thence south 56 degrees, 52 minutes west, 35.28 feet to a stake; thence south 3 degrees, 9 minutes west, 140.46

feet to a stake; thence south 80 degrees, 11 minutes west, 15 feet to a stake; thence south 78 degrees, 14 minutes west, 29.08 feet to a stake; thence south 45 degrees, 10 minutes west, 6.90 feet to a stake; thence south 85 degrees, 30 minutes west, 34.95 feet to a stake; thence south 38 degrees, 13 minutes west, 6.98 feet to a stake; thence south 88 degrees, 57 minutes west, 54.38 feet to a stake; thence north 57 degrees, 15 minutes west, 41.51 feet to a stake; thence north 44 degrees, 4 minutes west, 49.48 feet to a stake; thence south 7 degrees, 10 minutes east, 155.30 feet to a stake; thence north 86 degrees, 49 minutes west, 20.81 feet to a stake; thence north 98 degrees, 39 minutes west, 11 feet to a stake at the point of beginning.

"Tract No. 3: This tract shall embrace all those parcels of land and property, together with all, except as hereinafter provided, water rights and water flowage incident thereto, described as follows:

"To the extent that the same are situated within the boundaries of all property and lands now owned by Grantors, all islands and the bed, basin and strips of land 15 feet in width from the water's edge along all banks of all parts of the Comal River, its tributaries, and all springs, lakes and mill race connected or incident thereto, lying and situated within the boundaries of the lands now owned by Grantors, and without the limits of the two preceding tracts described above herein. It is the express intention to hereby convey to Comal Power Company, its successors and assigns, absolutely and without exception or reservation, except as hereinafter provided, all water and water rights of any and every nature whatsoever, and the right to divert, use and appropriate the same, except as hereinafter provided, to its own exclusive use."

Said deed from Landa Milling Company, et al., to Comal Power Company further provides:

(1) "A perpetual easement appurtenant to the lands described hereinabove is hereby granted and conveyed to Comal Power Company, its successors and assigns, and all future owners of the land and premises described hereinabove, to enter upon lands, other than those described hereinabove and which are now owned by Grantors, for the purpose of constructing, maintaining, repairing and operating a spur railroad track running from the present M. K. & T. spur railroad track, situated on property of the Grantor, on a tangent from a point north of the Landa Milling Company oil mill hull warehouse to the lands hereinabove described as Tract No. 1; provided, how-

ever, said spur track must be so constructed that it will be an extension on a straight line of the present track as it runs north of said hull warehouse, or deflected in a southeast direction from such a straight line, and said spur track shall be constructed in such a way so that where it crosses the main entrance park roadway it shall have the top of its rails on a level with the surface of said roadway, or, if necessary to raise the same above the surface of the existing roadway, then Comal Power Company, its successors and assigns, shall raise and reconstruct the roadway on each side of said crossing so that the approaches to the crossing shall never exceed a grade of 5 per cent. at any place, and so that the base and surface of said roadway shall be of the same construction as the adjoining roadway; provided further, Comal Power Company, its successors and assigns, hereby covenant, bind and obligate themselves to at all times maintain said roadway at said crossing in a smooth and serviceable condition for the full width of said roadway, and said Comal Power Company, its successors and assigns, do hereby likewise covenant, bind and obligate themselves to indemnify and hold harmless Grantors, their heirs, assigns and successors, and all future owners of the lands upon which said spur track may be situated, from and against any and all claims or liabilities, of every character, arising by reason of the construction, maintenance and/or out of the use of said spur track, and/or out of the maintenance of said roadway at the crossing of said spur track.

(2) "It is understood that Comal Power Company contemplates the erection of an electric power plant upon the property hereby conveyed, and Grantors, their successors, heirs and assigns do hereby (and this is hereby made a covenant running with all lands situated in Comal County, Texas, now owned by said Grantors, or either of them) release and forever discharge the Comal Power Company, its successors and assigns, from any and all liability of every nature whatsoever, arising on account of any and all damages or injury that may result to any property or land, or interference with the use of any such property or land or depreciation in the value of any such property or land now owned by Grantors, or either of them, and not conveyed hereby, by reason of the fact of the construction, maintenance or operation of said power plant and the diversion or use of the water from the Comal River, its lakes, springs and tributaries.

(3) "Comal Power Company, its successors and assigns, shall have the right to equal use of all railroad spur tracks now located upon any lands owned by Grantors for the purpose of getting cars to and from the property hereby conveyed.

(4) "Perpetual easements, rights and privileges appurtenant to the lands hereby conveyed to Comal Power Company are hereby granted to Comal Power Company, its successors and assigns, to enter upon the lands of Grantors which lie between Seguin Street and the main line of the I. & G. N. RR., and to construct, maintain, repair and operate a spur railroad track across said lands of Grantors; said spur to run from the main line of the I. & G. N. RR. to the land hereby conveyed and described as Tract No. 1; provided, however, that Comal Power Company, its successors and assigns, shall fully compensate Grantors, their successors, heirs and assigns, for any and all damages or injury occasioned to any building or structure on the lands of Grantors by reason of the construction of said spur track.

(5) "Perpetual easements, rights and privileges appurtenant to the lands hereby conveyed to Comal Power Company, its successors and assigns, are hereby created and granted to Comal Power Company, its successors and assigns; such easements, rights and privileges shall be upon, against and for the use of that certain tract or parcel of land described as follows, to-wit:

> Beginning at a stake set for the most northwest corner of Tract No. 2, hereinabove described; thence south 6 degrees, 49 minutes west, 244.60 feet to a stake; thence north 83 degrees, 54 minutes west, 94.17 feet to a stake set on the east boundary line of Tract No. 1 hereinabove described; thence north 35 degrees, 44 minutes west, 30.10 feet to a stake; thence north 20 degrees, 8 minutes west, 245.70 feet; thence on a straight line in an easterly direction to the place of beginning.

Such easements, rights and privileges are to enter, at any and all times, upon the land described above in this paragraph for the purposes of constructing, maintaining, operating, repairing, changing, enlarging or removing underground canals, flumes, and pipes and overhead wires, telephone and electric; it is understood that the enjoyment of the easements, rights and privileges granted in this paragraph may interfere with the free use and enjoyment of the property and land described particularly in this paragraph and all claims for damages, by reason of any such interference, are hereby expressly waived by Grantors, their successors, heirs, and assigns.

(6) "Perpetual easements, rights and privileges appurtenant to the land hereby conveyed are hereby created and granted to Comal Power Company, its successors and assigns,

for the use of that part of the main entrance park roadway which lies east of any part of Tract No. 1, described hereinabove and hereby conveyed.

(7) "Perpetual easements, rights and privileges appurtenant to the property conveyed to Comal Power Company, its successors and assigns, are hereby created and granted to Comal Power Company, its successors and assigns, to control, operate and maintain all spillways that are now located on lands of Grantors, with full privilege and right to use such spillways for the purpose of carrying off water from all water courses herein referred to, and the Comal Power Company, its successors and assigns, are hereby released by Grantors, their heirs, successors and assigns, from all damages that may be occasioned by the overflow of any lands of Grantors caused by any such water passing through such spillways.

(8) "A perpetual easement, rights and privileges appurtenant to Tract No. 2, hereinabove described and hereby conveyed to Comal Power Company, its successors and assigns, are hereby created and granted to Comal Power Company, its successors and assigns; such easement, rights and privileges, shall be upon, against and for the use of that certain tract or parcel of land described as follows, to-wit:

> All that portion of the Juan Martin Veramendi Two-League grant, Comal County, Texas, that is bounded on the north and east by Comal Springs, on the south by Comal Creek and on the west by the main line of the M. K. & T. RR. right-of-way and the Comal Springs.

Such easements, rights and privileges are to enter, at any and all times, upon the land described above in this paragraph for the purpose of constructing, maintaining, operating and repairing such canals, flumes and/or tunnels, and the passage of water through same, as the said Comal Power Company, its successors or assigns, may desire.

(9) "Comal Power Company, its successors and assigns, shall have the right to the equal use of all roadways, as they from time to time exist, on lands now owned by Grantors, and abutting Tract No. 2, hereinabove described.

"To have and to hold, subject to the easements, rights, and privileges hereinafter excepted, retained and provided for, the above granted premises and the easements, appurtenances, rights and privileges hereinbefore described as granted to Comal Power Company, unto the said Comal Power Company, its successors and assigns, forever.

"Grantors do hereby bind themselves, their heirs, assigns, successors, executors and administrators, to warrant and forever defend all and singular the property, premises, easements and rights herein recited above as conveyed to Comal Power Company, unto the said Comal Power Company, its successors and assigns, against every person whomsoever lawfully claiming or to claim the same, or any part thereof, subject only to such easements, rights and privileges as are herein retained, excepted, and reserved as follows, to-wit:

(10) "A perpetual easement appurtenant to each and every part of all lands now owned by Grantors and in the Veramendi grant, in Comal County, Texas, and not conveyed hereby, is hereby expressly reserved and excepted from this conveyance, and is hereby expressly retained by Grantors, their successors, heirs, and assigns, for the perpetual free, and uninterrupted use of the main entrance park roadway, as it now runs across the lands hereby conveyed and as it now exists, or as it may hereafter be widened as provided for herein. It is agreed and understood that this easement, in addition to being appurtenant to said lands as specified above, shall be for the use and benefit of, and in favor of, the present and future owners of said lands now owned by Grantors, and each part thereof, to which the same is appurtenant and, also, in favor of every person rightfully going to or coming from said lands, or any part thereof, Comal Power Company does hereby bind and obligate itself, its successors and assigns, to maintain and keep said roadway, as it now exists or as it may be widened (as herein provided) across the lands hereby conveyed, and all bridges therein, in good repair and in as good a condition as they now are; and, further, to widen and surface said roadway where the same does so cross lands hereby conveyed, to the extent of 6 feet on each side, at such time or times as said roadway is similarly widened and surfaced immediately north of the point where it passes off of the land hereby conveyed and described as Tract No. 2; provided, however, that nothing herein contained shall require the widening of the bridge that crosses the mill race on said road.

(11) "It is agreed and understood that Grantors now own certain lands, other than those hereby conveyed, which abut upon the various parts of the 15-foot strips of land, which are hereby conveyed and described in Tract No. 3, along the banks or margin of said Comal River, its springs, lakes and tributaries; and certain easements, privileges and rights appurtenant respectively to each particular part of said abutting lands are hereby excepted and reserved from this conveyance, and are hereby expressly retained by Grantors for the benefit of the present

and future respective owners of the various parts of said abutting lands; such easements, rights and privileges shall run against and upon the respective and particular parts of the said 15-foot strips of land, and upon and against the respective and particular parts of the Comal River, its lakes, springs and tributaries adjoining said parts of said strips of land and the bed and basin thereof and all water flowing in or through all of same, wherever and to the extent, the various parts of the lands now owned by Grantors, and not hereby conveyed, do so abut upon said 15-foot strips of land; it is agreed and understood, however, that as to that part of the mill race and those parts of the 15-foot strips of land on each side thereof which lie between the north boundary of Tract No. 1 hereby conveyed and the roadway bridge across the mill race, the easements, privileges and rights provided for in this paragraph shall terminate at such time as Comal Power Company, its successors and assigns, desire to use said particular part of the mill race and said particular parts of the 15-foot strips for spray ponds, but as to all other parts of the Comal River, its lakes, springs and tributaries, and the 15-foot strips of land along the margin or banks thereof, the easements, privileges and rights provided for in this paragraph shall be, and are hereby made, in all things perpetual; said easements, rights and privileges shall be for the benefit of the present or future owners of land abutting said strips of land, to the extent hereinbefore defined, and all persons who are permitted by such owners to use the same; said easements, privileges and rights, are as follows:

(a) To enter upon and pass over said 15-foot strips of land to and from the Comal River, its lakes, springs and tributaries.

(b) To freely use said 15-foot strips of land and to fill up gullies and ditches therein and to keep the same smooth, free from brush and weeds, with full right to plant thereon and remove therefrom trees, shade trees, grass, flowers and ornamental shrub and to water, care for and protect the same.

(c) To remove obstructions from said strips of land and to keep the channels of said river, its tributaries, lakes and springs, where they now are, and to remove from such channels and beds all brush, weeds, grass, or other obstruction which may grow or accumulate thereon or therein.

(d) The use of the said Comal River, its lakes, tributaries and springs, for fishing, boating, swimming and other water sports or pleasures.

(e) To construct club houses, cottages, boat buildings, wharves, spring boards and all structures and appliances commonly used in connection with swimming, and boating pools or pools, lakes and streams.

(f) To keep upon said strips of land and the banks and beds of all streams, lakes, springs or pools, all structures and buildings now thereon.

(g) To use water from said river, its springs, lakes and tributaries for drinking purposes.

(h) To construct, repair, and replace cement or concrete walks along, upon and across said 15-foot strips and steps down to and into the water, and to build, repair, and rebuild retaining walls and rails along the banks of the river, springs and tributaries, and to erect and construct, repair and replace bridges over and across the same.

(i) To run water and gas pipes and mains across said 15-foot strips of land and said river, springs, and tributaries, and repair and replace the same, and to excavate and dig such trenches and tunnels as may be proper for such purpose.

(j) To erect, repair and replace on said 15-foot strips drinking fountains, posts or rocks or concrete structures for lights, and run light wires across or over or under the same.

(k) To repair and replace any of the structures now in, along or adjoining such river, springs and tributaries built in connection with or as a part of, or for the purpose of, the swimming pool and fish pond.

(l) To erect screens across any of the springs or tributaries for the purpose of making fish ponds, but the same must be so constructed as to permit the full flow of the water.

(m) Comal Power Company, its successors or assigns, bind themselves not to raise the level of said 15-foot strips of land and not to erect or construct thereon any fences, buildings or structures of any kind, and not to leave upon the same or any part thereof any holes or ditches dug thereon by them.

"It is the express intention that the beneficiaries of said easements, rights and privileges shall have the full and free use of the said parts of the Comal River, its lakes, springs and tributaries, and of the 15-foot strips of land along the margin or banks thereof, for all park and pleasure purposes; with full power to do such acts and things, with reference to said parts of the Comal River, its lakes, springs and tributaries, and the 15-foot strips of land along the margin or banks thereof, which may be in any way beneficial or instrumental to such use for pleasure and park purposes, and the particular enumeration above of certain acts and things which the beneficiaries of said easements, privileges and rights may do, shall never be construed as limiting the general purpose of the easements, privileges and rights provided for in this paragraph. It is agreed and understood, however, that nothing contained in this paragraph shall ever be construed in such way as to give the beneficiaries of said easements, rights and privileges, the right to use said 15-foot strips of land, the bed and channel of said river, its lakes, springs and tributaries, and the water of same, for any other purpose except that for park and pleasure purposes, as contemplated by the above; it being the express intention that the beneficiaries of said easements, rights and privileges, shall never have the right, except as provided for in this deed of conveyance, to take, pump or divert any of the water of the Comal River, its lakes, springs or tributaries, or to do anything which will affect the natural flow thereof, or to use the same, or any part of the 15-foot strips of land for any business or industrial purposes other than as herein expressly provided. It is agreed and understood, however, that Comal Power Company, its successors and assigns, shall at all times have the right to have their officers, agents and employees to enter in, upon and across all such parts of the Comal River, its lakes, springs and tributaries, and all such 15-foot strips of land, for the purpose of inspecting the same, and doing such things as may be necessary, in their opinion, to maintain the flow of the water, in, through and along all the normal channels of such river, its lakes, springs, and tributaries; so that the same may be available for the uses and purposes of the Comal Power Company, its successors and assigns.

(12) "In addition to the easements, rights and privileges reserved, excepted, and provided for in the preceding paragraph, certain other perpetual easements, rights and privileges, appurtenant exclusively to the following described land, to-wit:

> That certain tract or parcel of land, being a part of the Juan Martin Veramendi Two-League grant, situated in Comal County, Texas, and bounded on the west by the Fredericksburg Road, on the north by Comal Springs, on the east by the mill race leading from Comal Springs to Comal Creek, and on the south by the north boundary line of Tract No. 1, hereinabove conveyed to Comal Power Company.

> It is further agreed and understood that the easements provided for in this paragraph shall be appurtenant, also, to such other land as may be included in what is known generally as 'Landa Park,' and which are to be fully described by metes and bounds in a deed from Grantors to J. E. Jarratt, conveying said park.

are hereby expressly excepted and reserved from this conveyance, and are hereby expressly retained by the present and future owners of the land described in this paragraph, their successors, heirs and assigns; said easements, rights, and privileges shall be for the sole and exclusive use and benefit of the present and future owners of the land described above in this paragraph and for the use and benefit of such persons as such owners may permit to enjoy the same; such easements, rights and privileges are as follows:

> (a) To have the full and exclusive use, for all the purposes set forth in the preceding paragraph, of the largest island, known generally as 'Pecan Island,' situated in the Comal Springs; said easements, rights and privileges are for the use and enjoyment of said island for all the purposes, and are, in all things and to the full extent, the same as those provided for in the preceding paragraph with reference to the use of certain parts of the Comal River, its lakes, springs and tributaries, and the 15-foot strips of land along the banks or margins thereof;

> (b) To have the exclusive possession, control, and use of what is known as the 'swimming pool' in Landa Park, with full and exclusive right to operate the same and charge for admission thereto, and, also, the perpetual right, at all times, to take from the Comal River, its springs, lakes and tributaries, at a point above the mill race, such quantity of water as will flow through a 12-inch pipe under a 2-foot head, such flow to be continuous, for use in said swimming pool, and, between the hours of 12 o'clock midnight and 6 o'clock A. M., to take additional water for the purposes of flushing and refilling said swimming pool (the right to so take water for flushing and refilling said swimming pool shall, at all times, be subject to the needs of Comal Power Company, its successors and assigns, which shall be considered, in this connection, paramount).

> (c) To operate trains over the I. & G. N. spur track, which is situated near the west boundary line of the property, described as Tract No. 1, hereby conveyed to Comal Power Company, into 'Landa Park,' provided, however, that

cars shall never be stored on said spur track so as to interfere with the use thereof either by the Comal Power Company, its successors and assigns, or by the owners of said park.

(13) "Perpetual easements, rights and privileges appurtenant to the following described land and property, to-wit:

That certain lot, tract or parcel of land, being a part of the Juan Martin Veramendi Two-League grant, and situated in Comal County, Texas, described as follows, to-wit:

> Beginning at a point in the north boundary line of Tract No. 1, hereinabove conveyed to Comal Power Company, 15 feet west of the west water's edge of the mill race; thence south 69 degrees, 10 minutes west, along the north boundary line of said Tract No. 1, hereinabove conveyed to Comal Power Company, for a distance of 200 feet to a point; thence north 20 degrees, 50 minutes west, 100 feet to a point; thence north 69 degrees, 10 minutes east, along a straight line to a point 15 feet west of the west water's edge of the mill race; thence in a southeasterly direction along a line parallel and 15 feet from the west water's edge of the mill race to the place of beginning.

are hereby excepted and reserved from this conveyance and are hereby retained by Grantors for the benefit of the present and future owners of the property described above in this paragraph, their heirs, successors, and assigns; such easements, rights and privileges are:

> (a) To have the perpetual and continuous right to take or pump from the mill race such water as they may desire for a water works system; provided, however, that the amount of water so taken or pumped shall in no case exceed 3,000,000 gallons of water in any 24-hour period, and not more than 250,000 gallons of water in any 1 hour period.
>
> (b) To have the perpetual and continuous right at all times to enter upon, and to lay, relay, repair, maintain, and remove water mains and pipes across, along and under:
>
> > (1) The park roadway, and bridge on same, and all railroad spur tracks, situated on Tract No. 2 and hereby conveyed to Comal Power Company.
> >
> > (2) All parts of the Comal River, its lakes, springs and tributaries, and the bed and channel thereof, and all 15-foot strips of land along the banks or margins thereof, hereby conveyed, and which are described above herein as Tract No. 3.

(14) "Grantors, their successors, heirs and assigns, shall have the right to equal use of all railroad spur tracks now located upon Tract No. 2, hereby conveyed to Comal Power Company, for the purpose of getting cars to and from all lands and property of Grantors.

(15) "As to all those parts of the two branches of the Comal River, its lakes, springs and tributaries, and the 15-foot strips of land along the margins or banks thereof, which lie respectively down-stream and below the present swimming pool in Landa Park and below and down-stream from the property described as Tract No. 2, and hereby conveyed to Comal Power Company, perpetual easements, rights and privileges appurtenant respectively to the particular parts of the lands of Grantors, wherever and to the extent the same do so abut, which abut said parts of the Comal River, its lakes, springs and tributaries, or upon said 15-foot strips of land along the margins or banks thereof, are hereby excepted and reserved from this conveyance for the benefit of the present and future owners of each such respective part of the lands of Grantors which does so abut; such easements, rights and privileges are:

(a) To freely use and cross over such 15-foot strips of land and the Comal River, its lakes, springs and tributaries, and to retain, construct, reconstruct, maintain and repair thereon pump houses, pipes and all other structures as the owners of such abutting property may desire.

(b) To take such quantity of water from such parts of the Comal River, its lakes, springs and tributaries (that is, from those parts of the two branches which lie respectively below and down-stream from the swimming pool in Landa Park and below and down-stream from the lands described hereinabove as Tract No. 2 hereby conveyed to Comal Power Company), as may be desired for all and/or any purposes. It is expressly agreed and understood, however, that nothing contained in this paragraph shall ever be construed in such a way as to require more water to be run or let through the swimming pool than is expressly provided for in this deed of conveyance."

The aforesaid property is further subject to an agreement dated October 29, 1927, between the City of New Braunfels and Comal Power Company, copy of which is as follows:

"THE STATE OF TEXAS }
COUNTY OF COMAL }

WHEREAS, a dispute has arisen between the City of New Braunfels and the Comal Power Company, concerning the true location of the Fredericksburg Road and the property line of the Comal Power Company of the properties of said companies abutting on said street, and

WHEREAS, the Comal Power Company has erected a fence on that strip of land claimed by the City of New Braunfels to be part of the Fredericksburg Road, and which said strip of land is also claimed by the Comal Power Company under and by virtue of a deed of Harry Landa conveying said property to said Company, and

WHEREAS, both parties are desirous of settling amicably said dispute,

NOW, THEREFORE, KNOW ALL MEN BY THESE PRESENTS, that this agreement made by and between the City of New Braunfels, acting by and through its Mayor thereunto duly authorized, and the Comal Power Company, acting through its Vice-President, witnesseth:

1. That for and in consideration of the forebearance of said parties to this agreement to bring suit to determine the true location of said property line and the line of Fredericksburg Road, the said Comal Power Company agrees to relinquish unto the City of New Braunfels so much of the property now inclosed by them and claimed by them abutting on this street, as the City may demand, whenever the said City of New Braunfels deems it necessary and advisable to obtain said property and has made adequate money appropriations and is ready to begin work for the purpose of widening Fredericksburg Road; but in no event shall the property so relinquished extend beyond 20 feet easterly from the present fence line into the premises of the Comal Power Company. It is further agreed and understood that formal written notice to the effect that said City intends to widen said street and has appropriated adequate funds and is ready to begin work thereon shall be deemed sufficient notice to the Company, and upon receipt of said notice the Company hereby agrees to move back their fence to such a distance as may be agreed upon by the parties hereto, not to exceed

20 feet as aforesaid, and said Company will execute and deliver to said City a good and sufficient deed to the property so relinquished.

Witness our hand this 29th day of October, A. D. 1927.

CITY OF NEW BRAUNFELS.
H. A. TRIESCH,
Mayor.

COMAL POWER COMPANY.
E. H. KIFER,
Vice-President."

Said property was conveyed, subject to said agreement, by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

DITTLINGER SUBSTATION.

That property in Comal County, Texas, conveyed by John Fenske and wife to Comal Power Company by deed recorded June 10, 1927, in Volume 54 on pages 72-73, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928, said property being described in said deed recorded June 10, 1927, as follows: Beginning at a point 998 feet from the center of the I. & G. N. Ry. Track; thence south 28 degrees east, parallel with the Dittlinger Road, for a distance of 100 feet to a point; thence at a 90 degree turn, north 62 degrees east, 100 feet to a point; thence at a turn of 90 degrees north, 28 degrees west, 100 feet to a point; thence at a turn of 90 degrees south, 62 degrees west, 100 feet to the place of beginning; and being part of the old John Fenske Farm, which was conveyed to John Fenske by W. Fenske, by deed dated the 16th day of April, A. D. 1881, and recorded in Book P, page 359, of the Deed Records of Comal County, Texas.

PENSHORN PROPERTY.

All that certain tract, piece or parcel of land situated within the corporate limits of the City of New Braunfels, in Comal County, Texas, being out of the J. Veramendi Survey No. 1, Abstract No. 2, and being part of the certain tract of land conveyed by Chas. Buehler, et al., to Edmund Penshorn, by deed dated November 6, A. D. 1905 recorded in Volume 27, on pages 547-548, Deed Records of Comal County, Texas, and more particularly described as follows, to-wit: Beginning at a point in the southwest line of the New Braunfels and Blanco Road, same being the north corner of the Hermann Thiele Tract and east corner of the said Edmund Penshorn Tract; thence in a northwesterly direction with the said southwest line of said New Braunfels and Blanco Road, 1,845 feet to a stake; thence in a southwesterly direction at an angle of 86 degrees, 47 minutes with said southwest line of said road to a point which is 30 feet from said road by a straight line drawn at a right angle to said road; thence in a southeasterly direction parallel with, and 30 feet from, the said southwest line of said New Braunfels and Blanco Road to a point in the Hermann Thiele northwest line; thence in an easterly direction with the said Hermann Thiele northwest line to the place of beginning; being the same property conveyed by Meta Penshorn, a feme sole, to Comal Power Company, by deed recorded November 2, 1925, in the records of Deeds of said county, in Volume 51, on pages 572-573, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

ADDITION TO COMAL PLANT (NOWOTNY).

All that certain tract or parcel of land lying and being situated within the corporate limits of the City of New Braunfels, Comal County, Texas, being a part of the Juan Martin Veramendi Survey No. 1, and described as follows, to-wit: Beginning at a point on the south line of North Street, which point is south 59 degrees, no minutes east, 165.0 feet from the intersection of the south line of North Street and the west line of River Avenue; thence south 16 degrees, 28 minutes east, 168.5 feet; thence south 2 degrees, 57 minutes east, 387.0 feet; thence south 46 degrees, 8 minutes east, 94.8 feet; thence north 69 degrees, 56 minutes east, 103.6 feet; thence south 72 degrees, 33 minutes east, 139.65 feet to a stake; thence 59 degrees west, to a stake set on the bank of the Comal River; thence up the meanders at the east bank of the Comal River to a point approximately 15 feet from the place of beginning; thence north 59 degrees east, to the place beginning.

The above described property being all that portion of that tract of land conveyed to E. H. Kifer by Albert Nowotny and Minnie Nowotny, by deed dated December 23, 1926, and recorded in Volume 53, pages 260-261, of the Deed Records of Comal County, Texas, save and except that portion of said tract conveyed by E. H. Kifer to South Texas Ice Company, by deed dated the 28th day of February, 1928, and this conveyance is made subject to the rights and easements granted in the aforesaid deed to South Texas Ice Company; being the same property conveyed by E. H. Kifer to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Comal County, March 19, 1928, in Volume 55, pages 64-65.

KUEHLER POWER STATION SITE.

All those certain tracts or parcels of land lying and being situated in Comal County, Texas, described as follows, to-wit:

First Tract: Thirty acres of land abutting on the Guadalupe River, south of, and adjacent to, the City of New Braunfels, and more particularly described as follows, to-wit: beginning at a concrete monument from which a hackberry 20 inches in diameter bears north 69 degrees east, 54 feet, said monument being 36.8 feet south 39 degrees, 28 minutes east, from the center of the east end of the 30-foot right-of-way this day purchased from W. Kuehler, et al.; thence north 32 degrees, 29 minutes east, 662 feet to a concrete monument; thence north 68 degrees, 9 minutes east, 770 feet to a concrete monument from which a hackberry 6 inches in diameter bears north 72 degrees, 50 minutes east, 63 feet; thence north 6 degrees, 11 minutes west, 1,088 feet to a stake at the water's edge of the Guadalupe River; thence up the river with its meanders 2,000 feet, more or less, to a cypress 8 inches in diameter at the water's edge of the Guadalupe River; thence south 39 degrees, 28 minutes east at 752.2 feet past the center of the east end of the above mentioned 30-foot right-of-way, and in all 789 feet, to the place of beginning.

Three and sixty-two hundredths acres of land, more or less, adjoining the 30 acres of land herein described, being more particularly described as follows, to-wit:

A strip of right-of-way 30 feet wide and 5,259.9 feet long, extending southeasterly from the south line of the city limits of the City of New Braunfels into the Kuehler property, the center line of said strip being described as follows: Beginning at a concrete monument on the south city limit line of the City of New Braunfels, said monument being 1,174.4 feet north 80 degrees, 56 minutes east, from the city monument at the Schumannsville Road, and 1,144 feet south 80 degrees, 56 minutes west, from a new concrete monument established on the city limit line near the Guadalupe River; thence south 29 degrees, 2 minutes east, parallel with, and 165 feet distant from, the southwest line of South Seguin Street, extended, as shown on the plat of the Kuehler Addition as recorded in Volume 46, pages 430-431, of the Deed Records of Comal County, Texas, in all 391.6 feet, to a stake; thence in a southeasterly direction on a line curving to the left with a radius of 1,433 feet, 344.2 feet to a stake, which is south 42 degrees, 48 minutes east, 172.9 feet from a concrete monument established at the point of intersection of this curve; thence south 42 degrees, 48 minutes east, 1,093.8 feet to a stake; thence in a southeasterly direction on a line curving to the left with a radius of 1,433 feet, 405.8 feet to a stake, which is south 59 degrees, 2 minutes east, 204.3 feet from a concrete monument established at the point of intersection of this curve; thence south 59 degrees, 2 minutes east, 622.1 feet to a stake; thence in an easterly direction on a line curving to the left with a radius of 955 feet, 1,189.2 feet to a stake, which is north 49 degrees, 37 minutes east, 685.6 feet from a concrete monument established at the point of intersection of this curve; thence north 49 degrees, 37 minutes east, 812.2 feet to a stake; thence in a northeasterly direction on a line curving to the left with a radius of 1,343 feet, 401 feet to a stake in the southwest line of the 30-acre tract, 36.8 feet north 39 degrees, 28 minutes west from the concrete monument established at the south corner of said 30-acre tract.

The above described property being that property conveyed by Ludgar Kuehler and wife, Hulda Kuehler, et al., to Comal Power Company, by deed dated June 30, 1924, and duly recorded in Book 49, pages 485-487, Deed of Records of Comal County, Texas.

Second Tract: Fourteen and forty-two hundredths acres of land abutting on the Guadalupe River, and being a part of the Wm. Kuehler Tract out of the John Thompson Survey No. 21 in Comal County, Texas, and more particularly described as follows: Beginning at the east corner of the 30-acre tract heretofore conveyed to the Comal Power Company, a concrete monument from which a hackberry 6 inches in diameter bears north 72 degrees, 50 minutes east, 63 feet; thence south 68 degrees, 9 minutes west along the southeast line of said 30-acre tract, 770 feet to a concrete monument; thence continuing along the southeast line of said 30-acre tract south 32 degrees, 29 minutes west, 662 feet to a concrete monument at the south corner of said 30-acre tract; thence south 39 degrees, 28 minutes east, 31.6 feet to a stake; thence north 32 degrees, 29 minutes east, parallel with, and 30 feet distant from, the southeast line of said 30-acre tract, 662.1 feet to a stake; thence north 68 degrees, 9 minutes east, parallel with, and 30 feet distant from, the southeast line of said 30-acre tract, 415 feet to a stake; thence north 82 degrees, 18 minutes east, 356 feet to a stake, which is 117 feet south 21 degrees, 51 minutes east, from the concrete monument at the beginning corner; thence north 78 degrees, 20 minutes east at 577 feet a cottonwood tree 30 inches in diameter, and in all 624 feet to the water's edge of the Guadalupe River; thence up the river with its meanders to the north corner of said 30-acre tract; thence south 6 degrees, 11 minutes east along the east line of said 30-acre tract 1,088 feet to the place of beginning, containing 14.42 acres of land.

The above described property being the same property conveyed by Ludgar Kuehler, et al., to Comal Power Company, by deed dated October 1, 1924, and duly recorded in Volume 50, pages 62-64, Deed Records of Comal County, Texas.

Third Tract: All that certain tract of land situated within the corporate limits of the City of New Braunfels, Comal County, Texas, being known as Lot No. 5 of Subdivision of Acre Lot No. 179, and more particularly described by metes and bounds as follows, to-wit: Beginning at the northeast corner of Lot No. 11, said beginning point being on Nacogdoches Road, for a distance of 79 feet to the southeast corner of said Lot No. 5; thence north 52 degrees west for a distance of 181 feet to the northeast corner of said Lot No. 5; thence south 38 degrees west for a distance of 70 feet to the northwest corner of said Lot No. 5; thence south 52 degrees east for a distance of 145 feet to the place of beginning.

The above described property having been conveyed by Willie Kuehler and wife, to Comal Power Company, by deed dated June 30, 1924, and duly recorded in Book 49, pages 477-478, Deed Records of Comal County, Texas, and by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Comal County on July 6, 1928, in Volume 55, on pages 310-314.

ADDITION TO COMAL PLANT SITE (LOCKE).

Being all that certain tract or parcel of land situated within the corporate limits of the City of New Braunfels, Comal County, Texas, and more particularly described as follows: Beginning at a point 30 feet south 75 degrees, 30 minutes west, from the west property line of the Fredericksburg Road and on the south property line of a new street cut through the south end of the Penshorn property, this point being also on the west line of the 30-foot right-of-way now owned by the San Antonio Public Service Company and on the south line of the new street at the south end of the Penshorn property; thence south 75 degrees, 30 minutes west, 199.34 feet along the south line of the said new street to a stake for the northwest corner of this tract; thence south 14 degrees, 30 minutes east, 1,092.6 feet parallel to, and 199.34 feet distant from, the west line of the 30-foot right-of-way, before mentioned, to a stake for the southwest corner of this tract; thence north 75 degrees, 30 minutes east, 199.34 feet to a stake on the west line of the said 30-foot right-of-way, which point is the southeast corner of this tract; thence along the west line of the said 30-foot right-of-way north 14 degrees, 30 minutes west, 1,092.6 feet to the place of beginning; being 5 acres of land out of the tract of land conveyed to Herman C. Locke by Meta Penshorn, by deed dated April 27, 1926, recorded in the Deed Records of Comal County, Texas, in Volume 52, on pages 375-376, to which deed and record thereof reference is particularly made as part of the description of the property herein conveyed; being the same property conveyed by Herman C. Locke and wife, Thekla Locke, to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Comal County, September 17, 1928, in Volume 55, pages 433-435.

P. & M. Mills Plant.

The following described property in Comal County, Texas, to-wit:

1. A part of the 6.14-acre tract out of the A. M. Esnaurizar 11-League grant in Comal County, Texas, described in deed from L. Meyer and wife to the Trustees of the P. & M. Mills, dated August 20, 1921, and recorded in Book 43, pages 619-621, of the Deed Records of Comal County, Texas, said part being more particularly described by metes and bounds as follows: Beginning at a stake on the east bank of Guadalupe River at water's edge, at a point which is 15 feet up-stream from the up-stream face of the water power house of the P. & M. Mills; thence north 73 degrees, 18 minutes east, parallel with, and 15 feet distant from, the up-stream face of said power house, 24 feet to a stake for north corner, which stake is south 7 degrees, 12 minutes east, 332.5 feet from the center of the I. & G. N. R. R., at the concrete bulkhead face of the east abutment of said railroad's Guadalupe River bridge; thence south 16 degrees, 42 minutes east, parallel with, and 15 feet distant from, the east face of the power house, 68 feet to a stake; thence south 73 degrees, 18 minutes west, parallel with, and 15 feet distant from, the down-stream face of said power house, 20 feet, more or less, to the water's edge of the Guadalupe River; thence in a northerly direction along the water's edge of the Guadalupe River with its meanders, 15 feet, more or less, to the down-stream face of the power house; thence

north 73 degrees, 18 minutes east, along the down-stream face of said power house, 6 feet, more or less, to its southeast corner; thence north 16 degrees, 42 minutes west, along the east face of said power house, 38 feet to its north corner; thence south 73 degrees, 18 minutes west, along the up-stream face of said power house, 11 feet, more or less, to the water's edge of the Guadalupe River; thence in a northerly direction along the water's edge of the Guadalupe River with its meanders 15 feet, more or less, to the place of beginning.

2. A part of the 6.14-acre tract out of the A. M. Esnaurizar 11-League grant in Comal County, Texas, described in deed from L. Meyer and wife to the Trustees of the P. & M. Mills, dated August 20, 1921, and recorded in Book 43, pages 619-621, of the Deed Records of Comal County, Texas, said part being more particularly described by metes and bounds as follows: Beginning at a point in the east line of the power house tract, 24.5 feet south 16 degrees, 42 minutes east from the north corner of said tract and being 15 feet from the east face of the power house; thence north 73 degrees, 18 minutes east, 76 feet to a point on concrete walk; thence south 16 degrees, 42 minutes east, 19 feet to a stake; thence south 73 degrees, 18 minutes west, 76 feet to a point in the east line of the power house tract; thence north 16 degrees, 42 minutes west, parallel with, and 15 feet distant from, the east face of the power house, 19 feet to the place of beginning.

3. A part of the John Thompson Survey within the corporate limits of the City of New Braunfels, Texas, more particularly described by metes and bounds as follows: Beginning at a stake in the southwest right-of-way line of the P. & M. Mills, same being also the northeast line of Block 1052, of the City of New Braunfels, Texas, said stake being 22.7 feet south 19 degrees, 41 minutes east from the north corner of Lot No. 3, of said Block 1052; thence south 19 degrees, 41 minutes east, along the southwest right-of-way line of the P. & M. Mills and the northeast line of said Block 1052, 40 feet to a point on rock ledge; thence north 73 degrees, 4 minutes east, 30 feet, more or less, to the water's edge of the Guadalupe River; thence in a northwesterly direction along the water's edge of the Guadalupe River with its meanders, passing around the southwest end of the P. & M. Dam to a point 15 feet up-stream from the up-stream face of said dam; thence south 73 degrees, 4 minutes west, parallel with, and 15 feet distant from, the face of said dam, 25 feet, more or less, to the place of beginning.

Which 3 parcels of land were surveyed on August 17 and 18, 1931, by R. S. Jahn, County Surveyor.

4. The dam formerly owned by Planters and Merchants Mills, Inc., extending across the Guadalupe River from a point which bears south 45 degrees, 34 minutes east, 852 feet from the west corner of A. M. Esnaurizar 11-League grant, on the bank of the Guadalupe River in Comal County, Texas, distant in an easterly direction from New Braunfels, Texas, 1½ miles, erected under original Permit No. 590, granted and issued by the Board of Water Engineers to the Planters and Merchants Mills of New Braunfels, Texas, under date of July 31, 1922, together with all riparian rights, rights of flowage, or to back up water by means of said dam or other water rights, all and any easements of any kind formerly owned by Planters and Merchants Mills, Inc., in any lands, or lots or parcels of land in Comal County, Texas, abutting on said Guadalupe and Comal Rivers, across from, above or below the said dam, whether acquired by deed, contract or use, it being the intention herein to convey the complete and entire water and power plant, formerly owned by the Planters and Merchants Mills, Inc., together with all riparian and other rights and appurtenances thereunto in anywise incident or appertaining, and all rights, however acquired, to impound and use water by means of said dam, and reference is here made to all deeds and contracts to Planters and Merchants Mills, Inc., in the Deed Records of Comal County, Texas, conveying riparian or other water rights and easements to the said Planters and Merchants Mills, Inc., or its predecessors in title, and reference is also made to the original Permit No. 590, granted and issued by the Board of Water Engineers to the Planters and Merchants Mills of New Braunfels, Texas, for the appropriation of water from the Guadalupe River in Comal County, Texas, and the amendment thereto, No. 755, granted and issued by the Board of Water Engineers of the State of Texas, and the amendment thereto, No. 755, granted and issued by the Board of Water Engineers of the State of Texas to the Planters and Merchants Mills of New Braunfels, Texas, both of which appear of record in the office of the Board of Water Engineers, at Austin, Texas.

5. An easement right-of-way over, across and upon the present gravel roadway lying between the present west wall of the old Planters and Merchants Mill Building and the Guadalupe River, leading from the Austin-San Antonio Highway to the boiler room of the Old Mill Building, as a permanent and perpetual means of ingress and egress to and from the said power plant and dam site, as hereinabove described; being the same land, property, rights, privileges and easements conveyed by H. A. Wagenfuehr to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Comal County, Texas, November 20, 1931, in Volume 60, pages 248-250.

GUADALUPE POWER SITE.

All those certain tracts or parcels of land lying and being situated in Guadalupe County, Texas, being out of Subdivision No. 88 of the A. M. Esnaurizar Original 11-League grant, which was conveyed by E. J. Laechelin and wife, Hulda Laechelin, to Comal Power Company, by deed dated August 22, 1927, and duly recorded in Book 94, pages 371-373, of the Deed Records of Guadalupe County, Texas, and in which said deed the property hereby conveyed is described as follows:

"First: Beginning at a point on the north fence line of the Southern Pacific Railroad right-of-way, and on the south boundary line of the property of grantors herein, 2,339 feet from the southeast corner of property of E. J. Laechelin and wife; thence north no degrees, 7 minutes west, 1,871.5 feet to Young's Ford Road; thence south 89 degrees, 53 minutes west, 297.87 feet; thence north 73 degrees, 52 minutes west, 98.87 feet; thence south 89 degrees, 12 minutes west, 383.67 feet; thence along the line of the property heretofore sold by E. J. Laechelin and wife to the Texas Power Corporation, south 69 degrees, 9 minutes west, 163 feet; north 89 degrees, 40 minutes west, 146 feet; south 58 degrees, 58 minutes west, 72.25 feet to corner; thence leaving the line of the Texas Power Corporation property and going south 14 degrees, 40 minutes east, 349.30 feet; thence south no degrees, 7 minutes west, 1579.79 feet to a point in fence line between the Southern Pacific Railroad right-of-way and the above property, this line being parallel to, and 1048 feet from, the eastern line of this tract; thence following the north fence line of the railroad right-of-way, in an eastern direction, 1056 feet to the place of beginning, containing 45.92 acres of land.

"Second: Beginning at a point on the western boundary of the above tract, 1467.33 feet north from the north property line of the railroad right-of-way; thence south 62 degrees, 41 minutes west, to the corner of the property of the Texas Power Corporation, this being a corner of that property where a dam is to be erected; thence with the northwest line of said property to the boundary line of the property heretofore sold by E. J. Laechelin and wife to the Texas Power Corporation; thence in a northern direction along the Texas Power Corporation property to a point 100 feet distant from, and at right angles to, the northwest boundary of the Texas Power Corporation land; thence in a northeasterly direction, parallel to the first course of this tract, and 100 feet therefrom, to a point on the western boundary of the above 45.92-acre tract, said point being 1579.79 feet from the northern property line of the Southern Pacific Railroad; thence south with the west line of said 45.92-acre tract to the place of beginning.

"This tract or strip of land identified as 'Second,' is expected to be used by Comal Power Company as and for a canal, and it is agreed that all dirt removed in the digging of the canal by said company shall be by them spread out evenly to a distance of 200 feet from the edge of the canal. It is further agreed that E. J. Laechelin and wife reserve to themselves, and to their heirs and assigns, the right to cross said strip and canal at as many as three places, with the right to construct bridges across and over said canal at as many as three places so selected by him to cross same, and Comal Power Company agrees that it will pay one half the cost of the construction of any one of said bridges as soon as constructed and when requested to contribute by E. J. Laechelin and wife.

"Third: Also a permanent easement for the construction of a tunnel and the construction and operation of not more than two electric transmission lines. This easement is upon and under the following strip of land: Beginning at a point on the western boundary of the above 45.92-acre tract of land, 716.5 feet from the north boundary of the Southern Pacific right-of-way; thence south 62 degrees, 41 minutes west, to the Guadalupe River; thence with the bank of the river a perpendicular distance of 100 feet; thence in a northeastern direction, parallel to the southeastern boundary of this easement and 100 feet therefrom, to a point on the western boundary of the 45.92 acres, 828.96 feet north of the northern property line of the Southern Pacific Railroad; thence south with the west line of said 45.92-acre tract to the place of beginning.

"It is agreed that no ditch of any kind shall be permanently left open on the above tract for any purpose except the first 250 feet beginning with the river front, and only two transmission lines shall be erected on the easement.

"It is understood that E. J. Laechelin and wife hereby convey to Comal Power Company all riparian and other rights which they own at the points where the conveyed premises touch the river or the property of the Texas Power Corporation, but that notice is taken of such rights as the Texas Power Corporation may own.

"It is also agreed that E. J. Laechelin and wife reserves to himself, and themselves, an easement for the passage of persons, vehicles and stock along the south side of said 45.92-acre tract above described, so long as they or either of them own land on both sides of said 45.92 acres, said right-of-way not to interfere with the construction and operation of a railroad spur that might be erected across same, but which is to permit a crossing at this point.

"It is further understood and agreed, and there is hereby given and granted to Comal Power Company, an easement for the passage of persons, vehicles and stock from the southwest corner of the 45.92 acres above conveyed, westward along the north boundary of the Southern Pacific railroad to the road going southward under the trestle of the railroad, and thence running with said road under said trestle and to the main road to Seguin, subject, however, to the right of E. J. Laechelin and wife to cross under the right-of-way of the Southern Pacific under said trestle."

The above described property was, as before mentioned, conveyed by E. J. Laechelin and wife, Hulda Laechelin, to Comal Power Company by deed dated August 22, 1927, and recorded in Book 94, pages 371-373, of the Deed Records of said Guadalupe County, and said property was thereafter conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Guadalupe County on July 10, 1928, in Book 98 on pages 361-365.

GERONIMO SUBSTATION.

All that certain tract or parcel of land lying and being situated in the County of Guadalupe, in the State of Texas, described as follows, to wit: Ten thousand square feet of land, more or less, out of an 124-acre tract located approximately two miles from the town of Geronimo in Guadalupe County, Texas, out of Esnaurizar grant, said 10,000 square feet of land being described by metes and bounds as follows: Beginning at a point at the southeast corner of the A. F. Baese property adjoining the public school; thence north 3 degrees east, 247 feet to a stake set for the southeast corner of the land to be described; thence north 87 degrees west, 100 feet to a stake set for the southwest corner; thence north 3 degrees east, 100 feet to a stake set in the northwest corner; thence south 87 degrees east, 100 feet to the northeast corner to a stake set in the west line of the Geronimo road; thence south 3 degrees west, 50 feet to the Luling high line of the San Antonio Public Service Company; thence continuing south 3 degrees west, 50 feet to the place of beginning, containing 10,000 square feet, more or less.

Being the same property conveyed by A. F. Baese and Paula Baese, husband and wife, to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Guadalupe County, July 14, 1928, in Book 97, page 487.

KINGSBURY SUBSTATION.

All that certain tract or parcel of land lying and being situated in the County of Guadalupe, in the State of Texas, described as follows, to-wit: Twenty-two thousand, five hundred square feet of land, more or less, out of a 213 acre tract located approximately one mile northwest of the Town of Kingsbury in Guadalupe County, Texas, out of the J. H. Kuykendall Survey, said 22,500 square feet of land, more or less, being described by metes and bounds as follows: Beginning at a stake set in the north corner of John Schmidt's property on the San Marcos and Kingsbury Road, about one mile northwest of the Town of Kingsbury; thence south 37 degrees, 30 minutes east, 253 feet to a stake set for the beginning point of land to be described, said stake being the west corner; thence north 52 degrees, 30 minutes east, 150 feet to a stake set for the north corner; thence south 37 degrees, 30 minutes east, 126 feet 10 inches to Luling high line; thence continuing south 37 degrees, 30 minutes east, 23 feet 2 inches to a stake set for the east corner; thence south 52 degrees, 30 minutes west, 150 feet to a stake set for the south corner, said stake being on the northeast side of the Kingsbury Road; thence along the northeast side of said road north 37 degrees, 30 minutes west, 100 feet to the Luling high line; and thence continuing north 37 degrees, 30 minutes west, 50 feet to a stake or point of beginning. Said piece of ground containing 22,500 square feet, more or less.

Being the same property conveyed by John Schmidt and wife, Marie Schmidt, to San Antonio Public Service Company by deed recorded in the records of Deeds of said Guadalupe County July 16, 1928, in Book 97, pages 489-490.

OIL FIELD SUBSTATION.

The following tract of land in Guadalupe County, Texas, out of the George Blair labor of 177 acres, which said 177 acres was on the 23rd day of November, 1908, conveyed by R. W. Nickell and wife, Emily A. Nickell, by deed to J. L. Mercer, which said deed is recorded in the Deed Records of Guadalupe County, Texas, in Volume 32, page 47, to which Deed Records reference is hereby made, as follows: Beginning at a stake set in the fence line at a south corner of the J. L. Mercer tract of land out of said George Blair labor, said stake being situated north 80 degrees, 55 minutes east, 16 feet north, 3 degrees, 31 minutes east, 89.2 feet from the center stake of structure No. 17/9 on Comal Power Company 60 K. W. McQueeney—Luling high line; thence north 88 degrees, 30 minutes west, 17.2 feet with fence line of said J. L. Mercer tract of land to a stake set at corner of said fence; thence north 38 degrees, 54 minutes west, 185.6 feet with said fence line to a stake set in fence line for the west corner of this one-acre tract; thence north 57 degrees east, 218.34 feet to a stake set for the north corner of this one-acre tract; thence south 33 degrees east, 209.92 feet to a stake set in the southeast fence line of said J. L. Mercer tract of land for the east corner of this one-acre tract; thence with said fence line south 53 degrees, 26 minutes west, 125.84 feet to a stake set in a corner of said fence line; and thence continuing with said fence line south 78 degrees, 17 minutes west, 63.9 feet to the place of beginning. Said tract of land as described above contains 1 acre of land.

Being the same property conveyed by J. L. Mercer and wife, Laura A. Mercer, to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Guadalupe County, November 5, 1929, in Volume 116, pages 224-225.

SEGUIN SUBSTATION.

All that certain lot or parcel of land situated in Guadalupe County, State of Texas, and a part of the Humphreys Branch League, and being out of the A. Byler tract, containing one acre, and described more particularly as follows: Beginning at the northwest corner of a plot of ground owned by Frank Wilson; thence north, 210 feet; thence east, 197½ feet; thence south, 210 feet; thence west 197½ feet to the place of beginning. Being the same property conveyed to Abner Jackson by Fannie Jackson, by deed dated September 10, 1924, as appears of record in Volume 79, on page 401, of the Deed Records of Guadalupe County, to which deed and the record thereof reference is here made.

Being the same property conveyed by G. Wallace Smith to San Antonio Public Service Company by deed recorded in the records of Deeds of said Guadalupe County on May 9, 1929, in Volume 106, pages 264-265.

EASEMENT FOR GUADALUPE POWER SITE.

The permanent easement conveyed by Edgar J. Laechelin and wife, Hulda Laechelin, to San Antonio Public Service Company, by warranty deed recorded in the records of Deeds of Guadalupe County on August 26, 1930, in Volume 130 on page 394-395, and therein described as follows:

"A permanent easement and use of that certain parcel and strip of land 40 feet wide, known and designated as lying along the southwestern side of the following tract of land situated about five miles west of Seguin, out of the A. M. Esnaurizar 11-League grant, in Guadalupe County, Texas, beginning at a stake in the east or southeast boundary of a 2.56-acre tract formerly owned by Aug. H. Koehler, said beginning point being about 388 feet south 46 degrees, 37 minutes west, of the most northern corner of said tract (said point being also in the north line of the highway leading from Seguin to San Antonio); thence north 46 degrees, 37 minutes east, with said road, 80 feet to a stake for corner, said stake being the southwest corner of a tract of land conveyed by Aug. H. Koehler to John P. Stuard by deed dated June 28, 1930; thence north 43 degrees, 11 minutes west, 133.5 feet to a stake set for corner, said stake being the northwest corner of said tract conveyed by Aug. H. Koehler to John P. Stuard, and to the south line of a right-of-way owned by San Antonio Public Service Company; thence south 65 degrees, 49 minutes west, 75 feet to a stake for corner; thence south 39 degrees, 55 minutes east, 158½ feet to the place of beginning, and being the western part of a strip of land conveyed to E. J. Laechelin and wife, Hulda Laechelin, by Aug. H. Koehler.

"It is the intention of this instrument to give to the San Antonio Public Service Company the permanent right of use of and over a strip of land 40 feet wide (which use shall at all times permit an open right-of-way), leading from the Seguin-San Antonio highway (immediately east of the McQueeney Bridge over the Guadalupe River) in a northerly direction to a right-of-way owned by San Antonio Public Service Company; along the south side of the Southern Pacific Railroad right-of-way, conveyed by deed from E. J. Laechelin and wife, Hulda Laechelin, to the Comal Power Company, dated August 22, 1927, of record in Volume 94, page 371, of the Deed Records of Guadalupe County, Texas, to which reference is here made. It is understood and agreed that the easement and right-of-way granted in that deed of conveyance for the passage of persons, vehicles and stock from the southwest corner of the 45.92-acre tract therein described, westward along the north boundary line of the Southern Pacific Railroad, to the road going southward under the trestle of the railroad; thence along the road under said trestle to the main road to Seguin, Texas, which easement and right-of-way is and shall be over a strip of land 30 feet wide along its entire course, extending from the boundary line of the Southern Pacific Railroad right-of-way."

Being as aforesaid the same permanent easement conveyed by Edgar J. Laechelin and wife, Hulda Laechelin, to San Antonio Public Service Company by warranty deed, recorded in the records of Deeds of said Guadalupe County on August 26, 1930, in Volume 130, pages 394-395.

SEGUIN OFFICE BUILDING.

All of that certain lot and parcel of land situated in Seguin, Guadalupe County, Texas, described as follows, to-wit:

Being part of original Inner or Building Block No. 25, now known as New City Block No. 163, and being all of Lots Nos. 5 and 6, and a small part of Lot No. 7, in said Block, so as to include the brick and rock or gravel and concrete building on the northeast corner of said Block: Beginning at the northwest corner of said Block; thence east with the south line of East Center Street, 106 feet to the northeast corner of the brick portion of the said building thereon; thence south 66⅔ feet to a stake; thence west 106 feet to a stake in the east line of South River Street; thence north 66⅔ feet to the place of beginning.

Being the same property conveyed by the South Texas Ice Company to San Antonio Public Service Company by deed recorded in the records of Deeds of said Guadalupe County on February 15, 1930, in Volume 121, page 457.

D'HANIS SUBSTATION.

All that certain piece of land in the town of D'Hanis, in Medina County, Texas, conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company by deed dated January 1, 1928, and recorded in the records of Deeds of said County in Volume 97, at page 574, and which is described in said deed as follows:

All that certain piece, parcel and block of land lying and being situated in the town of D'Hanis, in Medina County, Texas, Abstract No. 49, Certificate No. 296, Survey No. 441, Burnett D. G., being out of a 15-acre homestead tract owned by Chas. Boog and wife, Helena Boog, the part hereby conveyed being described by metes and bounds as follows, to-wit: Beginning at the southeast corner of said Boog 15-acre tract for the southeast corner of this piece; thence north along the Boog east line for a distance of 100 feet, turn interior angle of 89 degrees; thence due west for 100 feet, a stake for the northwest corner of this piece, turn interior angle of 91 degrees; thence due south for 100 feet, a stake, set for the southwest corner, interior angle 89 degrees; thence east for 100 feet along Boog south line to place of beginning; being the same land conveyed by Charles Boog and wife, Helena Boog, to Comal Power Company by deed dated November 22, 1927, and recorded in Volume 85, pages 467 and 468, of the Deed Records of Medina County, Texas.

FLORESVILLE PLANT SITE.

The following described property situated in Wilson County, Texas, and within the corporate limits of the City of Floresville, more particularly described as follows, to-wit:

The east half of Lot No. 11, and all of Lots Nos. 12, 13 and 14, Block C of the Railroad Addition to the City of Floresville, as shown by map or plat of said City, of record in the office of the County Clerk in Wilson County, Texas.

Being the same property conveyed by the Lone Star State Power Company to the South Texas Public Service Company, recorded on the 4th day of November, 1927, in Deed Records Book 144, pages 3 to 6, Wilson County, Texas, and by the said South Texas Public Service Company conveyed to the South Texas Ice Company by deed dated the 1st day of February, A. D. 1928, and recorded in Deed Records Book 144, pages 419-421, of Wilson County, Texas, said property being known as the Floresville Power and Ice Plant site, Wilson County, Texas.

Being the same property conveyed by South Texas Ice Company to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Wilson County, January 9, 1930, in Volume 163, pages 167-168.

FENTRESS PLANT AND SYSTEM.

All that land, property, property rights, franchises, privileges and easements conveyed by G. Wallace Smith to San Antonio Public Service Company by deed recorded in the records of Deeds of Caldwell County, Texas, in Volume 137, page 601 (and in Guadalupe County in Volume 106, pages 338-340), wherein said land, property, rights, franchises, privileges and easements are described as follows:—

"No. 1. All that certain tract or parcel of land lying and being situated in Caldwell County, Texas, more particularly described as follows, to-wit:

Beginning at an iron pin set at the northeast corner of the property owned by the Fentress Gin and Power Company, located on the east side of the San Marcos River, said northeast corner of said property being located approximately as follows: Beginning at a cypress tree on the north bank of the San Marcos River, at the upper northwest corner of the M. Gillan League; thence north 50 degrees east 4162 feet along said league line; thence south 40 degrees east, 5428 feet to the aforementioned iron pin set in the northeast corner of the property of the Fentress Gin and Power Company; thence south 3 degrees, 30 minutes east, 50 feet to a stake for a corner of this tract; thence south 86 degrees, 30 minutes west, 50 feet to a corner of this tract; thence north 3 degrees, 30 minutes west, 50 feet to a corner of this tract; thence north 86 degrees, 30 minutes east, 50 feet to the place of beginning.

"No. 2. All that certain tract or parcel of land lying and being situated in Caldwell County, Texas, on the east side of the San Marcos River, described as follows, to-wit: Beginning at an iron pin set in the property of the Fentress Gin and Power Company, on the east bank of the San Marcos River, the location of said iron pin being determined approximately as follows: Beginning at the iron pin set as the beginning point of Tract No. 1, above described; thence south 86 degrees, 30 minutes west, 103 feet and 10 inches; thence south 3 degrees, 30 minutes east, 296 feet; thence north 73 degrees, 30 minutes west, 94 feet 10 inches to a point where said iron pin is set for the beginning point of this tract; thence from said beginning point, south 73 degrees, 30 minutes east, 64 feet 2 inches to a point for a corner of this tract; thence south 15 degrees, 30 minutes west, 30 feet to a corner of this tract; thence south 52 degrees, 30 minutes west, 28 feet 6 inches to a corner of this tract; thence south 10 degrees, 30 minutes west, 27 feet to a corner of this tract; thence south 68 degrees, west, 5 feet 9 inches to a corner of this tract; thence south 79 degrees, 30 minutes west, 19 feet 3 inches to an iron pin driven in the east bank of the San Marcos River; thence north, along the east bank of the San Marcos River with its meanders, to the place of beginning.

"No. 3. All that certain tract or parcel of land lying and being situated in Guadalupe County, Texas, more particularly described as follows, to-wit:

Beginning at an iron pin set in the property of the Fentress Gin and Power Company on the west bank of the San Marcos River, the location of said iron pin so set as a beginning point of this tract being determined approximately as follows, to-wit: Beginning at the extreme southwest corner of Tract No. 2, above described, which said extreme southwest corner is located on the east bank of the San Marcos River; thence north 79 degrees, 30 minutes east, 19 feet 3 inches; thence south 16 degrees, 30 minutes west, 112 feet 6 inches to a cross-cut in a wooden bridge; thence due west approximately 200 feet, crossing the San Marcos River to said iron pin set on the west bank of the San Marcos River as the beginning point of this tract; from said beginning point so located, thence west 165 feet to a point, a corner of this tract, which said point is on the west bank of a slough; thence along the west bank of said slough, north 10 degrees west, 175 feet to a stake; thence north 15 degrees west, 200 feet to a stake; thence north 44 degrees west, 100 feet to a stake set for a corner of this tract, said point being on the J. H. Fleming southeast line; thence north 50 degrees east, along the said J. H. Fleming line to the west bank of the San Marcos River; thence south, along the west bank of the San Marcos River with the meanders of said river, to the place of beginning.

"No. 4. That certain concrete dam crossing the San Marcos River at a point between and abutting Tracts Nos. 2 and 3, above described, together with a forebay, two water wheels and the gates located at the east end of said dam.

"No. 5. All rights, privileges and easements of every nature whatsoever, with reference to the right of G. Wallace Smith to maintain said dam, forebay, water wheels and gates, and to operate same.

"No. 6. All improvements of any and every nature whatsoever located upon the above three tracts of land, together with all generators, machinery, tools and equipment of any and every nature located in and on the above described tracts.

"No. 7. The entire electric distribution system radiating from the power plant located on Tract No. 2 and serving the towns of Fentress, Prairie Lea and intermediate and adjacent territory, together with all rights, privileges and franchises of any and every nature whatsoever, owned and possessed by G. Wallace Smith in connection with the construction and maintenance of said electric distribution system, together with all tools, appliances and equipment of any and every nature whatsoever used and useful in connection with said electric distribution system.

"No. 8. A perpetual easement appurtenant to, and running in favor of, the title to Tracts Nos. 2 and 3, above described; said easement being of such nature as to at all times give to the said San Antonio Public Service Company, its successors and assigns, complete, free and uninterrupted ingress and egress for all purposes to the aforesaid Tracts Nos. 2 and 3, above described, and for the maintenance of such pole lines as are this day purchased by said San Antonio Public Service Company from G. Wallace Smith, and such additional pole lines as San Antonio Public Service Company, its successors or assigns, may hereafter, from time to time, desire to construct; all such easements to be on, over and along property now owned by the Fentress Gin and Power Company that is not covered by this conveyance; it being understood, however, that insofar as the same is practicable to the said San Antonio Public Service Company, its successors or assigns, such easements will coincide with the present driveways which are at this time maintained by said G. Wallace Smith, but in the event the same are not found to be practicable to the said San Antonio Public Service Company, its successors or assigns, then said easements shall run in such manner as to give to the said San Antonio Public Service Company, its successors or assigns, a direct line from the aforesaid Tracts Nos. 2 and 3, to the nearest public highway and also to Tract No. 1, and in addition to the aforementioned easements, an easement is also hereby given unto the said San Antonio Public Service Company, its successors and assigns, over and along the north end of the property owned by the Fentress Gin and Power Company on both the east and west sides of the San Marcos River, so as to enable the said San Antonio Public Service Company, its successors and assigns, to connect Tract No. 1, above described, with a transmission or power line now running between Luling and McQueeney, Texas.

"All of which property is more fully described in a deed of conveyance executed by the Fentress Gin & Power Company, a corporation, joined by its stockholders, individually, in favor of G. Wallace Smith, under date of December 31, 1928, which deed appears of record in the Deed Records of Caldwell County, Texas, in Volume 135, at page 591; it being the intention of G. Wallace Smith to convey and transfer to the San Antonio Public Service Company, its successors and assigns, all the right, title and interest to all properties of whatsoever nature and description acquired and held under that deed of conveyance, which deed and the record thereof is hereby referred to for all purposes. Said deed is also recorded in Guadalupe County in Volume 139, pages 561-565."

Being as aforesaid, the same land, property, rights, franchises, privileges and easements conveyed by G. Wallace Smith to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Caldwell County on May 14, 1929, in Volume 106, pages 338-340.

MCQUEENEY SUBSTATION.

The following parcel of land situated in the County of Guadalupe, State of Texas, viz.:

All that certain tract of land and parcel of real estate lying, being and situated in the County of Guadalupe, State of Texas, known and described as follows, to-wit: Beginning at a point 94 feet 4 inches south 45 degrees west, of a point in the south boundary line of the right-of-way belonging to the Galveston, Harrisburg & San Antonio Railway Company, said beginning point being 94 feet 4 inches south 45 degrees west of the northwest corner of a tract of land conveyed to Ed. W. Wuest by August Blumberg and wife, Anna Blumberg, by deed dated the 6th day of March, A. D. 1909; thence east 180 feet along the O. S. T. highway to a point; thence south 49 degrees, 52 minutes west, 251 feet 9 inches to a point on the south boundary line of said tract of land; thence west 45 degrees north, 125 feet 5 inches to a point; thence north 45 degrees east, 115 feet to the place of beginning.

Being the same property conveyed by Ed. W. Wuest and wife, Julia Wuest, to the Comal Power Company by deed recorded August 6, 1925, in Guadalupe County records of Deeds Book 86, pages 18-19, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company by deed dated January 1, 1928.

BOERNE SUBSTATION (KAUFMAN).

All that certain tract of land described as follows, to-wit: Lot No. 11 in Block No. 2 Sunrise Addition, in the City of Boerne, Kendall County, Texas.

Being the same property conveyed by Nathan Kaufman and L. Kaufman to Comal Power Company by deed recorded May 17, 1927, in Deed Records of said County, in Volume 42 on pages 455-456, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company by deed dated January 1, 1928.

BOERNE SUBSTATION SITE (WALKER).

All that certain tract or parcel of land out of Survey 180, conveyed to L. Walker and wife by Emil P. Stegner by deed recorded in Volume 30, page 298, situated and lying in Kendall County, Texas, and described as follows: Beginning at the southeast corner of L. Walker tract; thence north along the east fence line 392 feet to a stake placed for the southeast corner of said land to be used for a substation site; thence north along the east fence line for a distance of 100 feet to a stake; thence west by describing an interior angle of 90 degrees a distance of 75 feet to a stake, thence south by describing an interior angle of 90 degrees 100 feet to a stake; thence east 75 feet by describing an interior angle of 90 degrees to the place of beginning.

Being the same property conveyed by L. Walker and wife, to Comal Power Company by deed recorded June 7, 1926, in the Deed Records of said County in Volume 41 on pages 547-548, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company by deed dated January 1, 1928.

HONDO SUBSTATION.

That property conveyed by J. W. Heath, et al., to Comal Power Company by deed recorded June 25, 1926, in Deed Records of Medina County in Volume A-79, on pages 425-427, and therein described as follows:

All that certain piece, parcel and tract of land lying and being situated in Medina County, Texas, described as follows, to-wit: Being out of the east half of Survey No. 183, originally granted to Francios Sybelle, beginning at the southwest corner of the J. W. Heath 35 acres out of said Survey No. 183; thence in a northerly direction along the east side of a proposed road for a distance of 439 feet to a stake for the place of beginning of this substation site; thence along the same road in a northerly direction for a distance of 75 feet; thence in an easterly direction by describing an exterior angle of 90 degrees, a distance of 130 feet; thence in a southerly direction by describing an exterior angle of 90 degrees, a distance of 75 feet; thence in a westerly direction by describing an exterior angle of 90 degrees, a distance of 130 feet, to the place of beginning. The property hereby conveyed appears more fully on the plat of same hereto attached and made a part of this instrument. Reference is also made to deed from Jack Fusselman, et al., to J. W. Heath, bearing date of November 8, 1911, duly recorded in the Deed Records of

Medina County, Texas, in Volume A-46, pages 443-444, which conveyance is made a part hereof; being same property conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

That property conveyed by James W. Heath and wife to Comal Power Company, by deed recorded April 28, 1927, in the Deed Records of Medina County, in Volume 83, on pages 264-265, and therein described as follows:

All that certain piece, parcel and strip of land, lying and being situated in Medina County, Texas, out of the east half of Survey No. 183, originally granted to Francios Sybelle, and being further described as follows: Beginning at the southwest corner of the J. W. Heath 35 acres out of Survey No. 183; thence in a northerly direction along the east side of a proposed road for a distance of 439 feet to a stake for the place of beginning, said point being the southwest corner of a substation site purchased by Comal Power Company from James W. Heath and wife, by deed dated June 19, 1926, and duly recorded in the Deed Records of Medina County, Texas, in Volume A-79, pages 425 to 427, to which deed reference is made for all purposes; thence east along the south line of said substation site for a distance of 130 feet for the northeast corner of the strip hereby conveyed, and being the southeast corner of said substation site; thence south for a distance of 25 feet to a stake for the southeast corner of this strip; thence west for a distance of 130 feet to the east line of said proposed road for the southwest corner of this strip, said south line to run parallel with the north line; thence north to the place of beginning, the strip of land hereby conveyed being 130 feet in length by 130 feet wide or east to west; being same property conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

FLORESVILLE SUBSTATION.

All that certain tract or parcel of land out of the S. and J. Arosha grant, in Wilson County, Texas, containing 2 acres of land and described by metes and bounds as follows, to-wit: Beginning at a stake on the northwest side of the elongation of A. Street of the town of Floresville, south 48¾ degrees west, 64½ varas from the southwest corner of the Fairgrounds, the southwest corner of the upper or northeast one-half of said 4-acre tract for Konrad Lux and the northeast corner of this survey; thence with the center line of said 4-acre tract, north 41¼ degrees west, 164 varas to the northwest corner of the 2-

acre tract for Konrad Lux; thence south 48¾ degrees west, 64½ varas to the northwest corner of said 4-acre tract; thence south 41¼ degrees east, 164 varas to its southwest corner on the northwest side of elongation of A. Street; and thence with said street north 48¾ degrees east, 64½ varas to the place of beginning; being the same property conveyed by Mrs. M. V. Franklin to the Comal Power Company, by deed recorded on September 22, 1927, in Deed Records Book, Volume 143, pages 212-214, and conveyed by Comal Power Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

CIBOLO SUBSTATION.

That property conveyed by Henry Uhr and wife to South Texas Public Service Company, by deed recorded January 16, 1926 in Deed Records Book, Volume 87, on pages 601-603, and therein described as follows:

"All that certain parcel of real estate lying, being and situated in the County of Guadalupe, State of Texas, out of Survey No. 65 in the name of W. Bracken, our entire tract containing 66 acres of land, and being the same land conveyed to Henry Uhr and wife by Hy Schueler, said deed being of record in Volume 63, page 367, of the Deed Records of Guadalupe County, Texas, to which said deed and the record thereof reference is here had for all pertinent purposes, and more particularly described as follows, to-wit: Beginning at a point in the southwest corner of land of Henry Uhr and wife, same being on the north side of the old Seguin Public Road; thence north 30 degrees 30 minutes west, 463 feet to a point, for the southwest corner of the tract of land herein conveyed; thence north 30 degrees 30 minutes west, 60 feet to a point for corner of the tract of land herein conveyed; thence, after making interior angle of 90 degrees to the right, 50 feet to a corner of the tract of land herein conveyed; thence, after making interior angle of 90 degrees to the right, 60 feet to a corner of the tract of land herein conveyed; and thence, after making interior angle of 90 degrees, 50 feet to the place of beginning."

The tract of land therein conveyed being a rectangular tract 50 feet by 60 feet in size, a blue print of said tract of land being attached to deed of Henry Uhr, and wife, recorded January 6, 1926, in Deed Records Book, Volume 87, on pages 601-603, being designated "Cibolo Substation Site," and made a part thereof for the purpose of aiding in the location and description of the tract of land therein conveyed.

Being the same property conveyed by South Texas Public Service Company (by Liquidating Trustees), to San Antonio Public Service Company, by deed dated January 1, 1928.

MARION SUBSTATION.

That property conveyed by Herman Bulgerin and wife to South Texas Public Service Company by deed recorded January 16, 1926, in Deed Records Book, Volume 87, on pages 600-601, and therein described as follows, to-wit: "All that certain parcel of real estate, lying, being and situated in the County of Guadalupe, State of Texas, out of Survey No.......in the name of C. Rector, the entire tract containing 105 acres of land, and being the same land conveyed to Herman Bulgerin and wife by Elword G. Bulgerin, said deed being of record in Volume 35 at pages 478-9-10, and Volume 65 at page 28, of the Deed Records of Guadalupe County, Texas, to which said deed and the record thereof reference is here had for all pertinent purposes, and more particularly described as follows, to-wit: Beginning at a point in the southwest corner of land of Herman Bulgerin and wife; thence north 11 degrees, 5 minutes west, 141 feet 7 inches to the southwest corner of the tract of land herein conveyed; thence north 11 degrees, 6 minutes west, 50 feet to corner of the tract of land herein described; thence, after making an interior angle to the right of 90 degrees, 50 feet to a point for corner of the tract herein conveyed; thence, after making an interior angle of 90 degrees, 50 feet to a point for corner of the tract of land herein conveyed; and thence, after making an interior angle of 90 degrees, 50 feet to the place of beginning."

The parcel of land therein conveyed being a body of land 50 feet square, a blue-print of which is attached to deed of Herman Bulgerin, and wife, recorded January 16, 1926, in Deed Records, Volume 87, at pages 600-601, and designated "Marion Substation Site," and made part thereof for the purpose of aiding in the location and description of the tract of land therein conveyed; being the same property conveyed by South Texas Public Service Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

SCHERTZ SUBSTATION.

That property conveyed by Mrs. Elizabeth Schneider, a feme sole, to South Texas Public Service Company, by deed recorded January 15, 1926, in Deed Records Book, Volume 87, at pages 598-599, and therein described as follows:

"All that certain parcel of real estate, lying, being and situated in the County of Guadalupe, State of Texas, out of Survey No. 67, in the name of G. Malpoz, the entire tract containing 243-3/5 acres of land, and being the same land conveyed to W. A. Schneider by Chris Schneider, said deed being of record in Volume 21, page 201, Deed Records of Guadalupe County, Texas, to which said deed and the record thereof reference is here had for all pertinent purposes, and more particularly described as follows, to-wit: Being a rectangular tract of land, 150 feet long and 50 feet wide out of the property belonging to Elizabeth Schneider, and lying immediately northeast from the point where First Street in Schertz, Guadalupe County, Texas, abuts against the property of Elizabeth Schneider"; being the same property conveyed by South Texas Public Service Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

BOERNE SUBSTATION (DALY).

All that certain tract or parcel of land lying and being situated in the Town of Boerne, Kendall County, Tex., in the Wendler and Shrader Addition to said Town, and known and described as Lot No. 4, according to a plat of said addition recorded in the office of the County Clerk of Kendall County, Texas, in Volume 24, page 405; being a part of the property conveyed by Richard E. Daly to South Texas Public Service Company, by deed recorded June 3, 1926, in Deed Records of said County, in Volume 41, at pages 543-544, and being the same property conveyed by South Texas Public Service Company (by Liquidating Trustees) to San Antonio Public Service Company, by deed dated January 1, 1928.

LOS ANGELES HEIGHTS SUBSTATION.

All that certain tract or parcel of land located in the City of San Antonio, Bexar County, Texas, and being more fully described as follows, to-wit:

Lot No. 11 of a resubdivision of Lots Nos. 5 and 6, Block No. 1, City Block No. 6172, out of the southern portion of old City Lot No. 1, Range No. 6, District No. 3 of Old City Tract; being the same premises conveyed to San Antonio Public Service Company by William Bollier (unmarried), by deed dated May 11, 1937, and recorded May 13, 1937, in the records of Deeds of Bexar County in Volume 1577, page 626.

CASTROVILLE POWER PLANT.

That certain tract and parcel of land situated in the town of Castroville, Medina County, Texas, hereinafter referred to as the power plant site, described and bounded as follows: Beginning at a point 247.7 feet south 45 degrees east, from southeast corner of Florence and Main Streets, in the Town of Castroville, south 45 degrees west, 143 feet to a concrete monument; thence south 45 degrees east, 279 feet to the edge of the Medina River; thence from a concrete monument 42 feet from the river's edge along survey line north 69 degrees east, 156.2 feet to concrete monument; and thence along a line north 45 degrees west from the Medina River's edge 332.5 feet to the place of beginning; being the same property conveyed by Jordan T. Lawler to San Antonio Public Service Company, by deed recorded in the record of Deeds of said Medina County, on August 10, 1936, in Volume 106, at pages 309-310.

BERG'S MILL GENERATING STATION.

First: 2.25 acres of land, more or less, out of the Juan Francisco Gomez Suerte, being on the south side of the South Loop Road situated in Bexar County, Texas, conveyed to H. B. Tennant by deed dated November 21, 1933, from Robert Wensley, Bertha Hattenbach and V. L. Hattenbach, said deed being recorded in the record of Deeds of Bexar County in Volume 1379, pages 173-174, said 2.25 acres of land, more or less, being more particularly described as follows:

Beginning at the intersection of the southerly line of the South Loop Road with the center line of the San Antonio River, running thence north 72 degrees 15 minutes west, 320 feet along the southerly line of said road to corner of a fence, said corner being 67 feet from the center of the Espada Ditch; thence south 8½ degrees west, 290 feet along a fence to corner of a fence; thence south 72 degrees 45 minutes east, 386 feet along a fence to the bank of the San Antonio River, and continuing the same course to the center of said River; thence up the center line of said River, north 8½ degrees west, 165 feet; and thence north 1½ degrees east, 140 feet to the place of beginning; according to a survey and plat made by Louis Polk, County Surveyor of Bexar County, Texas, on November 16, 1933, and being all lying south of said Road, of the land described in deed from Sarah Dickenson et al., to F. F. Collins, dated May 18, 1900, recorded in the record of Deeds of Bexar County in Volume 192, page 175.

Second: Also all rights and privileges mentioned in said deed as having been reserved to the grantors therein by deed from Frank Ashley, dated July 15, 1898, and recorded in the record of Deeds of Bexar County in Volume 177, page 415; also all rights reserved in deed from F. F. Collins to Frank Ashley et al., dated April 16, 1906, and recorded in the record of Deeds of Bexar County in Volume 242, page 617; also all rights established, created or acquired by that certain instrument executed by F. F. Collins, dated June 27, 1914, and recorded Water Right Records of Bexar County in Volume 1, page 225. It being understood that this conveyance shall include all and every right, privilege, easement and title of whatever nature at any time owned or acquired by the said J. J. Wensley, R. Wensley or Bertha Hattenbach in connection with, or appurtenant to, the land conveyed hereby.

Third: All land, real estate, improvements, hydro-electric plants, riparian and water rights, easements, highway permits, franchises, rights, privileges, things of value, poles, wires, generators, water wheels, water dams, and property of every kind and character now on the premises, whether real, personal or mixed, heretofore conveyed to D. F. Youngblood by deed executed by Herbert B. Tennant and wife, Esther Tennant, and Berg's Mill Utilities Company, a corporation, which deed is dated July 23, 1936, and recorded in the deed Records of the County Clerk of Bexar County, Texas.

GAS PLANT PROPERTY.

1. All that portion of land situated in the City of San Antonio, County of Bexar, State of Texas, known as New City Block No. 229. This block is bounded on the north by Matamoras Street; on the south by Durango Street; on the east by Salado Street; on the west by Comal Street. There are 333.6 feet from east to west, and 337.4 feet from north to south.

2. All that portion of land situated in the City of San Antonio, County of Bexar, State of Texas, known as New City Block No. 230. This block is bounded on the north by Durango Street, on the east by Salado Street, on the south by San Luis Street, and on the west by Comal Street.

COLLINS GARDENS RIGHT-OF-WAY.

A right-of-way to construct, maintain and operate pipe lines and underground appurtenances thereto on and along a strip of land 15 feet in width, situated in what is known as "Collins

Gardens," in the City of San Antonio, Bexar County, Texas, described as follows, to-wit: Beginning at a stake set on the west side of Marian Street at the southeast corner of Lot No. 2, Block No. 41, City Block No. 6284; thence in an easterly direction 15 feet; thence in a northerly direction, parallel to and 15 feet from, the west line of Marian Street, along Marian Street, and through Lots Nos. 10 and 4, Block No. 11, City Block No. 6254, to a stake set on the southeast line of the right-of-way of the I. & G. N. Railway Company; thence in a southwesterly direction along the southeast line of the said right-of-way of the I. & G. N. Railway Company to the west line of Lot No. 4, Block No. 11, City Block No. 6254; and thence in a southerly direction parallel to, and 15 feet distant from, the line running in a northerly direction, hereinbefore mentioned, to the place of beginning; said Marian Street being the street over which the said San Antonio Public Service Company now operates a line of street railway; being the same property conveyed to San Antonio Public Service Company by San Antonio Loan and Trust Company, acting as Trustee for F. F. Collins and by F. F. Collins, by deed signed and recorded December 11, 1922, in the records of Deeds of Bexar County, Texas, in Volume 697, at pages 540-542.

WALKER AVENUE METER STATION.

All that certain property situated in the County of Bexar, State of Texas, described as follows, to-wit: Being a part of Lots Nos. 18 and 19, Block No. 4, in Artesian Gardens, an addition to the City of San Antonio, lying west of the right-of-way of the S. A. U. & G. R. R. Co., fully described as follows: Beginning at a stake set 4,256 feet east of the west line of Artesian Gardens Subdivision; thence north 290.4 feet to a stake; thence east 83 feet along the north line of Lot No. 18 to a stake at its intersection with the west line of the right-of-way of the S. A. U. & G. R. R. Co.; thence in a southerly direction 296.4 feet along the west line of said right-of-way to a stake, at its intersection with the north line of Walker Avenue; thence west 140 feet along the north line of Walker Avenue to the place of beginning, and being the same property as that conveyed by J. N. Bradley and wife, Artie Bradley, to Hart W. Donnell, by deed dated September 25, 1928, and recorded in Volume 1053, pages 608-609, of the Deed Records of Bexar County, Texas; being the same property conveyed by Hart W. Donnell and wife, Hortense Donnell, to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Bexar County, November 14, 1928, in Volume 1051, pages 615-16.

Avondale Regulator Station.

All that certain tract, lot and parcel of land situated in the Temple Hill Addition to the City of San Antonio, Bexar County, Texas, and described as follows: Being all of Lot No. 22, Block No. 1, of said addition, County Block No. 5575, and also that part of Lot No. 21, Block No. 1, of said addition, described as follows: Beginning at a stake set for the northeast corner of the intersection of South Presa Street and Avondale Street; thence northwest along South Presa Street 67 feet to a stake set for the dividing line between the J. A. McDaniel tract and the tract of land herein conveyed; thence in an easterly direction 63.1 feet along the dividing line between the said J. A. McDaniel tract and the tract of land herein conveyed, to a stake set on the property line between Lots Nos. 21 and 22, which said stake is situated 50 feet south of the northwest corner of Lot No. 22; thence south along the boundary line between Lots Nos. 21 and 22, to Avondale Street, to a stake; and thence west along the north boundary of Avondale Street, 23.5 feet to the place of beginning; being the same property conveyed by Jas. A. McDaniel and wife, Alice B. McDaniel, to San Antonio Public Service Company, by deed recorded in the records of Deeds of said Bexar County on June 13, 1929, in Vol. 1113, pages 519-520.

Camp Bullis Substation Site.

All that certain tract or parcel of land situated approximately three and one-half miles southeast of Leon Springs Railroad Station, Bexar County, Texas, being more particularly described as follows:

Beginning at a point known as the S.W. corner of the John B. Muesser tract, which point is 46 feet from east rail of the San Antonio & Aransas Pass Railroad; thence N 16°33′ W for a distance of 5.8 feet; thence N 65°51′ E for a distance of 45.0 feet; thence N 82°52′ E for a distance of 113.0 feet; thence S. 25°45′ E for a distance of 38.5 feet; thence S 89°25′ W for a distance of approximately 155 feet to the place of beginning.

Being the same property conveyed by James F. Jackson, and wife, Virginia A. Jackson, to San Antonio Public Service Company by deed dated October 31, 1938, recorded November 15, 1938, in the deed records of Bexar County, in book Volume 1667, page 56.

UNDERGROUND RIGHT-OF-WAY — STATION "B" TO GRANDVIEW SUBSTATION.

All of the following described real estate lying and being situate in San Antonio, the County of Bexar, State of Texas, to-wit:

Being part of Lot Six (6), New City Block Three Thousand and Fifty-seven (3057), Roberts Subdivision, according to plat thereof recorded in Vol. 368, page 175, Deed and Plat Records of Bexar County, Texas, being more fully described as follows:

Beginning at a point on the West line of Roosevelt Avenue 165 feet South from the Southwest intersection of Roosevelt Avenue and Fairplay Avenue; Thence West along the South line of Lot 6, New City Block 3057 to the Southwest corner of said Lot 6; Thence north along the West line of said Lot 6, 4 feet to a point; Thence East along a line parallel to the South line of Lot 6 to a point in the West line of Roosevelt Avenue, same being the east line of said Lot 6; Thence in a southeasterly direction along the East line of Lot 6 to the place of beginning.

Being the same property conveyed by William Buchholtz to San Antonio Public Service Company by deed dated July 31, 1939, recorded August 16, 1939, in the deed records of Bexar County, in book volume 1711, pages 166-67.

MARKET STREET — COMMERCE STREET PROPERTY.

The following described real estate, situated in the county of Bexar and the State of Texas, to-wit:

Beginning at a point in the south line of Commerce Street at the intersection of the south line of Commerce Street with the west line of the cut-off river channel, said point being the northeast corner of this tract of land; thence south along east line of concrete wall forming the western boundary line of said cut-off river channel, the entire length thereof, to a point where the western boundary line of said cut-off river channel intersects the north line of Market Street for the southeast corner of this tract of land; thence in a westerly direction along the north line of Market Street, a distance of 27.61 feet to a point in the east line of an alley for the most southerly southwest corner of this tract of land; thence in a northerly direction along the east line of said alley, a distance of 63.5 feet to a corner; thence in a northeasterly direction approximately 21 feet to the southeast corner of Lot 23 and the southwest corner of Lot A-25 in said City Block; thence in a northeasterly direction along the exterior face of a rock wall, a distance of 27.01 feet to a point for corner; thence turning from left to right at an angle of 87 deg. 8 min. and continuing a distance of 3.9 feet along the exterior face of a rock wall to a point for corner; thence in a northeasterly direction along the outside face of a rock wall a distance of 44.3 feet to a point in the south line of West Commerce Street for the most northerly northwest corner of this tract; thence east along the south line of West Commerce Street, a distance of 18.66 feet to the place of beginning; said tract of land comprising Lots 4, A-25 and A-27 and a strip of land lying between Lots A-25 and A-27, all in City Block 101 as shown on the block map of the city assessor of the City of San Antonio, Bexar County, Texas.

Being the same property conveyed by the City of San Antonio to San Antonio Public Service Company by deed dated March 30, 1940, recorded April 3, 1940, in the deed records of Bexar County, in book Volume 1759, pages 37-38.

WEST COMMERCE STREET PROPERTY.

The following described real estate, situated in the County of Bexar and the State of Texas, to-wit:

Beginning at the intersection of the west line of stone wall along the east line of cut-off river channel with the north line of West Commerce Street; thence in a northerly direction along the west line of said stone wall, forming the east line of said cut-off river channel, the full length thereof, to the intersection with the north line of retaining wall on south bank of the San Antonio River; thence in an easterly direction along the north line of said retaining wall on the south bank of the San Antonio River, a distance of 16.9 feet to a lead point on the line of party wall as agreed on February 7, 1873, for the northeast corner; thence in a southerly direction with party wall as per agreement February 7, 1873, to the north line of West Commerce Street; thence in a westerly direction along West Commerce Street a distance of 15.9 feet to the place of beginning; said tract of land being all that tract of land owned by the City of San Antonio and lying between the cut-off river channel and the George Witte property; subject, however, to party wall agreement between Charles F. Fischer and George Witte, dated February 10, 1873, duly recorded in Volume X-1, page 259 of the Deed Records of Bexar County, Texas, but including all of the right, title and interest of the City of San Antonio in the Witte building wall; and subject, however, to a perpetual right of the City of San Antonio to attach to and abut on the west side of said stone wall of said property a cantilever sidewalk for public use, together with the right and privilege, at its own cost, to maintain and repair the same in such manner as said city may from time to time see fit.

This conveyance is made subject to the terms and stipulations of a certain party wall agreement between Charles F. Fischer and George Witte, dated February 10, 1873, recorded in Volume X-1, page 259 of the Deed Records of Bexar County, Texas, but it is expressly intended that all right, title and interest owned by the City of San Antonio in and to said party wall be and the same is hereby conveyed to the Grantee herein.

The City of San Antonio expressly reserves a perpetual right to attach to and abut on the west side of said stone wall of said property a cantilever sidewalk for public use, together with the right and privilege, at its own cost, to maintain and repair the same in such manner as said city may from time to time see fit, which said perpetual right and easement is hereby expressly reserved in this conveyance by the City of San Antonio.

Being the same property conveyed by the City of San Antonio to San Antonio Public Service Company by deed dated March 30, 1940, recorded April 3, 1940, in the deed records of Bexar County, in book volume 1749, pages 569-70.

CAMP TRAVIS HIGHLINE RIGHT-OF-WAY.

The following described and situated real estate, to-wit:

Lot Six (6) and Twenty-three (23), and the East ten (E 10) feet of Lot Five (5), and the East ten (E 10) feet of Lot Twenty-two (22), in Block Two (2), City Block Fifteen Hundred Fifty-eight (1558), in GRANDVIEW ADDITION, Section Two (2), situated just outside of the city limits of San Antonio, in Bexar County, Texas.

Being the same property conveyed by John Cottor Sullivan, to San Antonio Public Service Company by deed dated April 4, 1940, recorded April 9, 1940, in the deed records of Bexar County, in book volume 1753, pages 212-13.

CLEVELAND COURTS SUBSTATION SITE.

All that certain property located in the City of Alamo Heights, Bexar County, Texas, described as follows, to-wit:

The southwest 17 feet, more or less, of Lot 19, and all of Lot 20, and the northeast 33 feet, more or less, of Lot 21, (excluding a certain parcel or strip of land 10 feet in width off the entire southwest side of said northeast 33 feet of lot 21) in block 8 of the Madeliene Terrace Subdivision in said City of Alamo Heights, Bexar County, Texas, said property fronting on Cleveland Court, being the property conveyed by the living heirs of Sam Maverick, deceased, to San Antonio Public Service Company by deed dated April 3rd, 1940, recorded May 29th, 1940, in the deed records of Bexar County in book volume 1759, pages 622-624.

GAS DISTRIBUTION PARCEL.

Beginning at the intersection of the south line in Durango Street with the west line of South Salado Street, same being the northeast corner of City Block 230 situated within the corporate limits of the City of San Antonio, in Bexar County, Texas;

Thence westerly along the north line of said City Block 230, the full length thereof, same being the south line of Durango Street to the northwest corner of said City Block 230, same being at the intersection of the south line of Durango Street with the east line of South Comal Street;

Thence northerly along the east line of South Comal Street (extended) to the intersection of the east line of South Comal Street with the north line of Durango Street, same being the southwest corner of City Block 229 situated within the corporate limits of the City of San Antonio, in Bexar County, Texas;

Thence easterly along the south line of said City Block 229, the full length thereof, the same being the north line of Durango Street to the southeast corner of said City Block 229, same being at the intersection of the north line of Durango Street with the west line of South Salado Street;

Thence in a southerly direction along the west line of South Salado Street (extended) to the place of beginning; and comprising that portion of Durango Street lying between said City Blocks 229 and 230, and extending from the west line of South Salado Street to the east line of South Comal Street within the corporate limits of the City of San Antonio, in Bexar County, Texas.

Being the same property conveyed by the City of San Antonio to San Antonio Public Service Company by deed dated March 30th, 1940, recorded April 3rd, 1940, in the deed records of Bexar County, in book volume 1759, pages 38-39.

SOUTH SAN ANTONIO SUBSTATION SITE

All that certain tract of land described as follows: Lots Nos. twenty-seven (27) and twenty-eight (28) Block No. eight (8) in Columbia Heights, a subdivision in Bexar County, Texas, as shown by the map or plat of said subdivision of record in the records of Deeds and Plats of Bexar County, Texas, in Volume 105, pages 14 and 15.

All the following described land, to-wit: Lots One (1) to Eight (8), inclusive, and Lot Eleven (11) in Block Eight (8) County Block 4028, Columbia Heights Addition to the City of San Antonio, Bexar County, Texas, as shown by plat recorded in Volume 105, page 14, of the Plat Records of Bexar County, Texas.

All that certain tract or parcel of land more particularly described as follows: to-wit: All of Lots 24, 25 and 26, in Block 8 in Columbia Heights Addition, in Bexar County, Texas, according to Plat Recorded in Volume 105, pages 14 and 15, of the Plat Records of said County, except the south 75-feet of said lots 24, 25 and 26.

HARLANDALE SUBSTATION SITE

All that certain property known as lot 10 of Block 36 in Harlandale Gardens Addition to the City of San Antonio (third filing), said lot being situated in the County of Bexar and State of Texas.

That certain strip and parcel of land out of Tract E of the Harlandale Gardens, a subdivision in Bexar County, Texas, as shown by the map and plat thereof of record in Volume 642, page 192 of the Map and Plat Records of Bexar County, Texas, lying between the south line of Lot 10, Block 36, of said subdivision and the Pyron Road, being a portion of said Tract E as would be cut off and included between an extension of the East and West line of said Lot 10, to an intersection with the said Pyron Road, said strip and parcel of land being in Bexar County, Texas.

HOT WELLS SUBSTATION SITE.

All that certain tract or parcel of land described as follows, to-wit:

Lot Ten (10), Block One (1), in Temple Hills Addition to the City of San Antonio, according to plat recorded in Volume 368, page 180, Plat Records of Bexar County, Texas, being situated in County Block 5575.

All that certain tract or parcel of land described as follows, to-wit:

Lot Eleven (11), Block One (1) in Temple Hills Addition to the City of San Antonio, according to Plat Recorded in Vol. 368, page 180, Plat Records of Bexar County, Texas, being situated in County Block 5575.

RIGHT-OF-WAY — GRANDVIEW SUBSTATION TO SOUTH SAN ANTONIO

All the following tracts of land in Bexar County, Texas, to-wit:

FIRST TRACT:

A tract of land 50 feet in width in City Block 1568, being on the southeast side of property owned by the San Antonio Belt & Terminal Railroad Company and having a frontage of 50.3 feet on Roland or Ogden Street and a frontage of 66.6 feet on K. Street.

SECOND TRACT:

A triangular tract of land out of Lots 1 and 2, City Block 1571, within the corporate limits of the City of San Antonio, beginning at the southeast intersection of Hallie Street and K Street; thence east 78.25 feet; thence in a southwesterly direction 117.4 feet to a point on the east side of Hallie Street 90.0 feet from the place of beginning; thence 90.0 feet from Hallie Street to the place of beginning.

THIRD TRACT:

A portion of Lots 1, 2 and 3 in City Block 1573, beginning at a point on the east side of Clark Avenue 3.96 feet north of the southwest corner of said Lot 1; thence north along the east side of Clark Avenue 146.04 feet to the southeast intersection of Clark Avenue and Swanee Street; thence east along Swanee Street 128.6 feet; thence in a southwesterly direction 192.9 feet to the place of beginning.

All that certain strip and parcel of land out of City Block No. 1572 in the City of San Antonio, Bexar County, Texas, particularly described as follows:

A strip of land running in a southwesterly direction through Block 1572 cutting Lots 10, 9, 8 and 7, the south line of this strip beginning on west P. L. Hallie Street at a point 142.9′ north of the S. E. Corner of Block 1572 and ending at a point on the north P. L. of Swanee at a point 127.8′ west of the S. E. corner of Block 1572, and being more fully described as follows:

Beginning at a point in the west property line of Hallie Street at a distance of 142.9′ north of the S. E. corner of Block 1572. Thence in a southwesterly direction 191.7′ to a point on the north property line of Swanee Street 127.8′ west of the S. E. corner of Block 1572.

Thence continuing west along the north property line of Swanee Street a distance of 66.6′ to a point which is 115.6′ east of the southwest corner of Block 1572.

Thence in a northeasterly direction parallel to and 50′ distant from the first mentioned line a distance of 180.6′ to intersect the S. E. property line of the S. A. B. & T. Co. property. This intersection point being 86.6 in a southwesterly direction from the intersection of the S. A. B. & T. Co's S. E. line and the west property line of Hallie Street.

Thence in a northeasterly direction 86.6 feet along the S. E. property line of the S. A. B. & T. Co's property to the intersection of this line with the west property line of Hallie Street.

Thence south along the west property line of Hallie Street 76.7′ to the place of beginning; together with all rights and incidents thereunto appertaining.

RIGHT-OF-WAY — SAN ANTONIO TO NEW BRAUNFELS

All the following described land, to-wit:

Out of the R. Patton Survey No. 1, Bexar County Block No. 5011, and being 35 feet in width along the west line of a tract of land containing 44.44 acres of land conveyed by Deborah B. Talcott, et al, to Albert Grona by deed dated December 20th, 1935, recorded in the Deed Records of Bexar County, Texas, in Volume 1507, at page 501, said tract of land being described as follows:

Beginning at a point on the south side of the Sommers Road in Bexar County, Texas, (which said Sommers Road is also known as the North Loop Road) where the west boundary line of said tract of 44.44 acres meets the south line of said Sommers Road; Thence south 48° 35′ east 36.65 feet with the south boundary line of said Sommers Road; Thence south 24° 10′ west, approximately 1,892 feet to the south line of said 44.44 acre tract of land; Thence south 89° 30′ west 385 feet with the south property line of said 44.44 acre tract to its southwest corner; Thence north 24° 10′ east 1892 feet to the place of beginning and containing 1.50387 acres of land.

LAUREL HEIGHTS TERRACE PROPERTY.

All that certain tract or parcel of land more particularly described as follows, to-wit:

The north 100 feet of Lots Twenty (20) twenty-one (21) and twenty-two (22) in block twelve (12) in New City Block Three Thousand Ninety-six (3096) in Laurel Heights Terrace, situated in the City of San Antonio, in Bexar County, Texas, according to plat recorded in Vol. 105, pages 170-171 of the deed and plat records of said County; the line dividing the north 100 feet of said lots from the remaining portion of said lots runs parallel with the north line of Lot 19 in said City Block.

CITY VIEW PROPERTY.

All the following described property, to-wit: Lot Twelve (12) Block Nineteen (19), City Block 4026, in City View Addition to the City of San Antonio, Bexar County, Texas.

ITEM IV.

GENERAL.

Also all other physical property of whatsoever kind or character and all appurtenances thereto, now owned or which may hereafter be acquired by the city and wheresoever situated, including (without in anywise limiting or impairing by the enumeration of the same the scope and intent of the foregoing or of any general description contained in this Indenture):

(1) All lands, rights-of-way, roads, power houses, buildings, dams, waterways, water rights, and other structures, and all offices, buildings and the contents thereof; all machinery, engines, boilers, turbines, condensers, water wheels, dynamos, electrical machinery, regulators, motors, transformers, generators, meters, electrical and mechanical appliances, conduits, cables, pole and transmission lines, wires, cross-arms, insulators, services, substations and substructures, generating, distributing and transmitting equipment, tools, implements, apparatus and supplies, now owned or hereafter acquired by the city;

(2) Also all gas plants, stations, substations, offices, repair shops, buildings, structures, substructures, regulators, holders, purifiers, scrubbers, tanks, retorts, boilers, machinery, engines, pumps, fixtures, apparatus, equipment, tools, instruments, appliances, implements, overhead and underground construction, pipes, mains, conduits, services, meters, supplies and appurtenances; whether appertaining to any existing or future system of the city or otherwise, and including all other property now used or provided for use or hereafter acquired for use in the construction, repair, maintenance and operation of the electric and gas systems of the city, both those now owned and those which may hereafter be acquired by the city.

(3) Also all contracts between the San Antonio Public Service Company and the suppliers of electricity and of gas which were in force on the date hereof and which have been or may hereafter be assigned to or acquired by the city.

(4) Also, to the full extent permitted by law and by their terms, the city hereby mortgages and pledges all corporate, municipal and other franchises, grants, rights, permits, consents, privileges, easements, licenses, ordinances, rights-of-way, and immunities of the city of every kind, description and character, howsoever conferred or acquired and whether now owned or hereafter acquired; provided, however, that as to any and all franchises which by their terms may be assigned only upon some consent or special condition, given or met at the time of assignment, and not in advance thereof, the city

(a) Hereby mortgages all such franchises, subject to the terms of this indenture;

(b) Intends hereby to assign such franchises to the trustees hereunder only to the extent that it may legally assign the same, without forfeiture or other penalty;

(c) Covenants that if and whenever under the terms hereof the trustees, or any purchaser or purchasers at any sale of the mortgaged property, made under the terms of this indenture or in any proceeding for the foreclosure of the lien of this indenture, shall be entitled to possession of or to title to the mortgaged property, the city will request such consent or will attempt in good faith to meet such condition, and, subject to the procurement of such consent or the meeting of such condition the city will by proper instrument convey, transfer and assign such franchise to the trustees, or to their nominee or to such purchasers, as the case may be;

(5) Also all real property, interests in real property, lands, rights-of-way, easements, licenses, leaseholds, consents, permits, and all power and gas contracts, street lighting contracts, and other rights with respect to the construction, maintenance, repair and operation of any system now owned or hereafter acquired by the city, and any additions thereto or extensions thereof;

(6) And also all property which at any time hereafter, by delivery or by an indenture supplemental hereto, may be expressly conveyed, mortgaged or pledged to the trustees or either of them hereunder by the city or by a successor thereto, or by anyone in its behalf or with its written consent as and for additional security hereunder; the trustees and each of them being hereby authorized at any and all times to receive any such conveyance, mortgage, pledge or delivery and to hold and apply any such property upon and subject to the terms and provisions hereof or of any such supplemental indenture; and

(7) Together with all and singular the buildings, improvements, additions, accretions, ways, alleys, passages, rights-of-way, waters, water-courses, easements, rights, liberties, privileges, licenses, tenements, hereditaments and appurtenances, whatsoever belonging or in anywise appertaining, or hereafter to belong or appertain, unto any and all of the premises hereby granted or intended so to be; and the reversion and reversions, remainder and remainders, and the incomes, rents, issues and profits thereof, and of every part and parcel thereof; and all of the estate, right, title, interest, property, claim and demand of every nature and kind whatsoever of the city at law, in equity or otherwise howsoever, of, in and to the same and every part and parcel thereof.

ITEM V

EXCEPTED PROPERTY.

Expressly excepting and excluding, however, from this indenture and from the lien and operation thereof the following property (herein called "Excepted Property")

(A) All shares of stock and certificates or evidences of interest therein, all bonds, notes, and other evidences of indebtedness or certificates of interest therein, all other securities, all bills, notes, accounts receivable, cash on hand or in banks, choses in action and all contracts (other than leases and agreements connected with leases), now owned or hereafter acquired or possessed by the city and not hereby or hereafter specifically mortgaged and pledged hereunder or required so to be.

(B) All property and franchises of any other corporation of whatever character, securities whereof, or obligations secured by lien upon which the properties and franchises whereof may be now owned or hereafter acquired or possessed by the city, notwithstanding the fact that the city may own or hereafter acquire all or substantially all of the securities issued by or secured by lien upon property of any such corporation or that any such corporation may be incorporated or organized at the instance of, or for the account of, the city.

(C) Materials and merchandise acquired for the purpose of resale in the ordinary course and conduct of business, and consumable supplies.

(D) All gas in manufacture, mains, pipes, holders or elsewhere.

(E) All bus transportation properties formerly owned by the San Antonio Public Service Company.

(F) All of the electric distribution properties formerly owned by the San Antonio Public Service Company comprising 4,000 volt and 2,400 volt primary pole lines and circuits and appurtenant secondary pole lines and secondary circuits, conduits, cables, wires, distribution transformers, services, meters and street lighting systems located within the limits of the Cities of Alamo Heights, Olmos Park and Terrell Hills, Bexar County, Texas.

(G) All of the electric distribution properties formerly owned by the San Antonio Public Service Company comprising 2,400 volt primary pole lines and circuits and appurtenant secondary pole lines and circuits, conduits, cables, wires, distribution transformers, services, meters and street lighting systems in the City of Boerne, Kendall County, Texas, and adjacent territory included within the following bounds:

Beginning at a point north on Sisterdale Road, 14 spans north of the S. A. A. P. R.R. (Southern Pacific System) including B. B. Smith Service, thence to northeast corner of city limits, thence southeast to School Street, 6 spans east to Plant Street, being the pole serving C. Phfeiffer, thence southeast to northeast corner of Fair Grounds, thence south to pole 2/8 on the Boerne-old San Antonio Highway (this pole serving Ferdinand Herff and Borchers) thence west to Russ Street, 7 spans south off Bandera Road and serving L. Lamm, thence northwest to Bandera Road, 7 spans west to Russ Street and including services to (1) Dr. Noce, (2) Rad Spencer (3) W. Simpson, thence northwest to private property of Bill Vogt, 3 spans west of San Antonio Avenue, including service to Bill Vogt, thence north to High Street, 11 spans west off Russ Street and including 3 spans to serve Schuchard, thence northeast to northwest corner of city limits, thence east along city limits to pole 1/1 of the Boerne-Popo Line located on Fredericksburg Road, thence north to point of beginning.

(H) All of the distribution properties formerly owned by the San Antonio Public Service Company comprising 2,400 volt primary pole lines and circuits and appurtenant secondary pole lines and circuits, conduits, cables, wires, distribution transformers, services, meters and street lighting system in the City of Floresville, Wilson County, Texas, and adjacent territory included in the following bounds:

From a point 8 spans northwest of city limits line on San Antonio Highway No. 181 on the San Antonio side of customer Victor Zuniger, thence northeast to the north corner of old Fair Grounds property now owned by Floresville Independent School District, thence southeast to the intersection of a line parallel with the streets of Floresville and the Sunnyside-Floresville Road to include customers H. Ridoudt, Joe Donaho and Gus Hill, thence south by west to a point twelve spans southeast of city limits line on State Highway No. 181 to Poth to include all customers served from transformer set eight spans southeast of city limits on Highway No. 181, thence west to the intersection of such westerly line with the Northwest-Southwest city limits line, thence northwest to the west corner of city sewage plant property, thence north by east to the point of beginning.

(I) All of the distribution properties formerly owned by San Antonio Public Service Company comprising 13,000 volt and 2,400 volt primary pole lines and circuits and appurtenant secondary pole lines and circuits, conduits, cables, wires, distribution transformers, services, meters and street lighting systems in the City of Hondo, Medina County, Texas, and adjacent territory included in the following bounds:

The new city limits of the City of Hondo, and in addition thereto: (1) the pole line extending 4 spans from the

66,000 volt Hondo High Line Substation to the city limits, 360′ south of old D'Hanis Road, (2) an extension eastward of approximately 17 spans, principally on U. S. Highway No. 90 serving Dr. W. H. Smith, (3) an extension westward on U. S. Highway No. 90, thence along Taylor Road and Batot Lane, approximately 51 spans, serving rural customers including W. O. Scott and Henry Batot and Hugh Batot.

(J) All of the electric distribution properties formerly owned by the San Antonio Public Service Company, comprising 2,400 volt primary pole lines and circuits and appurtenant secondary pole lines and circuits, conduits, cables, wires, distribution transformers, services, meters and street lighting system in the City of Poth, Wilson County, Texas, and adjacent territory included in the following bounds:

All property in city limits, including 2,300 volt line extending approximately 4 spans south by east to and including the C. V. Ploch residence and including the Catholic Church line on road to Schneider Gin to the southwest to and including the Catholic Church, and also including 13 KV to 120 volt transformer serving customers Anton Stevenoga and son's residences.

(K) All of the electric distribution properties formerly owned by San Antonio Public Service Company, comprising 2,400 volt primary pole lines and circuits, appurtenant secondary lines and circuits, conduits, cables, wires, distribution transformers, services and meters extending from the 2,400 volt terminals of the transformers at the Marion substation to and through the corporate limits of the City of Marion, Guadalupe County, Texas, and adjacent territory.

(L) All of the electric distribution properties formerly owned by the San Antonio Public Service Company, comprising 13,000 volt, 4,000 volt and 2,400 volt primary pole lines and circuits and appurtenant secondary pole lines and circuits, conduits, cables, wires, distribution transformers, services, meters and street lighting system in the City of New Braunfels, Comal County, Texas, and adjacent territory included in the following bounds:

Beginning at Pole 3/5, Comal Creek and Sipple Farm, thence air line south to distribution pole at end of line on Old Marion Road opposite residence of Emil Neuse, thence east by north to end of line at L. Kuehler on Koehler Road near City Disposal Plant, thence northeast to the intersection of center line of Guadalupe River and the south boundary line of Dr. M. C. Hagler's camp property, thence north to the intersection of north boundary line of Lake Front Addition with East bank of Guadalupe River, thence northeast to pole 1/1 on Highway No. 46, south of New Braunfels, thence northeast to end of line on Highway No. 81, five spans northeast of junction with Highway No. 46, to residence Wm. H. Weil, thence southwest on U. S. Highway No. 81 to pole on northwest corner of junction of Highways No. 81 and No. 46, thence north by west to intersection of the Guadalupe River and the boundary line between city blocks 5011 and 5012, thence up Guadalupe River to pole 1/13 on New Braunfels-Gruene 13 KV line, thence up Guadalupe River to M. K. T. R. R. Bridge over the Guadalupe River, thence northwest to intersection of California Boulevard and Ohio Avenue in Landa Highlands, No. 2, thence south of west to pole 2/2 on Highway No. 46, Smithson Valley 2,400 volt line, thence southwest to McQueeney hi-line structure 2/9 on Wald Road near crossing of Missouri Pacific R. R. thence along hi-line south by east to point of beginning. From hi-line structure 2/13 a dairy customer is served and is to be included within the New Braunfels boundaries.

✓ (M) All of the electric distribution properties formerly owned by San Antonio Public Service Company comprising 2,400 volt primary poles and circuits and appurtenant secondary poles and circuits, conduits, cables, wires, distribution transformers, services, meters, located within the corporate limits of the City of Stockdale, Wilson County, Texas, and including transformers, services and meters serving customers located along the Bandera Road as far east and including service to Leroy R. Smith's residence and also including transformers, services and meters along the 13,000 volt transmission lines of the City of San Antonio serving Otto Webber, Burk Carr and Mrs. Stoudt near intersection of old Floresville-Stockdale Road and the highway to San Antonio and also including the so-called Smith line running north from the city limits for about one mile to and including the services to George Johnson chicken farm and Joe Taller residence.

(N) All that certain tract, piece or parcel of land situated within the corporate limits of the City of New Braunfels, Comal County, Texas, and being the northwest portion of Lot No. 36 in Block No. 1005 more particularly described by metes and bounds as follows, to-wit: Beginning at the west corner of Lot 36 at the intersection of the southwest line of East San Antonio Street and the northeast line of the Main Plaza; thence north 38 degrees, 42 minutes east along the southeast line of East San Antonio Street 95.7 feet to the north corner of said Lot No. 36; thence south 52 degrees east, along the division line between Lot No. 36 and Lot No. 37, 65 feet to a stake; thence south 38 degrees, 42 minutes west 95.7 feet to a stake in the northeast line of the Main Plaza; thence north 52 degrees west along the northeast line of the Main Plaza 65 feet to the place of beginning; being the same property conveyed by Eiband and Fischer, Inc., to San Antonio Public Service Company by deed recorded in the records of deeds of said Comal County on December 2, 1929, in Volume 57, pages 307-309, and the building and contents thereof located thereon.

(O) All furniture and fixtures located in the electric distribution offices in the Cities of Boerne, Hondo, Floresville, Stockdale, Poth, Marion and New Braunfels, Texas.

(P) All of the right, title and interest of the City of San Antonio in and to the bridge across the Comal Canal in the extension of Seguin Street in the City of New Braunfels, Comal County, Texas, together with the abutments and adjacent roadway areas described as follows:

Beginning at a stake "W" on the north property line of Seguin Street at point of its intersection by a line running along the east side of the stone base of fence along the division line of Tract No. 1 and Tract No. 2 (approximately); thence N 5° 36' W 174.69 feet to a stake "N" located 15.0 feet south of the water's edge; thence S 56° 07′ E 38.0 feet to a monument "P" near the east end of the south abutment of the bridge crossing the Comal and 15.0 feet south of the water's edge. This monument is one in the original survey of Tract No. 2 and is N 7° 10′ W 155.3 feet from north property line of Seguin Street; thence S 7° 10′ E 155.3 feet to a stake "Q" in the north property line of Seguin Street; thence N 86° 49′ W 20.81 feet along the north property line of Seguin Street to a stake "R"; thence N 89° 39′ W 13.05 feet to the point of beginning.

Beginning at monument "A" on the most westerly corner of Tract No. 2 described in the deed from Landa Milling Company, et al., to Comal Power Company dated August 17th, 1925, this monument being also in the east line of Tract No. 1 described in said deed near the east end of the suspension foot bridge across the canal; thence S 35°

44′ E 45.42 feet to a stake "B"; thence S 25° 58′ E 62.42 feet to a stake "C" on the north bank of the canal 1 foot from the water's edge; thence S 55° 42′ E 45.75 feet to a stake "D" set 15.0 feet from the water's edge on the north bank of the Comal; thence N 4° 58′ W 36.02 feet to stake "E" at the intersection of this line with a line running N 25° 58′ W parallel to and 35.0 feet distant from the line "BC"; thence N 25° 58′ W 72.0 feet on the line parallel to and 35.0 feet distant from line "BC" to a stake "F" at the intersection of this line with a line running N 35° 44′ W parallel to and 35.0 feet distant from the line "AB"; thence N 35° 44′ W 17.12 feet on the line parallel to and 35.0 feet distant from line "AB" to stake "G" at the point of intersection of this line with a line running S 83° 54′ E from the monument "A"; thence N 83° 54′ W 46.95 feet to monument "A" the point of beginning.

together with all and singular the tenements, hereditaments and appurtenances belonging or in any wise appertaining to the aforesaid properties or any part thereof, and with the reversion or reversions, remainder or remainders, rents, income and profits of all such properties, and all of the estate, right, title, interest and claim whatsoever, at law, as well as in equity, which the city acquired in and to the aforesaid properties and every part thereof under and by virtue of the conveyance thereof to the city by San Antonio Public Service Company, it being understood and provided, however, that the cash on hand and bills and accounts receivable included in Items I and II above are not to be delivered to the trustees but are to be delivered to the Board of Trustees hereinafter created and that the Board of Trustees and not the trustees shall be accountable for the proper use and application of said cash, bills and accounts receivable under the terms and provisions of this indenture.

TO HAVE AND TO HOLD all and singular the said premises and property, real, personal and mixed, with all and singular their revenues, rents, issues, profits, privileges and appurtenances, and all the estate, right, title and interest of the city therein and thereto, unto the trustees and their successors in trust forever;

IN TRUST NEVERTHELESS, subject to the provisions of this indenture, for the equal and proportionate benefit, security and protection of all holders of the bonds and interest coupons issued or to be issued under and secured by this indenture, without preference, priority or distinction as to lien or otherwise of any bond over any other bond of the series by reason of priority in the issuance or negotiation thereof or by reason of the date or dates of maturity thereof, or for any other reason whatsoever, so that each and all of said bonds shall have the same rights, lien and privileges under this indenture; PROVIDED HOWEVER, and these presents are upon the express condition, that if the city, its successors and assigns shall well and truly pay or cause to be paid unto the holders of said bonds the principal and interest due thereon at the times and in the manner stipulated therein and shall well and truly keep, perform and observe all the covenants and conditions in said bonds and in this indenture expressed to be kept, performed and observed by the city and shall pay to the trustees all sums of money due or to become due to them in accordance with the terms and provisions hereof, then this indenture and the rights and estate hereby granted shall cease, determine and be void, and the trustees in such case on demand of the city, upon payment by the city to the trustees of their reasonable fees, costs and expenses, shall execute and deliver to the city such deeds as shall be requisite to discharge the lien hereof and to reconvey or revest in the city the properties hereby conveyed or intended to be conveyed; OTHERWISE this indenture is to be and shall remain in full force and effect.

THIS INDENTURE FURTHER WITNESSETH that the city has agreed and convenanted and does hereby agree and covenant with the trustees and respective holders from time to time of such bonds and coupons that is to say:

ARTICLE I

FORM, AUTHENTICATION, REGISTRATION AND ISSUANCE OF BONDS

SECTION 1. The bonds and the coupons attached thereto shall be in substantially the forms hereinbefore recited, and shall be limited to the aggregate principal amount of Thirty-five Million Dollars ($35,000,000). All bonds to be secured hereby shall be signed by the Mayor of the city, shall be attested by the City Clerk, shall have the corporate seal of the city impressed thereon, and when so signed and sealed, the bonds shall be submitted to the Attorney General of the State of Texas for approval and to the State Comptroller for registration. After the said bonds have been approved by the Attorney General and registered by the State Comptroller, they shall be delivered to the Trustee for signature and authentication as herein provided.

In case any officer or officers who shall have signed any of the bonds shall cease to be such officer or officers of the city after delivery of such bonds to the Trustee, but before the bonds so signed shall have been actually authenticated and delivered to the purchasers thereof, such bonds may nevertheless be authenticated and delivered as though the person or persons who signed and sealed such bonds had not ceased to be such officer or officers of the city.

The coupons to be attached to the bonds shall be signed by the facsimile signatures of the Mayor and City Clerk in office at the time of the preparation of the bonds, and delivery of such bonds thereafter shall be valid for all purposes even though one or both of said officials shall have ceased to hold office at the time of delivery.

Prior to the authentication of bonds under this indenture all matured coupons thereto attached shall be detached and cancelled and such cancelled coupons shall be delivered to the City Auditor.

SECTION 2. Only such of the bonds as shall have endorsed thereon the duly executed certificate of the Trustee substantially in the form hereinabove set forth shall be entitled to any lien or benefit hereunder, but such certificate of the Trustee upon any bond shall be conclusive evidence that such bond has been duly authenticated and delivered hereunder and that the holder is entitled to the benefit of the trust hereby created.

SECTION 3. The bonds shall be transferable by delivery unless registered as to principal by the Trustee as Bond Registrar. The Trustee shall maintain at its office a registration book in which shall be entered the name and address of any owner of a bond or bonds who shall present his bond or bonds with a request that such bond or bonds be registered as to principal, and such registration shall also be noted on such bond or bonds by the Trustee. On presentation to the Trustee of any bond registered pursuant to the provisions of this section, accompanied by a written instrument of transfer in form approved by the Trustee and executed by the registered owner in person or by his attorney thereunto duly authorized, transfer thereof shall be made on the registration book and noted on such bond by the Trustee, and after registration of any bond as aforesaid no transfer shall be valid unless made as above provided. The registered owner of any bond so registered as to principal shall be entitled to have such bond discharged from registration by being in like manner transferred to bearer and thereupon transferability by delivery shall be restored, but any such bond shall continue subject to successive registrations and transfers as before. Registration of any bond as to principal shall not affect the negotiability of the coupons appertaining to such bond and all coupons shall continue to be transferable by delivery merely and shall remain payable to bearer.

SECTION 4. In case any bond issued hereunder with the coupons appertaining shall become mutilated or be lost, stolen or destroyed prior to the payment thereof, a new bond, including coupons, of like tenor and date and bearing the same number may at the discretion of the city and the Trustee be executed, certified and delivered either in exchange for and upon cancellation of the mutilated bond and its coupons, or in substitution for the bond or coupons lost, stolen or destroyed, but such exchange or substitution shall be made only upon receipt of satisfactory evidence of the loss, theft, or destruction of such bond and its coupons, proof of ownership thereof, satisfactory indemnity to the Trustee and the city, and payment of the cost of preparing such bond and coupons.

ARTICLE II.

SPECIAL COVENANTS

The city hereby covenants as follows:

SECTION 1. The city is duly authorized under the laws of the State of Texas to create and issue the bonds and to execute and deliver this indenture and to mortgage and pledge the property conveyed and mortgaged hereunder and to pledge the revenues pledged hereunder, and all necessary action on the part of the city and its Commissioners for the creation and issue of the bonds and the execution and delivery of this indenture has been duly and effectively taken, and the bonds in the hands of the holders thereof are and will be valid and enforceable obligations of the city in accordance with their terms.

SECTION 2. The city is lawfully seized and possessed of the trust estate, free and clear of all liens or encumbrances; it has a good right and lawful authority to mortgage and pledge the trust estate as provided in this indenture; and it will warrant and defend unto the trustees, their respective successors and assigns, for the benefit of the holders for the time being of the bonds, the trust estate and the lien and interest of the trustees thereon and therein under this indenture, against all claims and demands of any persons whomsoever.

SECTION 3. At any and all times the city will duly execute, acknowledge and deliver, or will cause to be done, executed and delivered, all and every such further acts, deeds, conveyances, mortgages, transfers and assurances in law as the Trustee shall reasonably require for the better conveying, transferring, mortgaging and pledging and confirming unto the trustees, all and singular the hereditaments, premises, estates and property hereby conveyed, transferred, mortgaged, pledged or assigned, or intended so to be.

SECTION 4. The city will not avail itself of the provisions of the Federal Bankruptcy Act or avail itself of the provisions of any similar federal or state bankruptcy or debt readjustment act, now or hereafter existing, in such manner that the liability of the city to pay the bonds secured hereby in accordance with their terms and in accordance with the terms of this indenture will be in anywise affected or impaired.

SECTION 5. The city will not create or voluntarily permit to be created any debt, lien or charge which would be on a parity with or prior to the lien of this indenture on the trust estate or any part thereof or on the income to be derived from the trust estate and from the operation of the city's complete electric light and power system and gas distribution system or any part thereof; and will not do or omit to do or suffer to be done or omitted to be done any matter or thing whatsoever whereby the lien of this indenture or the priority of such lien or the bonds hereby secured might or could be lost or impaired; and that it will pay or cause to be paid or will make adequate provision for the satisfaction and discharge of all lawful claims and demands for labor, materials, supplies or other objects which if unpaid might by law be given precedence to or an equality with this indenture as a lien or charge upon the trust estate or any part thereof or the income and profits thereof; provided that nothing in this section shall require the city to pay, discharge or make provision for any such lien, charge, claim or demand so long as the validity thereof shall be by it in good faith contested, unless thereby, in the opinion of the Trustee, the trust estate or some material part thereof will be lost, forfeited or materially endangered.

The provisions of this section are subject to the exception that the Board of Trustees may borrow from time to time on a purely temporary basis, such sums as would ordinarily be borrowed by private companies engaged in similar business in connection with current operations, and expected to be paid and retired from current revenues received during the operating year in which such sums are borrowed, and are subject to the further exception that if, prior to the payment of all of the bonds, it shall be found desirable to refund part of said bonds under the provisions of any law then available, said bonds may be refunded (with the consent of the holders thereof, unless the bonds so refunded are then optional for redemption and provision for the call and redemption thereof is duly made) and the refunding bonds so issued shall enjoy complete equality of lien with the portion of the bonds which is not refunded, and the refunding bonds in like principal amount shall continue to enjoy in all respects the lien and right to security under this indenture enjoyed by the bonds refunded thereby, including the priorities enjoyed by such refunded bonds; provided, however, that if such bonds are refunded in such manner that the interest rate of the bonds is increased or the refunding bonds mature at a date earlier than the maturity date of any of the bonds not refunded, then such bonds may not be refunded without the consent of the holders of the unrefunded portion of the bonds, to be evidenced as provided in Section 1 of Article XI hereof. The Trustee shall, subject to the provisions of this section, authenticate and deliver any refunding bonds so authorized, upon the written order of the Mayor of the city and upon receipt by the Trustee of:

(a) A certified copy of the ordinance of the Commissioners of the City of San Antonio authorizing the issuance of such refunding bonds;

(b) A copy of an opinion of the Attorney General of the State of Texas approving the validity of such refunding bonds, if such opinion shall then be required by the laws of Texas;

(c) A certificate by the State Comptroller evidencing registration of such refunding bonds in his office, if such registration shall then be required by the laws of Texas;

(d) The outstanding bonds authorized to be refunded thereby, in principal amount equal to that of the bonds to be authenticated, which outstanding bonds shall be presented to the Trustee to be delivered, either by the Trustee or through the State Comptroller, in exchange for the refunding bonds and simultaneous cancellation and retirement, provided however, that in lieu of outstanding bonds properly called for redemption or then matured it shall be sufficient if the proceeds of the sale of the refunding bonds, together with other funds available for such purpose, in an amount sufficient to redeem or pay a like principal amount of such outstanding bonds so called for redemption or matured, including all accrued interest and redemption premiums, shall have been deposited with the Trustee, or deposited to the Trustee's satisfaction with the paying agent for such outstanding bonds, to be held solely for the payment of such bonds, accrued interest and redemption premiums;

(e) If required by the Trustee, an opinion by counsel acceptable to the Trustee that such refunding bonds have been legally authorized and, upon delivery thereof pursuant to the terms of this section, will have become effectively subrogated to the rights of the bonds refunded thereby and entitled to be secured by the lien of this indenture.

All bonds received by the Trustee in exchange for refunding bonds and all bonds redeemed and paid under the provisions of this section shall be by the Trustee cancelled and delivered to the City Auditor of said city.

SECTION 6. The city will cause this indenture and any and all supplemental indentures and instruments of further assurance at all times to be recorded and filed in such manner and in such places as may in the opinion of counsel for the Trustee be required by law in order fully to preserve and protect the rights of the bondholders and the Trustee hereunder, and upon the request of the Trustee it will furnish to the Trustee promptly after the execution and delivery of this indenture an opinion of counsel satisfactory to the Trustee stating that in the opinion of such counsel this indenture has been properly recorded and filed so as to make effective the lien intended to be created thereby, and reciting the details of such action, or stating that in the opinion of such counsel no such action is necessary to make such lien effective.

SECTION 7. The city will from time to time promptly pay and discharge all taxes, assessments and other governmental charges, the lien whereof would be prior to the lien hereof, lawfully imposed upon the trust estate or any part thereof or upon the income and proceeds thereof, so that the lien of this indenture and the priority of such lien shall at all times be wholly preserved at the cost of the city and without expense to the trustees or the holders of the bonds, provided however, that nothing in this section contained shall require the city to pay or discharge any such tax, assessment or governmental charge so long as the validity thereof be by it in good faith contested, unless thereby in the opinion of the Trustee or its counsel the trust estate or some material part thereof will be lost, forfeited or materially endangered.

SECTION 8. The city will maintain, preserve and keep the trust estate in a state of good repair, working order and condition and will not dispose of the trust estate in whole or in part except in the manner and upon the terms provided in Sections 2 and 3 of Article VII hereof.

SECTION 9. The city will duly and punctually keep, observe and perform each and every term, covenant and condition on its part to be kept, observed and performed, contained in this indenture, and will punctually perform all duties with reference to the trust estate required by the Constitution and Laws of the State of Texas, including particularly the making and collecting of such reasonable and sufficient rates and charges for electricity, gas and services supplied by its electric light and power plant and system and gas distribution system, to the city and to all other consumers, as will be fully sufficient to meet all the requirements of this indenture, and including the proper segregation and application of the revenues of said plant and systems, it being expressly hereby covenanted and agreed that such rates and charges will be so fixed that the revenues derived therefrom will be sufficient at all times to pay for all operating, maintenance, depreciation, replacement, betterment, and interest charges and to provide an interest and sinking fund sufficient to pay all indebtedness outstanding against the trust estate and fully to carry out all of the agreements contained in this indenture.

SECTION 10. The city will not grant a franchise for the operation of any competing electric system or gas system in the City of San Antonio until all bonds issued hereunder shall have been retired.

ARTICLE III.

ACCOUNTS AND RECORDS.

SECTION 1. The Board of Trustees hereinafter created shall be required to keep full and proper books of record and account, in which full, true and proper entries will be made of all dealings, business and affairs of the city which in any way affect or pertain to the operation of the trust estate and the city's electric light and power plant and system and gas distribution system, and will furnish to the Trustee and to such bondholders as may request such statement, at least once every six months and at such other times as the Trustee may reasonably request, statements in reasonable detail showing the earnings and expenditures of the city's electric light and power plant and system and gas distribution system, including the trust estate, and the application of funds in the Revenue Fund hereinafter established, for the preceding six months period. Said board will also furnish to the Trustee from time to time such other data as to the plants, properties and equipment comprising a part of the trust estate, as the Trustee shall reasonably request.

As soon after the close of each operating year as may reasonably be done, said board will furnish to the Trustee and to all bondholders who may so request full audits and reports covering the operations of the city's electric light and power plant and system and gas distribution system, including the trust estate, for the preceding operating year, and showing the earnings and expenses of the properties and the disposition made of all revenues for said operating year, the amounts available for the purposes set forth in Article V hereof, and, in such detail as the Trustee may request, the assets, liabilities and financial condition of the city's electric light and power plant and system and gas distribution system at the close of such operating year. The Board of Trustees at the same time shall furnish to the Trustee an estimate of cash receipts and disbursements for the ensuing year in sufficient detail to indicate the probable total net income from operations and amounts available for the several fund accounts established herein. If any such audit discloses any discrepancies or misapplication of funds, the Board of Trustees shall be charged with the duty of rectifying such misapplications as far as possible and of remedying any deficiencies in payments hereunder from the first funds available for such purpose.

The Board of Trustees will at the expense of the Board of Trustees, upon written request of the City Commissioners or the Trustee, permit the City Commissioners and the Trustee at all reasonable times, by their agents, engineers, accountants and attorneys, to examine and inspect the plants, property, books of account, records, reports and other data relating to the trust estate and to take copies and extracts therefrom, and will afford a reasonable opportunity to make any such examination and inspection and will furnish the Trustee and the City Commissioners any and all such other information as they may reasonably request. The Trustee shall be under no duty to make any such examination unless requested so to do by the holders of twenty-five per cent in principal amount of the bonds at the time outstanding and unless such holders shall have offered the Trustee security and indemnity satisfactory to it against any costs, expenses and liabilities which might be incurred thereby.

The Board of Trustees shall as nearly as possible keep its books and records in the manner prescribed in the Uniform System of Accounts for Electric Utilities adopted by the National Association of Railroad and Utilities Commissioners on November 10, 1936, and in the Uniform System of Accounts for Gas Utilities adopted by said Association on November 10, 1936.

ARTICLE IV.

INSURANCE.

SECTION 1. The city covenants and agrees that at all times it will insure and keep insured through the Board of Trustees all properties subject to the lien hereof which are of a character usually insured by companies operating like properties, in good and responsible insurance companies, against risks customarily insured against by companies engaged in a similar business, and in the same manner and to the same extent, all loss therefrom (except any single loss which does not exceed $25,000) being payable to the trustees as their interests shall appear, by the customary mortgagee or trustee clauses to be attached to or inserted in the policies. The Board of Trustees shall furnish to the Trustee a list of such policies, showing the character of the insurance, the property and risk covered, the name of the insurance company, and other pertinent details, and shall keep the Trustee fully informed of any change in or addition to such list. Upon the written request of the Trustee such policies will be deposited with it. The Trustee, subject to the provisions of Article IX hereof, shall be under no obligation or duty to obtain any such schedule and shall have no duty or responsibility with respect to the sufficiency or effect of any of such policies of insurance, the renewal thereof, or the responsibility of the insurers, or with respect to any such schedule or the matters shown therein, except to display any such schedule to any holder of bonds desiring to inspect the same.

In case of loss or damage to any of the insured property, the proceeds of any such insurance on any one loss amounting to not more than $25,000 shall either be promptly applied by the Board of Trustees to the repair or replacement of the property destroyed or damaged, or otherwise to the improvement of the mortgaged property, or if not so applied within one year of the date of receipt thereof by the Board of Trustees, such proceeds shall be deposited in the Reserve Account created by Article V hereof. In any case where the proceeds of any such insurance shall amount to a sum in excess of $25,000 on account of any one loss, all such moneys shall be promptly deposited with the Trustee and shall be paid out from time to time to the Board of Trustees upon written request of the board, signed by its Chairman and Secretary, and accompanied by a certified copy of the resolution of the board directing such request, and specifying that certain expenditures have been made or incurred in repairing or replacing the property so impaired or destroyed, and the amount thereof, and requesting the payment by the Trustee to the Board of Trustees of an amount not in excess of the amount of such expenditures. If in the judgment of the Board of Trustees and of a recognized public utility engineer selected by the Board of Trustees and approved by the Trustee, the interests of the Board of Trustees and the bondholders will be best served through the application of all or part of such insurance proceeds to improvements to the mortgaged property which do not constitute the repair or replacement of the property for the destruction or impairment of which the insurance proceeds are so paid, the amount of such proceeds may be applied by the Board of Trustees to the making of such improvements, and payment thereof shall be made to the Board of Trustees by the Trustee as expended in the manner provided in the last preceding sentence hereof. The Trustee may in its discretion require such additional proof of the matters certified in such resolution as it may consider necessary or desirable. Any insurance proceeds not so paid out by the Trustee within a period of two years from the date of the receipt thereof shall be used for the redemption of as many bonds as may be redeemed with the amount available and the city agrees that it will take such steps as may be necessary to call such bonds for redemption pursuant to the procedure therefor herein established.

Any adjustment of any loss under any policy of insurance made by the Board of Trustees may be consented to by the Trustee without investigation as to the fairness thereof. The payments of premiums for all insurance policies required under the provisions of this section shall be considered to be a maintenance and operation expense within the provisions of Article V hereof.

ARTICLE V.

APPLICATION OF REVENUES.

SECTION 1. From and after the issuance of any of the bonds all of the city's gas and electric facilities and properties, including the trust estate and including all additions and extensions to such properties which may be made while any of the bonds remain outstanding (all of which properties and facilities are in this and the following sections of this indenture sometimes referred to as "the system") shall be operated on the basis of an operating year commencing on August 2 of each year and ending on August 1 of the following year.

SECTION 2. All revenues of every nature received through the operation of the system shall be deposited as received in a special fund or account to be known as "City of San Antonio Electric and Gas Systems Revenue Fund" and which is hereinafter in this indenture referred to as the "Revenue Fund." The Revenue Fund shall be deposited from time to time in such bank or banks as may be selected for such purpose by the Board of Trustees, and such bank or banks are hereinafter collectively referred to as the "depositary." The bank or banks in which the Revenue Fund is kept on deposit shall always be a bank or banks located in the City of San Antonio unless there is no bank in the City of San Antonio qualified and willing to serve as depositary, in which case the depositary may be any bank or banks in the State of Texas. The Board of Trustees shall advise the Trustee of the names of the bank or banks initially selected as depositary and shall thereafter promptly advise the Trustee of all changes which are made in the depositary banks. If for any reason, in its sole discretion, the Trustee shall disapprove the appointment of any bank for such purpose and shall so advise the Board of Trustees, the Board of Trustees shall promptly appoint some other bank or banks which meet with the approval of the Trustee.

SECTION 3. The money in the Revenue Fund shall be used first from day to day and month to month to pay the current expenses of operating, maintaining and repairing the system, including the cost of insurance, the purchase of supplies, the purchase or manufacture of gas and the purchase and production of electricity for distribution and resale, the payment of salaries and the payment of all other expenses properly incurred in operating and maintaining the system and keeping it in good repair and operating condition. In determining whether any particular expenditure represents a proper maintenance and operating expense as distinguished from a capital expenditure for improvements and extensions to the system, the accounting classifications provided to be followed in Article III hereof shall be accepted for such determination. In the event that at any time hereafter taxes of any nature shall be lawfully imposed on the system or any part thereof or any income or revenues thereof by the United States of America or any governmental body or taxing subdivision other than the City of San Antonio, and such taxes are paid under the provisions of Section 7, Article II hereof, all such payments shall be made from the Revenue Fund as an expense of maintenance and operation under the provisions of this section.

SECTION 4. After the costs of maintenance and operation have been paid from the Revenue Fund as provided in the last preceding section of this article, the next available money therein shall be used for, and are hereby pledged to the payment of principal of and interest on the bonds and the accumulation of a reserve fund for such purpose, and the Board of Trustees shall cause to be paid to the Trustee in due season in each year such amounts as will be fully sufficient promptly to pay all principal of and interest on the bonds which will become due during such year.

The payments which are made to the Trustee for current principal and interest shall be increased in each year by an amount equivalent to twenty per cent (20%) of the total payments so otherwise to be made to the Trustee in such year. Such additional payments shall be held by the Trustee in an account to be known as the "San Antonio Electric and Gas Revenue Bonds Reserve Account" (hereinafter referred to as the "Reserve Account") and shall be used by the Trustee solely for the payment of principal of and interest on the bonds falling due at any time as to which there would be a default if money in the Reserve Account were not used for such purpose. The additional payments shall continue to be made into the Reserve Account until such time as there shall be in that account (as distinguished from the fund held by the Trustee for the payment of principal and interest falling due during the current year) money fully sufficient to pay all principal of and interest on the bonds which will become due during the eighteen (18) months immediately succeeding the close of the current operating year, and shall be thereafter made into the Reserve Account at all times when it shall be necessary in order to keep the money in the Reserve Account up to such minimum.

The payments required to be made to the Trustee in this section shall be made as nearly as possible in equal monthly installments in each year and shall be made on the tenth day of each month, except that when the tenth day of any month shall be a Sunday or a holiday the payment shall be made on the next preceding secular day.

The first operating year shall consist of the period elapsing between the date of the delivery of the first of the bonds delivered hereunder and August 2 next succeeding, and the payments herein required to be made to the various funds during such operating year shall be made proportionately in such manner as to place therein the full amounts required for such year. All money received by the city as accrued interest on the bonds at the date of delivery shall be paid to the Trustee under the provisions of this paragraph, to be used for the payment of interest first falling due on the bonds.

SECTION 5. From the next available money in the Revenue Fund after all payments contemplated by Sections 3 and 4 of this article have been made, there shall be paid to the bank which is at the time acting as depositary of general city funds, to be used for such general city purposes as may from time to time be approved by the Commissioners of the City of San Antonio, the annual sum of $210,300, and there shall also be paid to the treasurer of the Independent School District of the City of San Antonio, subject to approval as to allocation by the Commissioners of the City of San Antonio, the annual sum of $113,750, both sums to be paid as reimbursement to the City of San Antonio and Independent School District for the loss of taxes which would have been imposed on the properties of the system had the system remained under private ownership. To the extent that such remaining revenues are sufficient such payments shall be made in equal monthly installments. The obligation to pay such annual sums to the city and to the Independent School District shall be cumulative and if in any year the money in the Revenue Fund after making the payments required by Sections 3 and 4 of this article shall be insufficient to pay in full the sums so due for such year, so much thereof as possible shall be so paid and the deficiency shall be paid from the first revenues available in the succeeding year or years after the payments required by Sections 3 and 4 of this article shall have been made in such year or years.

SECTION 6. From the next available money in the Revenue Fund after the payments contemplated by Sections 3, 4 and 5 of this article have been made, there shall be paid into a separate fund to be held by the depositary and to be known as the "San Antonio Electric and Gas Systems Renewal and Replacement Fund" (hereinafter referred to as the "Renewal and Replacement Fund") an annual sum equal to not less than twelve and one-half per cent (12½%) of the receipts from the sale of electricity during the previous operating year and ten per cent (10%) of the receipts from the sale of gas during the previous operating year. The sums to be paid into such fund during the partial operating year ending on August 1, 1943, shall be in such proportion as is borne by the length of the partial operating year to that of a full operating year, and shall be computed on the basis of the gross revenues received by San Antonio Public Service Company from such sources during the last complete twelve-months period prior to acquisition of the system by the city. The money in such fund shall be used solely for the making of such improvements and extensions to the system not properly classified as maintenance and operation expenses as may be from time to time directed to be made by the Board of Trustees. To the extent that the money in the Revenue Fund is sufficient after the making of the payments required by Sections 3, 4 and 5 of this article, the payments into the Renewal and Replacement Fund shall be made in approximately equal monthly installments. If any payment herein required to be made into the Renewal and Replacement Fund shall at any time cause that fund to exceed the sum of Three Million Dollars ($3,000,000), any such payment shall be regarded and used as surplus for the purposes of the next succeeding section of this article.

SECTION 7. The money remaining in the Revenue Fund in each year after all payments required by the preceding sections of this article, including all payments necessary to be made by reason of deficiencies carried over from any preceding year or years, have been made, shall be regarded as surplus. There shall first be paid from such surplus existing at the end of each operating year, to the bank which is then acting as depositary of general city funds, a sum sufficient to reimburse the city for all money which has been paid to the Board of Trustees during such operating year for gas, electricity and the services of the system used by the city during such year. If the surplus which then remains in any year shall exceed $1,250,000, the money so in excess of $1,250,000 shall be applied to the redemption prior to maturity of as many of the bonds as can be retired with the sum so available. There shall next be taken from such remaining surplus (whether or not the surplus so remaining is in the amount of $1,250,000) the sum of $500,000, or if less than $500,000 remains, then all of the sum which so remains, and such sum of $500,000 or lesser remaining sum shall be placed by the Board of Trustees in a special fund to be known as a "Contingencies Fund" until the money in such fund shall equal $3,000,000. The money in the Contingencies Fund may be used from time to time pursuant to the direction of the Board of Trustees, either for the payment of principal of or interest on the bonds for which no money is available in the Reserve Account and as to which there would otherwise be a default, or for the making of such renewals or replacements to the properties of the system as are made necessary by reason of some unexpected calamity or act of God and for the making of which there is no money available either from the proceeds of insurance or in the Renewal and Replacement Fund. After the expenditure of any money from the Contingencies Fund reimbursement therefor shall be made from the first surplus money thereafter available for such purpose under the provisions of this section. In any year in which the Contingencies Fund is in its full specified amount, then such $500,000 sum, or such smaller remaining sum if the surplus available in such year is less than $500,000, or so much of such $500,000 sum or smaller sum as may not be needed to bring the money in the Contingencies Fund to its full $3,000,000 amount, shall be used by the Board of Trustees for the redemption of bonds prior to maturity as above provided for the use of surplus in excess of $1,250,000. Any surplus money remaining at the end of each operating year after all payments from surplus hereinabove in this section required have been made, shall be paid to the bank which is at the time acting as depositary of general city funds, to be used for such lawful purpose or purposes as may be prescribed by the Board of Commissioners, provided, however, that the Board of Commissioners may, by proper resolution adopted prior to the making of such payment, require the Board of Trustees to use such money in the reduction of rates for the ensuing operating year.

SECTION 8. All money held in the Revenue Fund, the Reserve Account, the Renewal and Replacement Fund and the Contingencies Fund shall be held as trust accounts for the benefit of the holders of the bonds and shall at all times be adequately secured by or, as to money in the Reserve Account, invested in, United States Government bonds or other marketable securities eligible as security for the deposit of trust funds under regulations of the Board of Governors of the Federal Reserve System, or by indemnity bonds of surety companies qualified as surety for United States Government deposits. All securities and indemnity bonds so standing as security for the money in such funds shall be approved by the Board of Trustees. The Board of Trustees shall make a monthly report to the Trustee specifying the amounts held in each of the two funds on deposit in the depositary and listing the securities and indemnity bonds standing as security for such deposits and the Trustee may, but need not, require such additions and substitutions to be made in such securities and indemnity bonds as in its opinion is necessary to protect the interests of the holders of the bonds. The money at any time held in the Renewal and Replacement Fund and Contingencies Fund may, at the discretion of the Board of Trustees, be invested in securities which are either direct obligations of the United States of America or direct obligations of any state or municipality thereof which are eligible for the investment of trust funds under the laws of the State of New York then in force, or which are direct obligations of Bexar County, Texas, the City of San Antonio, Texas, or the Independent School District of the City of San Antonio, Texas.

ARTICLE VI.

MANAGEMENT

SECTION 1. Pursuant to authority contained in Article 1115, Texas Revised Civil Statutes of 1925, the complete management and control of the system during such time as any of the bonds herein authorized are outstanding and unpaid, shall be in the hands of a Board of Trustees to consist of five citizens of the United States of America permanently residing in Bexar County, Texas, to be known as the "Board of Trustees of the San Antonio Electric and Gas System." Said board is hereinafter and hereinbefore in this indenture referred to as the "Board of Trustees." The Mayor of the City of San Antonio shall ex-officio be one member of the Board of Trustees and the remaining members of the Board of Trustees shall consist of D. F. Youngblood, to serve for a term ending December 31, 1944, W. B. Tuttle to serve for a term ending December 31, 1946, Franz C. Groos to serve for a term ending December 31, 1948, and Walter P. Napier to serve for a term ending December 31, 1950, each term of office to commence on the date of this indenture. After the expiration of each of the above prescribed terms of office, each member of the Board of Trustees, other than the Mayor, shall serve for a term of five years. All vacancies in membership, whether occasioned by expiration of office or otherwise, shall be filled by a majority vote of the members of the Board of Trustees. Permanent removal of any member of the Board from Bexar County shall vacate his membership. Members shall be eligible to be reelected for one additional term, and one only. If there shall hereafter be enacted by the Legislature of Texas an act making legal a seven person membership for the Board of Trustees, two additional members shall be elected for regular five year terms by the Board of Trustees in the manner hereinabove provided for filling vacancies.

Subject to the provisions and restrictions contained in this indenture, all of which shall be binding upon the Board of Trustees, the Board of Trustees shall have complete authority and control of the management and operation of the system and the expenditure and application of the revenues of the system.

The members of the Board of Trustees shall meet for the purpose of organization as soon as may be after the execution of this indenture and shall organize through the election of one of its members as Chairman and one as Vice-Chairman and through the appointment of a Secretary and a Treasurer or a Secretary-Treasurer, who may, but need not be, a member or members. If a member of the Board of Trustees is not appointed as Secretary or Treasurer, or Secretary-Treasurer, then the employee of the Board of Trustees whose duties in the operation of the system require him to perform similar duties may be appointed as such Secretary or such Treasurer or such Secretary-Treasurer. The Board of Trustees may make such regulations and by-laws for the orderly handling of its affairs as it may in its discretion see fit and shall thereafter operate and manage the system with the same freedom and in the same manner as are ordinarily enjoyed and followed by the Board of Directors of a private corporation operating properties of a similar nature.

The Board of Trustees shall obtain and keep continually in force an employees' fidelity and indemnity bond of the so-called "blanket" type, written by a solvent and recognized indemnity company and covering losses to the amount of not less than One Hundred Thousand Dollars ($100,000).

The Board of Trustees shall elect and appoint all officers and employees which it may consider desirable, including a general manager of the system and an attorney or attorneys. No officer or employee may be employed by the Board of Trustees who shall be related within the second degree of consanguinity to any member of the Board of Trustees, nor shall the Board of Trustees be permitted to fill a vacancy in its membership by any person so related to any member of the Board, or by any person who shall have been so related within a period of five years prior to his election. The members of the Board other than the Mayor of the city shall receive an annual compensation of Two Thousand Dollars ($2,000), except that the Chairman of the Board shall receive an annual compensation of Two Thousand Five Hundred ($2,500). With the consent of all remaining members of the Board, one member of the Board may be made general manager of the system, and in such event the member so acting as general manager may receive an annual compensation not in excess of Twelve Thousand Dollars ($12,000). The members of the Board of Trustees, either singly or collectively, shall not be personally liable for any act or omission not wilfully fraudulent or mala fide. Any member of the Board of Trustees other than the Mayor of the city who shall be continuously absent from all meetings of the Board for a period of four consecutive months shall, unless he shall have been granted leave of absence by the unanimous vote of the remaining members of the Board, be considered to have vacated his office. Any member of the Board other than the Mayor of the city may, by unanimous vote of the remaining members of the Board, be removed from office, but only for adequate cause.

ARTICLE VII.

POSSESSION OF MORTGAGED PROPERTY

SECTION 1. While not in default in the payment of principal of or interest on any of the bonds secured hereby, or in respect of any of the covenants, agreements or conditions in this indenture contained, the city through the Board of Trustees shall be permitted and suffered to possess, use and enjoy the trust estate and all property and appurtenances, franchises and rights conveyed by this indenture (except money or property, if any, expressly required to be deposited with the Trustee) and to receive and use the revenues, rents, issues, income, produce and profits thereof with power in the ordinary course of business freely and without let or hindrance on the part of the Trustee or of the holders of the bonds, to use and consume supplies; to alter, repair, dismantle and change the position of any of its buildings and structures, plants, mains, pipe lines, poles, wires, conduits or other property whatsoever (provided that no such change shall impair the lien of this indenture upon any such building, structure, plant, main, pipe line, pole, wire, conduit, or other property); to replace and renew any of its equipment, machinery or other property; and to acquire any and all rights under choses in action and contracts.

SECTION 2. The city from time to time, through the Board of Trustees, while in possession of the trust estate shall be suffered and permitted without any release from or action by the trustees or either of them to sell, exchange or otherwise dispose of, free from the lien of this indenture, (1) any of its equipment, machinery, fixtures, apparatus, appliances, tools, implements, or other chattels at any time subject to the lien hereof which may have become worn out or unserviceable, disused, undesirable or unnecessary for use in the conduct of its business, replacing the same by, or substituting for the same, other property of equal value to the city, which shall forthwith become, without further action, subject to the lien of this indenture, and (2) any materials, merchandise, equipment and supplies in the ordinary course and conduct of its business; provided however, that upon the sale or other disposition of such property to the value of $10,000 or more in any one calendar month, the Board of Trustees shall cause to be filed with the Trustee a certificate describing such property, stating that such property has become worn out, unserviceable, undesirable or unnecessary for use in the conduct of its properties and that such disposition thereof will not impair the operating integrity of the properties, and stating also the consideration received from such sale or other disposition thereof and the use made of such consideration.

SECTION 3. So long as the city is not in default hereunder to the knowledge of the Trustee, the city may sell or otherwise dispose of any property mortgaged hereunder not exceeding in the period ending December 31, 1942, the sum of $200,000, in the two-year period ending December 31, 1944, the sum of $1,150,000 (of which any amount over $400,000 must represent the sale of electric distribution systems and transmission lines lying outside of Bexar County, Texas), and in any calendar year thereafter the sum of $200,000, all in aggregate sale price or fair value (whichever is greater), without deduction for any liens on such property, and obtain the release of, and the trustees shall release from the lien hereof, such property, but only upon the receipt by the Trustee of a certificate signed by a majority of the Board of Trustees and by a licensed engineer stating in substance:

(1) The then fair value, in the opinion of the signers, of the property to be released, which property shall be described in such certificate in reasonable detail;

(2) That the aggregate sale price or fair value (whichever is greater) of such property, and of all property theretofore released by the trustees pursuant to the provisions hereof during the period in which the request for the release is made, does not exceed the amount hereinabove authorized to be released during such period, and, if such release is requested after the expiration of the third year from the date of this indenture, that all property released hereunder by the trustees from the date of this indenture to the date of the request of said additional release does not exceed ten per cent (10%) of the bonds of the issue secured hereby theretofore paid or otherwise retired; and

(3) That the city is not, to the knowledge of the signers, in default in the performance of any of the terms or covenants of this indenture or of the bonds secured hereby, and that such release will not be, in the opinion of the signers, prejudicial to the interest of the bondholders, and that the property to be released is not, in the opinion of the

signers, necessary to the proper and economical operation of the electric and gas systems.

The money received from the sale of such released property shall be held by the Board of Trustees as a special fund for the purchase of additional property deemed by them necessary or advantageous to the system, and unless such money is used in such purchase of property within eighteen months of the time received, the same shall be used in the redemption prior to maturity of as many of the bonds as may be redeemed with such money in the manner provided in Section 7, Article V, above, for the redemption of bonds with surplus funds. All additional property purchased or acquired under the provisions of this section shall immediately upon such purchase or acquisition become subject to the lien of this indenture.

ARTICLE VIII.

DEFAULTS AND REMEDIES

SECTION 1. For the purpose of this indenture the following events are hereby defined as and are declared to be "events of default":

(a) Default in the due and punctual payment of any interest on any of the bonds and the continuance thereof for a period of ninety (90) days after written notice thereof by the Trustee to each member of the Board of Commissioners of the City of San Antonio and to each member of the Board of Trustees, stating that payment has been demanded and default made.

(b) Default in the due and punctual payment of the principal of any of the bonds at maturity thereof and the continuance thereof for a period of ninety (90) days after written notice thereof by the Trustee to each member of the Board of Commissioners of the City of San Antonio and to each member of the Board of Trustees, stating that payment has been demanded and default made.

(c) Default in the performance or observance of any other of the covenants, agreements or conditions on the part of the city and the Board of Trustees to be kept, observed and performed contained in this indenture or in the bonds, and continuation of such default for a period of ninety (90) days after written notice thereof by the Trustee to each member of the Board of Commissioners of the City of San Antonio and to each member of the Board of Trustees.

(d) The institution of bankruptcy proceedings, either voluntary or involuntary, under any state or federal statute, whereby the city's duty to carry out all of the covenants and agreements in this indenture contained might be in anywise affected.

Any notice herein provided to be given to a member of the Board of Commissioners and the City Clerk and to a member of or the Secretary of the Board of Trustees shall be deemed sufficiently given if sent by registered mail with postage prepaid to the person to be notified, addressed to him at the post office in the City of San Antonio. The Trustee may give any such notice in its discretion and shall give such notice if requested so to do by the holders of not less than twenty per cent (20%) in principal amount of the bonds at the time outstanding.

Wherever "bonds" are referred to in this article and in Article XI hereof, the term shall be understood to mean not only all outstanding bonds of the issue of $35,000,000 originally secured hereby, but also all outstanding refunding bonds which may be issued under the provisions of this indenture in such manner as to be entitled to the security of this indenture on an equality with the bonds of said original issue.

SECTION 2. Upon the happening of any event of default as defined in Section 1 of this article, the Trustee shall, but only upon the written request of the holders of not less than sixty per cent (60%) in principal amount of the bonds then outstanding hereunder, and upon being indemnified to its satisfaction, by notice in writing to the Secretary of the Board of Trustees and to the City Clerk to be sent as provided in Section 1 hereof, declare the principal of all bonds then outstanding hereunder to be due and payable immediately, and upon any such declaration the said principal shall become and be due and payable immediately, anything in this indenture or in the said bonds to the contrary notwithstanding. This provision, however, is subject to the condition that if at any time after the principal of said bonds shall have been declared due and payable and before any sale of the trust estate shall have been made, all arrears of interest upon all such bonds, with interest upon all past due installments of interest at the rate borne by the bonds, and all past due principal of the bonds, together with the reasonable charges and expenses of the trustees, their agents, attorneys and counsel, shall be paid by the city and after all other defaults which may have occurred shall have been remedied or cured to the satisfaction of the Trustee, then and in every such case, the holders of sixty per cent (60%) in principal amount of the bonds then outstanding may, by notice in writing given to the Trustee, and to the City Clerk and the Secretary of the Board of Trustees in the manner provided in Section 1 of this article, waive such default and its consequences, and rescind such declaration, but no such waiver or rescission shall extend to or affect any subsequent default or impair or exhaust any right or power consequent thereon.

SECTION 3. Upon the happening of any event of default as defined in Section 1 of this article, the trustees or either of them, personally or by their attorneys or agents, may to the extent permitted by law enter into and upon and take possession of all the trust estate and each and every part thereof and exclude the city or its agents, servants and employees wholly therefrom, and have, hold, use, operate, manage and control the same and each and every part thereof, and in the name of the city or otherwise, as they shall deem best, conduct the business thereof and exercise the franchises pertaining thereto and all the rights and powers of the city and use all of the then existing property, materials, current supplies, stores, and other assets for that purpose, and at the expense of the trust estate from time to time maintain, restore, insure and keep insured, the properties, plants, equipment and apparatus provided or required for use in connection with such business, and likewise from time to time, at the expense of the trust estate, make all such necessary or proper repairs, renewals and replacements and all such useful alterations, additions, betterments and improvements as to them may seem judicious, and collect and receive all tolls, earnings, income, rents, issues, profits and revenues of the same and of every part thereof, and after deducting therefrom the expenses of operation and all expenses incurred hereunder and all other proper outlays herein authorized, and all payments which may be made as just and reasonable compensation for their own services, and for the services of their attorneys, agents, and assistants, the Trustee shall apply the rest and residue of the moneys received by the trustees or either of them as follows:

(a) In case the principal of none of the bonds shall have become due, to the payment of the interest in default, in order of the maturity of the installments of such interest, with interest on the overdue installments thereof at the same rates, respectively, as were borne by the bonds on which such interest shall be in default, such payments to be made ratably to the parties entitled thereto without discrimination or preference.

(b) In case the principal of any of the bonds shall have become due by declaration or otherwise, first to the payment of the interest in default, in the order of the maturity of the installments thereof, with interest on overdue installments thereof at the same rates, respectively, as were borne by the bonds on which such interest shall be in default, and next to the payment of the principal of all bonds then due, such payments to be made ratably to the parties entitled thereto without discrimination or preference.

In case all of such payments, and payment of whatever may be payable for any other purpose required by any provision of this indenture, shall have been made in full and no suit to foreclose or enforce this indenture shall have been begun or sale made as hereinafter provided, and upon compliance with all other provisions of this indenture as to which the city shall be in default, the trustees after making such provision as to them may seem advisable for the payment of the next maturing installment of interest to fall due upon the bonds, shall restore the possession of the trust estate (other than any cash at the time required to be held by the Trustee hereunder) to the city.

SECTION 4. Upon the happening of any event of default as defined in Section 1 of this article, if the principal of all of the bonds outstanding hereunder shall have been properly declared due and payable as provided in Section 2 of this article, and whether or not the remedies authorized by Section 3 of this article shall have been pursued in whole or in part, the trustees, or either of them, may cause this indenture to be foreclosed and the trust estate to be sold, and may proceed to protect and enforce the rights of the trustees and the bondholders hereunder in such manner as counsel for the trustees shall advise, whether for the specific performance of any covenant, condition, agreement or undertaking herein contained, or in aid of the execution of any power herein granted, or for the enforcement of such other appropriate legal or equitable remedies as may in the opinion of such counsel be more effectual to protect and enforce the rights aforesaid. The Trustee shall take any such action or actions if requested so to do by the holders of at least sixty per cent (60%) in principal amount of the bonds then outstanding hereunder.

SECTION 5. Upon the happening of any event of default as defined in Section 1 of this article, and if the principal of all of the outstanding bonds shall have been declared due and payable as provided in Section 2 of this article, then and in every such case, and whether or not the remedies authorized by Section 3 of this article shall have been pursued in whole or in part, the trustees, or either of them, shall, but only upon the written request of the holders of not less than sixty per cent (60%) in principal amount of the bonds then outstanding hereunder, with or without entry, sell to the highest bidder the trust estate and all right, title, interest, claim and demand thereto and the right of redemption thereof, at any such place or places, and at such time or times and upon such notice and terms as the Trustee may fix and specify and as may be required by law. In case of such sale of any of the property subject to this indenture, notice of such sale shall first be given by publication in at least one daily newspaper published in the city in which the sale is to be made, at least once a week for four successive weeks next preceding such sale, and by like publication in at least one daily newspaper published in the City of New York, New York, and by the giving of any other notices which may be required by law, and upon such sale the trustees may make and deliver to the purchaser or purchasers a good and sufficient deed or deeds for the same, which sale shall be a perpetual bar both at law and in equity against the city and all persons and corporations lawfully claiming or to claim by, through or under it. No purchaser at any such sale shall be bound to see to the application of the purchase money or to inquire as to the authorization, necessity, expediency or regularity of any such sale. Nevertheless, the city if so requested by the Trustee, shall ratify and confirm any sale or sales by executing and delivering to the Trustee or to such purchaser or purchasers all such instruments as may be necessary or in the judgment of the Trustee proper for the purposes which may be designated in such request.

Such notice of sale shall state that the city has granted to the purchaser of the mortgaged property a franchise for the operation thereof for a period of twenty years dating from such purchase.

SECTION 6. In the event of any sale, whether made under the power of sale hereby granted and conferred or under or by virtue of judicial proceedings or of a judgment or decree of foreclosure and sale, the whole of the trust estate shall be sold in one lot and as an entirety, unless such sale as an entirety is impossible or impracticable by reason of some statute or otherwise.

SECTION 7. The trustees may from time to time adjourn any sale to be made by them hereunder by announcement at the time and place of such adjourned sale, and without further notice or publication except as otherwise required by law may make such sale at the time and place to which the same may be so adjourned.

SECTION 8. In case an event of default as defined in Section 1 of this article occurs, and if all of the bonds outstanding hereunder shall have been declared due and payable as provided in Section 2 hereof, and in case a bill in equity shall be filed or any other judicial proceeding commenced to enforce any right of the trustees or of the bondholders under this indenture or otherwise, then as a matter of right, the Trustee shall be entitled to the appointment of a receiver of the trust estate and of the earnings, income or revenues, rents, issues and profits thereof with such powers as the court making such appointment may confer.

SECTION 9. In case the trustees or either of them shall have proceeded to enforce any rights under this indenture by foreclosure, sale, or otherwise, and such proceedings shall have been discontinued or appealed, or shall have been determined adversely to the trustees, then and in every such case, the city and the trustees shall be restored to their former respective positions and rights hereunder in respect of the trust estate, and all rights, remedies and powers of the trustees and the bondholders shall continue as though no such proceedings had been taken.

SECTION 10. In case of any such sale of the trust estate, any bondholder or bondholders or committee of bondholders, or either trustee, may bid for and purchase such property and upon compliance with the terms of sale may hold, retain possession and dispose of such property as the absolute right of the purchaser or purchasers without further accountability and shall be entitled, for the purposes of making settlement or payment for the property purchased, to use and apply any bonds hereby secured and any interest thereon due and unpaid, whether or not such interest be evidenced by coupons, by presenting such bonds and coupons in order that there may be credited thereon the sum apportionable and applicable thereto out of the net proceeds of such sale, and thereupon such purchaser or purchasers shall be credited on account of such purchase price payable by him or them with the sum apportionable and applicable out of such net proceeds to the payment of or as credit on the bonds and coupons so presented.

SECTION 11. The proceeds of any judicial or other sale of the trust estate, together with any funds at the time held by the Trustee and not otherwise appropriated, shall be applied by the Trustee as follows:

First: To the payment of the costs, expenses, fees and other charges of such sale and a reasonable compensation to the trustees, their agents and attorneys, and to the discharge of all expenses and liabilities incurred and advances or disbursements made by the trustees hereunder.

Second: Any surplus then remaining to the payment of the whole amount then due or unpaid upon the bonds issued hereunder and then outstanding for principal and interest, with interest on overdue principal and overdue installments of interest at the same rates, respectively, as were borne by the bonds whereof the principal or installments of interest may be overdue, and in case such proceeds shall be insufficient to pay in full the whole amount so due and unpaid, then to the payment of such principal and interest ratably according to the aggregate amount due on all bonds then outstanding without preference or priority of principal over interest or of interest over principal.

Third: Any surplus then remaining to the city or whomsoever shall be lawfully entitled thereto.

SECTION 12. In case of a sale under any of the foregoing provisions of this article, whether made under the power of sale herein granted, or under or by virtue of judicial proceedings, the principal of all bonds issued hereunder and then outstanding, if not previously due, shall immediately thereupon become due and payable, anything in said bonds or in this indenture to the contrary notwithstanding.

SECTION 13. The remedies herein conferred upon or reserved to the trustees or to the holders of bonds hereby secured are not intended to be exclusive of any other remedy, but each remedy herein provided shall be cumulative and shall be in addition to every other remedy given hereunder or now or hereafter existing, and every power and remedy hereby given to the trustees or to the holders of bonds issued hereunder may be exercised from time to time as often as may be deemed expedient. No delay or omission of the trustees or of any holder of bonds issued hereunder to exercise any power or right arising from any default hereunder shall impair any such right or power (unless the exercise of such right or power shall become barred by law) or shall be construed to be a waiver of any such default or to be acquiescence therein.

SECTION 14. Anything in this indenture contained notwithstanding, the holders of sixty per cent (60%) in principal amount of the bonds hereby secured and then outstanding, shall have the right by an instrument or instruments in writing delivered to the Trustee to direct and control the trustees as to the method of taking any and all proceedings for any sale of any or all of the trust estate, or for the foreclosure of this indenture, or for the appointment of a receiver, and may at any time cause any proceedings authorized by the terms hereof to be so taken or to be discontinued or delayed, provided however, that such holders shall not be entitled to cause the Trustee to take any proceedings which in its opinion would be unjustly prejudicial to non-assenting bondholders.

SECTION 15. No holder of any bond or coupon issued hereunder shall have any right as such holder to institute any suit, action or proceeding for the foreclosure of this indenture or for the execution of any trust hereunder or for the appointment of a receiver or for any other remedy hereunder, all rights of action hereunder being vested exclusively in the trustees, unless and until such holder shall have previously given to the Trustee written notice of a default hereunder and of the continuance thereof, and also unless the holders of the requisite principal amount of the bonds then outstanding shall have made written request upon the Trustee and shall have afforded it a reasonable opportunity to institute such action, suit or proceeding in its own name, and unless the trustees shall have been offered reasonable indemnity satisfactory to them against the costs, expenses and liabilities to be incurred therein or thereby, and the Trustee for thirty (30) days after receipt of such notification, request or offer of indemnity shall have failed to institute any such action, suit or proceeding, it being understood and intended that no one or more holders of the bonds shall have the right in any manner whatever by his or their action to affect, disturb or prejudice the lien of this indenture or to enforce any right hereunder except in the manner herein provided and for the equal benefit of all holders of such outstanding bonds.

SECTION 16. In any suit or action by the trustees, or either of them, arising under this indenture or on all or any of the bonds or coupons issued hereunder, the Trustee or trustees shall not be required to produce such bonds or coupons, but shall be entitled in all things to maintain any such suit or action without their production.

SECTION 17. If any covenant, agreement, waiver or part thereof in this article or elsewhere in this indenture contained be forbidden by any pertinent law, or under any pertinent law be effective to render this indenture invalid or unenforceable or to impair the lien hereof, then each such covenant, agreement, waiver or part thereof shall itself be and is hereby declared to be wholly ineffective and this indenture shall be construed as if the same were not included herein.

ARTICLE IX.

THE TRUSTEES

SECTION 1. The trustees accept the trusts herein created, but only upon the terms and conditions set forth in this Article IX.

SECTION 2. The recitals of fact herein and in said bonds contained shall be taken as the statements of the city and the trustees assume no responsibility for the correctness of the same. The trustees make no representations as to the value of the mortgaged and pledged property or any part thereof, or as to the title of the city thereto, or as to the security afforded thereby and hereby, or as to the validity of this indenture or of the bonds or coupons issued hereunder, and the trustees shall incur no responsibility in respect of such matters.

SECTION 3. The trustees shall be under no duty to file or record or cause to filed or recorded this indenture or any instrument supplemental thereto as a mortgage, conveyance or transfer of real or personal property or otherwise, or to re-file or re-record or renew the same, or to procure any further, other or additional instruments of further assurance, or to see to the delivery to them of any personal property intended to be mortgaged or pledged hereunder, or to do any act which may be suitable to be done for the better maintenance or continuance of the lien or security hereof, or for giving notice of the existence of such lien, or for extending or supplementing the same or to see that any property intended now or hereafter to be conveyed in trust hereunder is subjected to the lien hereof. The trustees shall not be liable for failure of the Board of Trustees to insure or renew insurance or for responsibilities of insurers, or for the amount of insurance carried by the Board of Trustees on any part of the trust estate, or for the failure of the city to pay any tax or taxes in respect of the mortgaged and pledged property, or any part thereof, or the income therefrom or otherwise, nor shall the trustees be under any duty in respect of any tax which may be assessed against them or the owners of the bonds in respect of the mortgaged and pledged property.

SECTION 4. The trustees may execute any of the trusts or powers hereof and perform any duty hereunder, either themselves or by or through their attorneys, agents, or employees, and they shall not be answerable or accountable for any act, default, neglect or misconduct of any such attorneys, agents or employees, if reasonable care has been exercised in the appointment and retention thereof, nor shall the trustees be otherwise answerable or accountable under any circumstances whatsoever, except for their own gross negligence or bad faith.

SECTION 5. The trustees shall be under no obligation or duty to perform any act hereunder or to institute or defend any suit in respect hereof, unless properly indemnified to their satisfaction. The trustees shall not be required to take notice, or be deemed to have knowledge, of any default of the city or the Board of Trustees hereunder and may conclusively assume that there has been no such default unless and until they shall have been specifically notified in writing of such default by the holders of the percentages in principal amount of the bonds then outstanding hereinabove specified.

SECTION 6. Neither of the trustees shall be bound to recognize any person as the holder of a bond unless and until his bond is submitted to such trustee for inspection, if required, and his title thereto satisfactorily established, if disputed, or unless his bond is registered.

SECTION 7. The trustees shall be protected in acting upon any notice, resolution, request, consent, order, certificate, report, appraisal, opinion, bond, or other paper or document believed by them to be genuine and to have been signed or presented by the proper party or parties. The trustees may consult with counsel (who may be of counsel for the city or for a bondholder), and with other experts, and the opinion of such counsel or other experts shall be full and complete authorization and protection in respect of any action taken or suffered and in respect of any determination made by them hereunder in good faith and in accordance with the opinion of such counsel.

SECTION 8. The Trustee shall not be obligated or liable to allow to the city interest on any moneys received by it hereunder, except that the Trustee shall pay the Board of Trustees interest on money in the Reserve Account at the rate or rates it is currently paying its depositors on checking account balances of similar amounts, if interest on balances is then being so paid.

SECTION 9. The Board of Trustees shall pay to the trustees from time to time a reasonable compensation for all services rendered by them hereunder, and also all their reasonable expenses, charges and other disbursements and those of their attorneys, agents, and employees, incurred in and about the administration and execution of the trusts hereby created. All payments so made to the trustees by way of compensation, expenses, charges and other disbursements shall be regarded as a maintenance and operation expense and paid from the Revenue Fund accordingly. In default of such payments by the city or the Board of Trustees, and as security for such payment, the trustees shall have a lien therefor on the trust estate and the proceeds thereof prior to any rights of the holders of the bonds and coupons.

SECTION 10. Any trustee hereunder may become the owner of bonds and coupons with the same rights he or it would have if not a trustee. The Trustee may act as depositary for, and permit any of its officers or directors to act as a member of, or in any other capacity in respect of any committee formed to protect the rights of the holders of bonds or to effect or aid in any reorganization growing out of the enforcement of the said bonds or of this indenture, whether or not any such committee shall represent the holders of more than fifty per cent (50%) in principal amount of the bonds.

SECTION 11. The Trustee and any successor to the Trustee may resign and be discharged from the trust created by this indenture by giving to the City Clerk and to the Secretary of the Board of Trustees notice in writing and by giving the bondholders notice through publication thereof at least once a week for three successive calendar weeks, the first publication to be not less than thirty and not more than sixty days prior to the effective date of such resignation, in one newspaper published and having general circulation in the City of San Antonio and in a financial newspaper or journal published in the City of New York, New York. Each of such notices shall specify the date on which such resignation is to take effect. Such resignation shall take effect on the day specified in such notice, unless previously a successor trustee shall have been appointed, either by the bondholders or by the city as hereinafter provided, in which event such resignation shall take effect immediately upon the appointment of such successor Trustee. The Individual Trustee and any successor to the Individual Trustee may resign at any time and be discharged from the trusts created by this indenture by giving the City Clerk, the Secretary of the Board of Trustees and the Trustee notice in writing of such resignation, specifying a date when such resignation shall take effect, which shall be at least thirty days after the giving of such notice.

SECTION 12. Either of the trustees or any successor trustee may be removed at any time by the holders of a majority in principal amount of the bonds secured hereby and at the time outstanding, upon payment to the trustee so removed of all moneys then due to it or him hereunder, by an instrument or concurrent instruments in writing in duplicate by such holders. One copy shall be filed with the Secretary of the Board of Trustees and the other with the trustee so removed.

The Individual Trustee and any successor to the Individual Trustee may be removed at any time upon payment to him of all moneys then due to him hereunder by an instrument in writing signed in duplicate by the Trustee, one copy of which shall be filed with Secretary of the Board of Trustees and the other delivered to the Individual Trustee so removed.

SECTION 13. In case at any time either of the trustees or any successor trustee shall resign, die, be dissolved, or be removed, or otherwise shall become disqualified to act or incapable of acting, or in case control of the Trustee or of any successor Trustee or of its officers shall be taken over by any public officer or officers, a successor trustee may be appointed by the holders of a majority in principal amount of the bonds secured hereby and at the time outstanding, by an instrument or concurrent instruments in writing signed and duly acknowledged by such bondholders or by their attorneys-in-fact duly authorized, and filed, one copy with the retiring trustee, and the other with the successor trustee, notification thereof being given to the Secretary of the Board of Trustees by such successor trustee; but until a successor trustee shall be so appointed by the bondholders as herein authorized the Board of Trustees by an instrument in writing duly authorized by resolution shall in such case appoint a successor to the Trustee and the Trustee shall by an instrument in writing in any such case appoint a successor to the Individual Trustee. In the case of any such appointment by the Board of Trustees of a successor to the Trustee, the board shall forthwith cause notice to be published once in each week for two consecutive calendar weeks in one newspaper published and having general circulation in the City of San Antonio and in one financial newspaper or journal published in the City of New York, New York. Every such successor Trustee so appointed by the bondholders, by a court of competent jurisdiction, or by the Board of Trustees shall be a bank or trust company in good standing, organized and doing business under the laws of the United States or of any state, and having its principal office in the Borough of Manhattan, the City of New York, New York, or in the City of Chicago, Illinois, and having a combined capital and surplus of not less than $5,000,000, which is authorized under the laws of the jurisdiction of incorporation to exercise corporate trust powers and is subject to supervision or examination by a Federal or State authority. Every successor trustee appointed by the bondholders or by the Trustee in succession to the Individual Trustee, shall always be an individual, a citizen of the United States of America, unless otherwise required by law.

If in a proper case no appointment of a successor Trustee or of a successor Individual Trustee shall be made pursuant to the foregoing provisions of this article within six months after a vacancy shall have occurred in the office of trustee, the holder of any bond or the retiring Trustee or Individual Trustee may apply to any court of competent jurisdiction to appoint a successor trustee. Said court may thereupon after such notice, if any, as such court may deem proper and prescribe, appoint a successor Trustee or Individual Trustee as the case may be.

SECTION 14. Any successor trustee appointed hereunder shall execute, acknowledge and deliver to its or his predecessor trustee, and also to the city, an instrument accepting such appointment hereunder, and thereupon such successor trustee, without any further act, deed or conveyance shall become fully vested with all the estate, properties, rights, powers, trusts, duties and obligations of its or his predecessor in trust hereunder, with like effect as if originally named as trustee herein; but the trustee ceasing to act, shall nevertheless, on the written request of the city, or of the successor trustee, execute, acknowledge and deliver such instruments of conveyance and further assurance and do such other things as may reasonably be required for more fully and certainly vesting and confirming in such successor trustee all the right, title and interest of the trustee which it or he succeeds, in and to the mortgaged and pledged property and such rights, powers, trusts, duties and obligations, and the trustee ceasing to act shall also, upon like request, pay over, assign and deliver to the successor trustee any money or other property subject to the lien of this indenture, including any pledged securities which may then be in its possession. Should any deed, conveyance or instrument in writing from the city be required by the new trustee for more fully and certainly vesting in and confirming to such new trustee such estate, properties, rights, powers and duties, any and all such deeds, conveyances and instruments in writing shall, on request, be executed, acknowledged and delivered by the city.

In case any of the bonds to be issued hereunder shall have been authenticated but not delivered, any successor Trustee may adopt the certificate of authentication of the Trustee or of any successor to the Trustee; and in case any of the bonds shall not have been authenticated any successor to the Trustee may authenticate such bonds in its own name; and in all such cases such certificate shall have the full force which it is anywhere in the bonds or in this indenture provided that the certificate of the Trustee shall have.

SECTION 15. Any notice, request or other instrument required by this indenture to be served on the city or sent to the city shall, unless otherwise expressly provided, be considered to have been sufficiently given when sent by registered mail to the Secretary of the Board of Trustees addressed to the office of said board in the City of San Antonio and to the City Clerk addressed to the City Hall in the City of San Antonio. Any notice, request or other writing by or in behalf of the city or any of the bondholders delivered solely to the Trustee shall be deemed to have been delivered to both of the trustees hereunder as effectually as if delivered to each of them.

SECTION 16. All the estate, right, title and interest in and to the trust estate by this indenture conveyed or assigned or transferred to the trustees is conveyed, assigned and transferred to them as joint tenants and not as tenants in common.

SECTION 17. The Trustee shall authenticate and turn over to the city official then performing the duties of City Treasurer for delivery, bonds in an aggregate principal amount not to exceed $35,000,000 when and as directed to do so upon written order of the city signed by its Mayor and its Clerk, which order shall specify the official to whom the bonds are to be so delivered.

SECTION 18. The Secretary of the Board of Trustees shall file with the Trustee annually a certificate showing the names of the then members of the Board of Commissioners of the City of San Antonio and the then members of the Board of Trustees and the names of the City Clerk and of the Secretary of the Board of Trustees. The Trustee shall be entitled for all purposes of this indenture to assume that the persons whose names appear on the latest list filed with it continue to hold their offices until it is notified to the contrary by the Secretary of the Board of Trustees.

SECTION 19. The trustees shall not be accountable or responsible in any manner whatsoever for any action of the Board of Trustees, or of the depositary of funds of such Board of Trustees, or for application of revenues from the trust estate by the Board of Trustees, and shall have no duty to make any inquiry into disposition of the Revenue Fund.

SECTION 20. All cash collected by, or payable to, the trustees or either of them shall be paid to, and deposited with, and all bonds and other obligations or securities shall be held by the Trustee, except as otherwise required by law. Any moneys at any time coming into the hands of the Individual Trustee shall be at once paid over to the Trustee.

Whenever any moneys, bonds, or other obligations or securities are, under any provision of this indenture, paid or delivered to, or deposited with, the Trustee, title to the same shall be deemed to be vested in both trustees hereunder, but nothing in this section contained shall be deemed to affect or impair any power or right conferred by any provision of this indenture upon the

Trustee to apply, disburse or otherwise act or deal with respect to any moneys, bonds or other obligations or securities received or held by it as aforesaid.

Any request in writing by the Trustee to the Individual Trustee shall be a sufficient warrant for the Individual Trustee to take such action as may be requested.

The Individual Trustee or any successor, so far as permitted by law, may delegate to the Trustee or any successor the right to exercise any and all power, discretionary or otherwise, conferred by any of the provisions of this Indenture.

Said Harold Eckhart has been joined as Individual Trustee in order to comply with any legal requirements respecting trustees under deeds of trust to property in the State of Texas, and shall as such trustee possess such powers, and such powers only, as may be necessary to comply with such requirements. In the event of the incapacity or lack of authority of the Trustee by reason of any present or future law of the State of Texas to exercise any of the powers, rights or remedies herein granted to the Trustee, or to hold title to the mortgaged property in trust as herein granted, or to take any other action which may be necessary or desirable in connection therewith, each and every remedy, power, right, claim, demand, cause of action, immunity, estate, right, title, interest, and lien expressed or intended by this indenture to be exercised by or vested in or conveyed to the Trustee with respect thereto, shall be exercisable by and vest in the Individual Trustee to the extent necessary to enable the Individual Trustee to exercise such powers, rights and remedies, and every conveyance and obligation necessary to the exercise thereof by the Individual Trustee shall run to and be enforceable by the Individual Trustee and the Individual Trustee shall take such action in respect thereof as may be directed in writing by the Trustee. Any such direction in writing by the Trustee shall be full protection to the Individual Trustee for any action taken by him pursuant thereto, and shall be competent evidence, and the only necessary evidence of the necessity for the taking of such action by the Individual Trustee. Except to the extent that, under any law of the State of Texas, the Trustee shall be incompetent or unqualified to perform any particular act or acts, the rights, powers, duties, and obligations conferred or imposed upon the trustees or either of them, shall be conferred or imposed upon and exercised or performed by the Trustee.

In the event that it may be necessary for the Trustee to enforce any of the provisions of this indenture in the State of Texas or in any other state, by court proceedings or in any other manner, the Trustee may, in writing, authorize the Individual Trustee in his name as trustee to take such action or institute such proceedings as may be appropriate under the provisions of the indenture, without joining the Trustee as a party thereto, and in such event the Individual Trustee shall be vested with all the rights, powers and duties of the Trustee hereunder, and may enforce the same in his name as Individual Trustee in the manner provided in the indenture without joinder of the Trustee in any action or proceeding so taken.

Any and all rights, powers or duties by any provisions of this indenture conferred or imposed upon the trustees may be exercised and performed by the Trustee alone without reference to the Individual Trustee in so far as permitted by law, and the Individual Trustee hereby irrevocably constitutes and appoints the Trustee his true and lawful attorney-in-fact with full power and authority, in so far as permitted by law, either in the name and on behalf of the Individual Trustee alone, or of the trustees jointly, to exercise any and all rights or powers conferred upon the Individual Trustee alone, or upon the trustees jointly, by any of the provisions of this indenture, but subject to the duties hereby imposed upon the Individual Trustee, with full power of substitution and revocation, hereby ratifying and confirming all and singular the acts and things lawfully done by the Trustee or any substitute by virtue of this power of attorney. Any and all rights, powers or duties by any provisions of this indenture conferred or imposed upon the trustees or the Trustee which may not be exercised and performed by the Trustee alone, or by the Individual Trustee and the Trustee jointly, may and shall be exercised and performed by the Individual Trustee without reference to the Trustee, in so far as permitted by law.

ARTICLE X.

FRANCHISE

SECTION 1. In the event that any sale of the trust estate shall be made under any of the provisions of this indenture for the enforcement of the lien of this indenture, the City of San Antonio hereby grants to the purchaser or purchasers at such sale a franchise to operate the property so purchased for a term of twenty years dating from such purchase, subject to all laws regulating same then in force. The properties so purchased, in the event they are operated by the purchaser pursuant to such franchise, shall be operated, conducted and maintained in such manner as to be a benefit to the City of San Antonio and its inhabitants, and such purchaser shall be pledged to render efficient public service.

ARTICLE XI.

MODIFICATION OF THIS INDENTURE

SECTION 1. The holders of seventy-five per cent (75%) in principal amount of the bonds at any time outstanding (not including in any case any bonds which may then be held or owned by or for the account of the city, but including such refunding bonds as are specified in Section 1 of Article VIII hereof and are not owned by the city) shall have the right from time to time to consent to and approve the execution by the city and the trustees of such indenture or indentures supplemental hereto as shall be deemed necessary or desirable by the city for the purpose of modifying or amending any of the terms or provisions contained in this indenture or in any indenture or indentures supplemental thereto or contained in the ordinance authorizing the bonds secured by this indenture, provided however, that nothing herein contained shall permit or be construed as permitting the modification or amendment of the terms and conditions contained in this indenture or in said ordinance or in the bonds so as to:

(a) Make any change in the maturity of the bonds.

(b) Reduce the rate of interest borne by any of the bonds.

(c) Reduce the amount of the principal or premium, if any, payable on the bonds.

(d) Modify the terms of payment of principal or of interest or premium upon the bonds or any of them or impose any conditions with respect to such payment.

(e) Affect the rights of the holders of less than all of the bonds then outstanding.

If at any time the city shall request the trustees to enter into such supplemental indenture, the trustees, unless they shall deem that such proposed supplemental indenture shall contain provisions which affect their rights or obligations and to which they are unwilling to assent, shall, at the expense of the Board of Trustees, cause notice of the proposed execution of such supplemental indenture to be published in a financial newspaper or journal published in the City of New York, New York, and in a newspaper of general circulation published in the City of San Antonio, once during each calendar week for at least four successive calendar weeks, and on or before the date of the first publication of such notice, the Trustee shall also mail a copy thereof to each registered owner of bonds at his address appearing on the Trustee's registry books, but failure to mail any such notice or any defect therein shall not affect the validity of the proceedings for obtaining consents to the execution and delivery of such supplemental indenture. Such notice shall briefly set forth the nature of such proposed supplemental indenture and shall state that a copy thereof is on file at the principal office of the Trustee for inspection by all holders of bonds.

Whenever at any time within one year from the date of the first publication of said notice, the city shall deliver to the Trustee an instrument or instruments executed by the holders of at least seventy-five percent (75%) in aggregate principal amount of the bonds then outstanding as in this section defined, which instrument or instruments shall refer to the proposed supplemental indenture described in said notice and shall specifically consent to and approve the execution thereof in substantially the form of the copy thereof on file with the Trustee, thereupon, but not otherwise, the trustees shall execute the said supplemental indenture in substantially the said form without liability or responsibility to any holder of any bond, whether or not such holder shall have consented thereto.

If the holders of at least seventy-five per cent (75%) in aggregate principal amount of the bonds outstanding as in this section defined at the time of execution of any such supplemental indenture, or the predecessors in title of such holders, shall have consented to and approved the execution thereof as herein provided, no holder of any bond, whether or not such holder shall have consented to or shall have revoked any consent as in this section provided, shall have any right or interest to object to the execution of such supplemental indenture or to object to any of the terms or provisions therein contained, or to the operation thereof, or to enjoin or restrain the trustees or the city from executing the same or from taking any action pursuant to the provisions thereof.

Upon the execution of any supplemental indenture pursuant to the provisions of this section, this indenture and the ordinance authorizing the bonds shall be and be deemed to be modified and amended in accordance with such supplemental indenture, and the respective rights, duties and obligations under this indenture of the city, the trustees and all the holders of outstanding bonds shall thereafter be determined, exercised and enforced hereunder, subject in all respects to such modifications and amendments.

Any consent given by the holder of a bond pursuant to the provisions of this section shall be irrevocable for a period of six months from the date of the first publication of the notice provided for in this section, and shall be conclusive and binding upon all future holders of the same bond during such period. Such consent may be revoked at any time after six months from the date of the first publication of such notice by the holder who gave such consent, or by a successor in title, by filing notice with the trustees in form satisfactory to them of such revocation of consent, but such revocation shall not be effective if the holders of seventy-five per cent (75%) aggregate principal amount of the bonds outstanding as in this section defined have, prior to the attempted revocation, consented to and approved the supplemental indenture referred to in such revocation. For the purposes of this section, ownership of bonds shall be established in the manner provided in Section 1 of Article XII of this indenture.

Any supplemental indenture executed in accordance with the provisions of this article shall thereafter form a part of this indenture and all the terms and conditions in any such supplemental indenture as to any provision authorized to be contained therein shall be and be deemed to be part of the terms and conditions of this indenture for any and all purposes.

ARTICLE XII.

MISCELLANEOUS

SECTION 1. Any notice, request or other instrument required by this indenture to be signed or executed by bondholders may be executed by the execution of any number of concurrent instruments of similar tenor, and may be signed or executed by such bondholders in person or by agent appointed in writing. As a condition for acting thereunder the trustees may demand proof of the execution of any such instrument and of the fact that any person claiming to be the owner of any of said bonds is such owner and may further require the actual deposit of such bond or bonds with the Trustee. The fact and date of the execution of such instrument may be proven by the certificate of any officer in any jurisdiction who by the laws thereof is authorized to take acknowledgments of deeds within such jurisdiction, that the person signing such instrument acknowledged before him the execution thereof, or may be proven by any affidavit of a witness to such execution sworn to before such officer.

The amount of bonds transferable by delivery held by any person executing such instrument as a bondholder and the fact, amount and numbers of the bonds held by such person and the date of his holding the same may be proven by a certificate executed by any responsible trust company, bank, bankers, or other depositary in a form approved by the Trustee, showing that at the date therein mentioned such person had on deposit with such depositary the bonds described in such certificate; provided, however, that at all times the Trustee may require the actual deposit of such bond or bonds with the Trustee.

SECTION 2. The covenants, agreements, conditions, promises and undertakings in this indenture shall extend to and be binding upon the successors and assigns of the city and all of the covenants hereof shall bind such successors and assigns, and each of them, jointly and severally. All the covenants, conditions and provisions hereof shall be held to be for the sole and exclusive benefit of the parties hereto and their successors and assigns and of the holders from time to time of said bonds and coupons.

No transfer of the trust estate, or any part thereof, by the city and no extension of the time of payment of any of said bonds or coupons after such transfer shall operate to release or discharge the city, it being agreed that the liability of the city shall continue as principal until all of said bonds and coupons are paid in full, notwithstanding any transfer of said property or subsequent extension of time to the then owner, or other act which might serve as a legal or equitable discharge of a surety.

SECTION 3. This indenture shall operate effectually as a lien on all property conveyed, mortgaged or pledged hereby, whether real, personal or mixed. Failure to file said instrument in the office of the County Clerk of any county in which part of the trust estate is situated shall in nowise invalidate such lien, but this instrument may be filed and recorded in the records of each county in which part of the trust estate is situated in the manner in which a deed of trust on real estate is filed and recorded, and it may also be recorded in the office of the County Clerk of each such county and may remain in his office on file as a chattel mortgage covering the personal property encumbered hereby. The city covenants and agrees that this indenture will be so filed as a deed of trust and as a chattel mortgage in every county in which any part of the trust estate is situated.

SECTION 4. If the lien of this indenture shall be or shall ever become ineffectual, invalid or unenforceable against any property hereby mortgaged or pledged because of want of power or title in the city, the inclusion of any such property described herein shall not in any way affect or invalidate the mortgage or lien hereof against such property as the city had the right to mortgage or pledge.

SECTION 5. No holder of bonds issued under this indenture nor of any coupons representing interest on such bonds shall ever have the right to demand payment of such bonds or coupons out of funds raised or to be raised by taxation.

SECTION 6. Any request or consent of the holder of any bonds secured hereby given for any of the purposes of this indenture shall bind all future holders of the same bond or any bonds issued in exchange therefor or in substitution thereof in respect of anything done or suffered by the city or the trustees in pursuance of such request or consent.

SECTION 7. Although this indenture for convenience and for the purpose of reference is dated as of August 1, 1942, the actual dates of execution by the city and by the trustees are as indicated by their respective acknowledgments hereto annexed.

SECTION 8. If deemed necessary or expedient by the city and the purchasers of the bonds secured hereby, interim certificates in such form as may be mutually satisfactory to the city and to such purchasers may be issued in anticipation of the bonds, and until such interim certificates are surrendered in exchange for the definitive bonds they shall be secured in every respect as the definitive bonds are secured by the provisions of this indenture and the holders of such interim certificates shall be entitled to all rights and privileges herein provided for the holders of the definitive bonds.

SECTION 9. To the extent permitted by laws presently existing or hereafter enacted, the Board of Trustees shall be considered authorized to make such provision for a Pension Fund for its employees as it may in its discretion determine, and if so determined, may continue in existence the Pension Fund which has heretofore been established by San Antonio Public Service Company for its employees.

ARTICLE XIII.

DEFEASANCE

SECTION 1. When all of the bonds and coupons hereby secured shall have been paid or redeemed, or, all of the bonds having become due by reason of maturity or proper call for redemption, the city shall have provided for such payment or redemption by depositing in cash with the Trustee the amount necessary for such payment or redemption and shall also have paid, or caused to be paid, all sums accrued and payable hereunder by the city, then and in that case the city shall be entitled to have all of the trust estate revert to it and to have the estate, right, title and interest of the trustees in respect thereof cease, determine and become void. Then, if the city shall so request in writing, the trustees upon the cancellation of all bonds and coupons for the payment of which money shall not have been deposited in accordance with the provisions of this indenture, shall at the cost and expense of the city execute and deliver to the city proper instruments acknowledging satisfaction of this indenture. Money deposited for the payment of bonds and coupons under the provisions hereof shall be held by the Trustee as a special trust fund for the account of the holder or holders of such bonds and coupons and so far as necessary for such purposes shall be applied to the payment of such bonds and coupons upon presentation and surrender thereof.

IN WITNESS WHEREOF the City of San Antonio, Texas, acting through and being duly authorized thereunto by its governing body, the Commissioners of the City of San Antonio, has caused this indenture in four originals to be signed in its name by C. K. Quin, its Mayor, and its corporate seal to be hereunto affixed, and to be attested by J. M. Woods, its City Clerk, and said Harris Trust and Savings Bank, to evidence its acceptance of the trusts hereby created, has caused its corporate name and seal to be hereunto affixed and this indenture to be signed by Donald C. Miller, its Vice President, and to be countersigned and said seal to be attested by G. A. Glow, its Assistant Secretary, andsaid Harold Eckhart, to evidence his acceptance of the trust hereby created and in him reposed, has hereunto subscribed his name and affixed his seal, all as of the day and year first above written.

CITY OF SAN ANTONIO, TEXAS

By C. K. QUIN
Mayor

Attest:

J. W. WOODS
City Clerk

(SEAL)

Witnesses as to City of San Antonio:

E. J. ALLISON

MRS. KATHRYN ROBBINS

HARRIS TRUST AND SAVINGS BANK

By DONALD C. MILLER
Its Vice President

Attest:

G. A. GLOW
Its Assistant Secretary

HAROLD ECKHART (SEAL)

Witnesses as to Harris Trust and Savings
Bank and Harold Eckhart:

H. O. PALM

G. H. ASKEW

STATE OF TEXAS } ss
COUNTY OF BEXAR }

Before me, the undersigned authority in and for Bexar County, Texas, on this day personally appeared C. K. Quin, Mayor, and J. M. Woods, City Clerk, respectively, of the City of San Antonio, Texas, known to me to be the persons whose names are subscribed to the foregoing instrument and known to me to be, respectively, the Mayor and City Clerk of the City of San Antonio, a municipal corporation, and each acknowledged to me that he executed the same for the purposes and consideration therein expressed and in the capacity therein stated as the act and deed of said City of San Antonio, Texas.

GIVEN under my hand and seal of office this 9th day of October, 1942.

E. J. ALLISON
Notary Public in and for Bexar County, Texas.
(SEAL)

STATE OF ILLINOIS } ss
COUNTY OF COOK }

Before me, the undersigned authority in and for Cook County, Illinois, on this day personally appeared Donald C. Miller, Vice President, and G. A. Glow, Assistant Secretary, respectively, of Harris Trust and Savings Bank, known to me to be the persons whose names are subscribed to the foregoing instrument and known to me to be, respectively, the Vice President and Assistant Secretary of Harris Trust and Savings Bank, a corporation, and each acknowledged to me that he executed the same for the purposes and consideration therein expressed and in the capacity therein stated as the act and deed of said Harris Trust and Savings Bank.

GIVEN under my hand and seal of office this 13th day of October, 1942.

GRANT M. DRYER
Notary Public in and for Cook County, Illinois.
(SEAL)
My Commission Expires March 19, 1943.

STATE OF ILLINOIS }
COUNTY OF COOK } ss

Before me, the undersigned authority in and for Cook County, Illinois, on this day personally appeared Harold Eckhart, known to me to be the identical person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same as his free and voluntary act for the purposes and consideration therein expressed and set forth.

GIVEN under my hand and seal of office this 13th day of October, 1942.

GRANT M. DRYER
Notary Public in and for Cook County, Illinois.

(SEAL)

My Commission Expires March 19, 1943.

SECTION 12. That in the event of judicial sale or other sale of the properties encumbered by the indenture which is set out in the preceding section hereof in order to enforce the payment of the bonds secured thereby, the City of San Antonio herein and hereby grants to the purchaser or purchasers at any such sale which may be so held under the provisions of such indenture the exclusive right, privilege and franchise to operate the properties and facilities so purchased for a term of twenty years dating from such purchase, subject to all laws regulating same then in force, as is provided in Article 1111, Texas Revised Civil Statutes of 1925, as amended, it being the intent hereof to grant a franchise which shall become operative and effective only in the event that said mortgaged properties are sold under the provisions of said indenture.

In addition to the consideration expressed in said indenture and which is the basis for this franchise, the grantee of such franchise shall pay annually to the City of San Antonio the sum of Five Dollars ($5.00) for each year such franchise shall be operative.

If the grantee during the life of this franchise shall fail to furnish efficient public service or to maintain the properties in good order, such failure or refusal shall subject the franchise and all rights thereunder to forfeiture at the suit of the city upon judicial ascertainment of such facts, provided the city shall give the grantee sixty days notice of the intention to institute such proceedings.

When this franchise becomes effective by reason of sale as hereinabove provided, if the grantee desires to accept and operate under this franchise it shall file a written acceptance thereof with the City Clerk of the City of San Antonio.

SECTION 13. That the procedural details to be followed in the acquisition of the system and the issuance of the bonds, to the extent that further and more specific provision for such procedural details may prove to be needed, shall be prescribed and provided for by ordinance or ordinances or resolution or resolutions to be hereafter adopted by the Commissioners of the City of San Antonio, and in that connection, it is hereby expressly provided that such ordinances or resolutions may, if considered necessary or desirable by the Commissioners, provide that the proceeds of the bonds herein authorized may be utilized in such manner not inconsistent with the provisions of this ordinance as is necessary to the accomplishment of the purposes of this ordinance, provided always that the properties to which title is acquired by the city by virtue of the proceeds of the sale of the bonds herein authorized shall be the property hereinabove described for the acquisition of which the bonds are herein authorized.

SECTION 14. That all ordinances, resolutions and orders or parts thereof in conflict herewith are, to the extent of such conflict, hereby repealed.

SECTION 15. That if any section, provision or part hereof shall be held to be invalid or ineffective for any reason, the remainder hereof shall nevertheless remain in full force and effect.

SECTION 16. That by reason of the fact that the properties herein authorized to be acquired by the City of San Antonio can be acquired only within a limited period and that the consummation of such acquisition can be effected within such period only if this ordinance becomes immediately effective, it is necessary to the immediate preservation of the public peace, health and safety of the City of San Antonio that this ordinance shall become effective immediately upon its passage and approval, and four of the five Commissioners having voted in favor thereof, it is so ordained.

ADOPTED AND APPROVED July 25, 1942.

C. K. QUIN
Mayor

Attest:

JAMES SIMPSON
City Clerk

(Other proceedings not pertinent to the above appear in the minutes.)

Pursuant to motion duly made and carried, the Commissioners adjourned.

C. K. QUIN
Mayor

ATTEST:

JAMES SIMPSON
City Clerk

XV

Amendment of October 23, 1942

San Antonio, Texas
October 23rd, 1942

The Commissioners of the City of San Antonio met in Special session at the regular meeting place of the Commissioners in the City Hall in the City of San Antonio, Texas, at 8:00 o'clock, P.M., on October 23, 1942. There were present Mayor C. K. Quin and the following Commissioners:

HENRY F. HEIN
PAUL E. STEFFLER
P. L. ANDERSON
Absent: C. RAY DAVIS

There was also present James M. Woods, City Clerk.

After the meeting had been duly called to order, the roll called, and the minutes of the preceding meeting approved, the following ordinance was introduced in writing by Mayor Quin, and was read in full. It was then moved by Com. Steffler and seconded by Com. Hein that the ordinance as read be adopted and, after due discussion, the motion was voted upon and carried by the following votes:

Aye: QUIN
STEFFLER
HEIN
ANDERSON

Nay: None

The ordinance was thereupon declared adopted, was approved and signed in open meeting by the Mayor and was ordered recorded by the City Clerk. The ordinance is as follows:

> "An ORDINANCE confirming, ratifying, approving, and declaring effective an ordinance entitled 'An ordinance authorizing the acquisition by the City of San Antonio of an electric light and power plant and system and a gas distribution system serving the City of San Antonio and its inhabitants and territory adjacent to said city, authorizing the issuance of the revenue bonds of said City for the purpose of paying the cost thereof, fixing the details and providing for the payment and security of such bonds, approving and

> ratifying the notice of intention to issue such bonds heretofore given, authorizing and providing for the execution of a mortgage on said plant and systems as security for the payment of such bonds, granting a franchise to any purchaser of said properties at any sale which may be held for the enforcement of such mortgage, providing for the management of said plant and systems, entering into certain covenants and agreements in connection with such acquisition and such bonds, and declaring an emergency,' confirming the sale and fixing the interest rates of bonds authorized by said ordinance to the amount of $33,950,000, approving changes in the form provided for such bonds, and declaring an emergency."

WHEREAS, on the 25th day of July, 1942, the Commissioners of the City of San Antonio adopted an ordinance entitled "An Ordinance authorizing the acquisition by the City of San Antonio of an electric light and power plant and system and a gas distribution system serving the City of San Antonio and its inhabitants and territory adjacent to said city, authorizing the issuance of the revenue bonds of said city for the purpose of paying the cost thereof, fixing the details and providing for the payment and security of such bonds, approving and ratifying the notice of intention to issue such bonds heretofore given, authorizing and providing for the execution of a mortgage on said plant and systems as security for the payment of such bonds, granting a franchise to any purchaser of said properties at any sale which may be held for the enforcement of such mortgage, providing for the management of said plant and system, entering into certain covenants and agreements in connection with such acquisition and such bonds, and declaring an emergency"; and

WHEREAS, it has been ascertained that certain changes in the language of said ordinance are desirable in order to correct certain typographical errors which apepar in the ordinance as it was adopted, and in order to clarify and make more certain the actual intent of said ordinance; and

WHEREAS, it is desired to amend one section of said ordinance in order to provide for the release of certain properties to be encumbered under the terms of the indenture which is set forth in said ordinance; and

WHEREAS, in printing the bonds authorized by said ordinance two changes have been made in the bond form in order to clarify and make more certain the intention of said ordinance, and it is desired to ratify and approve the changes so made; and

XVII

WHEREAS, on the 24th day of August, 1942, bonds authorized by said ordinance to the amount of $33,950,000 were by the Commissioners of the City of San Antonio sold to A. C. Allyn and Company of Chicago, Illinois, and associates, at the price of par plus accrued interest to the date of delivery plus a premium of $3,157.00, and it is desired to confirm said sale and provide for the delivery of the bonds to said purchasers;

NOW, THEREFORE, Be It Ordained by the Commissioners of the City of San Antonio:

SECTION 1. That Section 3 of Article VII of the form of indenture set out in Section 11 of the ordinance described in the preamble hereto shall read as follows:

Section 3. So long as the city is not in default hereunder to the knowledge of the Trustee, the city may sell or otherwise dispose of any property mortgaged hereunder not exceeding in the period ending December 31, 1942, the sum of $200,000, in the two-year period ending December 31, 1944, the sum of $1,150,000 (of which any amount over $400,000 must represent the sale of electric distribution systems and transmission lines lying outside of Bexar County, Texas), and in any calendar year thereafter the sum of $200,000, all in aggregate sale price or fair value (whichever is greater), without deduction for any liens on such property, and obtain the release of, and the trustees shall release from the lien hereof, such property, but only upon the receipt by the Trustee of a certificate signed by a majority of the Board of Trustees and by a licensed engineer stating in substance:

(1) The then fair value, in the opinion of the signers, of the property to be released, which property shall be described in such certificate in reasonable detail;

(2) That the aggregate sale price or fair value (whichever is greater) of such property, and of all property theretofore released by the trustees pursuant to the provisions hereof during the period in which the request for the release is made, does not exceed the amount hereinabove authorized to be released during such period, and, if such release is requested after the expiration of the third year from the date of this indenture, that all property released hereunder by the trustees from the date of this indenture to the date of the request of said additional release does not exceed ten per cent (10%) of the bonds of the issue secured hereby theretofore paid or otherwise retired; and

(3) That the City is not, to the knowledge of the signers, in default in the performance of any of the terms or covenants of

this indenture or of the bonds secured hereby, and that such release will not be, in the opinion of the signers, prejudicial to the interest of the bondholders, and that the property to be released is not, in the opinion of the signers, necessary to the proper and economical operation of the electric and gas systems.

The money received from the sale of such released property shall be held by the Board of Trustees as a special fund for the purchase of additional property deemed by them necessary or advantageous to the system, and unless such money is used in such purchase of property within eighteen months of the time received, the same shall be used in the redemption prior to maturity of as many of the bonds as may be redeemed with such money in the manner provided in Section 7 Article V, above, for the redemption of bonds with surplus funds. All additional property purchased or acquired under the provisions of this section shall immediately upon such purchase or acquisition become subject to the lien of this indenture.

SECTION 2. That bonds authorized by said ordinance to the amount of Thirty Three Million Nine Hundred Fifty Thousand Dollars ($33,950,000.00) of the following numbers shall bear interest at the following rates:

Bond Numbers	Maturity Date	Interest Rate
1 to 750	1944	3%
776 to 1550	1945	3%
1576 to 2375	1946	3%
2401 to 3225	1947	3%
3251 to 4100	1948	3%
4126 to 5000	1949	3%
5026 to 5925	1950	3%
5951 to 6875	1951	3%
6906 to 7860	1952	3%
7891 to 8870	1953	3%
8901 to 9910	1954	3%
9941 to 10980	1955	2¾%
11011 to 12080	1956	2¾%
12116 to 13215	1957	2¾%
13256 to 14390	1958	2¾%
14426 to 15595	1959	2½%
15631 to 16835	1960	2½%
16871 to 18110	1961	2¾%
18151 to 19425	1962	2¾%
19466 to 20780	1963	2¾%
20821 to 22175	1964	2¾%
22216 to 23610	1965	3%

34945
33231
1715

Bond Numbers	Maturity Date	Interest Rate
23656 to 25090	1966	3%
25136 to 26615	1967	3%
26661 to 28185	1968	3%
28231 to 29800	1969	3%
29851 to 31465	1970	3%
31516 to 33180	1971	3%
33231 to 34945	1972	2½%

SECTION 3. That the sale of the bonds described in Section 2 hereof to A. C. Allyn and Company, of Chicago, Illinois, and associates, at the price of par and accrued interest to the date of delivery, plus a premium of Three Thousand One Hundred Fifty-seven Dollars ($3,157.00) is hereby ratified and confirmed and said bonds shall be delivered to said purchasers in accordance with the terms of sale and the provisions of the above described ordinance.

SECTION 4. That the printed copy of the ordinance described in the preamble hereto which is attached hereto and marked "Exhibit A," and which copy contains the corrections described in the preamble hereto and contains the change authorized in Section 1 hereof, is hereby approved and ratified and declared to be fully effective, all with like force and effect as though said copy were herein set out in full, and the action of the Mayor and Clerk of the City of San Antonio in executing the indenture in the form set out in said "Exhibit A" is hereby confirmed, ratified and approved.

SECTION 5. That two variations which appear in the above described bonds as they have been printed and executed and which variations were made in order to make more certain the original intention of the above described ordinance, which changes consist of the insertion of the parenthetical expression "except as otherwise provided in the above mentioned indenture" after the word "solely" in the third paragraph of the bond, and substitution of the words "Bonds numbered 3251 to 35000" for the words "The Bonds" in the first line of paragraph 5 of the bond, are hereby ratified and approved.

SECTION 6. That if any section, provision, or part hereof shall be held to be invalid or ineffective for any reason, the remainder hereof shall, nevertheless, remain in full force and effect.

SECTION 7. That by reason of the fact that the sale of the bonds authorized by the above mentioned ordinance is effective only until October 24, 1942, and that the purchasers of said bonds can be compelled to take delivery of said bonds only if the bonds are delivered on or prior to that date, and that the Commissioners are of the opinion that it would be impossible to find other purchasers for said bonds at the very favorable interest rates which are specified in the existing sales contract, it is necessary to the immediate preservation of the public peace, health and safety of the City of San Antonio that this ordinance shall become effective immediately upon its passage and approval and it is so ordained.

ADOPTED AND APPROVED October 23rd, 1942.

C. K. QUIN
Mayor

ATTEST:
J. M. WOODS,
City Clerk

AMENDMENT OF OCTOBER 23, 1942

The form of indenture set out in the Ordinance of July 25, 1942, has in this printed copy been conformed to the amendments provided for in the foregoing ordinance of October 23, 1942, and the indenture, as printed herein, has been conformed to show its execution.

CERTIFICATION

THE STATE OF TEXAS
COUNTY OF BEXAR
CITY OF SAN ANTONIO.

I, J. M. Woods, City Clerk of the City of San Antonio in the State and County aforesaid, do hereby certify that the "Ordinance and Indenture, Authorizing Issuance of City of San Antonio Electric and Gas Revenue Bonds, in the sum of $35,000,000, San Antonio, Texas, July 25, 1942" and "Amendment of October 23, 1942, is a true and correct copy of papers, books and records of the City of San Antonio.

And that I am the lawful possessor and custodian of such papers, books and records.

GIVEN under my hand and seal of the City of San Antonio, this .... day of ...., A. D. 19.........

J. M. WOODS,
City Clerk.

(SEAL)

Attachment 23   Core Data Form

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (*If other is checked please describe in space provided.)*

☒ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.)*

☐ Renewal (*Core Data Form should be submitted with the renewal form)* ☐ Other

2. Customer Reference Number *(if issued)*

CN **603174244**

Follow this link to search for CN or RN numbers in Central Registry**

3. Regulated Entity Reference Number *(if issued)*

RN **100217975**

SECTION II: Customer Information

4. General Customer Information

5. Effective Date for Customer Information Updates (mm/dd/yyyy) 1/15/2022

☐ New Customer ☒ Update to Customer Information ☐ Change in Regulated Entity Ownership

☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)*

City Public Service of San Antonio

If new Customer, enter previous Customer below:

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*
	17460020716	746002071	

11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☐ Limited

Government: ☒ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☒ Other: Municipally Owned

12. Number of Employees

☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☒ 501 and higher

13. Independently Owned and Operated?

☒ Yes ☐ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

☐ Owner ☐ Operator ☒ Owner & Operator

☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:

PO Box 1771

City San Antonio State TX ZIP 78296 ZIP + 4

16. Country Mailing Information *(if outside USA)*

17. E-Mail Address *(if applicable)*

lesimmons@cpsenergy.com

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
(210) 353-5868		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☒ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

23. Street Address of the Regulated Entity: *(No PO Boxes)*	12940 US HWY 181 SOUTH						
	City	SanAntonio	State	TX	ZIP	78223	ZIP + 4
24. County	Bexar						

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	

26. Nearest City	State	Nearest ZIP Code
Elmendorf	TX	78112

27. Latitude (N) In Decimal:	29.308727		28. Longitude (W) In Decimal:	-98.321996	
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
29	18	31.53	98	19	19.12

29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)	31. Primary NAICS Code (5 or 6 digits)	32. Secondary NAICS Code (5 or 6 digits)
4911	4931	22111	2211

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

Electric Generation

34. Mailing Address:	PO Box 1771						
	City	San Antonio	State	TX	ZIP	78296	ZIP + 4
35. E-Mail Address:	lesimmons@cpsenergy.com						

36. Telephone Number	37. Extension or Code	38. Fax Number *(if applicable)*
(210) 353-5868		( ) -

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☒ Industrial Hazardous Waste
				31445
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☒ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
	TXR1599IX			
☐ Voluntary Cleanup	☒ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:
	WQ0001514000			

SECTION IV: Preparer Information

40. Name:	Lance Simmons	41. Title:	Environmental Analyst
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(210) 353-5868		( ) -	Lesimmons@cpsenergy.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	CPS Energy	Job Title:	Director Environmental Planning and Compliance
Name *(In Print)*:	Gregg Tieken	Phone:	(210) 353- 2158
Signature:		Date:	November 15, 2022

Attachment 24   TCEQ ePay Receipt

Your transaction is complete. Thank you for using TCEQ ePay.

Note: It may take up to 3 working days for this electronic payment to be processed and be reflected in the TCEQ ePay system. Print this receipt and the vouchers for your records. An email receipt has also been sent.

Transaction Information

Trace Number: 582EA000470805
Date: 01/19/2022 09:13 PM
Payment Method: CC - Authorization 0000019615
ePay Actor: WALLY ZVERINA
Actor Email: wally.zverina@erm.com
IP: 165.225.217.47
TCEQ Amount: $150.00
Texas.gov Price: $153.64*

* This service is provided by Texas.gov, the official website of Texas. The price of this service includes funds that support the ongoing operations and enhancements of Texas.gov, which is provided by a third party in partnership with the State.

Payment Contact Information

Name: WALTER ZVERINA
Company: ENVIRONMENTAL RESOURCES MANAGEMENT
Address: 111 CONGRESS AVENUE SUITE 500, AUSTIN, TX 78701
Phone: 512-994-7094

Cart Items

Click on the voucher number to see the voucher details.

Voucher	Fee Description	AR Number	Amount
554747	COAL COMBUSTION RESIDUALS-NEW OR AMENDMENT		$100.00
554748	30 TAC 305.53B CCR NOTIFICATION FEE		$50.00
		TCEQ Amount:	$150.00

ePay Again Exit ePay

Note: It may take up to 3 working days for this electronic payment to be processed and be reflected in the TCEQ ePay system. Print this receipt for your records.

Attachment 25 Laboratory Analytical Reports from 2020 *Annual Groundwater Monitoring and Corrective Action Reports*

Attachment 25-1

SAN ANTONIO
TESTING LABORATORY

May 13, 2020

Chelsey Vasbinder
CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio, TX 78296-1771

SATL Report No.: 2004454
RE: Calaveras Power Station- CCR Units FlyAsh Landfill

Dear Chelsey Vasbinder

SATL received 11 Sample(s) on 04/30/2020 as identified on the chain of custody. Analyses were performed only on the samples marked on the chain of custody using methods indicated on the laboratory report. Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Sincerely,

For San Antonio Testing Laboratory, Inc.

Richard Hawk

Richard Hawk,
General Manager

Appendix A Laboratory Data Package Cover Page

This data package consists of:

☑ This signature page, the laboratory review checklist, and the following reportable data:

☑ R1 Field chain-of-custody documentation;

☑ R2 Sample identification cross-reference;

☑ R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC 5.13 or ISO/IEC 17025 Section 5.10
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).

☑ R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.

☑ R5 Test reports/summary forms for blank samples;

☑ R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.

☑ R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits

☑ R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) the amount of analyte measured in the duplicate,
  b) the calculated RPD, and
  c) the laboratory's QC limits for analytical duplicates.

☑ R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

☑ R10 Other problems or anomalies.

☑ The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By me signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Aimee Landon For Marcela Gracia Hawk, President

Richard Hawk

Richard Hawk, General Manager

05/13/20 15:38
Date/Time

Project Name: Calaveras Power Station- CCR Units FlyAsh Landfill
Reviewer Name: ME
Laboratory Job Number: 2004454
Matrix : Liquid

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	05/13/20
Project Name:	Calaveras Power Station- CCR Units FlyAsh Lar	Laboratory Job Number:	2004454
Reviewer Name:	ME	Prep Batch Number(s):	B019176,B019198,B019204,B020136

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1		**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2		**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3		**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample quantitation limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?			X		
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		If required for the project, TICs reported?			X		
R4		**Surrogate recovery data**					
		Were surrogates added prior to extraction?			X		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			X		
R5		**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6		**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7		**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?		X			S001
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?			X		
R8		**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?		X			S002
R9		**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs included in the laboratory data package?	X				
R10		**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Appendix A (cont’d): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	05/13/20
Project Name:	Calaveras Power Station- CCR Units FlyAsh Lar	Laboratory Job Number:	2004454
Reviewer Name:	ME	Prep Batch Number(s):	B019176,B019198,B019204,B020136

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1		**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2		**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3		**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4		**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5		**Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?			X		
S6		**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7		**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8		**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?	X				
S9		**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	X				
S10		**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11		**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12		**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13		**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14		**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst’s competency up-to-date and on file?	X				
S15		**Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16		**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

1. Items identified by the letter “R” must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter “S” should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if “NR” or “No” is checked).

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Exception Reports

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	05/13/20
Project Name:	Calaveras Power Station- CCR Units FlyAsh Lar	Laboratory Job Number:	2004454
Reviewer Name:	ME	Prep Batch Number(s):	B019176,B019198,B019204,B020136

ER#[1]	Description
S001	Field duplicates (analytical duplicates) were analyzed in lieu of MS/MSD.
S002	RPD values above the acceptance limits are flagged on the analytical report.

1. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked on the LRC)

RG-366/TRRP-13 December 2002

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Notes:

Report No. 2004454

SAMPLE SUMMARY

Total Samples received in this work order: **11**

Sample ID	Laboratory ID	Matrix	Sampling Method	Date Sampled	Date Received
JKS-31	2004454-01	Liquid	Grab	04/28/20 14:22	04/30/20 14:31
JKS-33	2004454-02	Liquid	Grab	04/28/20 14:58	04/30/20 14:31
JKS-45	2004454-03	Liquid	Grab	04/28/20 09:32	04/30/20 14:31
JKS-46	2004454-04	Liquid	Grab	04/28/20 11:42	04/30/20 14:31
JKS-57	2004454-05	Liquid	Grab	04/28/20 10:18	04/30/20 14:31
JKS-58	2004454-06	Liquid	Grab	04/28/20 11:07	04/30/20 14:31
JKS-59	2004454-07	Liquid	Grab	04/28/20 13:02	04/30/20 14:31
JKS-60	2004454-08	Liquid	Grab	04/28/20 13:37	04/30/20 14:31
Fly Ash Field Dup	2004454-09	Liquid	Grab	04/28/20 12:00	04/30/20 14:31
Fly Ash Field Blank	2004454-10	Liquid	Grab	04/28/20 11:34	04/30/20 14:31
Equipment Blank	2004454-11	Liquid	Grab	04/29/20 14:25	04/30/20 14:31

Notes

All quality control samples and checks are within acceptance limits unless otherwise indciated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: JKS-31 **Sampling Method: Grab** **Lab Sample ID #: 2004454-01**

Sample Matrix: Liquid **Date/Time Collected: 04/28/20 14:22**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B020136*							
Total Dissolved Solids *	1890	7.14		2.50	7.14	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019198*							
Chloride *	272	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Fluoride *	1.00	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	877	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Total Metals				***Batch ID >*** *B019204*							
Boron *	0.429	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	171	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: JKS-33 **Sampling Method: Grab** **Lab Sample ID #: 2004454-02**

Sample Matrix: Liquid **Date/Time Collected: 04/28/20 14:58**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B020136*							
Total Dissolved Solids *	4370	16.7		2.50	16.7	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019198*							
Chloride *	756	10.0		0.052	5.19	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Fluoride *	1.68	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	1620	10.0		0.06	5.59	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Total Metals				***Batch ID >*** *B019204*							
Boron *	1.18	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	573	10.0		0.009	0.091	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: JKS-45
Sampling Method: Grab
Lab Sample ID #: 2004454-03
Sample Matrix: Liquid
Date/Time Collected: 04/28/20 09:32

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B020136*							
Total Dissolved Solids *	1590	5.56		2.50	5.56	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019198*							
Chloride *	113	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Fluoride *	0.100	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	619	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Total Metals				***Batch ID >*** *B019204*							
Boron *	3.01	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	141	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: JKS-46
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 04/28/20 11:42

Lab Sample ID #: 2004454-04

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B020136*							
Total Dissolved Solids *	1970	6.25		2.50	6.25	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019198*							
Chloride *	17.9	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Fluoride *	1.61	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	1180	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Total Metals				***Batch ID >*** *B019204*							
Boron *	0.864	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	143	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: JKS-57
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 04/28/20 10:18

Lab Sample ID #: 2004454-05

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B020136*							
Total Dissolved Solids *	15100	50.0		2.50	50.0	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019198*							
Chloride *	3460	25.0		0.052	13.0	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Fluoride *	4.17	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	6510	25.0		0.06	14.0	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Total Metals				***Batch ID >*** *B019204*							
Boron *	5.97	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	622	10.0		0.009	0.091	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: JKS-58 **Sampling Method: Grab** **Lab Sample ID #: 2004454-06**

Sample Matrix: Liquid **Date/Time Collected: 04/28/20 11:07**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B020136*							
Total Dissolved Solids *	3480	12.5		2.50	12.5	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019198*							
Chloride *	479	10.0		0.052	5.19	mg/L	EPA 300.0	EPA 300.0	05/07/20	JL	
Fluoride *	1.31	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	822	10.0		0.06	5.59	mg/L	EPA 300.0	EPA 300.0	05/07/20	JL	
Total Metals				***Batch ID >*** *B019204*							
Boron *	0.566	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	456	10.0		0.009	0.091	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: JKS-59
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 04/28/20 13:02

Lab Sample ID #: 2004454-07

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry			***Batch ID >*** *B020136*								
Total Dissolved Solids *	1760	6.25		2.50	6.25	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography			***Batch ID >*** *B019198*								
Chloride *	95.1	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/07/20	JL	
Fluoride *	0.830	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	478	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/07/20	JL	
Total Metals			***Batch ID >*** *B019204*								
Boron *	0.394	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	254	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

LABORATORY REPORT

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: JKS-60
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 04/28/20 13:37

Lab Sample ID #: 2004454-08

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B020136*							
Total Dissolved Solids *	3180	10.0		2.50	10.0	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019198*							
Chloride *	168	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/07/20	JL	
Fluoride *	0.188	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	1280	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/07/20	JL	
Total Metals				***Batch ID >*** *B019204*							
Boron *	0.325	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	530	10.0		0.009	0.091	mg/L	EPA 200.7	EPA 200.7	05/08/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: Fly Ash Field Dup **Sampling Method: Grab** **Lab Sample ID #: 2004454-09**

Sample Matrix: Liquid **Date/Time Collected: 04/28/20 12:00**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B020136*							
Total Dissolved Solids *	1780	6.25		2.50	6.25	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019198*							
Chloride *	19.2	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/07/20	JL	
Fluoride *	2.44	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	1240	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/07/20	JL	
Total Metals				***Batch ID >*** *B019204*							
Boron *	0.806	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	133	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Notes:

Report No. 2004454

Sample ID #: Fly Ash Field Blank
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 04/28/20 11:34

Lab Sample ID #: 2004454-10

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry			***Batch ID >*** *B020136*								
Total Dissolved Solids *	< 2.50	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography			***Batch ID >*** *B019198*								
Chloride *	0.152	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	0.20	0.10		0.06	0.06	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Total Metals			***Batch ID >*** *B019204*								
Boron *	0.017	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	0.023	1.00	J	0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

LABORATORY REPORT

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Sample ID #: Equipment Blank **Sampling Method: Grab** **Lab Sample ID #: 2004454-11**

Sample Matrix: Liquid **Date/Time Collected: 04/29/20 14:25**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry			***Batch ID >*** *B020136*								
Total Dissolved Solids *	< 2.50	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography			***Batch ID >*** *B019198*								
Chloride *	0.158	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Sulfate *	0.10	0.10	J	0.06	0.06	mg/L	EPA 300.0	EPA 300.0	05/06/20	JL	
Total Metals			***Batch ID >*** *B019204*								
Boron *	0.016	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	0.023	1.00	J	0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B020136 - SM2540C									
Blank (B020136-BLK1)				Prepared: 05/04/20 17:03 Analyzed: 05/05/20 08:30					
Total Dissolved Solids	<2.50	2.50	mg/L				–		
LCS (B020136-BS1)				Prepared: 05/04/20 17:03 Analyzed: 05/05/20 08:30					
Total Dissolved Solids	95.0	2.50	mg/L	100		95	80– 120		
LCS Dup (B020136-BSD1)				Prepared: 05/04/20 17:03 Analyzed: 05/05/20 08:30					
Total Dissolved Solids	115	2.50	mg/L	100		115	80– 120	19	20
Duplicate (B020136-DUP1)		**Source: 2004454-02**		Prepared: 05/04/20 17:03 Analyzed: 05/05/20 08:30					
Total Dissolved Solids	4300	16.7	mg/L		4370		–	2	20
Duplicate (B020136-DUP2)		**Source: 2004454-05**		Prepared: 05/04/20 17:03 Analyzed: 05/05/20 08:30					
Total Dissolved Solids	15000	50.0	mg/L		15100		–	0.4	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B019176 - EPA 300.0									
Blank (B019176-BLK1)				Prepared: 05/05/20 17:00	Analyzed: 05/05/20 17:06				
Fluoride	<0.020	0.020	mg/L				–		
LCS (B019176-BS1)				Prepared: 05/05/20 17:00	Analyzed: 05/05/20 17:24				
Fluoride	1.08	0.020	mg/L	1.00		108	90– 110		
LCS Dup (B019176-BSD1)				Prepared: 05/05/20 17:00	Analyzed: 05/05/20 17:41				
Fluoride	1.07	0.020	mg/L	1.00		107	90– 110	0.4	20
Duplicate (B019176-DUP1)		**Source: 2004454-01**		Prepared: 05/05/20 17:00	Analyzed: 05/05/20 23:57				
Fluoride	0.923	0.020	mg/L		1.00		–	8	20
Duplicate (B019176-DUP2)		**Source: 2004454-11**		Prepared: 05/05/20 17:00	Analyzed: 05/06/20 03:49				
Fluoride	<0.020	0.020	mg/L		<0.020		–		20
Matrix Spike (B019176-MS1)		**Source: 2004454-01**		Prepared: 05/05/20 17:00	Analyzed: 05/06/20 00:14				
Fluoride	2.08	0.020	mg/L	1.00	1.00	108	90– 110		
Matrix Spike (B019176-MS2)		**Source: 2004454-11**		Prepared: 05/05/20 17:00	Analyzed: 05/06/20 04:07				
Fluoride	1.08	0.020	mg/L	1.00	<0.020	108	90– 110		
Batch B019198 - EPA 300.0									
Blank (B019198-BLK1)				Prepared: 05/06/20 17:00	Analyzed: 05/06/20 18:35				
Chloride	<0.100	0.100	mg/L				–		
Sulfate	<0.10	0.10	mg/L				–		
LCS (B019198-BS1)				Prepared: 05/06/20 17:00	Analyzed: 05/06/20 18:53				
Chloride	4.91	0.100	mg/L	5.00		98	90– 110		
Sulfate	5.06	0.10	mg/L	5.00		101	90– 110		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Report No. 2004454

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B019198 - EPA 300.0									
LCS Dup (B019198-BSD1)				Prepared: 05/06/20 17:00 Analyzed: 05/06/20 19:10					
Chloride	4.92	0.100	mg/L	5.00		98	90-110	0.2	20
Sulfate	5.06	0.10	mg/L	5.00		101	90-110	0.01	20
Duplicate (B019198-DUP1)		**Source: 2004454-01**		Prepared: 05/06/20 17:00 Analyzed: 05/06/20 22:45					
Chloride	272	5.00	mg/L		272		–	0.09	20
Sulfate	893	5.00	mg/L		877		–	2	20
Duplicate (B019198-DUP2)		**Source: 2004454-11**		Prepared: 05/05/20 17:00 Analyzed: 05/06/20 03:49					
Chloride	0.138	0.100	mg/L		0.158		–	14	20
Sulfate	0.0902	0.10	mg/L		0.0987		–	9	20
Matrix Spike (B019198-MS2)		**Source: 2004454-11**		Prepared: 05/05/20 17:00 Analyzed: 05/06/20 04:07					
Chloride	4.85	0.100	mg/L	5.00	0.158	94	80-120		
Sulfate	4.92	0.10	mg/L	5.00	0.0987	97	90-110		

Total Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B019204 - EPA 200.7										
Blank (B019204-BLK1)				Prepared: 05/07/20 10:00 Analyzed: 05/07/20 17:55						
Boron	<0.010	0.010	mg/L				–			
Calcium	<1.00	1.00	mg/L				–			
LCS (B019204-BS1)				Prepared: 05/07/20 10:00 Analyzed: 05/07/20 18:00						
Boron	2.02	0.010	mg/L	2.00		101	85– 115			
Calcium	1.98	1.00	mg/L	2.00		99	85– 115			
LCS Dup (B019204-BSD1)				Prepared: 05/07/20 10:00 Analyzed: 05/07/20 18:05						
Boron	1.99	0.010	mg/L	2.00		100	85– 115	1	20	
Calcium	1.98	1.00	mg/L	2.00		99	85– 115	0.3	20	
Duplicate (B019204-DUP1)		**Source: 2004454-01**		Prepared: 05/07/20 10:00 Analyzed: 05/07/20 18:16						
Boron	0.429	0.010	mg/L		0.429		–	0.05	20	
Calcium	172	1.00	mg/L		171		–	0.6	20	
Duplicate (B019204-DUP2)		**Source: 2004454-11**		Prepared: 05/07/20 10:00 Analyzed: 05/07/20 19:37						
Boron	0.0160	0.010	mg/L		0.0157		–	2	20	
Calcium	0.0358	1.00	mg/L		0.0233		–	42	20	S
Matrix Spike (B019204-MS1)		**Source: 2004454-01**		Prepared: 05/07/20 10:00 Analyzed: 05/07/20 18:21						
Boron	2.46	0.010	mg/L	2.00	0.429	101	75– 125			
Calcium	172	1.00	mg/L	2.00	171	75	75– 125			
Matrix Spike (B019204-MS2)		**Source: 2004454-11**		Prepared: 05/07/20 10:00 Analyzed: 05/07/20 19:42						
Boron	1.99	0.010	mg/L	2.00	0.0157	99	75– 125			
Calcium	1.94	1.00	mg/L	2.00	0.0233	96	75– 125			

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Notes:

Report No. 2004454

DEFINITIONS

*	TNI / NELAC accredited analyte
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
ND	This qualifier indicates that the analyte was analyzed but not detected above the MDL
J	This qualifier indicates that the analyte is an estimate value between MQL and MDL
SQL	Sample Quantitation Limit
MQL	Method Quantitation Limit
MDL	Method Detection Limit
L	LCS/LCSD recovery is outside QC limits, the results may have a slight bias.
M	MS/MSD recovery is outside QC limits due to possible matrix interferences, results may have a slight bias .
S	RPD is outside QC limits.
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)
HT	Sample received past holdtime
IC	Improper Container
IT	Improper Temperature
V	Insufficient Volume
B	Sample collected in Bulk
AB	VOA Vial contained air bubbles.
OP	ortho-Phosphate was not filtered in the field within 15minutes of collection.
CCV	Continuing Calibration Verification Standard.
ICV	Initial Calibration Verification Standard.
Surr L	Surrogate recovery is low outside QC limits due to possible sample matrix interferences.
Surr H	Surrogate recovery is high outside QC limits due to possible sample matrix interferences.

Test Methods followed by the laboratory are referenced in the following approved methodology, unless otherwise specified.

Standard Methods for the Examination of Water and Wastewater, 21st Edition 2005
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/13/20 15:38
Received:
04/30/20 14:31

Notes:

Report No. 2004454

Aimee Landon For Marcela Gracia Hawk, President For

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Richard Hawk

Richard Hawk, General Manager

EnviroChain® By Promium

2004454

Submission key H119-PBF-183U	NOT SUBMITTED	Page 1/2

Client Information	Project Information	Laboratory Information	COC Information
CPS Energy - Environmental Dept. P.O. Box 1771 San Antonio TX 78296-1771 Phone: (210) 353-4719 Fax: (210) 353-4271	Calaveras Power Station- CCR Units FlyAsh Landfill Number: [none] Sample count: 11 TAT: 7	San Antonio Testing Laboratory 1610 S. Laredo St San Antonio TX 78207 Phone: 210-229-9920 Fax: 210-229-9921	Shipped via: Walk-in

		Analyses	Containers
#1	JKS-31 04/28/2020 14:22 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#2	JKS-33 04/28/2020 14:58 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#3	JKS-45 04/28/2020 09:32 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#4	JKS-46 04/28/2020 11:42 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#5	JKS-57 04/28/2020 10:18 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#6	JKS-58 04/28/2020 11:07 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#7	JKS-59 04/28/2020 13:02 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#8	JKS-60 04/28/2020 13:37 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#9	Fly Ash Field Dup	Analyses	Containers

EnviroChain® By Promium TRPP 2004454

Submission key H119-PBF-183U	NOT SUBMITTED	Page 2/2

	04/28/2020 12:00 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#10	Fly Ash Field Blank 04/28/2020 11:34 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#11	Equipment Blank 04/29/2020 14:25 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)

3.9°C T6#7 Iced

Relinquished by	Date/Time	Accepted by	Date/Time
	4.30.20/1400	Rhames Penrod	4-30-20 202 pm
Rhames Penrod	4-30-20 231 pm	APR 3 0 2020	1431

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: CPS
Report Number: 2004454
Project Name:
Date Received: 4/30/20
Shipped via: ☐FedEx ☐UPS ☐Lonestar ☐Hand Delivered ☐DHL ☒SATL ☐Other
Date Due: 5/14/20
Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No	✓	NA		If NA–reason:	
2. Custody Seals intact?	Yes		No		NA	✓	If NA–reason:	
3. Air Bill included in folder, if received?	Yes		No		NA	✓	If NA–reason:	
4. Is COC included with samples?	Yes	✓	No		NA		If NA–reason:	
5. Is COC signed and dated by client?	Yes	✓	No		NA		If NA–reason:	
6. Sample temperature: Thermal preservation between >0° - 6°C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	✓	No		NA		Temp: 3.9 °C	
7. Samples received with ice ☒ ice packs ☐ other cooling ☐	Yes	✓	No		NA		If NA–reason:	
8. Is the COC filled out correctly, and completely?	Yes	✓	No		NA		If NA–reason:	
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:	
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:	
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:	
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:	
13. Proper sample containers used?	Yes	✓	No		NA		If NA–reason:	
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:	
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No		NA	✓	If NA–reason:	no VOAs
16. Preservative for THMs only ($Na_2S_2O_3$)	Yes		No		NA	✓	If NA–reason:	no thms
17. Sample volume sufficient for requested analysis?	Yes	✓	No		NA		If NA–reason:	
18. Sample amount sufficient for TCLP analysis?	Yes		No		N/A	✓	If NA- reason	no tclp
19. Subcontracted Samples: [if Yes, complete the next section]	Yes		No	✓	NA		If NA–reason:	

Analyses Subcontracted Out: No. of Samples
Samples sent to: Sent By:
Date samples sent: Samples shipped via:
TAT Requested:
Tracking number [if any]:
Comments:

Received By: Date: 4/30/20
Labeled By: Date:
Logged into LIMS By: Date:
Logged into RF By: Date:

Q:\Controlled Documents\Forms\Login\Sample Receipt Checklist Form Rev 02052019.doc

SATL#FO001
Revised 02/05/19

Attachment 25-2

SAN ANTONIO
TESTING LABORATORY

May 11, 2020

Chelsey Vasbinder
CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio, TX 78296-1771

SATL Report No.: 2004452
RE: Calaveras Power Station-CCR Units Evaporation Pond

Dear Chelsey Vasbinder

SATL received 8 Sample(s) on 04/30/2020 as identified on the chain of custody. Analyses were performed only on the samples marked on the chain of custody using methods indicated on the laboratory report. Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Sincerely,

For San Antonio Testing Laboratory, Inc.

Richard Hawk

Richard Hawk,
General Manager

Appendix A Laboratory Data Package Cover Page

This data package consists of:

☑ This signature page, the laboratory review checklist, and the following reportable data:

☑ R1 Field chain-of-custody documentation;

☑ R2 Sample identification cross-reference;

☑ R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC 5.13 or ISO/IEC 17025 Section 5.10
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).

☑ R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.

☑ R5 Test reports/summary forms for blank samples;

☑ R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.

☑ R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits

☑ R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) the amount of analyte measured in the duplicate,
  b) the calculated RPD, and
  c) the laboratory's QC limits for analytical duplicates.

☑ R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

☑ R10 Other problems or anomalies.

☑ The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By me signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Sandra Felix For Marcela Gracia Hawk, President

Richard Hawk

Richard Hawk, General Manager

05/11/20 17:07
Date/Time

Project Name: Calaveras Power Station-CCR Units Evaporation Pond
Reviewer Name: ME
Laboratory Job Number: 2004452
Matrix : Liquid

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	05/11/20
Project Name:	Calaveras Power Station-CCR Units Evaporation	Laboratory Job Number:	2004452
Reviewer Name:	ME	Prep Batch Number(s):	B019119,B019148,B019151,B019242

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1		**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2		**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3		**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample quantitation limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?			X		
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		If required for the project, TICs reported?			X		
R4		**Surrogate recovery data**					
		Were surrogates added prior to extraction?			X		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			X		
R5		**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6		**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7		**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?		X			S001
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?			X		
R8		**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9		**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs included in the laboratory data package?	X				
R10		**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

RG-366/TRRP-13 December 2002

Appendix A (cont’d): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	05/11/20
Project Name:	Calaveras Power Station-CCR Units Evaporation	Laboratory Job Number:	2004452
Reviewer Name:	ME	Prep Batch Number(s):	B019119,B019148,B019151,B019242

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1		**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2		**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3		**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4		**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5		**Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?			X		
S6		**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7		**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8		**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?	X				
S9		**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	X				
S10		**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11		**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12		**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13		**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14		**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst’s competency up-to-date and on file?	X				
S15		**Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16		**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

1. Items identified by the letter “R” must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter “S” should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if “NR” or “No” is checked).

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Exception Reports

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	05/11/20
Project Name:	Calaveras Power Station-CCR Units Evaporation	Laboratory Job Number:	2004452
Reviewer Name:	ME	Prep Batch Number(s):	B019119,B019148,B019151,B019242

ER#[1]	**Description**
S001	Field duplicates (analytical duplicates) were analyzed in lieu of MS/MSD

1. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked on the LRC)

RG-366/TRRP-13 December 2002

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

SAMPLE SUMMARY

Total Samples received in this work order: **8**

Sample ID	Laboratory ID	Matrix	Sampling Method	Date Sampled	Date Received
JKS-36	2004452-01	Liquid	Grab	04/29/20 09:46	04/30/20 14:31
JKS-47	2004452-02	Liquid	Grab	04/29/20 11:39	04/30/20 14:31
JKS-61	2004452-03	Liquid	Grab	04/29/20 08:16	04/30/20 14:31
JKS-62	2004452-04	Liquid	Grab	04/29/20 09:08	04/30/20 14:31
JKS-63R	2004452-05	Liquid	Grab	04/29/20 10:53	04/30/20 14:31
JKS-64	2004452-06	Liquid	Grab	04/29/20 12:33	04/30/20 14:31
EP Field Dup	2004452-07	Liquid	Grab	04/29/20 09:00	04/30/20 14:31
EP Field Blank	2004452-08	Liquid	Grab	04/29/20 09:00	04/30/20 14:31

Notes

All quality control samples and checks are within acceptance limits unless otherwise indciated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Sample ID #: JKS-36 **Sampling Method: Grab** **Lab Sample ID #: 2004452-01**

Sample Matrix: Liquid **Date/Time Collected: 04/29/20 09:46**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1790	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019151*							
Chloride *	63.3	1.00		0.052	0.519	mg/L	EPA 300.0	EPA 300.0	05/04/20	JL	
Fluoride *	1.18	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Sulfate *	189	1.00		0.06	0.56	mg/L	EPA 300.0	EPA 300.0	05/04/20	JL	
Total Metals				***Batch ID >*** *B019148*							
Boron *	0.459	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	
Calcium *	175	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Sample ID #: JKS-47
Sampling Method: Grab
Lab Sample ID #: 2004452-02
Sample Matrix: Liquid
Date/Time Collected: 04/29/20 11:39

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	772	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019151*							
Chloride *	107	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.163	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Sulfate *	257	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019148*							
Boron *	0.800	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	
Calcium *	43.1	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Sample ID #: JKS-61 **Sampling Method: Grab** **Lab Sample ID #: 2004452-03**

Sample Matrix: Liquid **Date/Time Collected: 04/29/20 08:16**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1870	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019151*							
Chloride *	312	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.494	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Sulfate *	604	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019148*							
Boron *	1.82	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	
Calcium *	154	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Notes:

Report No. 2004452

Sample ID #: JKS-62

Sampling Method: Grab

Lab Sample ID #: 2004452-04

Sample Matrix: Liquid

Date/Time Collected: 04/29/20 09:08

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1100	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019151*							
Chloride *	284	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.331	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Sulfate *	190	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019148*							
Boron *	0.484	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	
Calcium *	122	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Sample ID #: JKS-63R
Sample Matrix: Liquid
Sampling Method: Grab
Date/Time Collected: 04/29/20 10:53
Lab Sample ID #: 2004452-05

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	7240	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019151*							
Chloride *	2530	25.0		0.052	13.0	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Sulfate *	1810	25.0		0.06	14.0	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019148*							
Boron *	0.950	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	
Calcium *	952	10.0		0.009	0.091	mg/L	EPA 200.7	EPA 200.7	05/06/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Sample ID #: JKS-64
Sampling Method: Grab
Lab Sample ID #: 2004452-06
Sample Matrix: Liquid
Date/Time Collected: 04/29/20 12:33

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	569	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019151*							
Chloride *	18.2	1.00		0.052	0.519	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.143	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Sulfate *	209	1.00		0.06	0.56	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019148*							
Boron *	0.711	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	
Calcium *	20.3	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Sample ID #: EP Field Dup
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 04/29/20 09:00

Lab Sample ID #: 2004452-07

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1870	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019151*							
Chloride *	317	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.549	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Sulfate *	608	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019148*							
Boron *	1.85	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	
Calcium *	157	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Sample ID #: EP Field Blank
Sampling Method: Grab
Lab Sample ID #: 2004452-08
Sample Matrix: Liquid
Date/Time Collected: 04/29/20 09:00

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	< 2.50	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019151*							
Chloride *	0.148	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Sulfate *	0.12	0.10		0.06	0.06	mg/L	EPA 300.0	EPA 300.0	05/02/20	JL	
Total Metals				***Batch ID >*** *B019148*							
Boron *	0.014	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	
Calcium *	< 0.009	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/05/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B019242 - SM2540C									
Blank (B019242-BLK1)				Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	<2.50	2.50	mg/L				–		
LCS (B019242-BS1)				Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	87.0	2.50	mg/L	100		87	80– 120		
LCS Dup (B019242-BSD1)				Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	82.0	2.50	mg/L	100		82	80– 120	6	20
Duplicate (B019242-DUP1)		**Source: 2004452-01**		Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	1850	2.50	mg/L		1790		–	3	20
Duplicate (B019242-DUP2)		**Source: 2004452-03**		Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	2150	2.50	mg/L		1870		–	14	20
Duplicate (B019242-DUP3)		**Source: 2004453-04**		Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	1750	2.50	mg/L		1570		–	11	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B019119 - EPA 300.0									
Blank (B019119-BLK1)				Prepared: 05/01/20 17:00 Analyzed: 05/01/20 17:47					
Fluoride	<0.020	0.020	mg/L				–		
LCS (B019119-BS1)				Prepared: 05/01/20 17:00 Analyzed: 05/01/20 18:05					
Fluoride	1.07	0.020	mg/L	1.00		107	90–110		
LCS Dup (B019119-BSD1)				Prepared: 05/01/20 17:00 Analyzed: 05/01/20 18:23					
Fluoride	1.06	0.020	mg/L	1.00		106	90–110	1	20
Duplicate (B019119-DUP1)		**Source: 2004452-01**		Prepared: 05/01/20 17:00 Analyzed: 05/02/20 03:01					
Fluoride	1.19	0.020	mg/L		1.18		–	0.6	20
Matrix Spike (B019119-MS1)		**Source: 2004452-01**		Prepared: 05/01/20 17:00 Analyzed: 05/02/20 03:19					
Fluoride	2.22	0.020	mg/L	1.00	1.18	104	90–110		
Batch B019151 - EPA 300.0									
Blank (B019151-BLK1)				Prepared: 05/04/20 17:00 Analyzed: 05/04/20 22:57					
Chloride	<0.100	0.100	mg/L				–		
Sulfate	<0.10	0.10	mg/L				–		
LCS (B019151-BS1)				Prepared: 05/04/20 17:00 Analyzed: 05/04/20 23:15					
Chloride	4.91	0.100	mg/L	5.00		98	90–110		
Sulfate	5.03	0.10	mg/L	5.00		101	90–110		
LCS Dup (B019151-BSD1)				Prepared: 05/04/20 17:00 Analyzed: 05/04/20 23:33					
Chloride	4.93	0.100	mg/L	5.00		99	90–110	0.2	20
Sulfate	5.02	0.10	mg/L	5.00		100	90–110	0.07	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B019151 - EPA 300.0									
Duplicate (B019151-DUP1)		**Source: 2004452-01**	Prepared: 05/04/20 17:00 Analyzed: 05/05/20 00:09						
Chloride	63.2	1.00	mg/L		63.3		–	0.2	20
Sulfate	195	1.00	mg/L		189		–	3	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771
Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Report No. 2004452

Total Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B019148 - EPA 200.7									
Blank (B019148-BLK1)				Prepared: 05/05/20 09:00 Analyzed: 05/05/20 15:37					
Boron	<0.010	0.010	mg/L				–		
Calcium	<1.00	1.00	mg/L				–		
LCS (B019148-BS1)				Prepared: 05/05/20 09:00 Analyzed: 05/05/20 15:42					
Boron	1.87	0.010	mg/L	2.00		94	85-115		
Calcium	1.85	1.00	mg/L	2.00		93	85-115		
LCS Dup (B019148-BSD1)				Prepared: 05/05/20 09:00 Analyzed: 05/05/20 15:47					
Boron	1.90	0.010	mg/L	2.00		95	85-115	2	20
Calcium	1.87	1.00	mg/L	2.00		94	85-115	1	20
Duplicate (B019148-DUP1)		**Source: 2004455-01**		Prepared: 05/05/20 09:00 Analyzed: 05/05/20 16:14					
Boron	0.280	0.010	mg/L		0.278		–	0.4	20
Calcium	93.1	1.00	mg/L		92.1		–	1	20
Matrix Spike (B019148-MS1)		**Source: 2004455-01**		Prepared: 05/05/20 09:00 Analyzed: 05/05/20 16:19					
Boron	1.89	0.010	mg/L	2.00	0.278	81	75-125		
Calcium	94.2	1.00	mg/L	2.00	92.1	104	75-125		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Notes:

Report No. 2004452

DEFINITIONS

*	TNI / NELAC accredited analyte
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
ND	This qualifier indicates that the analyte was analyzed but not detected above the MDL
J	This qualifier indicates that the analyte is an estimate value between MQL and MDL
SQL	Sample Quantitation Limit
MQL	Method Quantitation Limit
MDL	Method Detection Limit
L	LCS/LCSD recovery is outside QC limits, the results may have a slight bias.
M	MS/MSD recovery is outside QC limits due to possible matrix interferences, results may have a slight bias .
S	RPD is outside QC limits.
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)
HT	Sample received past holdtime
IC	Improper Container
IT	Improper Temperature
V	Insufficient Volume
B	Sample collected in Bulk
AB	VOA Vial contained air bubbles.
OP	ortho-Phosphate was not filtered in the field within 15minutes of collection.
CCV	Continuing Calibration Verification Standard.
ICV	Initial Calibration Verification Standard.
Surr L	Surrogate recovery is low outside QC limits due to possible sample matrix interferences.
Surr H	Surrogate recovery is high outside QC limits due to possible sample matrix interferences.

Test Methods followed by the laboratory are referenced in the following approved methodology, unless otherwise specified.

Standard Methods for the Examination of Water and Wastewater, 21st Edition 2005
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:07
Received:
04/30/20 14:31

Notes:

Report No. 2004452

Sandra Felix For Marcela Gracia Hawk, President For

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Richard Hawk

Richard Hawk, General Manager

EnviroChain® By Promium TRRP 2004452

Submission key H119-PAH-638B	NOT SUBMITTED	Page 1/2

Client Information	Project Information	Laboratory Information	COC Information
CPS Energy - Environmental Dept. P.O. Box 1771 San Antonio TX 78296-1771 Phone: (210) 353-4719 Fax: (210) 353-4271	Calaveras Power Station-CCR Units Evaporation Pond Number: [none] Sample count: 8 TAT: 7	San Antonio Testing Laboratory 1610 S. Laredo St San Antonio TX 78207 Phone: 210-229-9920 Fax: 210-229-9921	Shipped via: Walk-in

#1	JKS-36 04/29/2020 09:46 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#2	JKS-47 04/29/2020 11:39 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#3	JKS-61 04/29/2020 08:16 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#4	JKS-62 04/29/2020 09:08 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#5	JKS-63R 04/29/2020 10:53 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#6	JKS-64 04/29/2020 12:33 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#7	EP Field Dup 04/29/2020 09:00 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#8	EP Field Blank 04/29/2020 09:00 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)

EnviroChain® By Promium TRRP 2004452

Submission key H119-PAH-638B	NOT SUBMITTED	Page 2/2

3.1°c Iced TG #7

Relinquished by	Date/Time	Accepted by	Date/Time
Patricia Hugar	4·30·20 / 1400	Penrod	4-30-20 2:00pm
Penrod	4-30-20 231pm	Amelandor	APR 30 2020 1431

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: CPS
Report Number: 2004452
Project Name:
Date Received: 4/30/20
Shipped via: ☐FedEx ☐UPS ☐Lonestar ☐Hand Delivered ☐DHL ☒SATL ☐Other
Date Due: 5/14/20
Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No	✓	NA		If NA–reason:	
2. Custody Seals intact?	Yes		No		NA	✓	If NA–reason:	
3. Air Bill included in folder, if received?	Yes		No		NA	✓	If NA–reason:	
4. Is COC included with samples?	Yes	✓	No		NA		If NA–reason:	
5. Is COC signed and dated by client?	Yes	✓	No		NA		If NA–reason:	
6. Sample temperature: Thermal preservation between >0° - 6°C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	✓	No		NA		Temp: 3.1 °C	
7. Samples received with ice ☒ ice packs ☐ other cooling ☐	Yes	✓	No		NA		If NA–reason:	
8. Is the COC filled out correctly, and completely?	Yes	✓	No		NA		If NA–reason:	
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:	
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:	
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:	
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:	
13. Proper sample containers used?	Yes	✓	No		NA		If NA–reason:	
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:	
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No		NA	✓	If NA–reason:	no voas
16. Preservative for THMs only ($Na_2S_2O_3$)	Yes		No		NA	✓	If NA–reason:	no thms
17. Sample volume sufficient for requested analysis?	Yes	✓	No		NA		If NA–reason:	
18. Sample amount sufficient for TCLP analysis?	Yes		No		N/A	✓	If NA- reason	no tclp
19. Subcontracted Samples: [if Yes, complete the next section]	Yes		No	✓	NA		If NA–reason:	

Analyses Subcontracted Out:
No. of Samples
Samples sent to:
Sent By:
Date samples sent:
Samples shipped via:
TAT Requested:
Tracking number [if any]:
Comments:

Received By:
Date: 4/30/20
Labeled By:
Date:
Logged into LIMS By:
Date:
Logged into RF By:
Date:

Attachment 25-3

SAN ANTONIO
TESTING LABORATORY

May 11, 2020

Chelsey Vasbinder
CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio, TX 78296-1771

SATL Report No.: 2004453
RE: Calaveras Power Station-CCR SRH/Bottom Ash Pond

Dear Chelsey Vasbinder

SATL received 11 Sample(s) on 04/30/2020 as identified on the chain of custody. Analyses were performed only on the samples marked on the chain of custody using methods indicated on the laboratory report. Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Sincerely,

For San Antonio Testing Laboratory, Inc.

Richard Hawk

Richard Hawk,
General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Appendix A Laboratory Data Package Cover Page

This data package consists of:

☑ This signature page, the laboratory review checklist, and the following reportable data:

☑ R1 Field chain-of-custody documentation;

☑ R2 Sample identification cross-reference;

☑ R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC 5.13 or ISO/IEC 17025 Section 5.10
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).

☑ R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.

☑ R5 Test reports/summary forms for blank samples;

☑ R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.

☑ R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits

☑ R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) the amount of analyte measured in the duplicate,
  b) the calculated RPD, and
  c) the laboratory's QC limits for analytical duplicates.

☑ R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

☑ R10 Other problems or anomalies.

☑ The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By me signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Sandra Felix For Marcela Gracia Hawk, President

Richard Hawk

Richard Hawk, General Manager

05/11/20 17:15

Date/Time

Project Name:	Calaveras Power Station-CCR SRH/Bottom Ash Pond	Reviewer Name:	ME
Laboratory Job Number:	2004453	Matrix : Liquid	

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	05/11/20
Project Name:	Calaveras Power Station-CCR SRH/Bottom Ash	Laboratory Job Number:	2004453
Reviewer Name:	ME	Prep Batch Number(s):	B019152,B019175,B019203,B019242

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1		**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2		**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3		**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample quantitation limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?			X		
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		If required for the project, TICs reported?			X		
R4		**Surrogate recovery data**					
		Were surrogates added prior to extraction?			X		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			X		
R5		**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6		**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7		**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?		X			S001
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?			X		
R8		**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?		X			S002
R9		**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs included in the laboratory data package?	X				
R10		**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	05/11/20
Project Name:	Calaveras Power Station-CCR SRH/Bottom Ash	Laboratory Job Number:	2004453
Reviewer Name:	ME	Prep Batch Number(s):	B019152,B019175,B019203,B019242

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1		**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2		**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3		**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4		**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5		**Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?			X		
S6		**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7		**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8		**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?	X				
S9		**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	X				
S10		**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11		**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12		**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13		**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14		**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15		**Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16		**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Appendix A (cont'd): Laboratory Review Checklist: Exception Reports

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	05/11/20
Project Name:	Calaveras Power Station-CCR SRH/Bottom Ash	Laboratory Job Number:	2004453
Reviewer Name:	ME	Prep Batch Number(s):	B019152,B019175,B019203,B019242

ER#[1]	**Description**
S001	Field duplicates (analytical duplicates) were analyzed in lieu of MS/MSD
S002	RPD values above the acceptance limits are flagged on the analytical report

1. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked on the LRC)

RG-366/TRRP-13 December 2002

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

SAMPLE SUMMARY

Total Samples received in this work order: **11**

Sample ID	Laboratory ID	Matrix	Sampling Method	Date Sampled	Date Received
JKS-51	2004453-01	Liquid	Grab	04/28/20 10:57	04/30/20 14:31
JKS-52	2004453-02	Liquid	Grab	04/28/20 14:23	04/30/20 14:31
JKS-53	2004453-03	Liquid	Grab	04/28/20 09:31	04/30/20 14:31
JKS-54	2004453-04	Liquid	Grab	04/28/20 10:21	04/30/20 14:31
JKS-48	2004453-05	Liquid	Grab	04/28/20 15:36	04/30/20 14:31
JKS-49	2004453-06	Liquid	Grab	04/28/20 11:25	04/30/20 14:31
JKS-50R	2004453-07	Liquid	Grab	04/28/20 13:55	04/30/20 14:31
JKS-55	2004453-08	Liquid	Grab	04/28/20 16:17	04/30/20 14:31
JKS-56	2004453-09	Liquid	Composite	04/28/20 12:20	04/30/20 14:31
SRH/BA Field Dup	2004453-10	Liquid	Grab	04/28/20 14:30	04/30/20 14:31
SRH/BA Field Blank	2004453-11	Liquid	Grab	04/28/20 14:26	04/30/20 14:31

Notes

All quality control samples and checks are within acceptance limits unless otherwise indciated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: JKS-51
Sampling Method: Grab
Lab Sample ID #: 2004453-01
Sample Matrix: Liquid
Date/Time Collected: 04/28/20 10:57

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	2010	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	555	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.470	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	439	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	0.627	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	334	10.0		0.009	0.091	mg/L	EPA 200.7	EPA 200.7	05/08/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: JKS-52 **Sampling Method: Grab** **Lab Sample ID #: 2004453-02**

Sample Matrix: Liquid **Date/Time Collected: 04/28/20 14:23**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1470	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	433	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.908	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	315	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	2.05	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	174	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: JKS-53 **Sampling Method: Grab** **Lab Sample ID #: 2004453-03**

Sample Matrix: Liquid **Date/Time Collected: 04/28/20 09:31**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1160	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	381	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.428	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	244	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	1.43	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	114	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: JKS-54 | **Sampling Method: Grab** | **Lab Sample ID #: 2004453-04**

Sample Matrix: Liquid | **Date/Time Collected: 04/28/20 10:21**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1570	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	380	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.861	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	443	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	1.23	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	118	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: JKS-48
Sampling Method: Grab
Lab Sample ID #: 2004453-05
Sample Matrix: Liquid
Date/Time Collected: 04/28/20 15:36

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1400	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	485	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.051	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	206	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	2.36	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	130	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: JKS-49 **Sampling Method: Grab** **Lab Sample ID #: 2004453-06**

Sample Matrix: Liquid **Date/Time Collected: 04/28/20 11:25**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1240	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	452	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.894	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	217	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	2.47	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	114	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: JKS-50R
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 04/28/20 13:55

Lab Sample ID #: 2004453-07

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				*Batch ID >* *B019242*							
Total Dissolved Solids *	918	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				*Batch ID >* *B019152*							
Chloride *	102	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.510	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	194	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				*Batch ID >* *B019203*							
Boron *	5.52	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	126	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: JKS-55
Sampling Method: Grab
Lab Sample ID #: 2004453-08
Sample Matrix: Liquid
Date/Time Collected: 04/28/20 16:17

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1350	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	452	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	1.01	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	177	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	0.779	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	137	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: JKS-56 **Sampling Method: Composite** **Lab Sample ID #: 2004453-09**

Sample Matrix: Liquid **Date/Time Collected: 04/28/20 12:20**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	904	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	101	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.552	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	138	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	3.55	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	103	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: SRH/BA Field Dup
Sample Matrix: Liquid
Sampling Method: Grab
Date/Time Collected: 04/28/20 14:30
Lab Sample ID #: 2004453-10

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	1420	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	430	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.952	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	313	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	2.16	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	180	1.00		0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sample ID #: SRH/BA Field Blank **Sampling Method: Grab** **Lab Sample ID #: 2004453-11**

Sample Matrix: Liquid **Date/Time Collected: 04/28/20 14:26**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B019242*							
Total Dissolved Solids *	< 2.50	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	05/05/20	JL	
Anions by Ion Chromatography				***Batch ID >*** *B019152*							
Chloride *	0.276	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Fluoride *	0.036	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Sulfate *	0.08	0.10	J	0.06	0.06	mg/L	EPA 300.0	EPA 300.0	05/05/20	JL	
Total Metals				***Batch ID >*** *B019203*							
Boron *	0.020	0.010		0.0006	0.0006	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	
Calcium *	0.062	1.00	J	0.009	0.009	mg/L	EPA 200.7	EPA 200.7	05/07/20	ME	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B019242 - SM2540C									
Blank (B019242-BLK1)				Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	<2.50	2.50	mg/L				–		
LCS (B019242-BS1)				Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	87.0	2.50	mg/L	100		87	80– 120		
LCS Dup (B019242-BSD1)				Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	82.0	2.50	mg/L	100		82	80– 120	6	20
Duplicate (B019242-DUP1)		**Source: 2004452-01**		Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	1850	2.50	mg/L		1790		–	3	20
Duplicate (B019242-DUP2)		**Source: 2004452-03**		Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	2150	2.50	mg/L		1870		–	14	20
Duplicate (B019242-DUP3)		**Source: 2004453-04**		Prepared: 05/04/20 17:00 Analyzed: 05/05/20 09:30					
Total Dissolved Solids	1750	2.50	mg/L		1570		–	11	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B019152 - EPA 300.0									
Blank (B019152-BLK1)				Prepared: 05/04/20 17:00 Analyzed: 05/04/20 22:57					
Chloride	<0.100	0.100	mg/L				–		
Sulfate	<0.10	0.10	mg/L				–		
LCS (B019152-BS1)				Prepared: 05/04/20 17:00 Analyzed: 05/04/20 23:15					
Chloride	4.91	0.100	mg/L	5.00		98	90-110		
Sulfate	5.03	0.10	mg/L	5.00		101	90-110		
LCS Dup (B019152-BSD1)				Prepared: 05/04/20 17:00 Analyzed: 05/04/20 23:33					
Chloride	4.93	0.100	mg/L	5.00		99	90-110	0.2	20
Sulfate	5.02	0.10	mg/L	5.00		100	90-110	0.07	20
Duplicate (B019152-DUP1)		**Source: 2004453-01**		Prepared: 05/04/20 17:00 Analyzed: 05/05/20 02:50					
Chloride	554	5.00	mg/L		555		–	0.1	20
Sulfate	440	5.00	mg/L		439		–	0.2	20
Duplicate (B019152-DUP2)		**Source: 2004453-10**		Prepared: 05/04/20 17:00 Analyzed: 05/05/20 06:06					
Chloride	429	5.00	mg/L		430		–	0.2	20
Sulfate	313	5.00	mg/L		313		–	0.2	20
Batch B019175 - EPA 300.0									
Blank (B019175-BLK1)				Prepared: 05/05/20 17:00 Analyzed: 05/05/20 17:06					
Fluoride	<0.020	0.020	mg/L				–		
LCS (B019175-BS1)				Prepared: 05/05/20 17:00 Analyzed: 05/05/20 17:24					
Fluoride	1.08	0.020	mg/L	1.00		108	90-110		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B019175 - EPA 300.0									
LCS Dup (B019175-BSD1)				Prepared: 05/05/20 17:00 Analyzed: 05/05/20 17:41					
Fluoride	1.07	0.020	mg/L	1.00		107	90-110	0.4	20
Duplicate (B019175-DUP1)		**Source: 2004453-01**		Prepared: 05/05/20 17:00 Analyzed: 05/05/20 22:45					
Fluoride	0.478	0.020	mg/L		0.470		–	2	20
Matrix Spike (B019175-MS1)		**Source: 2004453-01**		Prepared: 05/05/20 17:00 Analyzed: 05/05/20 19:29					
Fluoride	1.46	0.020	mg/L	1.00	0.470	99	90-110		
Matrix Spike (B019175-MS2)		**Source: 2004453-10**		Prepared: 05/05/20 17:00 Analyzed: 05/05/20 23:03					
Fluoride	1.91	0.020	mg/L	1.00	0.952	95	90-110		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Total Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B019203 - EPA 200.7										
Blank (B019203-BLK1)				Prepared: 05/07/20 09:00	Analyzed: 05/07/20 15:36					
Boron	<0.010	0.010	mg/L				–			
Calcium	<1.00	1.00	mg/L				–			
LCS (B019203-BS1)				Prepared: 05/07/20 09:00	Analyzed: 05/07/20 15:41					
Boron	2.03	0.010	mg/L	2.00		102	85-115			
Calcium	2.01	1.00	mg/L	2.00		100	85-115			
LCS Dup (B019203-BSD1)				Prepared: 05/07/20 09:00	Analyzed: 05/07/20 15:46					
Boron	2.04	0.010	mg/L	2.00		102	85-115	0.5	20	
Calcium	2.02	1.00	mg/L	2.00		101	85-115	0.4	20	
Duplicate (B019203-DUP1)		**Source: 2004453-01**		Prepared: 05/07/20 09:00	Analyzed: 05/07/20 15:57					
Boron	0.586	0.010	mg/L		0.627		–	7	20	
Calcium	339	10.0	mg/L		334		–	2	20	
Duplicate (B019203-DUP2)		**Source: 2004453-11**		Prepared: 05/07/20 09:00	Analyzed: 05/07/20 17:19					
Boron	0.0167	0.010	mg/L		0.0203		–	19	20	
Calcium	0.0139	1.00	mg/L		0.0624		–	127	20	S
Matrix Spike (B019203-MS1)		**Source: 2004453-01**		Prepared: 05/07/20 09:00	Analyzed: 05/07/20 16:03					
Boron	2.68	0.010	mg/L	2.00	0.627	103	75-125			
Matrix Spike (B019203-MS2)		**Source: 2004453-11**		Prepared: 05/07/20 09:00	Analyzed: 05/07/20 17:24					
Boron	2.00	0.010	mg/L	2.00	0.0203	99	75-125			
Calcium	1.94	1.00	mg/L	2.00	0.0624	94	75-125			

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

DEFINITIONS

*	TNI / NELAC accredited analyte
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
ND	This qualifier indicates that the analyte was analyzed but not detected above the MDL
J	This qualifier indicates that the analyte is an estimate value between MQL and MDL
SQL	Sample Quantitation Limit
MQL	Method Quantitation Limit
MDL	Method Detection Limit
L	LCS/LCSD recovery is outside QC limits, the results may have a slight bias.
M	MS/MSD recovery is outside QC limits due to possible matrix interferences, results may have a slight bias .
S	RPD is outside QC limits.
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)
HT	Sample received past holdtime
IC	Improper Container
IT	Improper Temperature
V	Insufficient Volume
B	Sample collected in Bulk
AB	VOA Vial contained air bubbles.
OP	ortho-Phosphate was not filtered in the field within 15minutes of collection.
CCV	Continuing Calibration Verification Standard.
ICV	Initial Calibration Verification Standard.
Surr L	Surrogate recovery is low outside QC limits due to possible sample matrix interferences.
Surr H	Surrogate recovery is high outside QC limits due to possible sample matrix interferences.

Test Methods followed by the laboratory are referenced in the following approved methodology, unless otherwise specified.

Standard Methods for the Examination of Water and Wastewater, 21st Edition 2005
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
05/11/20 17:15
Received:
04/30/20 14:31

Report No. 2004453

Sandra Felix For Marcela Gracia Hawk, President For

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Richard Hawk

Richard Hawk, General Manager

EnviroChain® By Promium TRRP 2004453

Submission key H119-PAX-744E	NOT SUBMITTED	Page 1/2

Client Information	**Project Information**	**Laboratory Information**	**COC Information**
CPS Energy - Environmental Dept. P.O. Box 1771 San Antonio TX 78296-1771 Phone: (210) 353-4719 Fax: (210) 353-4271	Calaveras Power Station-CCR SRH/Bottom Ash Pond Number: [none] Sample count: 11 TAT: 7	San Antonio Testing Laboratory 1610 S. Laredo St San Antonio TX 78207 Phone: 210-229-9920 Fax: 210-229-9921	Shipped via: Walk-in

#1	JKS-51 04/28/2020 10:57 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#2	JKS-52 04/28/2020 14:23 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#3	JKS-53 04/28/2020 09:31 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#4	JKS-54 04/28/2020 10:21 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#5	JKS-48 04/28/2020 15:36 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#6	JKS-49 04/28/2020 11:25 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#7	JKS-50R 04/28/2020 13:55 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#8	JKS-55 04/28/2020 16:17 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#9	JKS-56	**Analyses**	**Containers**

TRRP

2004453

	04/28/2020 12:20 Composite / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#10	SRH/BA Field Dup 04/28/2020 14:30 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#11	SRH/BA Field Blank 04/28/2020 14:26 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)

3.3°c TG#7 Seed

Relinquished by	Date/Time	Accepted by	Date/Time
Patricia Herrera	4·30·20 / 1400	Blanes Penrod	4-30-20 2:02 pm
Blanes Penrod	4-30-20 2:31 pm	[illegible]	APR 30 2020 1431

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: CPS
Report Number: 2004453
Project Name:
Date Received: 4/30/20
Shipped via: ☐FedEx ☐UPS ☐Lonestar ☐Hand Delivered ☐DHL ☒SATL ☐Other
Date Due: 5/4/20
Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No	✓	NA		If NA–reason:	
2. Custody Seals intact?	Yes		No		NA	✓	If NA–reason:	
3. Air Bill included in folder, if received?	Yes		No		NA	✓	If NA–reason:	
4. Is COC included with samples?	Yes	✓	No		NA		If NA–reason:	
5. Is COC signed and dated by client?	Yes	✓	No		NA		If NA–reason:	
6. Sample temperature: Thermal preservation between >0° - 6°C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	✓	No		NA		Temp: 3.3 °C	
7. Samples received with ice ☒ ice packs ☐ other cooling ☐	Yes	✓	No		NA		If NA–reason:	
8. Is the COC filled out correctly, and completely?	Yes	✓	No		NA		If NA–reason:	
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:	
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:	
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:	
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:	
13. Proper sample containers used?	Yes	✓	No		NA		If NA–reason:	
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:	
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No		NA	✓	If NA–reason:	no VOAs
16. Preservative for THMs only ($Na_2S_2O_3$)	Yes		No		NA	✓	If NA–reason:	no thms
17. Sample volume sufficient for requested analysis?	Yes	✓	No		NA		If NA–reason:	
18. Sample amount sufficient for TCLP analysis?	Yes		No		N/A	✓	If NA- reason	no tclp
19. Subcontracted Samples: [if Yes, complete the next section]	Yes		No	✓	NA		If NA–reason:	

Analyses Subcontracted Out: ____ No. of Samples ____
Samples sent to: ____ Sent By: ____
Date samples sent: ____ Samples shipped via: ____
TAT Requested: ____
Tracking number [if any]: ____
Comments:

Received By: ____ Date: 4/30/20
Labeled By: ____ Date: ____
Logged into LIMS By: ____ Date: ____
Logged into RF By: ____ Date: ____

Q:\Controlled Documents\Forms\Login\Sample Receipt Checklist Form Rev 02052019.doc

SATL#FO001
Revised 02/05/19

Attachment 25-4

SAN ANTONIO
TESTING LABORATORY

November 06, 2020

Chelsey Vasbinder
CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio, TX 78296-1771

SATL Report No.: 2010326
RE: Calaveras Power Station- CCR Units FlyAsh Landfill

Dear Chelsey Vasbinder

SATL received 10 Sample(s) on 10/22/2020 as identified on the chain of custody. Analyses were performed only on the samples marked on the chain of custody using methods indicated on the laboratory report. Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Sincerely,

For San Antonio Testing Laboratory, Inc.

Richard Hawk

Richard Hawk,
General Manager

Appendix A Laboratory Data Package Cover Page

This data package consists of:

☑ This signature page, the laboratory review checklist, and the following reportable data:

☑ R1 Field chain-of-custody documentation;

☑ R2 Sample identification cross-reference;

☑ R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC 5.13 or ISO/IEC 17025 Section 5.10
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).

☑ R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.

☑ R5 Test reports/summary forms for blank samples;

☑ R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.

☑ R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits

☑ R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) the amount of analyte measured in the duplicate,
  b) the calculated RPD, and
  c) the laboratory's QC limits for analytical duplicates.

☑ R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

☑ R10 Other problems or anomalies.

☑ The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By me signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Aimee Landon For Marcela Gracia Hawk, President

Richard Hawk

Richard Hawk, General Manager

11/06/20 14:09
Date/Time

Project Name: Calaveras Power Station- CCR Units FlyAsh Landfill
Reviewer Name: JL
Laboratory Job Number: 2010326
Matrix : Liquid

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	11/05/20
Project Name:	Calaveras Power Station- CCR Units FlyAsh Lar	Laboratory Job Number:	2010326
Reviewer Name:	JL	Prep Batch Number(s):	B045098,B045110,B045126

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1		**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2		**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3		**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample quantitation limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?			X		
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		If required for the project, TICs reported?			X		
R4		**Surrogate recovery data**					
		Were surrogates added prior to extraction?			X		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			X		
R5		**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6		**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7		**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		X			S001
		Were MS/MSD RPDs within laboratory QC limits?			X		
R8		**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9		**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs included in the laboratory data package?	X				
R10		**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	11/05/20
Project Name:	Calaveras Power Station- CCR Units FlyAsh Lar	Laboratory Job Number:	2010326
Reviewer Name:	JL	Prep Batch Number(s):	B045098,B045110,B045126

# [1]	A [2]	Description	Yes	No	NA [3]	NR [4]	ER# [5]
S1		**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2		**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3		**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?	X				
S4		**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?	X				
S5		**Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6		**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7		**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8		**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?	X				
S9		**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	X				
S10		**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11		**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12		**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13		**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14		**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15		**Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16		**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Exception Reports

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	11/05/20
Project Name:	Calaveras Power Station- CCR Units FlyAsh Lar	Laboratory Job Number:	2010326
Reviewer Name:	JL	Prep Batch Number(s):	B045098,B045110,B045126

ER#[1]	**Description**
S001	Matrix Spike Recoveries outside the QC acceptance criteria, due to matrix interferences, are flagged on the analytical report.

1. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked on the LRC)

RG-366/TRRP-13 December 2002

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

SAMPLE SUMMARY

Total Samples received in this work order: **10**

Sample ID	Laboratory ID	Matrix	Sampling Method	Date Sampled	Date Received
JKS-31-20201020-CCR	2010326-01	Liquid	Grab	10/20/20 15:31	10/22/20 15:20
JKS-33-20201020-CCR	2010326-02	Liquid	Grab	10/20/20 14:38	10/22/20 15:20
JKS-45-20201021-CCR	2010326-03	Liquid	Grab	10/21/20 15:42	10/22/20 15:20
JKS-46-20201020-CCR	2010326-04	Liquid	Grab	10/20/20 13:01	10/22/20 15:20
JKS-57-20201020-CCR	2010326-05	Liquid	Grab	10/20/20 10:32	10/22/20 15:20
JKS-58-20201020-CCR	2010326-06	Liquid	Grab	10/20/20 11:22	10/22/20 15:20
JKS-59-20201020-CCR	2010326-07	Liquid	Grab	10/20/20 13:34	10/22/20 15:20
JKS-60-20201020-CCR	2010326-08	Liquid	Grab	10/20/20 14:01	10/22/20 15:20
DUP-001-20201020	2010326-09	Liquid	Grab	10/20/20 10:00	10/22/20 15:20
FB-001-20201021	2010326-10	Liquid	Grab	10/21/20 13:28	10/22/20 15:20

Notes

All quality control samples and checks are within acceptance limits unless otherwise indciated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: JKS-31-20201020-CCR
Sampling Method: Grab
Lab Sample ID #: 2010326-01
Sample Matrix: Liquid
Date/Time Collected: 10/20/20 15:31

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1700	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045126*							
Chloride *	319	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/02/20	JL	
Fluoride *	0.786	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	914	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/02/20	JL	
Total Metals				***Batch ID >*** *B045110*							
Boron *	0.379	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	216	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: JKS-33-20201020-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 10/20/20 14:38

Lab Sample ID #: 2010326-02

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	4060	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045126*							
Chloride *	751	10.0		0.052	5.19	mg/L	EPA 300.0	EPA 300.0	11/02/20	JL	
Fluoride *	0.864	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	1650	10.0		0.06	5.59	mg/L	EPA 300.0	EPA 300.0	11/02/20	JL	
Total Metals				***Batch ID >*** *B045110*							
Boron *	1.09	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	493	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: JKS-45-20201021-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 10/21/20 15:42

Lab Sample ID #: 2010326-03

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1260	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045126*							
Chloride *	98.7	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	564	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045110*							
Boron *	2.81	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	132	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: JKS-46-20201020-CCR **Sampling Method: Grab** **Lab Sample ID #: 2010326-04**

Sample Matrix: Liquid **Date/Time Collected: 10/20/20 13:01**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1160	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045126*							
Chloride *	23.4	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.764	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	734	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045110*							
Boron *	0.530	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	107	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: JKS-57-20201020-CCR
Sample Matrix: Liquid
Sampling Method: Grab
Date/Time Collected: 10/20/20 10:32
Lab Sample ID #: 2010326-05

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	12200	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045126*							
Chloride *	3150	50.0		0.052	26.0	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	2.99	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	3890	50.0		0.06	28.0	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045110*							
Boron *	3.82	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	592	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: JKS-58-20201020-CCR **Sampling Method: Grab** **Lab Sample ID #: 2010326-06**

Sample Matrix: Liquid **Date/Time Collected: 10/20/20 11:22**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	3050	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045126*							
Chloride *	472	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.795	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	792	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045110*							
Boron *	0.608	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	448	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: JKS-59-20201020-CCR **Sampling Method: Grab** **Lab Sample ID #: 2010326-07**

Sample Matrix: Liquid **Date/Time Collected: 10/20/20 13:34**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1510	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045126*							
Chloride *	81.1	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.532	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	452	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045110*							
Boron *	0.399	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	255	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: JKS-60-20201020-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 10/20/20 14:01

Lab Sample ID #: 2010326-08

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry			***Batch ID >*** *B045098*								
Total Dissolved Solids *	2520	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography			***Batch ID >*** *B045126*								
Chloride *	235	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	963	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals			***Batch ID >*** *B045110*								
Boron *	0.433	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	380	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: DUP-001-20201020
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 10/20/20 10:00

Lab Sample ID #: 2010326-09

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	2500	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045126*							
Chloride *	458	5.00		0.052	2.60	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.856	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	776	5.00		0.06	2.80	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045110*							
Boron *	0.550	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	438	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Sample ID #: FB-001-20201021
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 10/21/20 13:28

Lab Sample ID #: 2010326-10

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	< 2.47	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045126*							
Chloride *	0.280	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	0.12	0.10		0.06	0.06	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045110*							
Boron *	0.049	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	0.053	1.00	J	0.009	0.009	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B045098 - SM2540C									
Blank (B045098-BLK1)				Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	<2.50	2.50	mg/L				–		
LCS (B045098-BS1)				Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	104	2.50	mg/L	100		104	80– 120		
LCS Dup (B045098-BSD1)				Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	103	2.50	mg/L	100		103	80– 120	1	20
Duplicate (B045098-DUP1)		**Source: 2010325-04**		Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	1370	2.50	mg/L		1300		–	5	20
Duplicate (B045098-DUP2)		**Source: 2010325-11**		Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	<2.50	2.50	mg/L		<2.50		–		20
Duplicate (B045098-DUP3)		**Source: 2010326-07**		Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	1530	2.50	mg/L		1510		–	1	20
Duplicate (B045098-DUP4)		**Source: 2010327-04**		Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	649	2.50	mg/L		664		–	2	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B045126 - EPA 300.0									
Blank (B045126-BLK1)				Prepared: 11/02/20 16:30	Analyzed: 11/02/20 17:52				
Fluoride	<0.020	0.020	mg/L				–		
Chloride	<0.100	0.100	mg/L				–		
Sulfate	<0.10	0.10	mg/L				–		
LCS (B045126-BS1)				Prepared: 11/02/20 16:30	Analyzed: 11/02/20 18:10				
Fluoride	1.01	0.020	mg/L	1.00		101	90-110		
Chloride	4.69	0.100	mg/L	5.00		94	90-110		
Sulfate	4.89	0.10	mg/L	5.00		98	90-110		
LCS Dup (B045126-BSD1)				Prepared: 11/02/20 16:30	Analyzed: 11/02/20 18:28				
Fluoride	1.03	0.020	mg/L	1.00		103	90-110	2	20
Chloride	4.69	0.100	mg/L	5.00		94	90-110	0.2	20
Sulfate	4.87	0.10	mg/L	5.00		97	90-110	0.3	20
Duplicate (B045126-DUP1)		**Source: 2010326-01**		Prepared: 11/02/20 16:30	Analyzed: 11/02/20 23:31				
Fluoride	0.786	0.020	mg/L		0.786		–	0	20
Chloride	319	2.50	mg/L		319		–	0.2	20
Sulfate	925	2.50	mg/L		914		–	1	20
Duplicate (B045126-DUP2)		**Source: 2010326-10**		Prepared: 11/02/20 16:30	Analyzed: 11/03/20 02:48				
Fluoride	<0.020	0.020	mg/L		<0.020		–		20
Chloride	0.267	0.100	mg/L		0.280		–	5	20
Sulfate	0.120	0.10	mg/L		0.122		–	2	20
Matrix Spike (B045126-MS1)		**Source: 2010326-10**		Prepared: 11/02/20 16:30	Analyzed: 11/03/20 03:06				
Fluoride	1.08	0.020	mg/L	1.00	<0.020	108	90-110		
Chloride	4.82	0.100	mg/L	5.00	0.280	91	80-120		
Sulfate	4.96	0.10	mg/L	5.00	0.122	97	90-110		

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Total Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B045110 - EPA 3010A									
Blank (B045110-BLK1)				Prepared: 11/02/20 11:00 Analyzed: 11/02/20 20:22					
Boron	<0.010	0.010	mg/L				–		
Calcium	<1.00	1.00	mg/L				–		
LCS (B045110-BS1)				Prepared: 11/02/20 11:00 Analyzed: 11/02/20 20:28					
Boron	2.01	0.010	mg/L	2.00		100	85– 115		
Calcium	1.94	1.00	mg/L	2.00		97	85– 115		
LCS Dup (B045110-BSD1)				Prepared: 11/02/20 11:00 Analyzed: 11/02/20 20:33					
Boron	2.05	0.010	mg/L	2.00		102	85– 115	2	20
Calcium	1.96	1.00	mg/L	2.00		98	85– 115	0.9	20
Duplicate (B045110-DUP1)		**Source: 2010326-01**		Prepared: 11/02/20 11:00 Analyzed: 11/02/20 20:44					
Boron	0.380	0.010	mg/L		0.379		–	0.2	20
Calcium	213	10.0	mg/L		216		–	1	20
Matrix Spike (B045110-MS1)		**Source: 2010326-01**		Prepared: 11/02/20 11:00 Analyzed: 11/02/20 21:05					
Boron	2.34	0.010	mg/L	2.00	0.379	98	75– 125		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Notes:

Report No. 2010326

DEFINITIONS

*	TNI / NELAC accredited analyte
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
ND	This qualifier indicates that the analyte was analyzed but not detected above the MDL
J	This qualifier indicates that the analyte is an estimate value between MQL and MDL
SQL	Sample Quantitation Limit
MQL	Method Quantitation Limit
MDL	Method Detection Limit
L	LCS/LCSD recovery is outside QC limits, the results may have a slight bias.
M	MS/MSD recovery is outside QC limits due to possible matrix interferences, results may have a slight bias .
S	RPD is outside QC limits.
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)
HT	Sample received past holdtime
IC	Improper Container
IT	Improper Temperature
V	Insufficient Volume
B	Sample collected in Bulk
AB	VOA Vial contained air bubbles.
OP	ortho-Phosphate was not filtered in the field within 15minutes of collection.
CCV	Continuing Calibration Verification Standard.
ICV	Initial Calibration Verification Standard.
Surr L	Surrogate recovery is low outside QC limits.
Surr H	Surrogate recovery is high outside QC limits.

Test Methods followed by the laboratory are referenced in the following approved methodology, unless otherwise specified.

Standard Methods for the Examination of Water and Wastewater, 21st Edition 2005
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units FlyAsh Landfill

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:09
Received:
10/22/20 15:20

Report No. 2010326

Aimee Landon For Marcela Gracia Hawk, President For

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Richard Hawk

Richard Hawk, General Manager

EnviroChain® By Promium

TRRP Report 2010326

Submission key H296-JBG-754A	NOT SUBMITTED	Page 1/2

Client Information	Project Information	Laboratory Information	COC Information
CPS Energy - Environmental Dept. P.O. Box 1771 San Antonio TX 78296-1771 Phone: (210) 353-4719 Fax: (210) 353-4271	Calaveras Power Station- CCR Units FlyAsh Landfill Number: [none] Sample count: 10 TAT: 7	San Antonio Testing Laboratory 1610 S. Laredo St San Antonio TX 78207 Phone: 210-229-9920 Fax: 210-229-9921	Shipped via: Walk-in

		Analyses	Containers
#1	JKS-31-20201020-CCR 10/20/2020 15:31 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#2	JKS-33-20201020-CCR 10/20/2020 14:38 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#3	JKS-45-20201021-CCR 10/21/2020 15:42 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#4	JKS-46-20201020-CCR 10/20/2020 13:01 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#5	JKS-57-20201020-CCR 10/20/2020 10:32 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#6	JKS-58-20201020-CCR 10/20/2020 11:22 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#7	JKS-59-20201020-CCR 10/20/2020 13:34 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#8	JKS-60-20201020-CCR 10/20/2020 14:01 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#9	DUP-001-20201020		

EnviroChain® By Promium TRRP Report 2010326

Submission key H296-JBG-754A	NOT SUBMITTED	Page 2/2

	10/20/2020 10:00 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#10	FB-001-20201021 10/21/2020 13:28 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)

22°c / 2.2°c T6 #7 Iced

Relinquished by	Date/Time	Accepted by	Date/Time
	10-22-20 1400	Rec'd James Penrod	10-22-20 2:37p
Edward Partridge	10-22-20 1450	Rec'd James Penrod (Drop off Hold)	10-22-20 3:30p

Rec: at lab Aimee Landon

OCT 22 2020
1520

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: CPS Energy
Report Number: 2010326
Project Name: Calaveras
Date Received: 10-22-20
Shipped via: ☐FedEx ☐UPS ☐Lonestar ☐Hand Delivered ☐DHL ☑SATL ☐Other
Date Due: 10-31-20
Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No	✓	NA		If NA–reason:
2. Custody Seals intact?	Yes		No		NA	✓	If NA–reason:
3. Air Bill included in folder, if received?	Yes		No		NA	✓	If NA–reason:
4. Is COC included with samples?	Yes	✓	No		NA		If NA–reason:
5. Is COC signed and dated by client?	Yes	✓	No		NA		If NA–reason:
6. Sample temperature: Thermal preservation between >0° - 6°C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	✓	No		NA		Temp: 0.2 °C
7. Samples received with ice ☑ ice packs ☐ other cooling ☐	Yes	✓	No		NA		If NA–reason:
8. Is the COC filled out correctly, and completely?	Yes	✓	No		NA		If NA–reason:
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:
13. Proper sample containers used?	Yes	✓	No		NA		If NA–reason:
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No		NA	✓	If NA–reason:
16. Preservative for THMs only ($Na_2S_2O_3$)	Yes		No		NA	✓	If NA–reason:
17. Sample volume sufficient for requested analysis?	Yes	✓	No		NA		If NA–reason:
18. Sample amount sufficient for TCLP analysis?	Yes		No		N/A	✓	If NA- reason
19. Subcontracted Samples: [if Yes, complete the next section]	Yes	✓	No		NA		If NA–reason:

Analyses Subcontracted Out: Rads
No. of Samples:
Samples sent to: Test Am (Eurofins)
Sent By: ALL
Date samples sent: 10-22-20
Samples shipped via:
TAT Requested: Reg.
Tracking number [if any]:
Comments:

Received By: ALL
Date: 10-22-20
Labeled By:
Date:
Logged into LIMS By:
Date:
Logged into RF By:
Date:

Attachment 25-5

SAN ANTONIO
TESTING LABORATORY

November 06, 2020

Chelsey Vasbinder
CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio, TX 78296-1771

SATL Report No.: 2010327
RE: Calaveras Power Station-CCR Units Evaporation Pond

Dear Chelsey Vasbinder

SATL received 7 Sample(s) on 10/22/2020 as identified on the chain of custody. Analyses were performed only on the samples marked on the chain of custody using methods indicated on the laboratory report. Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Sincerely,

For San Antonio Testing Laboratory, Inc.

Richard Hawk

Richard Hawk,
General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Appendix A Laboratory Data Package Cover Page

This data package consists of:

- ☑ This signature page, the laboratory review checklist, and the following reportable data:
- ☑ R1 Field chain-of-custody documentation;
- ☑ R2 Sample identification cross-reference;
- ☑ R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - a) Items consistent with NELAC 5.13 or ISO/IEC 17025 Section 5.10
  - b) dilution factors,
  - c) preparation methods,
  - d) cleanup methods, and
  - e) if required for the project, tentatively identified compounds (TICs).
- ☑ R4 Surrogate recovery data including:
  - a) Calculated recovery (%R), and
  - b) The laboratory's surrogate QC limits.
- ☑ R5 Test reports/summary forms for blank samples;
- ☑ R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - a) LCS spiking amounts,
  - b) Calculated %R for each analyte, and
  - c) The laboratory's LCS QC limits.
- ☑ R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - a) Samples associated with the MS/MSD clearly identified,
  - b) MS/MSD spiking amounts,
  - c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  - d) Calculated %Rs and relative percent differences (RPDs), and
  - e) The laboratory's MS/MSD QC limits
- ☑ R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - a) the amount of analyte measured in the duplicate,
  - b) the calculated RPD, and
  - c) the laboratory's QC limits for analytical duplicates.
- ☑ R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;
- ☑ R10 Other problems or anomalies.
- ☑ The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By me signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Aimee Landon For Marcela Gracia Hawk, President

Richard Hawk

Richard Hawk, General Manager

11/06/20 14:08

Date/Time

Project Name:	Calaveras Power Station-CCR Units Evaporation Pond	Reviewer Name:	JL
Laboratory Job Number:	2010327	Matrix : Liquid	

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	11/05/20
Project Name:	Calaveras Power Station-CCR Units Evaporation	Laboratory Job Number:	2010327
Reviewer Name:	JL	Prep Batch Number(s):	B045098,B045101,B045111

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1		**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2		**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3		**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample quantitation limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?			X		
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		If required for the project, TICs reported?			X		
R4		**Surrogate recovery data**					
		Were surrogates added prior to extraction?			X		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			X		
R5		**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6		**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7		**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		X			S001
		Were MS/MSD RPDs within laboratory QC limits?			X		
R8		**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9		**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs included in the laboratory data package?	X				
R10		**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	11/05/20
Project Name:	Calaveras Power Station-CCR Units Evaporation	Laboratory Job Number:	2010327
Reviewer Name:	JL	Prep Batch Number(s):	B045098,B045101,B045111

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1		**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2		**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3		**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?	X				
S4		**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?	X				
S5		**Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6		**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7		**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8		**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?	X				
S9		**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	X				
S10		**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11		**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12		**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13		**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14		**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15		**Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16		**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Appendix A (cont'd): Laboratory Review Checklist: Exception Reports

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	11/05/20
Project Name:	Calaveras Power Station-CCR Units Evaporation	Laboratory Job Number:	2010327
Reviewer Name:	JL	Prep Batch Number(s):	B045098,B045101,B045111

ER#[1]	**Description**
S001	Matrix Spike Recoveries outside the QC acceptance criteria, due to matrix interferences, are flagged on the analytical report.

1. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked on the LRC)

RG-366/TRRP-13 December 2002

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

SAMPLE SUMMARY

Total Samples received in this work order: 7

Sample ID	Laboratory ID	Matrix	Sampling Method	Date Sampled	Date Received
JKS-36-20201021-CCR	2010327-01	Liquid	Grab	10/21/20 13:38	10/22/20 15:20
JKS-47-20201021-CCR	2010327-02	Liquid	Grab	10/21/20 14:27	10/22/20 15:20
JKS-61-20201021-CCR	2010327-03	Liquid	Grab	10/21/20 12:40	10/22/20 15:20
JKS-64-20201021-CCR	2010327-04	Liquid	Grab	10/21/20 15:02	10/22/20 15:20
DUP-003-20201021	2010327-05	Liquid	Grab	10/21/20 11:50	10/22/20 15:20
FB-003-20201021	2010327-06	Liquid	Grab	10/21/20 13:28	10/22/20 15:20
EB-001-20201021	2010327-07	Liquid	Grab	10/21/20 15:15	10/22/20 15:20

Notes

All quality control samples and checks are within acceptance limits unless otherwise indciated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported: 11/06/20 14:08
Received: 10/22/20 15:20

Notes:

Report No. 2010327

Sample ID #: JKS-36-20201021-CCR
Sampling Method: Grab
Lab Sample ID #: 2010327-01
Sample Matrix: Liquid
Date/Time Collected: 10/21/20 13:38

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				*Batch ID > B045098*							
Total Dissolved Solids *	1930	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				*Batch ID > B045101*							
Chloride *	319	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Fluoride *	1.07	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Sulfate *	890	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Total Metals				*Batch ID > B045111*							
Boron *	0.456	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	
Calcium *	259	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

Sample ID #: JKS-47-20201021-CCR
Sampling Method: Grab
Lab Sample ID #: 2010327-02
Sample Matrix: Liquid
Date/Time Collected: 10/21/20 14:27

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	782	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045101*							
Chloride *	60.9	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Fluoride *	0.161	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Sulfate *	195	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Total Metals				***Batch ID >*** *B045111*							
Boron *	0.904	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	
Calcium *	28.4	1.00		0.009	0.009	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

Sample ID #: JKS-61-20201021-CCR
Sample Matrix: Liquid
Sampling Method: Grab
Date/Time Collected: 10/21/20 12:40
Lab Sample ID #: 2010327-03

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	2000	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045101*							
Chloride *	281	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Fluoride *	0.366	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Sulfate *	553	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Total Metals				***Batch ID >*** *B045111*							
Boron *	1.82	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	
Calcium *	172	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

Sample ID #: JKS-64-20201021-CCR
Sampling Method: Grab
Lab Sample ID #: 2010327-04
Sample Matrix: Liquid
Date/Time Collected: 10/21/20 15:02

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry			***Batch ID >*** *B045098*								
Total Dissolved Solids *	664	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography			***Batch ID >*** *B045101*								
Chloride *	16.0	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Fluoride *	0.101	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Sulfate *	212	1.00		0.06	0.56	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Total Metals			***Batch ID >*** *B045111*								
Boron *	0.735	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	
Calcium *	20.4	1.00		0.009	0.009	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

Sample ID #: DUP-003-20201021 **Sampling Method: Grab** **Lab Sample ID #: 2010327-05**

Sample Matrix: Liquid **Date/Time Collected: 10/21/20 11:50**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	2180	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045101*							
Chloride *	319	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Fluoride *	1.23	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	10/31/20	JL	
Sulfate *	931	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	10/30/20	JL	
Total Metals				***Batch ID >*** *B045111*							
Boron *	0.463	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	
Calcium *	265	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

Sample ID #: FB-003-20201021
Sampling Method: Grab
Lab Sample ID #: 2010327-06
Sample Matrix: Liquid
Date/Time Collected: 10/21/20 13:28

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	< 2.47	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045101*							
Chloride *	0.210	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	10/31/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	10/31/20	JL	
Sulfate *	0.10	0.10		0.06	0.06	mg/L	EPA 300.0	EPA 300.0	10/31/20	JL	
Total Metals				***Batch ID >*** *B045111*							
Boron *	0.016	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	
Calcium *	0.018	1.00	J	0.009	0.009	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

Sample ID #: EB-001-20201021
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 10/21/20 15:15

Lab Sample ID #: 2010327-07

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				*Batch ID >* *B045098*							
Total Dissolved Solids *	< 2.47	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				*Batch ID >* *B045101*							
Chloride *	0.218	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	10/31/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	10/31/20	JL	
Sulfate *	0.11	0.10		0.06	0.06	mg/L	EPA 300.0	EPA 300.0	10/31/20	JL	
Total Metals				*Batch ID >* *B045111*							
Boron *	0.002	0.010	J	0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	
Calcium *	0.040	1.00	J	0.009	0.009	mg/L	EPA 3010A	EPA 6010B	11/03/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B045098 - SM2540C									
Blank (B045098-BLK1)				Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	<2.50	2.50	mg/L				–		
LCS (B045098-BS1)				Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	104	2.50	mg/L	100		104	80– 120		
LCS Dup (B045098-BSD1)				Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	103	2.50	mg/L	100		103	80– 120	1	20
Duplicate (B045098-DUP1)		**Source: 2010325-04**		Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	1370	2.50	mg/L		1300		–	5	20
Duplicate (B045098-DUP2)		**Source: 2010325-11**		Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	<2.50	2.50	mg/L		<2.50		–		20
Duplicate (B045098-DUP3)		**Source: 2010326-07**		Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	1530	2.50	mg/L		1510		–	1	20
Duplicate (B045098-DUP4)		**Source: 2010327-04**		Prepared: 10/26/20 11:00 Analyzed: 10/26/20 14:36					
Total Dissolved Solids	649	2.50	mg/L		664		–	2	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B045101 - EPA 300.0									
Blank (B045101-BLK1)				Prepared: 10/30/20 16:00 Analyzed: 10/30/20 18:05					
Fluoride	<0.020	0.020	mg/L				–		
Chloride	<0.100	0.100	mg/L				–		
Sulfate	<0.10	0.10	mg/L				–		
LCS (B045101-BS1)				Prepared: 10/30/20 16:00 Analyzed: 10/30/20 18:22					
Fluoride	0.992	0.020	mg/L	1.00		99	90– 110		
Chloride	4.69	0.100	mg/L	5.00		94	90– 110		
Sulfate	4.89	0.10	mg/L	5.00		98	90– 110		
LCS Dup (B045101-BSD1)				Prepared: 10/30/20 16:00 Analyzed: 10/30/20 18:40					
Fluoride	1.01	0.020	mg/L	1.00		101	90– 110	2	20
Chloride	4.70	0.100	mg/L	5.00		94	90– 110	0.3	20
Sulfate	4.90	0.10	mg/L	5.00		98	90– 110	0.2	20
Duplicate (B045101-DUP1)		**Source: 2010327-01**		Prepared: 10/30/20 16:00 Analyzed: 10/30/20 20:45					
Fluoride	<0.020	0.020	mg/L		1.07		–		20
Chloride	319	2.50	mg/L		319		–	0.08	20
Sulfate	929	2.50	mg/L		890		–	4	20
Duplicate (B045101-DUP2)		**Source: 2010327-06**		Prepared: 10/30/20 16:00 Analyzed: 10/31/20 00:56					
Fluoride	<0.020	0.020	mg/L		<0.020		–		20
Chloride	0.213	0.100	mg/L		0.210		–	2	20
Sulfate	0.105	0.10	mg/L		0.101		–	4	20
Matrix Spike (B045101-MS1)		**Source: 2010327-06**		Prepared: 10/30/20 16:00 Analyzed: 10/31/20 01:13					
Fluoride	1.07	0.020	mg/L	1.00	<0.020	107	90– 110		
Chloride	4.80	0.100	mg/L	5.00	0.210	92	80– 120		
Sulfate	4.97	0.10	mg/L	5.00	0.101	97	90– 110		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

Total Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	
Batch B045111 - EPA 3010A										
Blank (B045111-BLK1)				Prepared: 11/02/20 11:00 Analyzed: 11/03/20 17:54						
Boron	<0.010	0.010	mg/L				–			
Calcium	<1.00	1.00	mg/L				–			
LCS (B045111-BS1)				Prepared: 11/02/20 11:00 Analyzed: 11/03/20 18:00						
Boron	1.96	0.010	mg/L	2.00		98	85– 115			
Calcium	1.91	1.00	mg/L	2.00		95	85– 115			
LCS Dup (B045111-BSD1)				Prepared: 11/02/20 11:00 Analyzed: 11/03/20 18:05						
Boron	1.93	0.010	mg/L	2.00		96	85– 115	2	20	
Calcium	1.80	1.00	mg/L	2.00		90	85– 115	6	20	
Duplicate (B045111-DUP1)		**Source: 2010327-01**		Prepared: 11/02/20 11:00 Analyzed: 11/03/20 19:12						
Boron	0.454	0.010	mg/L		0.456		–	0.5	20	
Calcium	260	10.0	mg/L		259		–	0.2	20	
Matrix Spike (B045111-MS1)		**Source: 2010327-01**		Prepared: 11/02/20 11:00 Analyzed: 11/03/20 19:33						
Boron	1.84	0.010	mg/L	2.00	0.456	69	75– 125			M

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Notes:

Report No. 2010327

DEFINITIONS

*	TNI / NELAC accredited analyte
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
ND	This qualifier indicates that the analyte was analyzed but not detected above the MDL
J	This qualifier indicates that the analyte is an estimate value between MQL and MDL
SQL	Sample Quantitation Limit
MQL	Method Quantitation Limit
MDL	Method Detection Limit
L	LCS/LCSD recovery is outside QC limits, the results may have a slight bias.
M	MS/MSD recovery is outside QC limits due to possible matrix interferences, results may have a slight bias .
S	RPD is outside QC limits.
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)
HT	Sample received past holdtime
IC	Improper Container
IT	Improper Temperature
V	Insufficient Volume
B	Sample collected in Bulk
AB	VOA Vial contained air bubbles.
OP	ortho-Phosphate was not filtered in the field within 15minutes of collection.
CCV	Continuing Calibration Verification Standard.
ICV	Initial Calibration Verification Standard.
Surr L	Surrogate recovery is low outside QC limits.
Surr H	Surrogate recovery is high outside QC limits.

Test Methods followed by the laboratory are referenced in the following approved methodology, unless otherwise specified.

Standard Methods for the Examination of Water and Wastewater, 21st Edition 2005
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/06/20 14:08
Received:
10/22/20 15:20

Report No. 2010327

Aimee Landon For Marcela Gracia Hawk, President For

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Richard Hawk

Richard Hawk, General Manager

EnviroChain® By Promium TRRP Report 2010327

Submission key H296-LBA-521W	NOT SUBMITTED	Page 1/2

Client Information	Project Information	Laboratory Information	COC Information
CPS Energy - Environmental Dept. P.O. Box 1771 San Antonio TX 78296-1771 Phone: (210) 353-4719 Fax: (210) 353-4271	Calaveras Power Station-CCR Units Evaporation Pond Number: [none] Sample count: 7 TAT: 7	San Antonio Testing Laboratory 1610 S. Laredo St San Antonio TX 78207 Phone: 210-229-9920 Fax: 210-229-9921	Shipped via: Walk-in

		Analyses	Containers
#1	JKS-36-20201021-CCR 10/21/2020 13:38 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#2	JKS-47-20201021-CCR 10/21/2020 14:27 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#3	JKS-61-20201021-CCR 10/21/2020 12:40 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#4	JKS-64-20201021-CCR 10/21/2020 15:02 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#5	DUP-003-20201021 10/21/2020 11:50 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#6	FB-003-20201021 10/21/2020 13:28 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)
#7	EB-001-20201021 10/21/2020 15:15 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	1 L Plastic Unpreserved (1) 250 mL Plastic HNO3 (1)

Relinquished by	Date/Time	Accepted by	Date/Time
	10-22-20 1452		10-22-20 252 pm

TRRP Report 2010327

0.9°C / 0.9°C TG #7 Iced

Edward Partridge	10-22-20	Rel: (drop off @ close)	10-22-20 320 pm

Rec: Aimee London

OCT 22 2020
1520

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: CPS Energy

Report Number: 2010327

Project Name: Calaveras

Date Received: 10-22-20

Shipped via: ☐FedEx ☐UPS ☐Lonestar ☐Hand Delivered ☐DHL ☑SATL ☐Other

Date Due: 10-31-20

Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No	✓	NA		If NA–reason:	
2. Custody Seals intact?	Yes		No		NA	✓	If NA–reason:	
3. Air Bill included in folder, if received?	Yes		No		NA	✓	If NA–reason:	
4. Is COC included with samples?	Yes	✓	No		NA		If NA–reason:	
5. Is COC signed and dated by client?	Yes	✓	No		NA		If NA–reason:	
6. Sample temperature: Thermal preservation between >0° - 6°C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	✓	No		NA		Temp: 0.2 °C	
7. Samples received with ice ☑ ice packs ☐ other cooling ☐	Yes	✓	No		NA		If NA–reason:	
8. Is the COC filled out correctly, and completely?	Yes	✓	No		NA		If NA–reason:	
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:	
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:	
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:	
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:	
13. Proper sample containers used?	Yes	✓	No		NA		If NA–reason:	
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:	
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No		NA	✓	If NA–reason:	
16. Preservative for THMs only ($Na_2S_2O_3$)	Yes		No		NA	✓	If NA–reason:	
17. Sample volume sufficient for requested analysis?	Yes	✓	No		NA		If NA–reason:	
18. Sample amount sufficient for TCLP analysis?	Yes		No		N/A	✓	If NA- reason	
19. Subcontracted Samples: [if Yes, complete the next section]	Yes	✓	No		NA		If NA–reason:	

Analyses Subcontracted Out: Rads No. of Samples

Samples sent to: Test Am (Eurofins) Sent By: ALL

Date samples sent: 10-22-20 Samples shipped via:

TAT Requested: Reg.

Tracking number [if any]:

Comments:

Received By: ALL Date: 10-22-20

Labeled By: Date:

Logged into LIMS By: Date:

Logged into RF By: Date:

Q:\Controlled Documents\Forms\Login\Sample Receipt Checklist Form Rev 02052019.doc

SATL#FO001
Revised 02/05/19

Attachment 25-6

SAN ANTONIO
TESTING LABORATORY

December 01, 2020

Chelsey Vasbinder
CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio, TX 78296-1771

SATL Report No.: 2011261
RE: Calaveras Power Station-CCR Units Evaporation Pond

Dear Chelsey Vasbinder

SATL received 2 Sample(s) on 11/18/2020 as identified on the chain of custody. Analyses were performed only on the samples marked on the chain of custody using methods indicated on the laboratory report. Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Sincerely,

For San Antonio Testing Laboratory, Inc.

Richard Hawk

Richard Hawk,
General Manager

Appendix A Laboratory Data Package Cover Page

This data package consists of:

☑ This signature page, the laboratory review checklist, and the following reportable data:

☑ R1 Field chain-of-custody documentation;

☑ R2 Sample identification cross-reference;

☑ R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC 5.13 or ISO/IEC 17025 Section 5.10
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).

☑ R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.

☑ R5 Test reports/summary forms for blank samples;

☑ R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c) The laboratory's LCS QC limits.

☑ R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits

☑ R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) the amount of analyte measured in the duplicate,
  b) the calculated RPD, and
  c) the laboratory's QC limits for analytical duplicates.

☑ R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

☑ R10 Other problems or anomalies.

☑ The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By me signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Sandra Felix For Marcela Gracia Hawk, President

Richard Hawk

Richard Hawk, General Manager

12/01/20 11:23
Date/Time

Project Name: Calaveras Power Station-CCR Units Evaporation Pond
Reviewer Name: JL
Laboratory Job Number: 2011261
Matrix :

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	12/01/20
Project Name:	Calaveras Power Station-CCR Units Evaporation	Laboratory Job Number:	2011261
Reviewer Name:	JL	Prep Batch Number(s):	B047259,B048049,B048121

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1		**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2		**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3		**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample quantitation limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?			X		
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		If required for the project, TICs reported?			X		
R4		**Surrogate recovery data**					
		Were surrogates added prior to extraction?			X		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			X		
R5		**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6		**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7		**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		X			S001
		Were MS/MSD RPDs within laboratory QC limits?		X			S002
R8		**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9		**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs included in the laboratory data package?	X				
R10		**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	12/01/20
Project Name:	Calaveras Power Station-CCR Units Evaporation	Laboratory Job Number:	2011261
Reviewer Name:	JL	Prep Batch Number(s):	B047259,B048049,B048121

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1		**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2		**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3		**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?	X				
S4		**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?	X				
S5		**Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6		**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7		**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8		**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?	X				
S9		**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	X				
S10		**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11		**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12		**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13		**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14		**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15		**Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16		**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Appendix A (cont'd): Laboratory Review Checklist: Exception Reports

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	12/01/20
Project Name:	Calaveras Power Station-CCR Units Evaporation	Laboratory Job Number:	2011261
Reviewer Name:	JL	Prep Batch Number(s):	B047259,B048049,B048121

ER#[1]	**Description**
S001	Matrix spike Recoveries outside the QC acceptance criteria, due to matrix interferences, are flagged on the analytical report.
S002	RPD values outsides the acceptance limits are flagged on the analytical report.

1. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked on the LRC)

RG-366/TRRP-13 December 2002

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
12/01/20 11:23
Received:
11/18/20 11:10

Report No. 2011261

SAMPLE SUMMARY

Total Samples received in this work order: **2**

Sample ID	Laboratory ID	Matrix	Sampling Method	Date Sampled	Date Received
JKS 62-20201117-CCR	2011261-01	Liquid	Grab	11/17/20 10:40	11/18/20 11:10
JKS 63R-20201117-CCR	2011261-02	Liquid	Grab	11/17/20 11:32	11/18/20 11:10

Notes

All quality control samples and checks are within acceptance limits unless otherwise indciated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
12/01/20 11:23
Received:
11/18/20 11:10

Report No. 2011261

Sample ID #: JKS 62-20201117-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 11/17/20 10:40

Lab Sample ID #: 2011261-01

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B048049*							
Total Dissolved Solids *	1040	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	11/18/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B047259*							
Chloride *	284	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/20/20	JL	
Fluoride *	0.295	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/20/20	JL	
Sulfate *	212	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/20/20	JL	
Total Metals				***Batch ID >*** *B048121*							
Boron *	0.537	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/24/20	JL	
Calcium *	144	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/24/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
12/01/20 11:23
Received:
11/18/20 11:10

Report No. 2011261

Sample ID #: JKS 63R-20201117-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 11/17/20 11:32

Lab Sample ID #: 2011261-02

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B048049*							
Total Dissolved Solids *	8190	2.50		2.50	2.50	mg/L	SM2540C	SM2540C	11/18/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B047259*							
Chloride *	2830	50.0		0.052	26.0	mg/L	EPA 300.0	EPA 300.0	11/20/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/20/20	JL	
Sulfate *	2120	50.0		0.06	28.0	mg/L	EPA 300.0	EPA 300.0	11/20/20	JL	
Total Metals				***Batch ID >*** *B048121*							
Boron *	1.12	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/24/20	JL	
Calcium *	1050	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/24/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
12/01/20 11:23
Received:
11/18/20 11:10

Report No. 2011261

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B048049 - SM2540C									
Blank (B048049-BLK1)				Prepared: 11/17/20 14:45 Analyzed: 11/18/20 08:00					
Total Dissolved Solids	<2.50	2.50	mg/L				–		
LCS (B048049-BS1)				Prepared: 11/17/20 14:45 Analyzed: 11/18/20 08:02					
Total Dissolved Solids	113	2.50	mg/L	100		113	80–120		
LCS Dup (B048049-BSD1)				Prepared: 11/17/20 14:45 Analyzed: 11/18/20 08:04					
Total Dissolved Solids	118	2.50	mg/L	100		118	80–120	4	20
Duplicate (B048049-DUP1)		**Source: 2011188-01**		Prepared: 11/17/20 14:45 Analyzed: 11/18/20 08:42					
Total Dissolved Solids	786	2.50	mg/L		788		–	0.3	20
Duplicate (B048049-DUP2)		**Source: 2011239-01**		Prepared: 11/17/20 14:45 Analyzed: 11/18/20 08:44					
Total Dissolved Solids	1790	2.50	mg/L		1790		–	0.07	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
12/01/20 11:23
Received:
11/18/20 11:10

Report No. 2011261

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B047259 - EPA 300.0									
Blank (B047259-BLK1)				Prepared: 11/19/20 16:00 Analyzed: 11/19/20 18:19					
Fluoride	<0.020	0.020	mg/L				–		
Chloride	<0.100	0.100	mg/L				–		
Sulfate	<0.10	0.10	mg/L				–		
LCS (B047259-BS1)				Prepared: 11/19/20 16:00 Analyzed: 11/19/20 18:36					
Fluoride	1.05	0.020	mg/L	1.00		105	90– 110		
Chloride	5.28	0.100	mg/L	5.00		106	90– 110		
Sulfate	5.33	0.10	mg/L	5.00		107	90– 110		
LCS Dup (B047259-BSD1)				Prepared: 11/19/20 16:00 Analyzed: 11/19/20 18:53					
Fluoride	1.06	0.020	mg/L	1.00		106	90– 110	0.4	20
Chloride	5.28	0.100	mg/L	5.00		106	90– 110	0.04	20
Sulfate	5.26	0.10	mg/L	5.00		105	90– 110	1	20
Duplicate (B047259-DUP1)		**Source: 2011261-01**		Prepared: 11/19/20 16:00 Analyzed: 11/20/20 04:08					
Fluoride	0.288	0.020	mg/L		0.295		–	2	20
Chloride	276	2.50	mg/L		284		–	3	20
Sulfate	214	2.50	mg/L		212		–	1	20
Matrix Spike (B047259-MS1)		**Source: 2011261-01**		Prepared: 11/19/20 16:00 Analyzed: 11/20/20 04:26					
Fluoride	1.33	0.020	mg/L	1.00	0.295	104	90– 110		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
12/01/20 11:23
Received:
11/18/20 11:10

Report No. 2011261

Total Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B048121 - EPA 3010A									
Blank (B048121-BLK1)				Prepared: 11/24/20 11:00 Analyzed: 11/24/20 13:14					
Boron	<0.010	0.010	mg/L				–		
Calcium	<1.00	1.00	mg/L				–		
LCS (B048121-BS1)				Prepared: 11/24/20 11:00 Analyzed: 11/24/20 13:19					
Boron	2.03	0.010	mg/L	2.00		102	85-115		
Calcium	2.01	1.00	mg/L	2.00		100	85-115		
LCS Dup (B048121-BSD1)				Prepared: 11/24/20 11:00 Analyzed: 11/24/20 13:24					
Boron	2.04	0.010	mg/L	2.00		102	85-115	0.6	20
Calcium	2.08	1.00	mg/L	2.00		104	85-115	3	20
Duplicate (B048121-DUP1)		**Source: 2011261-01**		Prepared: 11/24/20 11:00 Analyzed: 11/24/20 13:35					
Boron	0.545	0.010	mg/L		0.537		–	1	20
Calcium	150	10.0	mg/L		144		–	4	20
Matrix Spike (B048121-MS1)		**Source: 2011261-01**		Prepared: 11/24/20 11:00 Analyzed: 11/24/20 13:56					
Boron	2.63	0.010	mg/L	2.00	0.537	105	75-125		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
12/01/20 11:23
Received:
11/18/20 11:10

Notes:

Report No. 2011261

DEFINITIONS

*	TNI / NELAC accredited analyte
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
ND	This qualifier indicates that the analyte was analyzed but not detected above the MDL
J	This qualifier indicates that the analyte is an estimate value between MQL and MDL
SQL	Sample Quantitation Limit
MQL	Method Quantitation Limit
MDL	Method Detection Limit
L	LCS/LCSD recovery is outside QC limits, the results may have a slight bias.
M	MS/MSD recovery is outside QC limits due to possible matrix interferences, results may have a slight bias .
S	RPD is outside QC limits.
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)
HT	Sample received past holdtime
IC	Improper Container
IT	Improper Temperature
V	Insufficient Volume
B	Sample collected in Bulk
AB	VOA Vial contained air bubbles.
OP	ortho-Phosphate was not filtered in the field within 15minutes of collection.
CCV	Continuing Calibration Verification Standard.
ICV	Initial Calibration Verification Standard.
Surr L	Surrogate recovery is low outside QC limits.
Surr H	Surrogate recovery is high outside QC limits.

Test Methods followed by the laboratory are referenced in the following approved methodology, unless otherwise specified.

Standard Methods for the Examination of Water and Wastewater, 21st Edition 2005
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR Units Evaporation Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
12/01/20 11:23
Received:
11/18/20 11:10

Report No. 2011261

Sandra Felix For Marcela Gracia Hawk, President For

Richard Hawk

Richard Hawk, General Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

TRRP 2011261

EnviroChain® By Promium

Submission key H322-NAI-896R	NOT SUBMITTED	Page 1/1

Client Information	Project Information	Laboratory Information	COC Information
CPS Energy - Environmental Dept. P.O. Box 1771 San Antonio TX 78296-1771 Phone: (210) 353-4719 Fax: (210) 353-4271	Calaveras Power Station-CCR Units Evaporation Pond Number: [none] Sample count: 2 TAT: 7	San Antonio Testing Laboratory 1610 S. Laredo St San Antonio TX 78207 Phone: 210-229-9920 Fax: 210-229-9921	Shipped via: Walk-in

#1	JKS 62-20201117-CCR 11/17/2020 10:40 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#2	JKS 63R-20201117-CCR 11/17/2020 11:32 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)

TG#7 temp 0.6°c/0.6°c iced

Relinquished by	Date/Time	Accepted by	Date/Time
Ed Partridge	1039 11·18·20		11-18-20 1046
Edward Partridge		Baines Penrod	

Baines Penrod 11-18-20 1110 — Sandra Felix SANDRA Felix 11/18/20 11:10

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: CPS

Report Number: 2011261

Project Name:

Date Received: 11/18/20

Shipped via: ☐FedEx ☐UPS ☐Lonestar ☐Hand Delivered ☐DHL ☑SATL ☐Other

Date Due: 12/01/20

Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No	✓	NA		If NA–reason:	
2. Custody Seals intact?	Yes		No	✓	NA		If NA–reason:	
3. Air Bill included in folder, if received?	Yes		No	✓	NA		If NA–reason:	
4. Is COC included with samples?	Yes	✓	No		NA		If NA–reason:	
5. Is COC signed and dated by client?	Yes	✓	No		NA		If NA–reason:	
6. Sample temperature: Thermal preservation between >0° - 6°C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	✓	No		NA		Temp: 0.6 °C	
7. Samples received with ice ☑ ice packs ☐ other cooling ☐	Yes	✓	No		NA		If NA–reason:	
8. Is the COC filled out correctly, and completely?	Yes	✓	No		NA		If NA–reason:	
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:	
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:	
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:	
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:	
13. Proper sample containers used?	Yes	✓	No		NA		If NA–reason:	
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:	
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No	✓	NA	✓	If NA–reason:	
16. Preservative for THMs only ($Na_2S_2O_3$)	Yes		No	✓	NA	✓	If NA–reason:	
17. Sample volume sufficient for requested analysis?	Yes	✓	No		NA		If NA–reason:	
18. Sample amount sufficient for TCLP analysis?	Yes		No	✓	N/A	✓	If NA- reason	
19. Subcontracted Samples: [if Yes, complete the next section]	Yes		No	✓	NA		If NA–reason:	

Analyses Subcontracted Out: ______ No. of Samples ______

Samples sent to: ______ Sent By: ______

Date samples sent: ______ Samples shipped via: ______

TAT Requested: ______

Tracking number [if any]: ______

Comments:

Received By: SA Date: 11/18/20

Labeled By: Date:

Logged into LIMS By: Date:

Logged into RF By: Date:

Q:\Controlled Documents\Forms\Login\Sample Receipt Checklist Form Rev 02052019.doc

SATL#FO001
Revised 02/05/19

Attachment 25-7

SAN ANTONIO
TESTING LABORATORY

November 10, 2020

Chelsey Vasbinder
CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio, TX 78296-1771

SATL Report No.: 2010325
RE: Calaveras Power Station-CCR SRH/Bottom Ash Pond

Dear Chelsey Vasbinder

SATL received 11 Sample(s) on 10/22/2020 as identified on the chain of custody. Analyses were performed only on the samples marked on the chain of custody using methods indicated on the laboratory report. Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Sincerely,

For San Antonio Testing Laboratory, Inc.

Richard Hawk

Richard Hawk,
General Manager

Appendix A Laboratory Data Package Cover Page

This data package consists of:

☑ This signature page, the laboratory review checklist, and the following reportable data:

☑ R1 Field chain-of-custody documentation;

☑ R2 Sample identification cross-reference;

☑ R3 Test reports (analytical data sheets) for each environmental sample that includes:
- a) Items consistent with NELAC 5.13 or ISO/IEC 17025 Section 5.10
- b) dilution factors,
- c) preparation methods,
- d) cleanup methods, and
- e) if required for the project, tentatively identified compounds (TICs).

☑ R4 Surrogate recovery data including:
- a) Calculated recovery (%R), and
- b) The laboratory's surrogate QC limits.

☑ R5 Test reports/summary forms for blank samples;

☑ R6 Test reports/summary forms for laboratory control samples (LCSs) including:
- a) LCS spiking amounts,
- b) Calculated %R for each analyte, and
- c) The laboratory's LCS QC limits.

☑ R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %Rs and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits

☑ R8 Laboratory analytical duplicate (if applicable) recovery and precision:
- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for analytical duplicates.

☑ R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

☑ R10 Other problems or anomalies.

☑ The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By me signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Gina Peachey For Marcela Gracia Hawk, President

Richard Hawk

Richard Hawk, General Manager

11/10/20 14:31

Date/Time

Project Name: Calaveras Power Station-CCR SRH/Bottom Ash Pond

Reviewer Name: JL

Laboratory Job Number: 2010325

Matrix : Liquid

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	12/30/99 to 11/05/20
Project Name:	Calaveras Power Station-CCR SRH/Bottom Ash	Laboratory Job Number:	2010325
Reviewer Name:	JL	Prep Batch Number(s):	B045095,B045096,B045098,B045171

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1		**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2		**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3		**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample quantitation limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?			X		
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		If required for the project, TICs reported?			X		
R4		**Surrogate recovery data**					
		Were surrogates added prior to extraction?			X		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			X		
R5		**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6		**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?					
		Was the LCSD RPD within QC limits?	X				
R7		**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		X			S001
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8		**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9		**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs included in the laboratory data package?	X				
R10		**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Appendix A (cont’d): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	12/30/99 to 11/05/20
Project Name:	Calaveras Power Station-CCR SRH/Bottom Ash	Laboratory Job Number:	2010325
Reviewer Name:	JL	Prep Batch Number(s):	B045095,B045096,B045098,B045171

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1		**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2		**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3		**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?	X				
S4		**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?	X				
S5		**Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6		**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7		**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8		**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?	X				
S9		**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	X				
S10		**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11		**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12		**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13		**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14		**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst’s competency up-to-date and on file?	X				
S15		**Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16		**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

1. Items identified by the letter “R” must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter “S” should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if “NR” or “No” is checked).

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Exception Reports

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	12/30/99 to 11/05/20
Project Name:	Calaveras Power Station-CCR SRH/Bottom Ash	Laboratory Job Number:	2010325
Reviewer Name:	JL	Prep Batch Number(s):	B045095,B045096,B045098,B045171

ER#[1]	Description
S001	Matrix spike recoveries outside QC acceptance criteria, due to matrix interferences , are flagged on the analytical report.

1. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked on the LRC)

LABORATORY REPORT

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

SAMPLE SUMMARY

Total Samples received in this work order: **11**

Sample ID	Laboratory ID	Matrix	Sampling Method	Date Sampled	Date Received
JKS-51-20201020-CCR	2010325-01	Liquid	Grab	10/20/20 10:30	10/22/20 15:20
JKS-53-20201020-CCR	2010325-02	Liquid	Grab	10/20/20 09:03	10/22/20 15:20
JKS-54-20201020-CCR	2010325-03	Liquid	Grab	10/20/20 09:40	10/22/20 15:20
JKS-48-20201021-CCR	2010325-04	Liquid	Grab	10/21/20 09:13	10/22/20 15:20
JKS-49-20201021-CCR	2010325-05	Liquid	Grab	10/21/20 11:37	10/22/20 15:20
JKS-50R-20201021-CCR	2010325-06	Liquid	Grab	10/21/20 10:27	10/22/20 15:20
JKS-52-20201021-CCR	2010325-07	Liquid	Grab	10/21/20 08:17	10/22/20 15:20
JKS-55-20201021-CCR	2010325-08	Liquid	Grab	10/21/20 09:53	10/22/20 15:20
JKS-56-20201021-CCR	2010325-09	Liquid	Grab	10/21/20 11:02	10/22/20 15:20
DUP-002-20201020	2010325-10	liquid	Grab	10/20/20 09:00	10/22/20 15:20
FB-002-20201020	2010325-11	Liquid	Grab	10/20/20 08:00	10/22/20 15:20

Notes

All quality control samples and checks are within acceptance limits unless otherwise indciated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: JKS-51-20201020-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 10/20/20 10:30

Lab Sample ID #: 2010325-01

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry			***Batch ID >*** *B045098*								
Total Dissolved Solids *	1930	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography			***Batch ID >*** *B045171*								
Chloride *	493	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	376	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals			***Batch ID >*** *B045095*								
Boron *	0.668	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	298	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: JKS-53-20201020-CCR
Sample Matrix: Liquid
Sampling Method: Grab
Date/Time Collected: 10/20/20 09:03
Lab Sample ID #: 2010325-02

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry			*Batch ID >*	*B045098*							
Total Dissolved Solids *	1320	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography			*Batch ID >*	*B045171*							
Chloride *	359	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Sulfate *	224	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals			*Batch ID >*	*B045095*							
Boron *	1.47	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	117	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: JKS-54-20201020-CCR **Sampling Method: Grab** **Lab Sample ID #: 2010325-03**

Sample Matrix: Liquid **Date/Time Collected: 10/20/20 09:40**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1530	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045171*							
Chloride *	383	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.455	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Sulfate *	398	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045096*							
Boron *	1.31	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	129	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: JKS-48-20201021-CCR
Sampling Method: Grab
Lab Sample ID #: 2010325-04
Sample Matrix: Liquid
Date/Time Collected: 10/21/20 09:13

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1300	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045171*							
Chloride *	446	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	1.05	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Sulfate *	170	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045096*							
Boron *	2.36	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	142	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: JKS-49-20201021-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 10/21/20 11:37

Lab Sample ID #: 2010325-05

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1380	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045171*							
Chloride *	435	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.656	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Sulfate *	193	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045096*							
Boron *	2.81	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	132	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: JKS-50R-20201021-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 10/21/20 10:27

Lab Sample ID #: 2010325-06

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	863	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045171*							
Chloride *	69.8	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.332	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Sulfate *	171	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045096*							
Boron *	6.79	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	140	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Notes:

Report No. 2010325

Sample ID #: JKS-52-20201021-CCR
Sampling Method: Grab
Lab Sample ID #: 2010325-07
Sample Matrix: Liquid
Date/Time Collected: 10/21/20 08:17

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1430	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045171*							
Chloride *	408	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.659	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Sulfate *	282	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045096*							
Boron *	2.21	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	199	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: JKS-55-20201021-CCR **Sampling Method: Grab** **Lab Sample ID #: 2010325-08**

Sample Matrix: Liquid **Date/Time Collected: 10/21/20 09:53**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1380	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045171*							
Chloride *	431	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.727	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Sulfate *	164	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045096*							
Boron *	0.815	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	154	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: JKS-56-20201021-CCR
Sampling Method: Grab
Lab Sample ID #: 2010325-09
Sample Matrix: Liquid
Date/Time Collected: 10/21/20 11:02

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	847	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045171*							
Chloride *	77.2	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.418	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Sulfate *	140	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045096*							
Boron *	4.00	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	120	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: DUP-002-20201020 **Sampling Method: Grab** **Lab Sample ID #: 2010325-10**

Sample Matrix: liquid **Date/Time Collected: 10/20/20 09:00**

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	1700	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045171*							
Chloride *	367	2.50		0.052	1.30	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Fluoride *	0.597	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Sulfate *	385	2.50		0.06	1.40	mg/L	EPA 300.0	EPA 300.0	11/03/20	JL	
Total Metals				***Batch ID >*** *B045096*							
Boron *	1.33	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	132	10.0		0.009	0.091	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Sample ID #: FB-002-20201020
Sampling Method: Grab
Lab Sample ID #: 2010325-11
Sample Matrix: Liquid
Date/Time Collected: 10/20/20 08:00

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
General Chemistry				***Batch ID >*** *B045098*							
Total Dissolved Solids *	< 2.47	2.50		2.47	2.47	mg/L	SM2540C	SM2540C	10/26/20	SG	
Anions by Ion Chromatography				***Batch ID >*** *B045171*							
Chloride *	0.204	0.100		0.052	0.052	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Fluoride *	< 0.018	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Sulfate *	0.11	0.10		0.06	0.06	mg/L	EPA 300.0	EPA 300.0	11/04/20	JL	
Total Metals				***Batch ID >*** *B045096*							
Boron *	0.018	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	
Calcium *	0.021	1.00	J	0.009	0.009	mg/L	EPA 3010A	EPA 6010B	11/02/20	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B045098 - SM2540C									
Blank (B045098-BLK1)				Prepared: 10/26/20 11:00	Analyzed: 10/26/20 14:36				
Total Dissolved Solids	<2.50	2.50	mg/L				–		
LCS (B045098-BS1)				Prepared: 10/26/20 11:00	Analyzed: 10/26/20 14:36				
Total Dissolved Solids	104	2.50	mg/L	100		104	80– 120		
LCS Dup (B045098-BSD1)				Prepared: 10/26/20 11:00	Analyzed: 10/26/20 14:36				
Total Dissolved Solids	103	2.50	mg/L	100		103	80– 120	1	20
Duplicate (B045098-DUP1)		**Source: 2010325-04**		Prepared: 10/26/20 11:00	Analyzed: 10/26/20 14:36				
Total Dissolved Solids	1370	2.50	mg/L		1300		–	5	20
Duplicate (B045098-DUP2)		**Source: 2010325-11**		Prepared: 10/26/20 11:00	Analyzed: 10/26/20 14:36				
Total Dissolved Solids	<2.50	2.50	mg/L		<2.50		–		20
Duplicate (B045098-DUP3)		**Source: 2010326-07**		Prepared: 10/26/20 11:00	Analyzed: 10/26/20 14:36				
Total Dissolved Solids	1530	2.50	mg/L		1510		–	1	20
Duplicate (B045098-DUP4)		**Source: 2010327-04**		Prepared: 10/26/20 11:00	Analyzed: 10/26/20 14:36				
Total Dissolved Solids	649	2.50	mg/L		664		–	2	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B045171 - EPA 300.0									
Blank (B045171-BLK1)				Prepared: 11/03/20 16:45 Analyzed: 11/03/20 17:35					
Fluoride	<0.020	0.020	mg/L				–		
Chloride	<0.100	0.100	mg/L				–		
Sulfate	<0.10	0.10	mg/L				–		
LCS (B045171-BS1)				Prepared: 11/03/20 16:45 Analyzed: 11/03/20 17:53					
Fluoride	1.04	0.020	mg/L	1.00		104	90– 110		
Chloride	4.77	0.100	mg/L	5.00		95	90– 110		
Sulfate	4.97	0.10	mg/L	5.00		99	90– 110		
LCS Dup (B045171-BSD1)				Prepared: 11/03/20 16:45 Analyzed: 11/03/20 18:11					
Fluoride	1.03	0.020	mg/L	1.00		103	90– 110	1	20
Chloride	4.78	0.100	mg/L	5.00		96	90– 110	0.3	20
Sulfate	4.97	0.10	mg/L	5.00		99	90– 110	0.04	20
Duplicate (B045171-DUP1)		**Source: 2010325-01**		Prepared: 11/03/20 16:45 Analyzed: 11/03/20 19:40					
Fluoride	<0.020	0.020	mg/L		<0.020		–		20
Chloride	493	2.50	mg/L		493		–	0.1	20
Sulfate	378	2.50	mg/L		376		–	0.4	20
Duplicate (B045171-DUP2)		**Source: 2010325-11**		Prepared: 11/03/20 16:45 Analyzed: 11/04/20 03:25					
Fluoride	<0.020	0.020	mg/L		<0.020		–		20
Chloride	0.203	0.100	mg/L		0.204		–	0.1	20
Sulfate	0.0961	0.10	mg/L		0.106		–	10	20
Matrix Spike (B045171-MS1)		**Source: 2010325-01**		Prepared: 11/03/20 16:45 Analyzed: 11/03/20 23:32					
Fluoride	1.08	0.020	mg/L	1.00	<0.020	108	90– 110		
Matrix Spike (B045171-MS2)		**Source: 2010325-11**		Prepared: 11/03/20 16:45 Analyzed: 11/04/20 03:42					
Fluoride	1.04	0.020	mg/L	1.00	<0.020	104	90– 110		
Chloride	4.74	0.100	mg/L	5.00	0.204	91	80– 120		
Sulfate	4.92	0.10	mg/L	5.00	0.106	96	90– 110		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Notes:

Report No. 2010325

Total Metals - Quality Control

Batch B045095 - EPA 3010A

Blank (B045095-BLK1) Prepared: 10/30/20 11:00 Analyzed: 11/02/20 13:41

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Boron	<0.010	0.010	mg/L				–		
Calcium	<1.00	1.00	mg/L				–		

LCS (B045095-BS1) Prepared: 10/30/20 11:00 Analyzed: 11/02/20 13:46

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Boron	2.11	0.010	mg/L	2.00		106	85–115		
Calcium	2.03	1.00	mg/L	2.00		102	85–115		

LCS Dup (B045095-BSD1) Prepared: 10/30/20 11:00 Analyzed: 11/02/20 13:52

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Boron	2.12	0.010	mg/L	2.00		106	85–115	0.3	20
Calcium	2.05	1.00	mg/L	2.00		102	85–115	0.8	20

Duplicate (B045095-DUP1) **Source: 2010322-01** Prepared: 10/30/20 11:00 Analyzed: 11/02/20 17:51

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Boron	0.289	0.010	mg/L		0.288		–	0.3	20
Calcium	128	10.0	mg/L		131		–	2	20

Matrix Spike (B045095-MS1) **Source: 2010322-01** Prepared: 10/30/20 11:00 Analyzed: 11/02/20 17:56

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Boron	1.98	0.010	mg/L	2.00	0.288	84	75–125		

Batch B045096 - EPA 3010A

Blank (B045096-BLK1) Prepared: 11/02/20 11:00 Analyzed: 11/02/20 13:41

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Boron	<0.010	0.010	mg/L				–		
Calcium	<1.00	1.00	mg/L				–		

LCS (B045096-BS1) Prepared: 11/02/20 11:00 Analyzed: 11/02/20 13:46

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Boron	2.11	0.010	mg/L	2.00		106	85–115		
Calcium	2.03	1.00	mg/L	2.00		102	85–115		

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept. P.O. Box 1771 San Antonio TX, 78296-1771	Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond Project Number: [none] Project Manager: Chelsey Vasbinder	**Reported:** 11/10/20 14:31 **Received:** 10/22/20 15:20

Notes:

Report No. 2010325

Total Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B045096 - EPA 3010A									
LCS Dup (B045096-BSD1)				Prepared: 11/02/20 11:00	Analyzed: 11/02/20 13:52				
Boron	2.12	0.010	mg/L	2.00		106	85 – 115	0.3	20
Calcium	2.05	1.00	mg/L	2.00		102	85 – 115	0.8	20
Duplicate (B045096-DUP1)		**Source: 2010325-03**		Prepared: 11/02/20 11:00	Analyzed: 11/02/20 19:12				
Boron	1.30	0.010	mg/L		1.31		–	0.5	20
Calcium	129	10.0	mg/L		129		–	0.08	20
Matrix Spike (B045096-MS1)		**Source: 2010325-03**		Prepared: 11/02/20 11:00	Analyzed: 11/02/20 19:18				
Boron	3.45	0.010	mg/L	2.00	1.31	107	75 – 125		

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Notes:

Report No. 2010325

DEFINITIONS

*	TNI / NELAC accredited analyte
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
ND	This qualifier indicates that the analyte was analyzed but not detected above the MDL
J	This qualifier indicates that the analyte is an estimate value between MQL and MDL
SQL	Sample Quantitation Limit
MQL	Method Quantitation Limit
MDL	Method Detection Limit
L	LCS/LCSD recovery is outside QC limits, the results may have a slight bias.
M	MS/MSD recovery is outside QC limits due to possible matrix interferences, results may have a slight bias .
S	RPD is outside QC limits.
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)
HT	Sample received past holdtime
IC	Improper Container
IT	Improper Temperature
V	Insufficient Volume
B	Sample collected in Bulk
AB	VOA Vial contained air bubbles.
OP	ortho-Phosphate was not filtered in the field within 15minutes of collection.
CCV	Continuing Calibration Verification Standard.
ICV	Initial Calibration Verification Standard.
Surr L	Surrogate recovery is low outside QC limits.
Surr H	Surrogate recovery is high outside QC limits.

Test Methods followed by the laboratory are referenced in the following approved methodology, unless otherwise specified.

Standard Methods for the Examination of Water and Wastewater, 21st Edition 2005
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

NELAC Cert. No. **T104704360**

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station-CCR SRH/Bottom Ash Pond
Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
11/10/20 14:31
Received:
10/22/20 15:20

Report No. 2010325

Gina Peachey For Marcela Gracia Hawk, President For

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Richard Hawk

Richard Hawk, General Manager

TRRP Report 2010325

Submission key H296-NBL-813Q	NOT SUBMITTED	Page 1/2

Client Information	**Project Information**	**Laboratory Information**	**COC Information**
CPS Energy - Environmental Dept. P.O. Box 1771 San Antonio TX 78296-1771 Phone: (210) 353-4719 Fax: (210) 353-4271	Calaveras Power Station-CCR SRH/Bottom Ash Pond Number: [none] Sample count: 11 TAT: 7	San Antonio Testing Laboratory 1610 S. Laredo St San Antonio TX 78207 Phone: 210-229-9920 Fax: 210-229-9921	Shipped via: Walk-in

#1	JKS-51-20201020-CCR 10/20/2020 10:30 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#2	JKS-53-20201020-CCR 10/20/2020 09:03 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#3	JKS-54-20201020-CCR 10/20/2020 09:40 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#4	JKS-48-20201021-CCR 10/21/2020 09:13 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#5	JKS-49-20201021-CCR 10/21/2020 11:37 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#6	JKS-50R-20201021-CCR 10/21/2020 10:27 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#7	JKS-52-20201021-CCR 10/21/2020 08:17 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#8	JKS-55-20201021-CCR 10/21/2020 09:53 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#9	JKS-56-20201021-CCR	**Analyses**	**Containers**

TRRP Report 2010325

	10/21/2020 11:02 Grab / Liquid	B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#10	DUP-002-20201020 10/20/2020 09:00 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)
#11	FB-002-20201020 10/20/2020 08:00 Grab / Liquid	**Analyses** B_T TAT: 7 Ca_T TAT: 7 Chloride_IC TAT: 7 Fluoride_IC TAT: 7 Sulfate_IC TAT: 7 TDS TAT: 7	**Containers** 250 mL Plastic HNO3 (1) 1 L Plastic Unpreserved (1)

2.6°C/2.6°C TG #7 Iced

Relinquished by	Date/Time	Accepted by	Date/Time
	10-22-20 1452	Rec: [illegible]	10-22-20 252pm
Edward Partridge	10-22-20 1452	Rec: [illegible] (Composites)	10-22-20 320pm

Rec: [illegible]

OCT 2 2 2020
1500

SAN ANTONIO TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: CPS Energy
Report Number: 2010325
Project Name: Calaveras
Date Received: 10-22-20
Shipped via: ☐FedEx ☐UPS ☐Lonestar ☐Hand Delivered ☐DHL ☑SATL ☐Other
Date Due: 10-31-20
Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes		No	✓	NA		If NA–reason:	
2. Custody Seals intact?	Yes		No		NA	✓	If NA–reason:	
3. Air Bill included in folder, if received?	Yes		No		NA	✓	If NA–reason:	
4. Is COC included with samples?	Yes	✓	No		NA		If NA–reason:	
5. Is COC signed and dated by client?	Yes	✓	No		NA		If NA–reason:	
6. Sample temperature: Thermal preservation between >0° - 6°C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	✓	No		NA		Temp: 0.2 °C	
7. Samples received with ice ☑ ice packs ☐ other cooling ☐	Yes	✓	No		NA		If NA–reason:	
8. Is the COC filled out correctly, and completely?	Yes	✓	No		NA		If NA–reason:	
9. Information on the COC matches the samples?	Yes	✓	No		NA		If NA–reason:	
10. Samples received within holding time?	Yes	✓	No		NA		If NA–reason:	
11. Samples properly labeled?	Yes	✓	No		NA		If NA–reason:	
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	✓	No		NA		If NA–reason:	
13. Proper sample containers used?	Yes	✓	No		NA		If NA–reason:	
14. All samples received intact, containers not damaged or leaking?	Yes	✓	No		NA		If NA–reason:	
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes		No		NA	✓	If NA–reason:	
16. Preservative for THMs only ($Na_2S_2O_3$)	Yes		No		NA	✓	If NA–reason:	
17. Sample volume sufficient for requested analysis?	Yes	✓	No		NA		If NA–reason:	
18. Sample amount sufficient for TCLP analysis?	Yes		No		N/A	✓	If NA- reason	
19. Subcontracted Samples: [if Yes, complete the next section]	Yes	✓	No		NA		If NA–reason:	

Analyses Subcontracted Out: Rads No. of Samples:
Samples sent to: Test Am. (Eurofins) Sent By: ALL
Date samples sent: 10-22-20 Samples shipped via:
TAT Requested: Reg.
Tracking number [if any]:
Comments:

Received By: ALL Date: 10-22-20
Labeled By: Date:
Logged into LIMS By: Date:
Logged into RF By: Date:

Attachment 26   Updated *Alternate Source Demonstration*

ERM

CityCentre Four
840 West Sam Houston Parkway
North, Suite 600
Houston, Texas 77024

Telephone: +281-600-1000
Fax: +281-520-4625

www.erm.com

~~April 26, 2022~~Updated November 28, 2022

Mr. Michael Malone
CPS Energy
500 McCullough Avenue
San Antonio, Texas 78215

Reference: Project No. 0636109

Subject: *Alternat~~iv~~e Source Demonstration* – Responses to Potential Statistically Significant Increases
Calaveras Power Station
San Antonio, Texas

Executive Summary

Title 40, Code of Federal Regulations, Part 257 (40 CFR §257) Subpart D (a.k.a. the Coal Combustion Residual (CCR) Rule) was published in the Federal Register in April 2015 and became effective in October 2015. CPS Energy has been operating surface impoundments and a landfill primarily for temporary storage and historically for disposal of fly ash and bottom ash.

On June 28, 2021, the US EPA partially approved the Texas CCR Program. The Texas partial program, administered under Title 30, Texas Administrative Code, Chapter 352, became effective on July 28, 2021. Although the Texas partial program generally adopts by reference the federal CCR Rule (with some additions), the Texas partial program operates in lieu of the federal CCR program.

One of the many requirements of the CCR programs was for CPS Energy to determine if there are impacts to groundwater from any of the surface impoundments and landfill at the Calaveras Power Station that contain CCR, and post the evaluation to its website on an annual basis. The evaluation of the October 2021 groundwater sample results indicated a potential statistically significant increase (SSI) for a limited number of constituents from the Evaporation Pond (EP), Fly Ash Landfill (FAL), and Bottom Ash Ponds (BAPs). Groundwater sample results from the Sludge Recycle Holding (SRH) Pond did not indicate a potential SSI.

Based on the evidence provided in this *Alternat~~iv~~e Source Demonstration*, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy will continue with a detection monitoring program.

Introduction

CPS Energy owns and operates the Calaveras Power Station that consists of two power plants (J.T Deely and J.K. Spruce) that are subject to regulation under the CCR Rule. Currently, CPS Energy operates three CCR units at the Power Station: Evaporation Pond (EP), Fly Ash Landfill (FAL), and the Sludge Recycle Holding (SRH) Pond. Although the J.T. Deely Power Plant ceased operation at the end of December 2018 and sluiced bottom ash is no longer being received at the

Bottom Ash Ponds (BAPs), the BAPs will continue to be monitored until the units have undergone closure. An *Annual Groundwater Monitoring and Corrective Action Report* (Report) was completed for each of these CCR units. Upper Prediction Limits (UPLs) and Lower Prediction Limits (LPLs) were calculated in each Report for the purpose of determining a potential statistically significant increase (SSI) over background levels. The Reports indicated that a potential SSI over background levels was determined for one or more Appendix III constituents from monitoring wells associated with the EP, FAL, and BAPs. A potential SSI over background levels was not determined from monitoring wells associated with the SRH Pond.

According to the CCR Rule [§257.94(e)], if the owner or operator of a CCR unit determines there is a SSI over background levels for one or more Appendix III constituents, the owner or operator may demonstrate that a source other than the CCR unit caused the SSI over background levels or that the SSI resulted from error in sampling, analysis, statistical evaluation or natural variation in groundwater quality. The CCR Rule also indicates that the owner or operator must complete the written demonstration within 90 days of detecting a SSI over the background levels. If a successful demonstration is completed within the 90-day period, the owner or operator may continue with a detection monitoring program. If a successful demonstration is not completed within the 90-day period, the owner or operator must initiate an assessment monitoring program.

General Comments and Terms

- Several groundwater monitoring wells were installed in the northern portion of the property prior to the construction of the EP and FAL (collectively termed Northern CCR Units). The EP was initially constructed as a landfill in 1990 and later converted to the surface impoundment in 1996 and the FAL was constructed in 1992.
- 'Historical data' refers to analytical data collected from 1988 through 1992 from monitoring wells that were in existence before the EP and FAL were operated. These monitoring wells are located over one-mile north of the BAPs, and although the BAPs were constructed in 1977, the historical data collected from these wells and the current data collected from upgradient wells of the Northern CCR Units is ~~useful~~ relevant in both a regional and site-specific context for all the CCR units and therefore, useful in evaluating BAP data.
- 'Background monitoring period' refers to the period from December 2016 to October 2017 when eight independent samples were collected from each background and downgradient well within the individual CCR monitoring well networks.
- Summary tables showing groundwater analytical results since the start of sampling (December 2016) through October 2021 for each CCR unit are provided in Attachment 1.

Evaporation Pond (EP)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the EP are presented in the following table and are discussed below.

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Boron	JKS-61	--	1.80	2021-10-19	1.95	mg/L
pH	JKS-61	4.58	6.26	2021-10-19	6.52	SU
pH	JKS-62	4.58	6.26	2021-10-19	6.67	SU

Boron (JKS-61)

Boron concentrations detected in JKS-61 were previously discussed in the February 2019 and April 2020 *Written Demonstrations*[1] and no SSI was determined for boron in this well based on the lines of evidence provided below. The boron concentrations detected in JKS-61 during the October 2021 monitoring event (1.95 mg/L) and the February 2022 resampling event (1.86 mg/L) are less than ~~or within~~ the ~~range of~~ boron concentrations (~~between 2.67 to~~up to 3.48 mg/L) detected in upgradient monitoring well JKS-57 and are less than the boron concentrations (up to 2.27 mg/L) detected in upgradient monitoring well JKS-45 for the other Northern CCR Unit during the background monitoring period. The boron concentrations in these monitoring wells reflect the regional and site-specific natural variability in groundwater quality. The laboratory analytical report from the February 2022 resampling event is provided in Attachment 2~~1~~.

pH (JKS-61 and JKS-62)

pH values detected in JKS-61 and JKS-62 were previously discussed in the June 2021 *Written Demonstration* and no SSI was determined for pH in these wells based on the lines of evidence provided below. The pH value in JKS-61 during the October 2021 monitoring event (6.52 SU) is within the range of pH values (between 6.48 and 7.40 SU) detected during the background monitoring period. The pH value in JKS-62 during the October 2021 monitoring event (6.67 SU) is within the range of pH values (between 6.63 and 7.51 SU) detected during the background monitoring period. These pH values; however, are essentially neutral (between 6.0 to 8.0 SU) indicative of naturally occurring pH values.

Fly Ash Landfill (FAL)[2]

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the FAL are presented in the following table and are discussed below.

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
pH	JKS-31	4.87	6.73	2021-10-20	3.92	SU
pH	JKS-46	4.87	6.73	2021-10-20	3.41	SU

pH (JKS-31 and JKS-46)

pH values detected in JKS-31 and JKS-46 were previously discussed in the April 2018, February 2019, April 2020, and June 2021 *Written Demonstrations* and no SSI was determined for pH in these wells based on the same lines of evidence provided below. The pH value detected in JKS-31 during the October 2021 monitoring event (3.92 SU) is within the range of pH values (between

---

[1] The term *'Written Demonstration'* was historically used for a document that provided responses to potential SSIs. In this document and all future documents, the term *'Alternat~~iv~~e Source Demonstration'* will be used for these types of documents.

[2] The FAL is primarily used for the storage of fly ash prior to offsite beneficial use and does not store liquid CCR or non-CCR wastestreams.

3.84 and 6.34 SU) detected in this well during the background monitoring period; however, historical data from JKS-31 indicate naturally occurring pH values ranging between 2.8 and 5.0 SU. The pH values detected in JKS-46 during the October 2021 monitoring event (3.41 SU) is within the range of pH values (between 2.1 and 3.6 SU) detected in this well during the background monitoring period. In addition, historical data from JKS-36, JKS-40, and JKS-43 located in the vicinity of the Northern CCR Units indicate naturally occurring pH values ranging between 2.9 and 4.9 SU.

Bottom Ash Ponds (BAPs)

Downgradient monitoring well results determined to be a potential SSI (i.e., greater than the UPLs or less than the LPLs) for the BAPs are presented in the following table and are discussed below.

Analyte	Well	LPL	UPL	Sample Date	Value	Unit
Boron	JKS-50R	--	2.63	2021-10-19	6.87	mg/L
Boron	JKS-56	--	2.63	2021-10-19	4.31	mg/L
Fluoride	JKS-56	--	0.894	2021-10-19	0.992	mg/L

Boron (JKS-50R and JKS-56)

Boron concentrations detected in JKS-50R and JKS-56 were previously discussed in the February 2019, April 2020, and June 2021 *Written Demonstrations* and no SSI was determined for boron in these wells based on the lines of evidence provided below. The boron concentrations detected in JKS-50R and JKS-56 during the October 2021 monitoring event (6.87 mg/L and 4.31 mg/L, respectively) and the February 2022 resampling event (6.59 mg/L and 4.06, respectively) are in the same order of magnitude detected in upgradient monitoring wells JKS-57 and JKS-45 (up to 3.48 mg/L and 2.27 mg/L, respectively) for the Northern CCR Units during the background monitoring period. Although JKS-57 and JKS-45 are not monitoring the BAPs, ~~T~~the boron concentrations in all these monitoring wells reflect the regional and site-specific natural variability in groundwater quality.

For comparison, a study of groundwater contamination from coal power plants across the southeast United States documented a 1 to 2 order of magnitude increase in boron concentrations between background and affected monitoring wells (Harkness et al., 2016). The detections in the wells in the study had boron concentrations of 1 to 6 mg/L, compared to background levels ranging from non-detect to 0.04 mg/L. Another study of affected groundwater from a CCR site in Indiana (Buszka et al., 2007) documented a 2 to 3 order of magnitude increase in boron concentrations between background and affected monitoring wells.

In addition, the statistical analysis and February 2022 resampling results (See Fluoride (JKS-56) below) show that no other Appendix III constituents were identified as potential SSIs in JKS-50R or JKS-56. If the elevated boron concentrations were associated with a release, other elevated Appendix III constituent concentrations would also be expected in these wells (Milligan and Ruane, 1980).

Finally, the concentration of boron within the BAPs was considered with respect to concentrations in the surrounding monitoring wells. During two sampling events in February 2018, grab samples of effluent water from the BAPs had reported boron concentrations of 1.03 mg/L and 1.16 mg/L.

Because boron is concentrated in coal ash compared to the original coal (Openshaw, 1992), and because boron is one of the more easily leached constituents in coal ash (Izquierdo and Querol, 2012), a low concentration of boron in the effluent indicates that the leachable boron concentration in the bottom ash is relatively low. In February 2018, a grab sample of the bottom ash being sent to the BAPs had a boron concentration of 122 mg/kg, and the toxicity characteristic leaching procedure (TCLP) analysis on this same sample had a boron concentration of 1.1 mg/L. The concentration of boron in the effluent and the leachable concentration of boron in the bottom ash are less than the concentrations in JKS-50R or JKS-56. Although CPS Energy agrees that the effluent results are not a direct comparison for groundwater quality, it does indicate that high concentrations of boron were not emptied into the BAPs at the time the sample was collected. Furthermore, the leachate sample of the bottom ash showed concentrations in the 1 mg/l range suggesting there is not an accumulation of leachable boron in the BAPs.

Fluoride (JKS-56)

Fluoride concentrations detected in JKS-56 were not previously identified as a potential SSI necessitating discussion. While the fluoride concentration detected in JKS-56 during the October 2021 monitoring event (0.992 mg/L) exceeded the UPL, the concentration detected during the February 2022 resampling event (0.178 mg/L) does not exceed the UPL. Additionally, the fluoride concentration detected during the February 2022 resampling event is within the range of fluoride concentrations (0.096 U mg/L to 0.564 mg/L) detected in this well during the background monitoring period and prior detection monitoring events. In consideration of these observations, the fluoride concentration observed during the October 2021 event appears to be anomalous.

Summary

EP – The concentrations of constituents associated with potential SSIs (boron and pH) appear to be naturally occurring and reflect natural variability in groundwater quality.

FAL – The concentrations of constituents associated with potential SSIs (pH) appear to be naturally occurring and reflect natural variability in groundwater quality.

BAPs – The concentrations of constituents associated with potential SSIs (boron and fluoride) appear to be naturally occurring and reflect regional and site-specific natural variability in groundwater quality. In addition, if the boron concentrations were associated with a release, other elevated Appendix III constituents would be expected and the expectation would be that the detected boron concentrations would be lower based on the effluent water and bottom ash analyses.

Conclusions

Based on the evidence provided in this *Alternat~~iv~~e Source Demonstration*, no SSIs over background levels have been determined for any of the CPS Energy CCR units (EP, FAL, BAPs, and SRH Pond) and therefore, CPS Energy should continue with a detection monitoring program.

Regarding the identification of a naturally occurring source for these minor increases, a direct source has not been identified. However, topographic maps from the mid 1900s indicate this area was formerly woodland (not cultivated or agricultural land) and it is therefore assumed that the regional and site-specific variability is natural and therefore the source.

References

Buszka, P. M., J. Fitzpatrick, L. R. Watson, and R. T. Kay. 2007. Evaluation of Ground-Water and Boron Sources by Use of Boron Stable-Isotope Ratios, Tritium, and Selected Water-Chemistry Constituents near Beverly Shores, Northwestern Indiana, 2004. U.S. Geological Survey Scientific Investigations Report Series 2007-5166.

Harkness, J. S., B. Sulkin, and A. Vengosh. 2016. Evidence for Coal Ash Ponds Leaking in the Southeastern United States. Environmental Science and Technology, v. 50 no. 12, p 6583-6592.

Izquierdo, M. and X. Querol. 2012. Leaching behaviour of elements from coal combustion fly ash: An overview. International Journal of Coal Geology. v. 94. p. 54-66.

Milligan, J. D. and R. J. Ruane. 1980. Effects of Coal-ash Leachate on Ground Water Quality. USEPA Interagency Energy/Environment R&D Program Report, EPA-600/7-80-066.

Openshaw, S. C. 1992. Utilization of Coal Fly Ash. MS Thesis. University of Florida.

Certification

Certification from a Texas licensed professional geoscientist verifying the accuracy of the information provided in this *Alternat~~iv~~e Source Demonstration* is provided in Attachment 3~~2~~.

We appreciate the opportunity to work with you on this project. Please contact me if you should have any questions.

Yours sincerely,

Environmental Resources Management Southwest, Inc.

Nicholas Houtchens, P.G.
Senior Consultant

ATTACHMENT 1 GROUNDWATER ANALYTICAL RESULTS SUMMARIES

TABLE 1
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-49 Upgradient															
	Sample Date	**12/7/16**	**2/22/17**	**3/28/17**	**5/3/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**	**4/13/21**	**10/19/21**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	3.24	3.28	3.28	3.03 X	3.04 J	2.76	2.85	2.87	2.71	2.70	2.05	2.58	2.47	2.81	2.59	2.50
Calcium	mg/L	130	146	173	113	127	120	145	147	135	117 D	154 D	127 D	114 J	132	133	119
Chloride	mg/L	295 D	383 D	372 D	326	414 D	448 D	459 D	424	446 D	408	449	429	452	435	449	437
Fluoride	mg/L	0.715	0.643 JH	0.665 JH	0.809	0.627 JH	0.617 JH	0.525	0.712	0.697	0.719	0.749	0.793	0.894	0.656	0.729	0.018 U
Sulfate	mg/L	211 D	232 D	234 D	194	218 D	227	265 D	219 X	237	237	240	205	217	193	211	232
pH - Field Collected	SU	7.19	7.12	7.12	7.02	7.06	6.16	7.05	6.89	7.12	7.12	7.31	6.43	7.15	7.14	7.12	7.06
Total dissolved solids	mg/L	1250	1240	1190	1100	1450	1440	1490	1730	1310	1210	1290	1380	1240	1380	1290	1300
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00173 J	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000676 J	0.000729 J	0.00123 U	0.00123 U	0.000544 J	0.000538 J	0.000478 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0607	0.0575	0.0503	0.0554	0.0783	0.0721	0.0788	0.0735	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000859 J	0.000572 J	0.00262 U	0.00262 U	0.000963 J	0.000997 J	0.00113 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00102 J	0.00109 J	0.00124 J	0.00155 J	0.00133 J	0.00153 J	0.00155 J	0.00146 J	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.715	0.643 JH	0.665 JH	0.809	0.627 JH	0.617 JH	0.525	0.712	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000758 U	0.000155 J	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0137 J	0.0341	0.0295	0.0427	0.0252	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000690 J	0.0000263 U	0.0000490 J	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00779 J	0.00846	0.00875	0.0106	0.00908 J	0.00938	0.0107	0.0111	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00992 J	0.00597	0.00479	0.00521 J	0.00370 J	0.00235	0.00188 J	0.00141 J	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.198 ± 0.197	0.615 ± 0.272	0.747 ± 0.323	0.195 ± 0.167	0.294 ± 0.192	0.241 ± 0.193	0.159 ± 0.191	0.746 ± 0.274	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.1 ± 0.907	-1.37 ± 1.37	0.854 ± 0.724	1.08 ± 1.72	2.23 ± 0.949	0.658 ± 0.636	0.812 ± 0.604	1.43 ± 0.898	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 1
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-51 Upgradient															
	Sample Date	12/8/16	2/22/17	3/28/17	5/3/17	6/21/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/9/19	10/22/19	4/28/20	10/20/20	4/13/21	10/20/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	Dec 2016	Feb 2017	Mar 2017	May 2017	Jun 2017	Jul 2017	Aug 2017	Oct 2017	Apr 2018	Oct 2018	Apr 2019	Oct 2019	Apr 2020	Oct 2020	Apr 2021	Oct 2021
Appendix III - Detection Monitoring																	
Boron	mg/L	0.512	0.517	0.473	0.565	0.512	0.525	0.453	0.509	0.465	0.347	0.489	0.648	0.627	0.668	0.579	0.665
Calcium	mg/L	267	292	322	266	261 X	232	236	256	246	149 D	328	336 D	334 J	298	314	321
Chloride	mg/L	403 D	331 D	414 D	447	424 D	455 D	384 D	375	395 D	301	559	574 D	555	493	522	543
Fluoride	mg/L	0.247	0.341 JH	0.415 JH	0.534	0.354	0.391	0.0960 U	0.407 JH	0.305 J	0.291 J	0.329 J	0.405 J	0.470	0.018 U	0.292	0.018 U
Sulfate	mg/L	293 D	330 D	348 D	359	342 D	330 D	314 D	302	354 D	260	428	405 D	439	376	382	421
pH - Field Collected	SU	6.59	6.51	6.48	6.56	6.40	5.48	6.38	6.20	6.44	6.70	6.66	5.73	6.43	6.47	6.42	6.32
Total dissolved solids	mg/L	1650	1650	1490	1980	1530	1580	1390	1650	1320	916	1890	2150	2010	1930	2190	2260
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.000953 J	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000412 J	0.000390 J	0.00123 U	0.000392 J	0.000344 J	0.000395 J	0.000418 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0655	0.0563	0.0517	0.0512	0.0534	0.0520	0.0520	0.0564	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000212 J	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000941 J	0.000525 U	0.00262 U	0.000657 J	0.000874 J	0.00113 J	0.00133 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000350 U	0.0000770 J	0.0000920 J	0.000350 U	0.000124 J	0.0000940 J	0.0000800 J	0.000108 J	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.247	0.341 JH	0.415 JH	0.534	0.354	0.391	0.0960 U	0.407 JH	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0322	0.0874	0.0790	0.0958 JX	0.0718	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.000199 J	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000255 U	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.09 ± 0.376	0.104 ± 0.122	0.618 ± 0.247	0.197 ± 0.145	0.328 ± 0.195	0.0847 ± 0.186	4.83 ± 0.763	0.682 ± 0.309	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.312 ± 0.688	1.09 ± 1.37	2.32 ± 1.45	-1.26 ± 1.37	-0.799 ± 0.928	1.57 ± 0.786	0.762 ± 0.706	0.963 ± 0.954	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 1
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-48 Downgradient															
	Sample Date	12/7/16	2/22/17	3/30/17	5/2/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/9/19	10/22/19	4/28/20	10/21/20	4/13/21	10/20/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 14	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Oct 2020**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	2.21	2.14	--	2.08	2.13	2.15 X	2.02	2.23	2.03	2.13	2.22	2.27	2.36	2.36	2.19	2.33
Calcium	mg/L	130	139	125	NR	111	136 X	134	147	143	128 D	166 D	135 D	130 J	142	140	130
Chloride	mg/L	395 D	408 D	435 D	427	440 D	465 D	166 D	427	433 D	438	467	446	485	446	477	458
Fluoride	mg/L	1.43	1.21 JH	1.62	1.41 JH	1.07	1.62	0.0960 U	1.22	1.35	1.31	1.46	1.25	0.051 JH	1.05	1.06	0.018 U
Sulfate	mg/L	239 D	251 D	266 D	259	253 D	244	140 D	257	282 D	266	271	213	206	170	187	224
pH - Field Collected	SU	7.06	6.92	6.86	6.99	6.88	5.92	6.90	6.74	6.91	6.92	7.06	6.12	6.89	6.83	6.8	6.72
Total dissolved solids	mg/L	1400	1270	1440	1490	1540	1380 J	850	1470	1400	1410	1420	1520	1400	1300	1420	1470
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	--	0.000240 U	0.00120 U	0.00129 J	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000538 J	--	0.000424 J	0.00123 U	0.000452 J	0.000459 J	0.000475 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0717	0.0699	--	0.0659	0.0686	0.0769	0.0725	0.0761	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	--	0.000131 U	0.000654 U	0.000233 J	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	--	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000608 J	--	0.000525 U	0.00262 U	0.000525 U	0.000863 J	0.00130 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00111 J	0.000844 J	--	0.000920 J	0.000987 J	0.00137 J	0.000917 J	0.00106 J	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	1.43	1.21 JH	1.62	1.41	1.07	1.62	0.0960 U	1.22	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	--	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000203 J	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	NR	0.0536	0.0501	0.0700	0.0551	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000310 JX	0.0000263 U	0.0000263 UX	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000422 J	--	0.000263 J	0.00128 U	0.000344 J	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	--	0.000454 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	--	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.139 ± 0.250	0.251 ± 0.149	0.0232 ± 0.136	0.357 ± 0.174	0.46 ± 0.235	0.544 ± 0.259	0.562 ± 0.283	0.26 ± 0.241	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.847 ± 1.14	0.317 ± 1.15	1.1 ± 0.737	-0.109 ± 1.35	0.284 ± 0.662	0.273 ± 0.867	0.459 ± 0.649	0.772 ± 0.931	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 1
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-50R Downgradient															
	Sample Date	**12/7/16**	**2/22/17**	**3/28/17**	**5/3/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**	**4/13/21**	**10/19/21**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	4.70	5.18	5.87	5.92	4.87	4.38	4.18	4.54	3.52	5.17	5.85	6.93	5.52	6.79	5.18	6.87
Calcium	mg/L	126	134	189	120	125	108	130	132	127	116 D	159 D	135 D	126 J	140	139	126
Chloride	mg/L	47.7 X	49.0 J	63.9	81.3	111	123	141 D	100	170	87.9	70.0	60.3	102	69.8	110	57.4
Fluoride	mg/L	0.316	0.331 JH	0.447 JH	0.528	0.387 JH	0.390 JH	0.0960 U	0.427 JH	0.335 J	0.392 J	0.319 J	0.380 J	0.510	0.332	0.336	0.018 U
Sulfate	mg/L	137 X	146	156	160	146	148	195 D	144	131	141	168	172	194	171	182	181
pH - Field Collected	SU	6.83	6.77	NR	6.80	6.63	5.69	6.62	6.43	6.67	6.61	6.80	5.85	6.65	6.63	6.70	6.53
Total dissolved solids	mg/L	737	808	789	902	914	856	992	947	883	688	842	899	918	863	942	838
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.00111 J	0.000735 J	0.00123 U	0.00123 U	0.000520 J	0.000545 J	0.000596 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.133	0.128	0.113	0.117	0.125	0.117	0.123	0.118	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000147 J	0.000187 J	0.000654 U	0.000654 U	0.000131 U	0.000131 U	0.000174 J	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000189 J	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.00251 J	0.00169 J	0.00262 U	0.00262 U	0.000788 J	0.000759 J	0.00108 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00305 J	0.00345	0.00251	0.00215 J	0.00191 J	0.00216	0.00233	0.00285	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.316	0.331 JH	0.447 JH	0.528	0.387 JH	0.390 JH	0.0960 U	0.427 JH	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000796 J	0.000988 J	0.000627 J	0.000758 U	0.000758 U	0.000178 J	0.000152 U	0.000168 J	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.000476 U	0.00209 J	0.000476 U	0.00621 J	0.000476 U	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00150 J	0.00153 J	0.00125 J	0.00128 U	0.00128 U	0.00102 J	0.00104 J	0.00108 J	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000514 J	0.000454 U	0.00227 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.102 ± 0.173	0.479 ± 0.216	-0.0714 ± 0.168	0.197 ± 0.183 U	0.245 ± 0.204	0.408 ± 0.226	0 ± 0.176	0.815 ± 0.292	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.99 ± 1.31	-0.428 ± 1.24	0.665 ± 1.14	0.00273 ± 1.33 U	0.783 ± 0.638	1.08 ± 0.832	0.0172 ± 1.12	1.5 ± 0.842	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 1
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-52 Downgradient															
	Sample Date	**12/7/16**	**2/21/17**	**3/28/17**	**5/2/17**	**6/21/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**	**4/13/21**	**10/20/21**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	1.66	2.11	1.63	1.51	1.33	1.43	1.46	1.71 X	1.95	1.54	1.46 X	1.65	2.05	2.21	2.51	1.69
Calcium	mg/L	169	181	189	--	145	140	162	168	175	153 D	195 DX	171 D	174 J	199	209	171
Chloride	mg/L	331 D	377 D	323 DX	320	326 D	343 D	417 D	355	360 D	326	336	320	433	408	470	336
Fluoride	mg/L	0.796	0.665	0.718 JH	0.915 JH	0.705	0.996 JH	0.0960 U	0.740	0.720	0.710	0.831	0.808	0.908	0.659	0.601	0.440 U
Sulfate	mg/L	277 D	318 D	299 DX	290	287 D	292 D	171 D	289	278 D	292	268	288 D	315	282	292	282
pH - Field Collected	SU	7.01	6.47	6.91	6.94	6.87	5.87	6.81	6.63	6.79	6.76	6.91	6.00	6.83	6.78	6.70	6.71
Total dissolved solids	mg/L	1290	1380	1100	1250	1280	1250	1250	1220	1240	1210	1170	1270	1470	1430	1590	1290
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000565 J	0.000398 J	0.000425 J	0.000427 J	0.000392 J	0.000412 J	0.000448 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0646	0.0583	0.0519	0.0483	0.0527	0.0558	0.0565	0.0616	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000153 J	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000525 U	0.000525 U	0.000525 U	0.000841 J	0.000860 J	0.00123 J	0.00108 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00188 J	0.00233	0.00112 J	0.00119 J	0.00211	0.00183 J	0.00159 J	0.00189 J	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.796	0.665	0.718 JH	0.915 JH	0.705	0.996 JH	0.0960 U	0.740	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000292 J	0.000152 U	0.000152 U	0.000163 J	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0471	0.000476 U	--	0.0616	0.0605	0.0827	0.0588	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.000234	0.0000263 U	0.0000263 U	0.0000263 U	0.0000810 J	0.0000263 U	0.0000263 UX	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.00128 J	0.00115 J	0.00102 J	0.000911 J	0.000865 J	0.000843 J	0.000914 J	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.71 ± 0.465	0.608 ± 0.289	0.296 ± 0.169	0 ± 0.150	0.435 ± 0.241	0.449 ± 0.196	0.194 ± 0.194	0.704 ± 0.319	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.65 ± 1.12	0.744 ± 0.833	0.0645 ± 0.649	0.53 ± 1.10	0.928 ± 0.784	1.16 ± 0.867	0.716 ± 0.767	1.54 ± 1.22	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 1
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-55 Downgradient															
	Sample Date	12/7/16	2/22/17	3/28/17	5/3/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/9/19	10/22/19	4/28/20	10/21/20	4/13/21	10/19/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.716	0.716	0.785	0.710	0.787	0.651	0.687	0.759	0.645	0.611	0.740	0.771	0.779	0.815	0.762	0.826
Calcium	mg/L	143	153	181	133	133	118	136	146	134	119 D	165 D	145 D	137 J	154	146	139
Chloride	mg/L	384 DX	50.5	403 D	388	395 D	400 D	168 D	386	387 D	429	438	432	452	431	440	424
Fluoride	mg/L	0.857	0.352 JH	0.746 JH	0.891	1.14	1.08 JH	0.0960 U	0.864	0.791	0.820	0.822	0.832	1.01	0.727	0.857	0.880 U
Sulfate	mg/L	164 X	147	172	173	164	166	139 D	157	168	155	168	159	177	164	173	182
pH - Field Collected	SU	6.85	6.80	6.81	6.82	6.72	5.77	6.72	6.53	6.75	6.70	6.90	5.96	6.81	6.77	6.78	6.68
Total dissolved solids	mg/L	1430	1380	1290	1310	1500	1270	826	1470	1300	1190	1420	1370	1350	1380	1390	1440
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000650 J	0.000520 J	0.00123 U	0.00123 U	0.000507 J	0.000582 J	0.000599 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.103	0.0876	0.0823	0.0758	0.0828	0.0780	0.0801	0.0816	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000134 J	0.000654 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000625 J	0.000525 U	0.00262 U	0.00262 U	0.000525 U	0.000797 J	0.000903 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00702 J	0.00516	0.00579	0.00750 J	0.00642 J	0.00562	0.00565	0.00565	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.857	0.352 JH	0.746 JH	0.891	1.14	1.08 JH	0.0960 U	0.864	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0136 J	0.0425	0.0354	0.0495	0.0338	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 UX	0.0000263 U	0.0000263 UX	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00130 J	0.00123 J	0.00108 J	0.00128 U	0.00128 U	0.000804 J	0.000898 J	0.000837 J	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.00227 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.694 ± 0.358	0.721 ± 0.320	0.745 ± 0.258	0.576 ± 0.261	0.305 ± 0.190	0.0212 ± 0.171	0.327 ± 0.233	0.588 ± 0.314	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	3.76 ± 1.33	1.87 ± 1.01	-0.0356 ± 1.09	1.01 ± 1.02	0.591 ± 0.843	0.532 ± 0.795	0.234 ± 0.821	1.24 ± 0.848	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 1
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Bottom Ash Ponds

		JKS-56 Downgradient															
	Sample Date	12/7/16	2/22/17	3/30/17	5/3/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/9/19	10/22/19	4/28/20	10/21/20	4/13/21	10/19/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	3.97	4.13	--	4.60	3.98	3.60	3.60 X	3.48	3.95	3.95	3.85	4.47	3.55	4.00	3.16	4.31
Calcium	mg/L	137	143	127	124	136	116	137	146	126	121 D	150 D	131 D	103 J	120	111	120
Chloride	mg/L	131	95.7	96.3	95.6	114	126	146 D	150	121	108 JL	81.0	81.2	101	77.2	176	71.3
Fluoride	mg/L	0.344	0.354 JH	0.333	0.564	0.407 JH	0.401 JH	0.0960 U	0.448 JH	0.37 J	0.428 J	0.372 J	0.452 J	0.552	0.418	0.403	0.992
Sulfate	mg/L	193	190	188	183	186	194	201 D	200	193	192	193	194	138	140	64.0	181
pH - Field Collected	SU	6.73	6.63	6.56	6.71	6.56	5.63	6.57	6.38	6.64	6.55	6.76	5.84	6.72	6.63	6.7	6.59
Total dissolved solids	mg/L	1100	969	1020	997	1060	1060	986	1240	992	976	918	968	904	847	838	870
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	--	0.00120 U	0.00120 U	0.000240 U	0.00104 J	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00527 J	0.00425	--	0.00350 J	0.00435 J	0.00373	0.00517	0.00451	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.126	0.0974	--	0.0890	0.0921	0.0897	0.103	0.0909	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	--	0.000654 U	0.000654 U	0.000131 U	0.000136 J	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	--	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000654 J	--	0.00276 J	0.00262 U	0.000525 U	0.00498	0.00141 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00560 J	0.00564	--	0.00641 J	0.00687 J	0.00668	0.00771	0.00746	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.344	0.354 JH	0.333	0.564	0.407 JH	0.401 JH	0.0960 U	0.448 JH	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	--	0.000758 U	0.000758 U	0.000152 U	0.000211 J	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.000476 U	0.000476 U	0.00156 J	0.000476 U	0.00598 J	0.000476 U	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000700 J	0.0000263 UX	0.0000263 U	0.0000263 UX	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00360 J	0.00190 J	--	0.00168 J	0.00152 J	0.00156 J	0.00160 J	0.00155 J	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	--	0.00227 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	--	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.23 ± 0.430	0.254 ± 0.175	0.372 ± 0.215	0.138 ± 0.166	0.273 ± 0.253	0.177 ± 0.213	0.441 ± 0.225	0.397 ± 0.252	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.949 ± 1.38	3.07 ± 1.28	1.09 ± 0.897	1.97 ± 1.35	1.27 ± 0.994	1.16 ± 0.862	1.45 ± 0.895	3.36 ± 1.42	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 2
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-47 Upgradient															
Sample Date		12/8/16	2/28/17	3/29/17	5/3/17	6/21/17	7/26/17	8/30/17	10/11/17	4/5/18	10/30/18	4/10/19	10/23/19	4/29/20	10/21/20	4/14/21	10/19/21
Task		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.824	0.838	0.696	0.817	0.804	0.828 JH	0.760	1.02	0.844	0.806	0.590	1.05	0.800	0.904 JL	0.816	0.881
Calcium	mg/L	54.0	62.1	168	26.2	71.1	62.7 JH	66.7	36.1	53.5	83.2 D	128	36.5	43.1	28.4	62.1	67.1
Chloride	mg/L	107	150	232 D	193	168	148 JH	210 D	68.5	151	186	279	53.9 X	107	60.9	154	162
Fluoride	mg/L	0.0360 U	0.0360 U	0.315	0.382 JH	0.213 JH	0.360 U	0.0960 U	0.0360 U	0.0360 U	0.0998 J	0.0985 J	0.154 JH	0.163	0.161	0.142	0.018 U
Sulfate	mg/L	213 D	267 D	369 D	299	266 D	248 JH	284 D	171	236	262	347	210 X	257	195	278	271
pH - Field Collected	SU	5.82	5.83	5.75	6.00	5.75	5.85	5.90	5.93	5.91	5.72	5.92	4.58	5.87	5.88	6.09	6.16
Total dissolved solids	mg/L	811	922	1170	1060	979	806 JH	904	677	787	727	1240	665	772	782	929	980
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000294 J	0.00120 U	0.000275 J	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00442 J	0.00130 J	0.00136 J	0.00123 U	0.00185 J	0.00105 J	0.00124 J	0.000246 U	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0475	0.0132	0.0180	0.0118 J	0.0154	0.00981	0.0104	0.00785	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000813 J	0.000255 J	0.000131 U	0.000654 U	0.000352 J	0.000131 U	0.000172 J	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000637 J	0.000977 J	0.000797 J	0.000735 J	0.000611 J	0.000814 J	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.234	0.00430	0.000988 J	0.00262 U	0.00262 J	0.000855 J	0.00130 J	0.000525 U	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00915 J	0.00102 J	0.00153 J	0.00113 J	0.00227	0.000976 J	0.00107 J	0.0000699 U	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.0360 U	0.315	0.382 JH	0.213 JH	0.360 U	0.0960 U	0.0360 U	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.00586 J	0.000950 J	0.000448 J	0.000758 U	0.00157 J	0.000202 J	0.000449 J	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0615	0.0478	0.00238 U	0.0207	0.0720	0.0644	0.0799	0.0521	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000600 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.0317	0.00126 J	0.00173 J	0.00128 J	0.000788 J	0.000581 J	0.000653 J	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0493	0.0697	0.0518	0.0564	0.0613	0.0577	0.0525	0.0854	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.2 ± 0.342	0.578 ± 0.275	0.630 ± 0.237	0.538 ± 0.192	0.729 ± 0.278	0.304 ± 0.233	1.06 ± 0.361	0.246 ± 0.180	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.66 ± 1.15	1.34 ± 1.05	1.27 ± 0.960 U	2.17 ± 1.01	0.664 ± 0.929	0.771 ± 1.48	1.65 ± 1.05	0.463 ± 0.886	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 2
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-63 / JKS-63R Upgradient (A)															
	Sample Date	12/8/16	2/22/17	3/29/17	5/3/17	6/21/17	7/26/17	8/30/17	10/11/17	4/5/18	10/30/18	8/20/19	10/23/19	4/29/20	11/17/20	4/14/21	10/19/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Nov 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.800	0.866	NR	0.981	(1)	1.33 JH	1.23	1.06	1.13	(2)	2.03	1.03	0.950	1.12	1.12	1.23
Calcium	mg/L	783	914	713	1060	(1)	835	174	872	836	(2)	221	953 D	952	1050	1060	1140
Chloride	mg/L	1230 D	1160 D	1220 D	1340	(1)	1960 JHD	1890 D	1420	1670	(2)	2360 D	2240	2530	2830	2440	2590
Fluoride	mg/L	0.0573 J	0.320	0.297	0.364 JH	(1)	0.0971 JH	0.182 JH	0.0360 U	0.0360 U	(2)	0.206 J	0.352 JH	0.018 U	0.018 U	0.018 U	0.018 U
Sulfate	mg/L	0.0460 U	1860 D	1890 D	1860	(1)	1970 D	1920 D	1820	2110	(2)	1810 D	1750 D	1810	2120	1720	1640
pH - Field Collected	SU	5.61	5.35	5.60	5.85	(1)	5.88	5.82	5.63	5.64	(2)	--	4.76	5.83	5.79	5.99	6.07
Total dissolved solids	mg/L	5750	4760	4870	5560	(1)	6410	5000	5080	5220	(2)	6660	5200	7240	8190	8440	9940
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000459 J	0.000695 J	0.00120 U	(1)	0.000240 U	0.000424 J	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00332 J	0.00294	0.00128 J	0.00123 U	(1)	0.000893 J	0.000992 J	0.000246 U	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0626	0.0540	0.0336	0.0316	(1)	0.0294	0.0258	0.0222	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000930 J	0.000442 J	0.000654 U	(1)	0.000196 J	0.000223 J	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.00339 J	0.00405	0.00394	0.00316 J	(1)	0.00282	0.00263	0.00285	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	1.49	0.735	0.371	0.114	(1)	0.0742	0.0584	0.0130	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.0802	0.0762	0.0546	0.0331	(1)	0.0137	0.0119	0.0119	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0573 J	0.320	0.297	0.364 JH	(1)	0.0971 JH	0.182 JH	0.0360 U	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.00441 J	0.00599	0.00108 J	0.000758 U	(1)	0.000238 J	0.000551 J	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.116	0.00238 U	0.654	(1)	0.946	1.15	0.791	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.000236	0.000237	0.000206	0.0000400 J	(1)	0.000260	0.000441	0.000376	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.186	0.00789	0.00966	0.00419 J	(1)	0.00281	0.00180 J	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0188	0.0210	0.0257	0.0188	(1)	0.0288	0.0318	0.0244	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	(1)	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	3.42 ± 0.573	2.76 ± 0.476	5.79 ± 0.790	4.57 ± 0.577	(1)	6.7 ± 0.744	7.36 ± 0.874	5.04 ± 0.711	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.44 ± 1.44	4.13 ± 1.21	2.04 ± 1.61 U	3.41 ± 0.968	(1)	10.9 ± 2.31	1.79 ± 1.27	6.77 ± 1.48	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 2
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-64 Upgradient															
Sample Date		12/8/16	2/23/17	3/29/17	5/4/17	6/21/17	7/26/17	8/30/17	10/11/17	4/5/18	10/30/18	4/10/19	10/23/19	4/29/20	10/21/20	4/14/21	10/19/21
Task		Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	Unit	Dec 2016	Feb 2017	Mar 2017	May 2017	Jun 2017	Jul 2017	Aug 2017	Oct 2017	Apr 2018	Oct 2018	Apr 2019	Oct 2019	Apr 2020	Oct 2020	Apr 2021	Oct 2021
Appendix III - Detection Monitoring																	
Boron	mg/L	0.839	0.837	1.14	0.962	0.816	0.904 JH	0.835	0.901	0.837	0.805	0.804	0.747	0.711	0.735 JL	0.771	0.844
Calcium	mg/L	24.0	24.0	31.4	23.8	20.6	21.7 JH	21.6	25.2	23.6	24.4	23.0	24.4	20.3	20.4	23.9	0.0004 J
Chloride	mg/L	12.7	12.4	11.8	11.0	11.4	11.5	11.5	9.63	14.2	15.5	16.6	17.7	18.2	16.0	18.4	15.7
Fluoride	mg/L	0.0360 U	0.294 JH	0.332	0.188	0.231 JH	0.157 JH	0.224 JH	0.0360 U	0.0360 U	0.106 J	0.121 J	0.176 JH	0.143	0.101	0.380	0.018 U
Sulfate	mg/L	171	182	184	174	172	170 JH	172	164	189	196	193	192 X	209	212	218	196
pH - Field Collected	SU	6.46	5.50	6.30	6.33	6.21	6.09	6.20	6.21	6.13	5.97	6.14	4.82	5.86	5.96	6.07	6.19
Total dissolved solids	mg/L	594	585	611	581	572	555 JH	463	576	549	525	551	588	569	664	586	597
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.000911 J	0.000730 J	0.000556 J	0.00123 U	0.000476 J	0.000490 J	0.000519 J	0.000246 U	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.00768	0.00451	0.00392 J	0.00410 J	0.00320 J	0.00324 J	0.00275 BJ	0.000484 U	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000131 U	0.000131 U	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000147 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.000525 U	0.000905 J	0.000525 U	0.00262 U	0.000867 J	0.000637 J	0.000961 J	0.000525 U	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000998 J	0.000952 J	0.000851 J	0.000859 J	0.000745 J	0.000856 J	0.000889 J	0.0000699 U	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.294 JH	0.332	0.188	0.231 JH	0.157 JH	0.224 JH	0.0360 U	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000186 J	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0173 J	0.0146 J	0.00238 U	0.0152 J	0.0173 J	0.0181 J	0.0252	0.0208	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 UX	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000540 J	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.000398 J	0.000317 J	0.000255 U	0.00128 U	0.000265 J	0.000255 U	0.000273 J	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.000512 J	0.000550 J	0.000495 J	0.00227 U	0.000468 J	0.000468 J	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.000332 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.981 ± 0.400	1.16 ± 0.408	0.530 ± 0.284	0.231 ± 0.174	0.258 ± 0.175	0.286 ± 0.247	1.05 ± 0.361	0.531 ± 0.276	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.429 ± 1.56	2.07 ± 1.22	-0.102 ± 1.07 U	0.408 ± 0.764	0.699 ± 0.761	2.49 ± 1.54	0.26 ± 0.639	1 ± 0.834	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 2
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-36 Downgradient															
	Sample Date	**12/8/16**	**2/23/17**	**3/29/17**	**5/4/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/5/18**	**10/30/18**	**4/10/19**	**10/22/19**	**4/29/20**	**10/21/20**	**4/14/21**	**10/19/21**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.308	0.671	0.748	0.731	0.581	0.625 JH	0.663	0.637	0.625	0.686	0.663	0.632	0.459	0.456 JL	0.436	0.630
Calcium	mg/L	69.7	165	147	282	247	255 JHX	241	289	281	311 D	315 D	265 D	175	259	268	299
Chloride	mg/L	14.5	199 D	37.0	355	364 D	379 JHD	319 D	328	347 X	313	285	274	63.3	319	316	260
Fluoride	mg/L	0.0360 U	0.439 JH	0.330	1.53	1.26	1.37 JH	1.30	1.32	1.95 X	1.47	1.45	1.41	1.18	1.07	1.02	0.018 U
Sulfate	mg/L	49.2	409 D	271 D	726	731 D	775 JHD	707 D	741	816 X	946	697	756 D	189	890	923	727
pH - Field Collected	SU	6.71	4.96	6.98	4.04	3.72	3.80	5.20	3.24	3.48	3.61	3.71	3.66	3.42	3.98	4.29	5.96
Total dissolved solids	mg/L	368	1010	591	1610	1820	1700 JH	1220	1770	1650	1630	1520	1600	1790	1930	2100	1640
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.00123 J	0.00120 U	0.000240 U	0.00121 J	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000588 J	0.00134 J	0.00324 J	0.00276	0.00369	0.00341	0.00372	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0988	0.0967	0.139	0.0270	0.0187	0.0207	0.0372	0.0225	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.00198 J	0.000131 U	0.0259	0.0226	0.0261	0.0212	0.0259	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.00257 J	0.00510	0.000548 J	0.0118	0.0102	0.0117	0.0101	0.0113	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.00608	0.0409	0.0100 J	0.00968	0.0156	0.00792	0.0132	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000579 J	0.0871	0.00751	0.220	0.186	0.216	0.195	0.215	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.439 JH	0.330	1.53	1.26	1.37 JH	1.30	1.32	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000164 J	0.000220 J	0.000261 J	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0123 J	0.119	0.00238 U	0.326	0.340	0.371	0.372	0.379	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.000834	0.000289	0.00143	0.00240	0.00244	0.00160	0.00113	0.00226	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00397 J	0.00261	0.0686	0.00183 J	0.000704 J	0.000791 J	0.00151 J	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0334	0.0448	0.0313	0.0673	0.0616	0.0697	0.0633	0.0663	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000487 J	0.000332 U	0.00166 U	0.000876 J	0.00114 J	0.000889 J	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.0888 ± 0.151	1.12 ± 0.342	0.453 ± 0.276	4.85 ± 0.656	4.02 ± 0.608	4.32 ± 0.667	6.28 ± 0.845	3.6 ± 0.600	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.14 ± 1.02	2.17 ± 0.979	0.166 ± 0.861 U	4.28 ± 1.19	3.44 ± 1.04	3.95 ± 1.79	2.63 ± 0.928	3.3 ± 1.33	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 2
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-61 Downgradient															
Sample Date		**12/7/16**	**2/23/17**	**3/29/17**	**5/3/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/5/18**	**10/31/18**	**4/10/19**	**10/22/19**	**4/29/20**	**10/21/20**	**4/13/21**	**10/19/21**
Task		**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	1.07	1.29	1.15	1.18	0.960	1.01 JH	0.994	0.997	1.09	3.25	2.72	2.90	1.82	1.82 JL	1.57	1.95
Calcium	mg/L	134	95.9	155	113	115	107 JH	105	135	171	197 D	176	168 D	154	172	122	130
Chloride	mg/L	198	158	162	168	193	190 JH	218 D	210	285	213	253	248	312	281	204	207
Fluoride	mg/L	0.393	0.503	0.522	0.643 JH	0.459 JH	0.479 JH	0.0960 U	0.0360 U	0.406 J	0.430 J	0.403 J	0.480 J	0.494	0.366	0.216	0.018 U
Sulfate	mg/L	401 D	377 JD	382 D	388	408 D	390 JHD	385 D	401	562	548	619	548 D	604	533	393	397
pH - Field Collected	SU	6.72	6.51	6.48	6.68	6.53	6.55	7.40	6.27	6.42	6.38	6.52	5.61	6.27	6.57	6.40	6.52
Total dissolved solids	mg/L	1400	1180	1190	1260	1430	1290 JH	1170	1280	1620	514	1650	1790	1870	2000	1320	1380
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000768 J	0.000709 J	0.00123 U	0.000563 J	0.000622 J	0.000569 J	0.000246 U	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0364	0.0186	0.0173	0.0178 J	0.0148	0.0167	0.0153	0.0162	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000911 J	0.000525 U	0.00262 U	0.000525 U	0.000604 J	0.000808 J	0.000525 U	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000719 J	0.000725 J	0.000769 J	0.000779 J	0.000805 J	0.000765 J	0.000855 J	0.0000699 U	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.393	0.503	0.522	0.643 JH	0.459 JH	0.479 JH	0.0960 U	0.0360 U	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0158 J	0.00238 U	0.0120 J	0.0342	0.0336	0.0443	0.0335	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00165 J	0.00129 J	0.000984 J	0.00128 U	0.000776 J	0.000742 J	0.000712 J	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.00123 J	0.00123 J	0.00227 U	0.00185 J	0.00154 J	0.00172 J	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.15 ± 0.429	0.723 ± 0.306	0.256 ± 0.237 U	0.237 ± 0.193	0.398 ± 0.239	0.511 ± 0.223	0.821 ± 0.324	0.485 ± 0.212	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.79 ± 1.44	0.358 ± 1.06	0.761 ± 0.688 U	-0.064 ± 0.607	2.03 ± 0.997	0.491 ± 0.813	0.247 ± 0.710	1.64 ± 1.08	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 2
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Evaporation Pond

		JKS-62 Downgradient															
	Sample Date	12/8/16	2/23/17	3/29/17	5/4/17	6/21/17	7/26/17	8/30/17	10/11/17	4/5/18	10/30/18	4/10/19	10/23/19	4/29/20	11/17/20	4/14/21	10/19/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Nov 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.549	0.481	0.597	0.601	0.501	0.485 JH	0.485	0.549	0.522	0.559	0.612	0.528	0.484	0.537	0.541	0.558
Calcium	mg/L	155	152	220	156	150	134 JH	150	158	160	161 D	205 D	151 D	122	144	149	159
Chloride	mg/L	257 D	279 DX	279 D	278	291 D	260 JHD	281 D	241	312	279	336	276	284	284	279	270
Fluoride	mg/L	0.246	0.362 JH	0.418	0.388	0.366 JH	0.342 JH	0.233 JH	0.0360 U	0.353 J	0.309 J	0.356 J	0.380 J	0.331	0.295	0.258	0.018 U
Sulfate	mg/L	190	187	193	188	184	181 JH	188 D	175	200	183	191	183	190	212	191	180
pH - Field Collected	SU	6.79	6.67	6.63	6.71	6.68	6.82	7.51	6.52	6.72	6.58	6.29	5.43	6.54	6.55	6.61	6.67
Total dissolved solids	mg/L	1120	1170	1140	1100	1080	976 JH	1080	1080	1110	956	1190	1160	1100	1040	1100	1070
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.000684 J	0.000293 J	0.000246 U	0.00123 U	0.000254 J	0.000246 U	0.000246 U	0.000246 U	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0825	0.0786	0.0813	0.0747	0.0734	0.0737	0.0708	0.0793	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000131 U	0.000131 U	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000147 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00186 J	0.00109 J	0.000525 U	0.00262 U	0.000551 J	0.000691 J	0.00107 J	0.000525 U	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00110 J	0.000198 J	0.000744 J	0.000350 U	0.000278 J	0.000211 J	0.0000699 U	0.0000699 U	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.246	0.362 JH	0.418	0.388	0.366 JH	0.342 JH	0.233 JH	0.0360 U	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000588 J	0.000152 U	0.000152 U	0.000758 U	0.000154 J	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0129 J	0.00238 U	0.00134 J	0.0353	0.0305	0.0457	0.0263	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000540 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.000414 J	0.000259 J	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.222	0.192	0.196	0.195	0.185	0.181	0.191	0.208	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.000332 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.485 ± 0.229	0.402 ± 0.220	0.665 ± 0.321	0.0997 ± 0.153	0.425 ± 0.233	0.399 ± 0.220	2.02 ± 0.489	0.669 ± 0.279	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.15 ± 1.38	1.53 ± 1.28 U	0.305 ± 1.10 U	-0.138 ± 0.656	0.66 ± 0.760	1.07 ± 0.949	0.673 ± 0.821	0.371 ± 0.631	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:

(A) JKS-63 plugged and abandoned and replaced with JKS-63R on 5/2/19. Sample events 1 through 10 collected from JKS-63 and thereafter from JKS-63R.

(1) Sample not collected due to the well going dry during sampling activities.

(2) Sample not collected due to blockage in the well casing.

mg/L: Milligrams per Liter.

SU: Standard Units.

pCi/L: Picocuries per Liter.

-- : Laboratory did not analyze sample for indicated constituent.

B: Target analyte or common lab contaminant was identified in the method blank.

D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.

J: Analyte detected above method (sample) detection limit but below method quantitation limit.

H: Bias in sample result likely to be high.

NR: Analysis of this constituent not required for detection monitoring.

U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).

X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-45 Upgradient															
	Sample Date	12/6/16	2/23/17	3/28/17	5/3/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/10/19	10/23/19	4/28/20	10/21/20	4/13/21	10/20/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	1.65	1.51	2.27	1.11	2.03	1.91	2.02	2.21	2.28	3.24	2.78	2.98	3.01	2.81	2.76	2.94
Calcium	mg/L	144	122	184	105	101	103	120	130	128	161 D	195	161 D	141 J	132	146	188
Chloride	mg/L	196	187	181 J	160	152	0.803	345 JHD	24.8	118	137	167	144	113	98.7	109	130
Fluoride	mg/L	0.0360 U	0.207	0.334	0.337 JH	0.174 J	0.274 JH	0.0960 U	0.131 JH	0.0360 U	0.0360 U	0.0621 UJ	0.101 J	0.100	0.018 U	0.018 U	0.018 U
Sulfate	mg/L	623 D	639 D	661	613 X	602 D	2.95 JH	770 JHD	120	662 D	707	874	698	619	564	561	634
pH - Field Collected	SU	5.41	5.17	3.98	5.62	5.13	5.66	5.82	5.60	5.59	5.70	5.03	5.59	5.85	5.94	5.99	5.93
Total dissolved solids	mg/L	1270	1300	1330	1350	1270	1250	1680 JH	1100	1190	741	1350	1320	1590	1260	1360	1390
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.000240 U	0.000310 J	0.000400 J	0.00120 U	0.00120 U	0.000240 U	0.000348 J	0.000490 J	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.000534 J	0.00216	0.00595	0.00123 U	0.00123 U	0.000346 J	0.00283	0.000618 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0185	0.0436	0.103	0.0128 J	0.0176 J	0.0114	0.0480	0.0142	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.00261 U	0.000383 J	0.000921 J	0.000654 U	0.000654 U	0.000149 J	0.000408 J	0.000229 J	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000147 U	0.000147 U	0.000189 J	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00743	0.0152	0.0320	0.00403 J	0.00262 U	0.00313 J	0.0135	0.00272 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00506	0.00465	0.00828	0.00346 J	0.00351 J	0.00277	0.00376	0.00358	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.207	0.334	0.337 JH	0.174 J	0.274 JH	0.0960 U	0.131 JH	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000571 J	0.00419	0.0117	0.000758 U	0.000758 U	0.000479 J	0.00482	0.000968 J	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0329	0.0601	0.00238 U	0.0600	0.0639	0.0694	0.0935	0.0781	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000320 JX	0.0000263 U	0.0000263 U	0.0000300 J	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00105 J	0.00245	0.00372	0.00128 U	0.00128 U	0.000255 U	0.00115 J	0.000271 J	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0147	0.0144	0.0174	0.0121	0.0123	0.00990	0.0136	0.0118	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.000332 U	0.000332 U	0.000460 J	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	4.78 ± 0.890	4.29 ± 0.612	7.63 ± 0.795	3.29 ± 0.485	4.24 ± 0.671	4.34 ± 0.607	3.65 ± 0.553	5.07 ± 0.718	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.92 ± 1.19	4.59 ± 1.34	2.27 ± 1.19	1.42 ± 0.908	2.84 ± 1.15	1.83 ± 0.868	1.86 ± 0.827	1.66 ± 0.847	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-57 Upgradient															
	Sample Date	12/7/16	2/22/17	3/28/17	5/2/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/10/19	10/23/19	4/28/20	10/20/20	4/13/21	10/20/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	3.19	3.24	3.17	2.67	3.09	3.08	2.98	3.48	4.49	2.81	3.23	4.14	5.97	3.82	3.74	4.99
Calcium	mg/L	349	362	413	--	290	327	337	393	409	401 D	477 D	479 D	622 J	592	742	742
Chloride	mg/L	70.6	76.2	89.6	130	158	311 D	12.5 JH	185	534 D	3770	119	841	3460	3150	4360	4940
Fluoride	mg/L	3.62	3.32	2.84	2.27	3.42	3.43	0.0960 U	3.28	4.29	2.31	3.03	2.72	4.17	2.99	4.28	0.018 U
Sulfate	mg/L	2780 D	1980 DX	2090	2470 D	3080	3410 D	450 JH	3610	4260 D	5000	3570	4240	6510	3890	3740	5380
pH - Field Collected	SU	6.73	6.08	5.13	6.63	6.37	6.72	6.60	6.70	6.63	6.35	6.20	6.19	6.49	6.33	6.38	6.68
Total dissolved solids	mg/L	4770	3780	3320	4060	5800	5920	850 JH	5850	7390	9750	6000	6700	15100	12200	13300	16000
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00138 J	0.000630 J	0.000654 J	0.000561 J	0.00123 U	0.000480 J	0.000519 J	0.000486 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0311	0.0211	0.0208	0.0174	0.0164 J	0.0149	0.0128	0.0145	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000161 J	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000687 J	0.000525 U	0.000525 U	0.00262 U	0.000739 J	0.000816 J	0.00104 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000520 J	0.00232	0.000297 J	0.000449 J	0.000407 J	0.000748 J	0.000195 J	0.000322 J	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	3.62	3.32	2.84	2.27	3.42	3.43	0.0960 U	3.28	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000256 J	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.545	0.287 X	0.00238 U	--	0.533	0.649	0.671	0.733	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000300 J	0.0000263 U	0.0000580 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000385 J	0.000278 J	0.000255 U	0.00128 U	0.000329 J	0.000283 J	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00237 J	0.000664 J	0.000594 J	0.000561 J	0.00227 U	0.000612 J	0.000858 J	0.000697 J	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.592 ± 0.325	0.322 ± 0.157	0.519 ± 0.219	0.356 ± 0.176	0.273 ± 0.273	0.338 ± 0.221	0.255 ± 0.176	0.0986 ± 0.153	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.15 ± 0.895	2.31 ± 1.03	0.794 ± 0.818	2.86 ± 1.27	0.903 ± 0.843	0.786 ± 0.900	1.9 ± 0.894	1.73 ± 1.00	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-31 Downgradient															
	Sample Date	**12/8/16**	**2/21/17**	**3/29/17**	**5/2/17**	**6/20/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/10/19**	**10/22/19**	**4/28/20**	**10/20/20**	**4/14/21**	**10/20/21**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.446	0.580	0.642	0.499	0.573	0.510	0.494	0.553	0.485	0.514	0.557	0.483	0.429	0.379	0.511	0.435
Calcium	mg/L	188	384 X	317	--	216	171	230	228	187	208 D	295 D	200 D	171 J	216	286	330
Chloride	mg/L	223 D	477 D	303 D	317	285 D	0.280 UDXF	0.347 U	288	253 D	256	322	267	272	319	411	467
Fluoride	mg/L	0.801	0.186 J	0.548	0.865	0.661	0.979 JHXF	0.0960 U	0.735 JH	0.839	0.694	0.791 U	0.784	1.00	0.786	0.742	0.018 U
Sulfate	mg/L	697 D	1130 D	768 D	875	782 D	1.17 JHDXF	0.160 JH	803	771 D	774	852	819	877	914	1060	1150
pH - Field Collected	SU	3.94	4.04	6.34	4.29	3.84	5.14	3.99	3.98	3.74	3.07	3.56	2.62	3.70	3.68	3.96	3.92
Total dissolved solids	mg/L	1470	2290	2430	1850	1730	1500	25.0 U	1890	1420	1390	1660	1620	1890	1700	2380	2440
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000295 J	0.000301 J	0.00120 U	0.000527 J	0.000240 U	0.000559 J	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00151 J	0.0110	0.00834	0.00501	0.00363 J	0.00134 J	0.00556	0.00279	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0167 J	0.0141	0.0198	0.0136	0.0127 J	0.0229	0.0129	0.0122	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.00793 J	0.00851	0.00885	0.00814	0.00865 J	0.00593	0.00827	0.00857	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.0200 J	0.000663 J	0.000596 J	0.000525 U	0.00262 U	0.000890 J	0.000849 J	0.000760 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000440 J	0.0399	0.0623	0.0227	0.0173	0.0113	0.0302	0.0192	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.801	0.186 J	0.548	0.865	0.661	0.979 JHXF	0.0960 U	0.735 JH	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000415 J	0.000223 J	0.000344 J	0.000758 U	0.000348 J	0.00233	0.000580 J	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.533	0.510	0.00238 U	--	0.572	0.484	0.615	0.590	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000360 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000255 U	0.000255 U	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.00163 J	0.00175 J	0.00125 J	0.00227 U	0.00162 J	0.00177 J	0.00155 J	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	2.46 ± 0.574	2.60 ± 0.473	1.44 ± 0.425	1.40 ± 0.338	1.40 ± 0.403	1.28 ± 0.341	1.36 ± 0.399	1.01 ± 0.323	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	7.35 ± 1.59	8.16 ± 2.15	5.33 ± 1.47	5.85 ± 1.79	4.63 ± 1.23	4.44 ± 1.37	3.58 ± 1.22	4.96 ± 1.43	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-33 Downgradient															
	Sample Date	**12/7/16**	**2/22/17**	**3/28/17**	**5/2/17**	**6/20/17**	**7/26/17**	**8/29/17**	**10/10/17**	**4/5/18**	**10/30/18**	**4/10/19**	**10/22/19**	**4/28/20**	**10/20/20**	**4/13/21**	**10/20/21**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.940	1.02	1.05	0.987	1.09	1.01	1.03	1.11	0.990	0.791	1.13	1.18	1.18	1.09	1.09	1.06
Calcium	mg/L	564	600	553	--	563	558	567	531	552	385 D	631	553 D	573 J	493	516	504
Chloride	mg/L	735 D	679 D	731 D	690	692 D	693 D	125 JH	666	786	758	806	773 JLKD	756	751	1560	693
Fluoride	mg/L	1.86	1.08	1.77	1.36	1.81	1.34	0.480 U	1.69	1.85	1.21	1.23	1.24 JLK	1.68	0.864	0.988	0.018 U
Sulfate	mg/L	1850 D	1670 D	1780 D	1710	1690 D	1710 D	3170 D	1640	1810	1740	1640	1690 JLKD	1620	1650	3270	1450
pH - Field Collected	SU	6.51	5.90	4.91	6.52	6.15	5.71	6.49	6.49	6.33	6.26	5.98	5.18	6.30	6.23	6.27	6.33
Total dissolved solids	mg/L	4000	3990	4310	4410	3750	4070	3580	4320	3970	3320	2650 JLK	4040 JLK	4370	4060	4080	3590
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.00120 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000246 U	0.00123 U	0.000257 J	0.00123 U	0.000279 J	0.000316 J	0.000246 U	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0326	0.0318	0.0297	0.0268	0.0279	0.0274	0.0263	0.0264	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000709 J	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000734 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000611 J	0.00262 U	0.000525 U	0.00262 U	0.000525 U	0.00113 J	0.00108 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000690 J	0.000433 J	0.000487 J	0.000435 J	0.000512 J	0.000731 J	0.000902 J	0.000554 J	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	1.86	1.08	1.77	1.36	1.81	1.34	0.480 U	1.69	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000758 U	0.000152 U	0.000758 U	0.000152 U	0.000157 J	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	--	0.194	0.181	0.255	0.176	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000720 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000255 U	0.00128 U	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0314	0.0356	0.0389	0.0368	0.0451	0.0495	0.0546	0.0342	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.00166 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	2.04 ± 0.439	1.14 ± 0.328	2.36 ± 0.522	1.81 ± 0.365	1.73 ± 0.428	1.55 ± 0.422	1.37 ± 0.394	2.23 ± 0.491	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.95 ± 1.16	3.52 ± 1.07	4.69 ± 1.33	3.24 ± 1.26	1.73 ± 0.902	4.11 ± 1.19	1.98 ± 1.01	2.99 ± 1.26	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-46 Downgradient															
	Sample Date	12/6/16	2/22/17	3/28/17	5/3/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/10/19	10/23/19	4/28/20	10/20/20	4/13/21	10/20/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.902	0.837	0.645	0.799	0.920	0.801	0.788	1.01	0.828	0.702	0.997	1.01	0.864	0.530	0.431	0.797
Calcium	mg/L	120	132	145	115	126	117	137	145	140	126 D	212 D	172 D	143 J	107	90.3	207
Chloride	mg/L	11.6	11.8	12.2	10.5	12.6	11.8	327 JHD	11.7	11.6	11.6	13.2	13.0	17.9	23.4	35.5	14.9
Fluoride	mg/L	1.51	1.38	1.03	1.59	2.25	2.34	0.460 JH	1.83	2.16	1.68	2.52	2.22	1.61 J	0.764	1.07	0.018 UJ
Sulfate	mg/L	700 D	692 D	608 D	677	0.0460 U	780 D	288 JHD	800	864 D	855	1030	1020	1180	734	658	1180
pH - Field Collected	SU	3.60	3.55	2.10	3.57	2.96	3.54	3.21	3.20	3.15	3.00	2.85	2.62	3.10	3.01	3.42	3.41
Total dissolved solids	mg/L	1160	1040	926	1030	1270	1180	1170 JH	1390	1300	1220	1550	1500	1970	1160	1130	1760
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00190 J	0.00227	0.00144 J	0.00196 J	0.00277 J	0.00253	0.00295	0.00290	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0429	0.0356	0.0308	0.0307	0.0364	0.0317	0.0323	0.0331	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.00381 J	0.00362	0.00340	0.00399 J	0.00459 J	0.00415	0.00462	0.00479	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.00110 J	0.000988 J	0.00121 J	0.00120 J	0.00101 J	0.00133 J	0.00141 J	0.00136 J	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.000942 J	0.00140 J	0.00104 J	0.00262 U	0.00262 U	0.00156 J	0.00191 J	0.00202 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.0303	0.0324	0.0329	0.0367	0.0387	0.0383	0.0412	0.0414	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	1.51	1.38	1.03	1.59	2.25	2.34	0.460 JH	1.83	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.0162	0.0134	0.0109	0.0144	0.0192	0.0201	0.0236	0.0257	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0646	0.000476 U	0.00238 U	0.0673	0.0749	0.0799	0.107	0.0863	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.000255 U	0.000255 U	0.000255 U	0.00128 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.0255	0.0266	0.0205	0.0247	0.0296	0.0257	0.0298	0.0283	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00293	0.00292	0.00235	0.00263 J	0.00314 J	0.00300	0.00335	0.00345	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	3.16 ± 0.701	1.69 ± 0.387	1.80 ± 0.448	1.2 0± 0.315	1.82 ± 0.420	1.40 ± 0.353	1.52 ± 0.375	1.99 ± 0.459	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	4.98 ± 1.41	2.17 ± 1.48	2.96 ± 1.24	1.98 ± 0.957	4.39 ± 1.13	2.80 ± 1.05	2.28 ± 1.13	3.82 ± 1.15	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 3
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
Fly Ash Landfill

		JKS-60 Downgradient															
	Sample Date	12/7/16	2/22/17	3/28/17	5/2/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/10/19	10/23/19	4/28/20	10/20/20	4/13/21	10/20/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**Apr 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.655	0.504	0.449	0.456	0.442	0.394	0.436	0.479	0.399	0.334	0.405	0.377	0.325	0.433	0.533	0.579
Calcium	mg/L	433	375	290	--	379	336	350	383	363	382 D	501 D	524 D	530 J	380	432	473
Chloride	mg/L	411 D	311 D	311 D	285	300 D	319 D	287 JHD	352	366 D	202	149 X	183	168	235	281	278
Fluoride	mg/L	0.0360 U	0.319	0.324	0.421	0.306	0.338 JH	0.0960 U	0.284 JH	0.22 J	0.239 J	0.187 UJ	0.231 J	0.188	0.018 U	0.290	0.018 U
Sulfate	mg/L	1480 D	999 D	1010 D	976 X	1020 D	818 D	760 JHDX	759	801 D	906	968	1320	1280	963	1080	1130
pH - Field Collected	SU	5.82	5.38	4.21	5.75	6.07	6.44	5.93	5.97	6.09	6.42	5.93	6.23	6.61	6.16	6.21	6.20
Total dissolved solids	mg/L	2790	2340	2020	2110	2510	2120	1450 JH	2300	1860	1910	2010	2820	3180	2520	2450	2530
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000861 J	0.000592 J	0.000366 J	0.00123 U	0.000367 J	0.000381 J	0.000266 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0702	0.0491	0.0465	0.0450	0.0469	0.0454	0.0490	0.0503	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000774 J	0.000778 J	0.000786 J	0.000695 J	0.000734 U	0.000359 J	0.000608 J	0.000699 J	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000743 J	0.000525 U	0.000525 U	0.00262 U	0.000690 J	0.00204 J	0.00100 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.115	0.0542	0.0423	0.0389	0.0210	0.00896	0.0166	0.0183	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.0360 U	0.319	0.324	0.421	0.306	0.338 JH	0.0960 U	0.284 JH	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000216 J	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	--	0.0305	0.0179 J	0.0635	0.0314	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000370 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000726 J	0.000622 J	0.000715 J	0.00148 J	0.00162 J	0.00124 J	0.00103 J	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.00168 J	0.00132 J	0.00981	0.0390	0.0244	0.00761	0.00745	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000425 J	0.000412 J	0.000403 J	0.00166 U	0.000332 U	0.000372 J	0.000387 J	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	3.01 ± 0.578	2.29 ± 0.421	2.74 ± 0.572	1.71 ± 0.378	0.914 ± 0.341	1.57 ± 0.381	1.34 ± 0.378	4.61 ± 0.650	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.57 ± 1.15	2.62 ± 1.04	0.838 ± 0.826	0.269 ± 0.713	2.24 ± 1.02	0.701 ± 0.850	1.72 ± 0.940	2.48 ± 1.60	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
F: Relative percent difference exceeded laboratory control limits.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
K: Sample analyzed outside of recommended hold time.
L: Bias in sample result likely to be low.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 4
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-49 Upgradient															
	Sample Date	12/7/16	2/22/17	3/28/17	5/3/17	6/20/17	7/25/17	8/29/17	10/10/17	4/4/18	10/30/18	4/9/19	10/22/19	4/28/20	10/21/20	4/13/21	10/19/21
	Task	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	3.24	3.28	3.28	3.03 X	3.04 J	2.76	2.85	2.87	2.71	2.70	2.05	2.58	2.47	2.81	2.59	2.50
Calcium	mg/L	130	146	173	113	127	120	145	147	135	117 D	154 D	127 D	114 J	132	133	119
Chloride	mg/L	295 D	383 D	372 D	326	414 D	448 D	459 D	424	446 D	408	449	429	452	435	449	437
Fluoride	mg/L	0.715	--	0.665 JH	0.809	0.627 JH	0.617 JH	0.525	0.712	0.697	0.719	0.749	0.793	0.894	0.656	0.729	0.018 U
Sulfate	mg/L	211 D	232 D	234 D	194	218 D	227	265 D	219 X	237	237	240	205	217	193	211	232
pH - Field Collected	SU	7.19	7.12	7.12	7.02	7.06	6.16	7.05	6.89	7.12	7.12	7.31	6.43	7.15	7.14	7.12	7.06
Total dissolved solids	mg/L	1250	1240	1190	1100	1450	1440	1490	1730	1310	1210	1290	1380	1240	1380	1290	1300
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00173 J	0.00120 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000676 J	0.000729 J	0.00123 U	0.00123 U	0.000544 J	0.000538 J	0.000478 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0607	0.0575	0.0503	0.0554	0.0783	0.0721	0.0788	0.0735	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000654 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000859 J	0.000572 J	0.00262 U	0.00262 U	0.000963 J	0.000997 J	0.00113 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00102 J	0.00109 J	0.00124 J	0.00155 J	0.00133 J	0.00153 J	0.00155 J	0.00146 J	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.715	0.643 JH	0.665 JH	0.809	0.627 JH	0.617 JH	0.525	0.712	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000758 U	0.000155 J	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0137 J	0.0341	0.0295	0.0427	0.0252	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000690 J	0.0000263 U	0.0000490 J	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00779 J	0.00846	0.00875	0.0106	0.00908 J	0.00938	0.0107	0.0111	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00992 J	0.00597	0.00479	0.00521 J	0.00370 J	0.00235	0.00188 J	0.00141 J	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.198 ± 0.197	0.615 ± 0.272	0.747 ± 0.323	0.195 ± 0.167	0.294 ± 0.192	0.241 ± 0.193	0.159 ± 0.191	0.746 ± 0.274	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.1 ± 0.907	-1.37 ± 1.37	0.854 ± 0.724	1.08 ± 1.72	2.23 ± 0.949	0.658 ± 0.636	0.812 ± 0.604	1.43 ± 0.898	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 4
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-51 Upgradient															
	Sample Date	**12/8/16**	**2/22/17**	**3/28/17**	**5/3/17**	**6/21/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/20/20**	**4/13/21**	**10/20/21**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	0.512	0.517	0.473	0.565	0.512	0.525	0.453	0.509	0.465	0.347	0.489	0.648	0.627	0.668	0.579	0.665
Calcium	mg/L	267	292	322	266	261 X	232	236	256	246	149 D	328	336 D	334 J	298	314	321
Chloride	mg/L	403 D	331 D	414 D	447	424 D	455 D	384 D	375	395 D	301	559	574 D	555	493	522	543
Fluoride	mg/L	0.247	0.341 JH	0.415 JH	0.534	0.354	0.391	0.0960 U	0.407 JH	0.305 J	0.291 J	0.329 J	0.405 J	0.470	0.018 U	0.292	0.018 U
Sulfate	mg/L	293 D	330 D	348 D	359	342 D	330 D	314 D	302	354 D	260	428	405 D	439	376	382	421
pH - Field Collected	SU	6.59	6.51	6.48	6.56	6.40	5.48	6.38	6.20	6.44	6.70	6.66	5.73	6.43	6.47	6.42	6.32
Total dissolved solids	mg/L	1650	1650	1490	1980	1530	1580	1390	1650	1320	916	1890	2150	2010	1930	2190	2260
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.00120 U	0.000953 J	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000412 J	0.000390 J	0.00123 U	0.000392 J	0.000344 J	0.000395 J	0.000418 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0655	0.0563	0.0517	0.0512	0.0534	0.0520	0.0520	0.0564	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000654 U	0.000212 J	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000941 J	0.000525 U	0.00262 U	0.000657 J	0.000874 J	0.00113 J	0.00133 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000350 U	0.0000770 J	0.0000920 J	0.000350 U	0.000124 J	0.0000940 J	0.0000800 J	0.000108 J	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.247	0.341 JH	0.415 JH	0.534	0.354	0.391	0.0960 U	0.407 JH	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.000476 U	0.00238 U	0.0322	0.0874	0.0790	0.0958 JX	0.0718	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.000199 J	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000255 U	0.000255 U	0.00128 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.09 ± 0.376	0.104 ± 0.122	0.618 ± 0.247	0.197 ± 0.145	0.328 ± 0.195	0.0847 ± 0.186	4.83 ± 0.763	0.682 ± 0.309	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	0.312 ± 0.688	1.09 ± 1.37	2.32 ± 1.45	-1.26 ± 1.37	-0.799 ± 0.928	1.57 ± 0.786	0.762 ± 0.706	0.963 ± 0.954	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:

mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 4
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-52 Downgradient															
	Sample Date	**12/7/16**	**2/21/17**	**3/28/17**	**5/2/17**	**6/21/17**	**7/25/17**	**8/29/17**	**10/10/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/21/20**	**4/13/21**	**10/20/21**
	Task	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	1.66	2.11	1.63	1.51	1.33	1.43	1.46	1.71 X	1.95	1.54	1.46 X	1.65	2.05	2.21	2.51	1.69
Calcium	mg/L	169	181	189	--	145	140	162	168	175	153 D	195 DX	171 D	174 J	199	209	171
Chloride	mg/L	331 D	377 D	323 DX	320	326 D	343 D	417 D	355	360 D	326	336	320	433	408	470	336
Fluoride	mg/L	0.796	0.665	0.718 JH	0.915 JH	0.705	0.996 JH	0.0960 U	0.740	0.720	0.710	0.831	0.808	0.908	0.659	0.601	0.440 U
Sulfate	mg/L	277 D	318 D	299 DX	290	287 D	292 D	171 D	289	278 D	292	268	288 D	315	282	292	282
pH - Field Collected	SU	7.01	6.47	6.91	6.94	6.87	5.87	6.81	6.63	6.79	6.76	6.91	6.00	6.83	6.78	6.70	6.71
Total dissolved solids	mg/L	1290	1380	1100	1250	1280	1250	1250	1220	1240	1210	1170	1270	1470	1430	1590	1290
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000565 J	0.000398 J	0.000425 J	0.000427 J	0.000392 J	0.000412 J	0.000448 J	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0646	0.0583	0.0519	0.0483	0.0527	0.0558	0.0565	0.0616	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000153 J	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000525 U	0.000525 U	0.000525 U	0.000841 J	0.000860 J	0.00123 J	0.00108 J	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.00188 J	0.00233	0.00112 J	0.00119 J	0.00211	0.00183 J	0.00159 J	0.00189 J	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.796	0.665	0.718 JH	0.915 JH	0.705	0.996 JH	0.0960 U	0.740	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000292 J	0.000152 U	0.000152 U	0.000163 J	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0471	0.000476 U	--	0.0616	0.0605	0.0827	0.0588	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.000234	0.0000263 U	0.0000263 U	0.0000263 U	0.0000810 J	0.0000263 U	0.0000263 UX	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.00128 J	0.00115 J	0.00102 J	0.000911 J	0.000865 J	0.000843 J	0.000914 J	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	1.71 ± 0.465	0.608 ± 0.289	0.296 ± 0.169	0 ± 0.150	0.435 ± 0.241	0.449 ± 0.196	0.194 ± 0.194	0.704 ± 0.319	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	2.65 ± 1.12	0.744 ± 0.833	0.0645 ± 0.649	0.53 ± 1.10	0.928 ± 0.784	1.16 ± 0.867	0.716 ± 0.767	1.54 ± 1.22	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 4
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-53 Downgradient															
Sample Date		**12/8/16**	**2/23/17**	**3/29/17**	**5/2/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/4/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/20/20**	**4/13/21**	**10/20/21**
Task		**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	1.50	1.38	1.55	1.54	1.47	1.45	1.36	1.45	1.60	1.61	1.42	1.36	1.43	1.47	1.71	1.78
Calcium	mg/L	134	105	156	NR	94.1	97.0	99.0	113	113	111 D	116	123 D	114 J	117	156	127
Chloride	mg/L	383 D	336 D	315 D	322	335 D	329 X	341	313	361	350	354	342	381	359	472	418
Fluoride	mg/L	0.230	0.377	0.408	0.547 JH	0.339	0.385 J	0.412	0.0360 U	0.392 J	0.265 J	0.270 J	0.352 J	0.428	0.018 U	0.291	0.880 U
Sulfate	mg/L	283 D	267 D	238 D	241	236 D	234 X	227	214	249	236	224	213	244	224	279	312
pH - Field Collected	SU	6.80	6.63	6.54	6.56	6.67	6.69	6.62	6.50	6.67	6.65	6.60	5.60	6.67	6.60	6.63	6.60
Total dissolved solids	mg/L	1390	1250	1160	1180	1150	1220	1150	1140	1160	1140	1150	1250	1160	1320	1520	1560
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000284 J	0.000266 J	0.000274 J	0.000276 J	0.000246 U	0.000246 U	0.000246 U	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0692	0.0633	0.0633	0.0623	0.0597	0.0638	0.0541	0.0617	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000701 J	0.000525 U	0.000525 U	0.000525 U	0.000557 J	0.000906 J	0.000525 U	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000356 J	0.000140 J	0.000135 J	0.000165 J	0.000137 J	0.000150 J	0.000163 J	0.0000699 U	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.230	0.377	0.408	0.547 JH	0.339	0.385 J	0.412	0.0360 U	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.0279	0.0816	0.000476 U	NR	0.0931	0.104	0.125	0.109	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000780 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000470 JX	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000290 J	0.000255 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.306 ± 0.261	0.909 ± 0.363	0.117 ± 0.211 U	0.519 ± 0.221	0.558 ± 0.232	0.385 ± 0.244	2.76 ± 0.582	0.451 ± 0.270	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.09 ± 1.24	2.33 ± 1.13	1.81 ± 1.61	0.906 ± 1.02	-0.0622 ± 0.583	1.9 ± 1.24	1.44 ± 0.713	0.919 ± 0.853	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

TABLE 4
Groundwater Analytical Results Summary
CPS Energy - Calaveras Power Station
SRH Pond

		JKS-54 Downgradient															
Sample Date		**12/8/16**	**2/23/17**	**3/28/17**	**5/2/17**	**6/21/17**	**7/26/17**	**8/30/17**	**10/11/17**	**4/5/18**	**10/30/18**	**4/9/19**	**10/22/19**	**4/28/20**	**10/20/20**	**4/13/21**	**10/20/21**
Task		**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**	**Event 7**	**Event 8**	**Event 9**	**Event 10**	**Event 11**	**Event 12**	**Event 13**	**Event 14**	**Event 15**	**Event 16**
Constituents	**Unit**	**Dec 2016**	**Feb 2017**	**Mar 2017**	**May 2017**	**Jun 2017**	**Jul 2017**	**Aug 2017**	**Oct 2017**	**Apr 2018**	**Oct 2018**	**Apr 2019**	**Oct 2019**	**April 2020**	**Oct 2020**	**Apr 2021**	**Oct 2021**
Appendix III - Detection Monitoring																	
Boron	mg/L	1.24	1.16	1.35	1.26	1.14	1.26	1.16	1.28	1.26	1.30	1.38	1.50	1.23	1.31	1.22	1.21
Calcium	mg/L	114	106	160	--	103	102	95.8	113	111	98.2 D	117	117 D	118 J	129	148	135
Chloride	mg/L	345 D	350 D	353 D	344	355 D	354 D	339 D	328	382	356	385	368	380	383	385	401
Fluoride	mg/L	0.718	0.731	0.655 JH	0.850 JH	0.623	0.728	0.0960 U	0.661	0.742	0.643	0.711	0.773	0.861	0.455 J	0.628	0.880 U
Sulfate	mg/L	308 D	312 D	315 D	312	304 D	305 D	298 D	287	309	283	309	341 D	443	398	434	438
pH - Field Collected	SU	6.98	6.78	6.92	6.89	6.88	6.91	6.79	6.69	6.86	6.85	6.75	5.60	6.76	6.74	6.72	6.64
Total dissolved solids	mg/L	1370	1430	1310	1310	1410	1320	1360	1500	1230	1240	1470	1470	1570	1530	1650	1690
Appendix IV - Assessment Monitoring																	
Antimony	mg/L	0.00120 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	0.000240 U	NR	NR	NR	NR	NR	NR	NR	NR
Arsenic	mg/L	0.00123 U	0.000369 J	0.000898 J	0.000351 J	0.000354 J	0.000484 J	0.000324 J	0.000246 U	NR	NR	NR	NR	NR	NR	NR	NR
Barium	mg/L	0.0631	0.0564	0.0611	0.0537	0.0543	0.0593	0.0471	0.0558	NR	NR	NR	NR	NR	NR	NR	NR
Beryllium	mg/L	0.000654 U	0.000131 U	0.000131 U	0.000131 U	0.000162 J	0.000131 U	0.000131 U	0.000131 U	NR	NR	NR	NR	NR	NR	NR	NR
Cadmium	mg/L	0.000734 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	0.000147 U	NR	NR	NR	NR	NR	NR	NR	NR
Chromium	mg/L	0.00262 U	0.000657 J	0.00186 J	0.000525 U	0.000525 U	0.000693 J	0.000765 J	0.000525 U	NR	NR	NR	NR	NR	NR	NR	NR
Cobalt	mg/L	0.000420 J	0.000212 J	0.00199 J	0.000253 J	0.000260 J	0.000532 J	0.000334 J	0.0000699 U	NR	NR	NR	NR	NR	NR	NR	NR
Fluoride	mg/L	0.718	0.731	0.655 JH	0.850 JH	0.623	0.728	0.0960 U	0.661	NR	NR	NR	NR	NR	NR	NR	NR
Lead	mg/L	0.000758 U	0.000152 U	0.000862 J	0.000152 U	0.000152 U	0.000241 J	0.000152 U	0.000152 U	NR	NR	NR	NR	NR	NR	NR	NR
Lithium	mg/L	0.000476 U	0.0452	0.00238 U	--	0.0595	0.0599	0.0712	0.0608	NR	NR	NR	NR	NR	NR	NR	NR
Mercury	mg/L	0.0000263 U	0.0000620 J	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	0.0000263 U	NR	NR	NR	NR	NR	NR	NR	NR
Molybdenum	mg/L	0.00128 U	0.000447 J	0.000367 J	0.000377 J	0.000342 J	0.000352 J	0.000260 J	0.000255 U	NR	NR	NR	NR	NR	NR	NR	NR
Selenium	mg/L	0.00227 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	0.000454 U	NR	NR	NR	NR	NR	NR	NR	NR
Thallium	mg/L	0.00166 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	0.000332 U	NR	NR	NR	NR	NR	NR	NR	NR
Radium-226	pCi/L	0.88 ± 0.339	0.878 ± 0.358	0.546 ± 0.213	0.217 ± 0.217	0.433 ± 0.249	0.313 ± 0.254	0.926 ± 0.324	0.42 ± 0.205	NR	NR	NR	NR	NR	NR	NR	NR
Radium-228	pCi/L	1.12 ± 1.11	1.94 ± 1.01	0.429 ± 0.781	0.574 ± 1.41	0.451 ± 0.660	0.766 ± 1.29	1.48 ± 0.968	1.17 ± 0.827	NR	NR	NR	NR	NR	NR	NR	NR

NOTES:
mg/L: Milligrams per Liter.
SU: Standard Units.
pCi/L: Picocuries per Liter.
-- : Laboratory did not analyze sample for indicated constituent.
D: Sample diluted due to targets detected over highest point of calibration curve or due to matrix interference.
H: Bias in sample result likely to be high.
J: Analyte detected above method (sample) detection limit but below method quantitation limit.
NR: Analysis of this constituent not required for detection monitoring.
U: Analyte not detected at laboratory reporting limit (Sample Detection Limit).
X: Matrix Spike/Matrix Spike Duplicate recoveries were found to be outside of the laboratory control limits.

~~Attachment 1~~ATTACHMENT 2 LABORATORY ANALYTICAL REPORT

SAN ANTONIO
TESTING LABORATORY

March 03, 2022

Chelsey Vasbinder
CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio, TX 78296-1771

SATL Report No.: 2202349
RE: Calaveras Power Station- CCR Units

Dear Chelsey Vasbinder

SATL received 3 Sample(s) on 02/23/2022 for analyses identified on the chain of custody. The analyses were performed using methods indicated on the laboratory report. Any deviations observed at sample receiving are notated on the Sample Receipt Checklist and/or Chain of Custody documents attached as part of this analytical report.

Sincerely,

For San Antonio Testing Laboratory, Inc.

Richard Hawk

Richard Hawk,
General Manager

Appendix A Laboratory Data Package Cover Page

This data package consists of:

- ☑ This signature page, the laboratory review checklist, and the following reportable data:
- ☑ R1 Field chain-of-custody documentation;
- ☑ R2 Sample identification cross-reference;
- ☑ R3 Test reports (analytical data sheets) for each environmental sample that includes:
  - a) Items consistent with NELAC 5.13 or ISO/IEC 17025 Section 5.10
  - b) dilution factors,
  - c) preparation methods,
  - d) cleanup methods, and
  - e) if required for the project, tentatively identified compounds (TICs).
- ☑ R4 Surrogate recovery data including:
  - a) Calculated recovery (%R), and
  - b) The laboratory's surrogate QC limits.
- ☑ R5 Test reports/summary forms for blank samples;
- ☑ R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  - a) LCS spiking amounts,
  - b) Calculated %R for each analyte, and
  - c) The laboratory's LCS QC limits.
- ☑ R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - a) Samples associated with the MS/MSD clearly identified,
  - b) MS/MSD spiking amounts,
  - c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  - d) Calculated %Rs and relative percent differences (RPDs), and
  - e) The laboratory's MS/MSD QC limits
- ☑ R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  - a) the amount of analyte measured in the duplicate,
  - b) the calculated RPD, and
  - c) the laboratory's QC limits for analytical duplicates.
- ☑ R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;
- ☑ R10 Other problems or anomalies.
- ☑ The Exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

Release Statement: I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratory in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

Sandra Felix For Marcela Gracia Hawk, President

Richard Hawk

Richard Hawk, General Manager

03/03/22 15:40

Date/Time

Project Name: Calaveras Power Station- CCR Units

Laboratory Job Number: 2202349

Reviewer Name: JL,SG

Matrix :

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	03/01/22 to 03/02/22
Project Name:	Calaveras Power Station- CCR Units	Laboratory Job Number:	2202349
Reviewer Name:	JL,SG	Prep Batch Number(s):	B210142,B210175

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1		**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2		**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3		**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample quantitation limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?			X		
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		If required for the project, TICs reported?			X		
R4		**Surrogate recovery data**					
		Were surrogates added prior to extraction?			X		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			X		
R5		**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6		**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7		**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8		**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9		**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs included in the laboratory data package?	X				
R10		**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Reportable Data

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	03/01/22 to 03/02/22
Project Name:	Calaveras Power Station- CCR Units	Laboratory Job Number:	2202349
Reviewer Name:	JL,SG	Prep Batch Number(s):	B210142,B210175

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1		**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2		**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3		**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?	X				
S4		**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?	X				
S5		**Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6		**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7		**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8		**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?	X				
S9		**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	X				
S10		**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11		**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12		**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13		**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14		**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15		**Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16		**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

RG-366/TRRP-13 December 2002

Appendix A (cont'd): Laboratory Review Checklist: Exception Reports

Laboratory Name:	San Antonio Testing Laboratory Inc.	LRC Date:	03/01/22 to 03/02/22
Project Name:	Calaveras Power Station- CCR Units	Laboratory Job Number:	2202349
Reviewer Name:	JL,SG	Prep Batch Number(s):	B210142,B210175

ER#[1]	**Description**

[1] ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked on the LRC)

RG-366/TRRP-13 December 2002

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
03/03/22 15:40
Received:
02/23/22 09:13

Report No. 2202349

SAMPLE SUMMARY

Total Samples received in this work order: **3**

Sample ID	Laboratory ID	Matrix	Sampling Method	Date Sampled	Date Received
JKS-56-20220222-CCR	2202349-01	Liquid	Grab	02/22/22 08:47	02/23/22 09:13
JKS-61-20220222-CCR	2202349-02	Liquid	Grab	02/22/22 11:37	02/23/22 09:13
JKS-50R-20220222-CCR	2202349-03	Liquid	Grab	02/22/22 09:27	02/23/22 09:13

Notes

All quality control samples and checks are within acceptance limits unless otherwise indciated.
Test results pertain only to those items tested.
All samples were in good condition when received by the laboratory unless otherwise noted.

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
03/03/22 15:40
Received:
02/23/22 09:13

Report No. 2202349

Sample ID #: JKS-56-20220222-CCR

Sample Matrix: Liquid

Sampling Method: Grab

Date/Time Collected: 02/22/22 08:47

Lab Sample ID #: 2202349-01

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
Anions by Ion Chromatography				***Batch ID >*** *B210175*							
Fluoride *	0.178	0.020		0.018	0.018	mg/L	EPA 300.0	EPA 300.0	02/28/22	SG	
Total Metals By ICP				***Batch ID >*** *B210142*							
Boron *	4.06	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	02/28/22	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
03/03/22 15:40
Received:
02/23/22 09:13

Report No. 2202349

Sample ID #: JKS-61-20220222-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 02/22/22 11:37

Lab Sample ID #: 2202349-02

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
Total Metals By ICP				***Batch ID >*** *B210142*							
Boron *	1.86	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	02/28/22	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
03/03/22 15:40
Received:
02/23/22 09:13

Report No. 2202349

Sample ID #: JKS-50R-20220222-CCR
Sample Matrix: Liquid

Sampling Method: Grab
Date/Time Collected: 02/22/22 09:27

Lab Sample ID #: 2202349-03

Analyte	Result	MQL	Flag	MDL	SQL[SDL]	Units	PrepMethod	Method	Analyzed	Analyst	Notes
Total Metals By ICP				***Batch ID >*** *B210142*							
Boron *	6.59	0.010		0.0006	0.0006	mg/L	EPA 3010A	EPA 6010B	02/28/22	JL	

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Notes:

Project: Calaveras Power Station- CCR Units

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
03/03/22 15:40
Received:
02/23/22 09:13

Report No. 2202349

Anions by Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B210175 - EPA 300.0									
Blank (B210175-BLK1)				Prepared: 02/28/22 10:00	Analyzed: 02/28/22 10:52				
Fluoride	<0.020	0.020	mg/L				–		
LCS (B210175-BS1)				Prepared: 02/28/22 10:00	Analyzed: 02/28/22 11:10				
Fluoride	1.05	0.020	mg/L	1.00		105	90– 110		
LCS Dup (B210175-BSD1)				Prepared: 02/28/22 10:00	Analyzed: 02/28/22 11:28				
Fluoride	1.03	0.020	mg/L	1.00		103	90– 110	2	20
Duplicate (B210175-DUP1)		**Source: 2202349-01**		Prepared: 02/28/22 10:00	Analyzed: 02/28/22 15:38				
Fluoride	0.176	0.020	mg/L		0.178		–	1	20
Matrix Spike (B210175-MS1)		**Source: 2202349-01**		Prepared: 02/28/22 10:00	Analyzed: 02/28/22 15:56				
Fluoride	1.18	0.020	mg/L	1.00	0.178	100	80– 120		
Matrix Spike Dup (B210175-MSD1)		**Source: 2202349-01**		Prepared: 02/28/22 10:00	Analyzed: 02/28/22 16:14				
Fluoride	1.11	0.020	mg/L	1.00	0.178	93	80– 120	6	20

Total Metals By ICP - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B210142 - EPA 3010A									
Blank (B210142-BLK1)				Prepared: 02/28/22 10:00 Analyzed: 02/28/22 17:46					
Boron	<0.010	0.010	mg/L				–		
LCS (B210142-BS1)				Prepared: 02/28/22 10:00 Analyzed: 02/28/22 17:51					
Boron	2.08	0.010	mg/L	2.00		104	85– 115		
LCS Dup (B210142-BSD1)				Prepared: 02/28/22 10:00 Analyzed: 02/28/22 17:57					
Boron	2.11	0.010	mg/L	2.00		105	85– 115	1	20
Duplicate (B210142-DUP1)		**Source: 2202349-01**		Prepared: 02/28/22 10:00 Analyzed: 02/28/22 18:08					
Boron	4.05	0.010	mg/L		4.06		–	0.2	20
Matrix Spike (B210142-MS1)		**Source: 2202349-01**		Prepared: 02/28/22 10:00 Analyzed: 02/28/22 18:14					
Boron	6.16	0.010	mg/L	2.00	4.06	105	75– 125		
Matrix Spike Dup (B210142-MSD1)		**Source: 2202349-01**		Prepared: 02/28/22 10:00 Analyzed: 02/28/22 18:19					
Boron	6.15	0.010	mg/L	2.00	4.06	105	75– 125	0.08	20

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station- CCR Units

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
03/03/22 15:40
Received:
02/23/22 09:13

Notes:

Report No. 2202349

DEFINITIONS

*	TNI / NELAC accredited analyte
PQL	Practical Quantitation Limit
MCL	Maximum Contaminant Level
mg/Kg	Milligrams per Kilogram (Parts per Million)
mg/L	Milligrams per Liter (Parts per Million)
PPM	Parts per Million
ND	This qualifier indicates that the analyte was analyzed but not detected above the MDL
J	This qualifier indicates that the analyte is an estimate value between MQL and MDL
SQL	Sample Quantitation Limit
MQL	Method Quantitation Limit
MDL	Method Detection Limit
L	LCS/LCSD recovery is outside QC limits, the results may have a slight bias.
M	MS/MSD recovery is outside QC limits due to possible matrix interferences, results may have a slight bias .
S	RPD is outside QC limits.
RMCCL	Recommended Maximum Concentration of Contaminants Level
µR/hr	MicroRoentgens per hour (Measure of Radioactivity Level)
HT	Sample received past holdtime
IC	Improper Container
IT	Improper Temperature
V	Insufficient Volume
B	Sample collected in Bulk
AB	VOA Vial contained air bubbles.
OP	ortho-Phosphate was not filtered in the field within 15minutes of collection.
CCV	Continuing Calibration Verification Standard.
ICV	Initial Calibration Verification Standard.
Surr L	Surrogate recovery is low outside QC limits.
Surr H	Surrogate recovery is high outside QC limits.
NR	Not Recovered due to source sample concentration exceeds spiked concentration.

Test Methods followed by the laboratory are referenced in the following approved methodology, unless otherwise specified.

Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017
Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Rev. March 1983
EPA SW Test Methods for the Examination of Solid Waste, SW-846, 1996

CPS Energy - Environmental Dept.
P.O. Box 1771
San Antonio TX, 78296-1771

Project: Calaveras Power Station- CCR Units

Project Number: [none]
Project Manager: Chelsey Vasbinder

Reported:
03/03/22 15:40
Received:
02/23/22 09:13

Notes:

Report No. 2202349

Sandra Felix For Marcela Gracia Hawk, President For

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Richard Hawk

Richard Hawk, General Manager

2202349

EnviroChain® By Promium

Submission key J053-OAS-370N	NOT SUBMITTED	Page 1/1

Client Information	Project Information	Laboratory Information	COC Information
CPS Energy - Environmental Dept. P.O. Box 1771 San Antonio TX 78296-1771 Phone: (210) 353-4719 Fax: (210) 353-4271	Calaveras Power Station- CCR Units Number: [none] Sample count: 3 TAT: 7	San Antonio Testing Laboratory 1610 S. Laredo St San Antonio TX 78207 Phone: 210-229-9920 Fax: 210-229-9921	Shipped via: Walk-in

		Analyses	Containers
#1	JKS-56-20220222-CCR 02/22/2022 08:47 Grab / Liquid	B_T TAT: 7 Fluoride_IC TAT: 7	250 mL Plastic HNO3 (1) 250 mL Plastic Unpreserved (1)
	Comments: TRRP REPORTING		
#2	JKS-61-20220222-CCR 02/22/2022 11:37 Grab / Liquid	B_T TAT: 7	250 mL Plastic HNO3 (1)
	Comments: TRRP REPORTING		
#3	JKS-50R-20220222-CCR 02/22/2022 09:27 Grab / Liquid	B_T TAT: 7	250 mL Plastic HNO3 (1)
	Comments: TRRP REPORTING		

1.6°C | 1.6°C TG#7 Iced N.C.S.

Relinquished by	Date/Time	Accepted by	Date/Time
LANCE SIMMONS	~~2-23-22~~ 0840	BARNES PENROD	2-23-22 0843
BARNES PENROD	2-23-22 0913	AJ Ld Aimee Landon FEB 2	3 2022 ~~0910~~ 0913

SATESTING

From: Vasbinder, Chelsey <CVasbinder@cpsenergy.com>
Sent: Wednesday, February 23, 2022 12:05 PM
To: Simmons, Lance E.
Cc: SATESTING
Subject: Re: [InternetMail] Calaveras Power Station - CCR Units, Closed Landfills, and Waste Water Permit

Yes, it's 2173863.

We are on the way with the oil sample now.

Chelsey Vasbinder

> On Feb 23, 2022, at 11:42 AM, Simmons, Lance E. <LESimmons@cpsenergy.com> wrote:
>
> Aimee, the wastewater does not not need to be TRRP.
>
> Chelsey, can you please confirm the PO?
>
> Thanks,
>
> Lance Simmons
>
>> On Feb 23, 2022, at 11:06 AM, SATESTING <satesting@satestinglab.com> wrote:
>>
>> **EXTERNAL EMAIL:** Do not click any links or open any attachments unle
>> trust the sender and know the content is safe.
>>
>> James brought in the samples for Calaveras Power Station - CCR Units (2202349), Closed Landfills (2202350), and Waste Water Permit (2202351). Since these are electronic invoices and there isn't a place for the PO# I just want to confirm that these will be under the PO# 2173863. Also Does the Waste Water Permit CoC 2202351 need TRRP Reporting as well?
>>
>> Aimee Landon
>> San Antonio Testing Laboratory
>> 1610 S. Laredo St.
>> San Antonio, TX 78207
>> 210-229-9920
>
> <2202351_draftCoC.pdf>
> <2202350_draftCoC.pdf>
> <2202349_draftCoC.pdf>

SAN ANTONIO
TESTING LABORATORY, INC.

Sample Receipt Checklist

Client: CPS
Report Number: 2202349
Project Name:
Date Received: 2/23/22
Shipped via: ☐FedEx ☐UPS ☐Lonestar ☐Hand Delivered ☐DHL ☑SATL ☐Other
Date Due: 3/4/22
Rush: ☐ Specify: ☐3-5 ☐2 ☐1

Items to be checked upon Receipt: [Yes, No, N/A]

1. Custody Seals present?	Yes	☐	No	☑	NA	☐	If NA–reason:	
2. Custody Seals intact?	Yes	☐	No	☐	NA	☑	If NA–reason:	
3. Air Bill included in folder, if received?	Yes	☐	No	☐	NA	☑	If NA–reason:	
4. Is COC included with samples?	Yes	☑	No	☐	NA	☐	If NA–reason:	
5. Is COC signed and dated by client?	Yes	☑	No	☐	NA	☐	If NA–reason:	
6. Sample temperature: Thermal preservation between >0° - 6°C? (Samples that are delivered to the laboratory on the same day that they are collected may not meet this criterion, but are acceptable if they arrive on ice.)	Yes	☑	No	☐	NA	☐	Temp: 1.6 °C	
7. Samples received with ice ☒ ice packs ☐ other cooling ☐	Yes	☑	No	☐	NA	☐	If NA–reason:	
8. Is the COC filled out correctly, and completely?	Yes	☑	No	☐	NA	☐	If NA–reason:	
9. Information on the COC matches the samples?	Yes	☑	No	☐	NA	☐	If NA–reason:	
10. Samples received within holding time?	Yes	☑	No	☐	NA	☐	If NA–reason:	
11. Samples properly labeled?	Yes	☑	No	☐	NA	☐	If NA–reason:	
12. Samples submitted with chemical preservation? (e.g. pH adjusted, or sodium thiosulfate added for microbiological tests)	Yes	☑	No	☐	NA	☐	If NA–reason:	
13. Proper sample containers used?	Yes	☑	No	☐	NA	☐	If NA–reason:	
14. All samples received intact, containers not damaged or leaking?	Yes	☑	No	☐	NA	☐	If NA–reason:	
15. VOA vials (requesting BTEX/VOC analysis) received with no air bubbles? Bubbles acceptable on VOA vials for TPH.	Yes	☐	No	☐	NA	☑	If NA–reason:	novoas
16. Preservative for THMs only ($Na_2S_2O_3$)	Yes	☐	No	☐	NA	☑	If NA–reason:	nothms
17. Sample volume sufficient for requested analysis?	Yes	☑	No	☐	NA	☐	If NA–reason:	
18. Sample amount sufficient for TCLP analysis?	Yes	☐	No	☐	N/A	☑	If NA- reason	notcp
19. Subcontracted Samples: [if Yes, complete the next section]	Yes	☐	No	☑	NA	☐	If NA–reason:	

Analyses Subcontracted Out:
No. of Samples
Samples sent to:
Sent By:
Date samples sent:
Samples shipped via:
TAT Requested:
Tracking number [if any]:
Comments:

Received By:
Date: 2/23/22
Labeled By:
Date:
Logged into LIMS By:
Date:
Logged into RF By:
Date:

Q:\Controlled Documents\Forms\Login\Sample Receipt Checklist Form Rev 02052019.doc

SATL#FO001
Revised 02/05/19

~~Attachment 2~~ATTACHMENT 3 CERTIFICATION

ALTERNATE SOURCE DEMONSTRATION CERTIFICATION

Calaveras Power Station
San Antonio, Texas
CPS Energy

CERTIFICATION

I hereby verify the accuracy of the information provided in this *Alternate Source Demonstration* in accordance with the requirements of 40 CFR §257.94(e)(2).

____

Nicholas Houtchens, P.G.
Texas Licensed Professional Geoscientist No. 11108

Attachment 27   Pertinent Documents Submitted to EPA

Attachment 27-1

March 1, 2022

Ms. Kirsten Hillyer
U.S. Environmental Protection Agency
Office of Resource Conservation & Recovery (ORCR)
Materials Recovery & Waste Management Division (MRWMD)

Re: Calaveras - CCR Part A Demonstration, Request for Additional Information

Dear Ms. Hillyer:

CPS Energy is in receipt of your February 14, 2022, communication requesting additional information regarding the Alternative Capacity Infeasibility Demonstrations (ACID) dated November 30, 2020, for the Evaporation Pond and the Sludge Recycle Holding (SRH) Pond located at the Calaveras Power Station. CPS Energy is pleased to submit this summary in response to the request.

Additional information requested for the Evaporation Pond ACID - Calaveras Power Station

Request 1: *A narrative explaining the progress made and current activities and phase/step at the facility to achieve alternative capacity.*

Response 1: The following are activities that have been completed or are in progress on the new lined surface impoundment identified in the Evaporation Pond ACID:

- 100% design drawings and specifications - completed
- Permitting
  - Texas Pollutant Discharge Elimination System (TPDES) Permit Amendment and Notification Approval - in progress
  - Texas Commission on Environmental Quality (TCEQ) General Permit Application Preparation and Technical Report Review/Approval - in progress
  - City of San Antonio Cultural Resources and Environmental Permitting Review/Approval - completed
  - City of San Antonio Tree Survey and Permit Review/Approval - completed
  - Bexar County Flood Control Permit - completed
  - Bexar County Storm Water Quality Site Development Permit - completed
- Contractor Bid - completed
- Contractor Bid Evaluation and Management Review - completed
- Contract Negotiation - completed
- CPS Energy Board Review and Approval - completed
- Contract Award - completed
- Site Mobilization and Construction – in progress

Request 2: *A discussion of the issues that led to the delay (if a delay has occurred) to the requested date to cease receipt of waste.*

Response 2: Permitting through the City of San Antonio and Bexar County had delayed the mobilization to the field. Both the City of San Antonio and Bexar County took approximately double the time for the anticipated review period to issue permits. As indicated in the Evaporation Pond ACID, the original mobilization date for the construction of the new lined surface impoundment was October 14, 2021. However due to delays on permitting, the actual mobilization occurred on February 7, 2022.

Request 3: *An updated requested date to cease receipt of waste (if the original date requested has changed).*

Response 3: CPS Energy is requesting that the date to cease receipt of waste be updated to September 30, 2022, to allow non-CCR waste flow to the new lined surface impoundment.

Request 4: *An updated narrative justifying the new date to cease receipt of waste (if the original date requested has changed).*

Response 4: As mentioned above, permitting through the City of San Antonio and Bexar County had delayed the mobilization to the field by four months. The remainder of the construction activities are anticipated to be completed with the original durations as indicated in the Evaporation Pond ACID. The date of the startup & commissioning of the new lined surface impoundment will need to be shifted back four months to September 30, 2022, due to the delayed mobilization.

Additional information requested for the SRH Pond ACID - Calaveras Power Station

Request 1: *A narrative explaining the progress made and current activities and phase/step at the facility to achieve alternative capacity.*

Response 1: The following are activities that have been completed or are in progress on the new lined surface impoundment identified in the SRH Pond ACID:

- Environmental, archeological permits - completed
- Civil earthworks detailed design for the Plant Drains Pond - completed
- Civil structural and mechanical detailed design substantially - completed
- Electrical and controls initial design - completed
- Contractor Bid Evaluation and Management Review - completed
- Approval of Construction Contract - completed
- Obtain permits for construction - in progress
- Mobilize contractor on site - in progress

__Request 2:__ *A discussion of the issues that led to the delay (if a delay has occurred) to the requested date to cease receipt of waste.*

__Response 2:__ No delay has occurred that would change the original requested date.

__Request 3:__ *An updated requested date to cease receipt of waste (if the original date requested has changed).*

__Response 3:__ No change has occurred to the original requested date.

__Request 4:__ *An updated narrative justifying the new date to cease receipt of waste (if the original date requested has changed).*

__Response 4:__ No change has occurred to the original requested date.

Please call me at (210) 353-3625 with any questions.

Sincerely,

Michael M. Malone, P.E.
CPS Energy Senior Manager
Environmental Management

Attachment 27-2

PROPOSED DECISION

Proposed Conditional Approval of Alternative Closure Deadline for the Calaveras Power Station

SUMMARY:

CPS Energy owns and operates Calaveras Power Station located in southeast San Antonio, Texas. Calaveras Power Station is composed of two coal-fired power plants, J.K. Spruce and J.T. Deely, and is located next to Calaveras Lake. At Calaveras, CPS Energy operates four coal combustion residuals (CCR) surface impoundments and a Fly Ash Landfill. The surface impoundments are an active Sludge Recycling Holding (SRH) Pond, an active Evaporation Pond, and the North and South Bottom Ash Ponds, which have ceased receiving waste and are currently in the process of being closed. The SRH Pond and the North and South Bottom Ash Ponds are located at the southern end of the facility directly next to Calaveras Lake. The Fly Ash Landfill and the Evaporation Pond are located on the northern end of the facility and approximately 1,200 feet and 1,600 feet, respectively from Calaveras Lake.

Under the Environmental Protection Agency (EPA) regulations for CCR landfills and surface impoundments at 40 C.F.R. §257.101(a), unlined CCR surface impoundments such as the Evaporation Pond and SRH Pond were generally required to cease receipt of all CCR and non-CCR wastestreams by April 11, 2021. This deadline was established after the United States Court of Appeals for the District of Columbia Circuit (D.C. Cir.) found that EPA erred when it established a rule that allows unlined CCR surface impoundments to continue to operate until they leak despite the Agency's conclusions that "unlined impoundments have a 36.2 to 57% chance of leakage at a harmfully contaminating level" and that such leaks, when they occur, pose substantial risks to humans and the environment. *See Utility Solid Waste Activities Group (USWAG) v. EPA*, 901 F.3d 414, 427-428 (D.C. Cir. 2018) (finding that "[i]t is inadequate under

RCRA for the EPA to conclude that a major category of impoundments that the agency's own data show are prone to leak pose 'no reasonable probability of adverse effects on human health or the environment,' 42 U.S.C. §6944(a), simply because they do not already leak"). Despite the risks posed by unlined CCR surface impoundments, EPA's regulations provide an opportunity for such impoundments to continue to operate beyond April 11, 2021, if the owner or operator submits a demonstration showing that the facility meets the criteria for 40 C.F.R. § 257.103(f)(1).

On November 30, 2020, CPS Energy submitted two alternative capacity infeasibility demonstrations (collectively referred to as the "Demonstration") to the Environmental Protection Agency (EPA), one for the SRH Pond and one for the Evaporation Pond, seeking an extension pursuant to 40 Code of Federal Regulations (C.F.R.) § 257.103(f)(1) to continue to receive CCR and non-CCR wastestreams after April 11, 2021. CPS Energy requests alternative closure deadlines of September 1, 2023, and May 26, 2022, for the SRH Pond and the Evaporation Pond, respectively. On March 1, 2022, CPS Energy requested an updated alternative closure deadline of September 30, 2022, for the Evaporation Pond.

EPA is proposing to find that Calaveras Power Station is not in compliance with all of the requirements of Part 257 subpart D, including noncompliance with the groundwater monitoring requirements. EPA is also proposing that CPS Energy failed to adequately explain the lack of available on-site alternative disposal capacity for the Evaporation Pond wastestreams. For these reasons, EPA is proposing to conditionally approve the request for an extension for the SRH Pond until September 1, 2023, because the Agency has determined that conditions can be developed to address the identified noncompliance before the date of the requested extension.

EPA is also taking comment on whether the Agency should deny the request for an extension based on the proposed findings of noncompliance.

DATES: *Comments.* Comments must be received on or before August 25, 2022.

ADDRESSES AND PUBLIC PARTICIPATION: The EPA has established a docket for this proposed decision under Docket ID No. EPA-HQ-OLEM-2022-0333. The EPA established a separate docket for the CCR Part A final rule published on August 28, 2020, under Docket ID No. EPA-HQ-OLEM-2019-0172.[1] All documents in the docket are listed in the *https://www.regulations.gov* index. Publicly available docket materials are available either electronically at *https://www.regulations.gov* or in hard copy at the EPA Docket Center. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the EPA Docket Center is (202) 566-1742. You may send comments, identified by Docket ID. No. EPA-HQ-OLEM-2022-0333, by any of the following methods:

- Federal e-Rulemaking Portal: *https://www.regulations.gov* (our preferred method). Follow the online instructions for submitting comments.
- Mail: U.S. Environmental Protection Agency, EPA Docket Center, Office of Land and Emergency Management, Docket ID No. EPA-HQ-OLEM-2022-0333, Mail Code 28221T, 1200 Pennsylvania Avenue NW, Washington, DC 20460.
- Hand Delivery or Courier (by scheduled appointment only): EPA Docket Center, WJC West Building, Room 3334, 1301 Constitution Avenue NW, Washington, DC 20004. The Docket Center's hours of operations are 8:30 a.m. – 4:30 p.m., Monday – Friday (except Federal Holidays).

---

[1] See Section II.A of this document for more information on the CCR Part A Rule.

Instructions: All submissions received must include the Docket ID number (EPA-HQ-OLEM-2022-0333) for this action. Comments received may be posted without change to *https://www.regulations.gov*, including any personal information provided. Once submitted, comments cannot be edited or removed from the docket. The EPA may publish any comment received to its public docket. Do not submit electronically any information you consider to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Multimedia submissions (audio, video, etc.) must be accompanied by a written comment. The written comment is considered the official comment and should include discussion of all points you wish to make. The EPA will generally not consider comments or comment contents located outside of the primary submission (i.e., on the web, cloud, or other file sharing system). For additional submission methods, the full EPA public comment policy, information about CBI or multimedia submissions, and general guidance on making effective comments, please visit *https://www.epa.gov/dockets/commenting-epa-dockets*.

Due to public health concerns related to COVID-19, the EPA Docket Center and Reading Room are open to the public by appointment only. Our Docket Center staff also continues to provide remote customer service via email, phone, and webform. Hand deliveries or couriers will be received by scheduled appointment only. For further information and updates on EPA Docket Center services, please visit us online at *https://www.epa.gov/dockets*.

The EPA continues to carefully and continuously monitor information from the Centers for Disease Control and Prevention (CDC), local area health departments, and our Federal partners so that we can respond rapidly as conditions change regarding COVID-19.

FOR FURTHER INFORMATION CONTACT: For information concerning this proposed decision, contact:

- Kirsten Hillyer, Office of Resource Conservation and Recovery, Materials Recovery and Waste Management Division, Environmental Protection Agency, 1200 Pennsylvania Avenue NW, MC: 5304T, Washington, DC 20460; telephone number: (202) 566-0542; email address: Hillyer.Kirsten@epa.gov.
- Frank Behan, Office of Resource Conservation and Recovery, Materials Recovery and Waste Management Division, Environmental Protection Agency, 1200 Pennsylvania Avenue NW, MC: 5304P, Washington, DC 20460; telephone number: (202) 566-0531; email address: Behan.Frank@epa.gov.
- For more information on coal ash regulations, please visit *https://www.epa.gov/coalash*.

SUPPLEMENTARY INFORMATION:

List of Acronyms

ASD – Alternate Source Demonstration

BAPs – Bottom Ash Ponds

CBI – Confidential Business Information

CCR – Coal Combustion Residuals

C.F.R. – Code of Federal Regulations

Clouse WRC – Steven M. Clouse Water Recycling Center

EPA – Environmental Protection Agency

ERCOT – Electric Reliability Council of Texas

FAL – Fly Ash Landfill

FGD – flue gas desulfurization

gpd – gallons per day

gpm – gallons per minute

GWMCA – Groundwater Monitoring Corrective Action

HDPE – high density polyethlene

IFC – issue for construction

MGD – million gallons per day

MW – megawatts

P.E. – Professional Engineer

POTW – publicly owned treatment works

RTO – Regional Transmission Organization

SAWS – San Antonio Water Service

SRH – Sludge Recycling Holding

SSI – statistically significant increase

TCEQ – Texas Commission of Environmental Quality

TDS – total dissolved solids

TSS – total suspended solids

WWTF – wastewater treatment facility

WWTPs – wastewater treatment ponds

I. General Information

A. The Decision the Agency is Proposing.

The EPA is proposing to conditionally approve the extension request submitted by CPS Energy for the CCR surface impoundment, the SRH Pond, located at the Calaveras Power Station in San Antonio, Texas. CPS Energy submitted the Demonstration to EPA seeking an extension pursuant to 40 C.F.R § 257.103(f)(1) to allow two CCR surface impoundments, the SRH Pond and the Evaporation Pond, to continue to receive CCR and non-CCR wastestreams after April 11, 2021.

After review of the Demonstration and additional information provided by CPS Energy, EPA proposes to find that the Demonstration fails to show that CPS Energy is in compliance with the CCR regulations. Notwithstanding this proposed finding, EPA is proposing to conditionally approve the request for an extension for the SRH Pond, instead of proposing to deny the extension, based on proposed conditions that address the identified compliance issues and that could be implemented at Calaveras Power Station before the date of the requested extension. Thus, EPA is proposing to conditionally approve the request if, prior to final action, CPS Energy agrees to satisfy the conditions specified in Section IV.A of this proposed decision. If the conditions are met, EPA's conditional approval would allow Calaveras Power Station to continue placing certain CCR and non-CCR wastestreams in the SRH Pond through September 1, 2023. EPA is proposing that failure to meet any of the conditions subsequent to issuance of the final conditional approval would automatically convert the conditional approval into a denial. In such a case, the facility's deadline to cease placing any waste into the SRH Pond would revert to 135 days from the date of EPA's final decision, which is the deadline that would have been established had EPA denied the extension request. See Section IV.B of this document for further discussion of the basis for that deadline and of the process for a potential extension to address reliability issues.

Additionally, EPA solicits comment on whether to deny the Demonstration on the grounds that it fails to meet the requirements of 40 C.F.R. § 257.103(f)(1)(iv) in the event that, after reviewing public comment, EPA determines a conditional approval to be inappropriate.

B. The Agency's Authority for Proposing This Decision.

This proposal is being issued pursuant to the authority in 40 C.F.R. § 257.103(f). The Texas State CCR Program approval did not include 40 C.F.R. § 257.103. Therefore, it is EPA's duty to act on the submitted Demonstration.

II. Background

A. Summary of Part A Final Rule

In April 2015, EPA issued its first set of regulations establishing requirements for CCR surface impoundments and landfills, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities," 80 FR 21302 (April 17, 2015). In 2020, EPA issued revisions to that rule, "Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure Part A: Deadline to Initiate Closure rule" 85 FR 53516 (Aug. 28, 2020) (the "Part A Rule"). The Part A Rule established April 11, 2021 as the date that electric utilities must cease placing waste into all unlined CCR surface impoundments. The Part A Rule also revised the alternative closure provisions of the CCR regulations (40 C.F.R. § 257.103) by allowing owners or operators to request an extension to continue to receive CCR and/or non-CCR wastestreams in unlined CCR surface impoundments after April 11, 2021, provided that certain criteria are met. EPA established two site-specific alternatives to initiate closure of unlined CCR surface impoundments (40 C.F.R. § 257.103(f)), commonly known as extensions to the date to cease receipt of waste.

The first alternative is for a facility that must continue to use an unlined CCR surface impoundment after April 11, 2021, because no alternative capacity is available either on-site or off-site, and it was technically infeasible to develop alternative capacity by that date. 40 C.F.R. § 257.103(f)(1) (titled *Development of Alternative Capacity is Technically Infeasible*). The second alternative is for coal-fired boiler(s) that are going to permanently shut down by a date certain after April 11, 2021, but there is no alternative capacity either on- or off-site that is available to accept the CCR and non-CCR wastestreams between April 11, 2021, and the permanent closure date of the coal-fired boiler. 40 C.F.R. § 257.103(f)(2) (titled *Permanent Cessation of Coal-Fired Boiler(s) by a Date Certain*).

In this case, Calaveras is requesting an extension under the first Part A alternative. Under this alternative, an owner or operator may submit a demonstration seeking EPA approval to continue using its unlined CCR surface impoundment for the specific amount of time needed to develop alternative disposal capacity for its CCR and/or non-CCR wastestreams. EPA may grant an extension of the deadline to cease receipt of waste if the facility demonstrates that the requirements of 40 C.F.R. § 257.103(f)(1) are met. Specifically, the regulation requires the facility to demonstrate that: 1) no alternative disposal capacity is currently available on or off-site of the facility; 2) the CCR and/or non-CCR waste stream must continue to be managed in that CCR surface impoundment because it was technically infeasible to complete the measures necessary to obtain alternative disposal capacity either on or off-site at the facility by April 11, 2021; and 3) the facility is in compliance with all the requirements of 40 C.F.R. part 257, subpart D. 40 C.F.R. § 257.103(f)(1)(i)-(iii).

Under the first requirement, the owner or operator must demonstrate that there is no alternative disposal capacity available on or off-site. 40 C.F.R. § 257.103(f)(1)(i). As part of this, facilities must evaluate all potentially available disposal options to determine whether any are technically feasible. 40 C.F.R. § 257.103(f)(1)(iv)(A)(1). The owner or operator must also evaluate the site-specific conditions that affected the options considered. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*1*)(*i*). Additionally, the regulations prohibit the owner or operator from relying on an increase of cost or inconvenience of existing capacity as a basis for meeting this criterion. 40 C.F.R. § 257.103(f)(1)(i).

The Demonstration must substantiate the absence of alternative capacity for each wastestream that the facility is requesting to continue placing in the CCR surface impoundment beyond April 11, 2021. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*1*). As soon as alternative capacity is available for any of the wastestreams, the owner or operator must use that capacity to dispose of those wastestreams instead of using the unlined CCR surface impoundment. 40 C.F.R. § 257.103(f)(1)(v). This means that if there is a technically feasible option to reroute any of the wastestreams away from the unlined surface impoundment, the owner or operator must do so. 40 C.F.R. § 257.103(f)(1)(ii), (v). In the CCR Part A Rule preamble, EPA acknowledged that some of these wastestreams are very large and will be challenging to relocate, especially for those that are sluiced. However, the smaller volume wastestreams have the potential to be rerouted to temporary storage tanks. In such cases, the owner or operator must evaluate this option, and, if it is determined to be technically feasible, must implement it. 85 Fed. Reg. 53,541.

EPA also stated in the Part A Rule that it is important for the facility to include an analysis of the adverse impacts to the operation of the power plant if the CCR surface impoundment cannot be used after April 11, 2021. EPA stated that this is an important factor in determining whether the disposal capacity of the CCR surface impoundment in question is truly needed by the facility. EPA required that a facility provide analysis of the adverse impacts that would occur to plant operations if the CCR surface impoundment in question were no longer available. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*1*)(*ii*).

In addition, to support the alternative deadline requested in the demonstration, the facility must submit a workplan that contains a detailed explanation and justification for the amount of time requested. 40 C.F.R. § 257.103(f)(1)(iv)(A). The written workplan narrative must describe each option that was considered for the new alternative capacity selected, the time frame under which each potential capacity could be implemented, and why the facility selected the option that it did. *Id*. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*1*). The discussion must include an in-depth analysis of the site and any site-specific conditions that led to the decision to implement the selected alternative capacity. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*1*)(*i*).

The workplan must contain a visual timeline and narrative discussion to justify the time request. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*3*). The visual timeline must clearly indicate how each phase and the steps within that phase interact with or are dependent on each other and the other phases. Additionally, any possible overlap of the steps and phases that can be completed concurrently must be included. This visual timeline must show the total time needed to obtain the alternative capacity and how long each phase and step is expected to take. The detailed narrative of the schedule must discuss all the necessary phases and steps in the workplan, in addition to the overall time frame that will be required to obtain capacity and cease receipt of waste. The discussion must include: 1) why the length of time for each phase and step is needed and a discussion of the tasks that occur during the specific step, 2) why each phase and step must happen in the order it is occurring, 3) the tasks that occur during each of the steps within the phase and 4) anticipated worker schedules. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*3*). This overall discussion of the schedule assists EPA in understanding whether the time requested is warranted. Finally, facilities must include a narrative on the progress made towards the development of alternative capacity as of the time the demonstration was compiled. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*4*). This section of the Demonstration is intended to show the progress and efforts the facility has undertaken to work towards ceasing placement of waste in the unlined CCR surface impoundment and to determine whether the submitted schedule for obtaining alternative capacity was adequately justified at the time of submission.

The Part A Rule also requires that a facility be in compliance with all the requirements in 40 C.F.R. part 257 subpart D in order to be approved for an extension. 40 C.F.R. § 257.103(f)(1)(iii). Various compliance documentation must be submitted with the demonstration for the entire facility, not just for the CCR surface impoundment in question. 40 C.F.R. § 257.103(f)(1)(iv)(B). Additionally, the information presented in the narrative of the Demonstration and information posted on the facility's website relating to the closure or retrofit of the impoundment and the development of the new alternative disposal capacities are considered by EPA to allow for an adequate analysis of the facility's compliance with the CCR regulations.

The first group of compliance documents required to be included in the Demonstration relate to documentation of the facility's compliance with the requirements governing the design, construction, and installation of the groundwater monitoring systems. The rule specifically requires copies of the following documents: 1) map(s) of groundwater monitoring well locations (these maps should identify the CCR units as well); 2) well construction diagrams and drilling logs for all groundwater monitoring wells; 3) maps that characterize the direction of groundwater flow accounting for seasonal variation; 4) constituent concentrations, summarized in table form, at each groundwater monitoring well monitored during each sampling event; and 5) description of site hydrogeology including stratigraphic cross-sections. 40 C.F.R. § 257.103(f)(1)(iv)(B)(*2*)-(*4*).

The second group of documents required under the regulations are those necessary to demonstrate compliance with the corrective action regulations, if applicable. To comply with this requirement, a facility that triggered corrective action must at the least submit the following documentation: the corrective measures assessment required at 40 C.F.R. § 257.96; progress reports on remedy selection and design; and the report of final remedy selection required at 40 C.F.R. § 257.97(a). 40 C.F.R. § 257.103(f)(1)(iv)(B)(*5*) and (*6*).

Finally, the regulations require facilities to submit the most recent structural stability assessment required at 40 C.F.R. § 257.73(d), and the most recent safety factor assessment required at 40 C.F.R. § 257.73(e) and §§ 257.103(f)(1)(iv)(B) (7) and (8).

B. Description of Calaveras Power Station and Summary of Request for an Extension

On November 30, 2020, CPS Energy submitted a Demonstration pursuant to 40 C.F.R. § 257.103(f)(1) requesting additional time to develop alternative capacity to manage CCR and non-CCR wastestreams at the Calaveras Power Station in San Antonio, Texas. CPS Energy is the owner and operator of the Calaveras Power Station. EPA reviewed the Calaveras Demonstration to determine whether it included the information, analyses, and documentation required under 40 C.F.R. § 257.103(f)(1). On January 11, 2022, EPA notified CPS Energy of the completeness determination and, pursuant to 40 C.F.R. § 257.103(f)(3)(ii), that the completeness determination tolls the April 11, 2021, cease receipt of waste date for the identified unlined surface impoundments the Demonstration covers, until EPA issues a final decision on this proposed action.[2]

The Demonstration submitted by CPS Energy seeks approval of alternative site-specific deadlines to initiate closure of the SRH Pond and Evaporation Pond. Specifically, CPS Energy requests alternative deadlines of September 1, 2023, for the SRH Pond and May 26, 2022, for the Evaporation Pond, by which dates it would cease routing all CCR and non-CCR wastestreams to these CCR surface impoundments and initiate closure. On March 1, 2022, CPS Energy notified EPA that there were permitting delays from the City of San Antonio and Bexar County for the

---

[2] *See* CPS Energy Completeness Letter in the docket.

Evaporation Pond. Therefore, CPS Energy is requesting an updated deadline of September 30, 2022, for the Evaporation Pond and to keep the original date for the SRH Pond of September 1, 2023.

As described in the Demonstration, CPS Energy will obtain alternative capacity by constructing a new Plant Drains Pond to replace the SRH Pond and a new Evaporation Pond to replace the existing Evaporation Pond.

To assist the reader, EPA provides additional details on the Calaveras Power Station below, including information on the generation capacity, on the CCR surface impoundments and landfills, and other non-CCR impoundments. This summary is based on information provided in the Demonstration.

1. Coal-fired Boilers and Generation Capacity.

The Calaveras Power Station consists of three power plants, two of which are subject to the CCR regulations, the J.K. Spruce Plant and the J.T. Deely Plant. The J.T. Deely Plant ceased operation in December 2018. The J.K. Spruce Plant operates two coal-fired units. The total generation capacity of these two units is approximately 1,410 megawatts (MW).

2. CCR Units and CCR Wastestreams.

CPS Energy currently operates five CCR units at Calaveras Power Station that are subject to the federal CCR regulations. Two are active CCR surface impoundments, the SRH Pond and the Evaporation Pond, for which alternative deadlines are sought. The approximate surface areas of the SRH and Evaporation Ponds are 3 and 6.7 acres, respectively. The Evaporation Pond was originally constructed as a fly ash landfill in 1990, then converted to a fly ash impoundment in 1996. After 1996 it was converted to an evaporation pond. Although the Evaporation Pond does not currently receive CCR wastestreams, it is considered a CCR surface impoundment and eligible for the alternative closure deadline pursuant to 40 C.F.R. § 257.103(f)(1). The SRH Pond currently receives CCR wastestreams from the flue gas desulfurization (FGD) system. The total flowrates of wastestreams into the SRH Pond are shown in Table 1 below.

Relevant to CPS Energy's request, the CCR surface impoundments are unlined and subject to closure pursuant to 40 C.F.R. § 257.101(a)(1). This provision provides that CPS Energy must cease placing CCR and non-CCR wastestreams into the units and either retrofit or close them as soon as technically feasible, not later than April 11, 2021. According to the Demonstration, the SRH Pond and the Evaporation Pond meet all location restrictions specified in 40 C.F.R. §§ 257.60 – .64.

CPS Energy has two inactive CCR surface impoundments, the North and South Bottom Ash Ponds. These two CCR units are currently in closure. The last receipt of waste into either pond was in December 2018. The fifth CCR unit is the Fly Ash Landfill. It is an active CCR landfill that accepts the fly ash from Calaveras Power Station.

Based on the evaluation of alternative disposal capacity options, CPS Energy selected the following options for compliance at Calaveras Power Station: 1) construct a new Evaporation Pond, and 2) construct a new CCR surface impoundment, the Plant Drains Pond. The Demonstration maintains that these options can be implemented in the least amount of time of the alternatives evaluated and that they accommodate the unique site features such as quantity of wastestreams and the lack of off-site disposal facilities.

3. Non-CCR Impoundments and Non-CCR Wastestreams.

CPS Energy identifies eight non-CCR impoundments: the Diked Oil Storage Area, the Coal Pile Runoff Pond, the Stormwater Southwest Runoff Pond 3, the Stormwater CRP Runoff

Pond 1, the Stormwater CRP Pond 2, the Stormwater Runoff Fly Ash Pond, the Clarifier Sludge Recycling Pond, and the Stormwater Coal Conveyor Area Temporary Holding Pond.

The Evaporation Pond only receives non-CCR wastestreams. The wastestreams come from the Calaveras Power Station and other CPS Energy power generation facilities. These wastestreams include wastewater from the boiler, cleaning liquids, ion exchange, steam turbine cleaning liquids, plasma cutter liquids, acid/base vessel cleaning liquids, spill clean-ups, laboratory analyte solution liquids, air preheater basket cleaning liquids, heat exchanger condenser cleaning liquids, and circulating water from service activities on plant equipment. During typical operations the Evaporation Pond receives one to two million gallons per year.

The SRH Pond also receives non-CCR wastestreams. The flowrates of the various wastestreams into the SRH Pond are shown below in Table 1.

Table 1: Flowrates to the SRH Pond[3]

Item	Flow Description	Instantaneous Flowrate (gpm)	Average Flowrate (gpd)
Boiler and Plant Sumps			
1	Transfer Tower Sump	250	19,000
2	Eastside Drainage Sump	400	8,600
3	Eastside Drainage Sump	400	8,600
4	Unit 1 Boiler Build Area Sump	200	40,000
5	Unit 2 Boiler Area Waste Sump	1,300	253,000
	Subtotal Boiler and Plant	2,550	330,000
FGD System			
1	Limestone Hopper Area Sump	400	5,800
2	Limestone Hopper Area Sump	400	5,800
3	Limestone Prep Area Sump	200	35,000
4	FGD system Reclaim Water	600	144,000
5	Unit 2 Absorber Area Sump	650	68,000
6	Unit 1 Absorber Waste Slurry Sump	625	259,000
7	Thickener Tunnel Sump	400	29,000
8	Control/Dewatering Building Sump	750	86,000
	Subtotal FGD System	4,025	633,000
Total		6,575	963,000

---

[3] See Exhibit 3.7 of the SRH Pond Demonstration (pdf page 19).

III. EPA's Analysis of CPS Energy's Demonstration

EPA is proposing to conditionally approve the extension request notwithstanding the facility being out of compliance with 257 subpart D related to the groundwater monitoring requirements if CPS Energy meets the list of conditions in Section IV below. If the conditions are not met, EPA is proposing that CPS Energy cease placement of all CCR and non-CCR wastestreams into the SRH and Evaporation Ponds no later than 135 days after the date of EPA's final decision.

Below, EPA first discusses CPS Energy's evaluation of on- and off-site alternative disposal capacity and the impacts on the facility if the SRH and Evaporation Pond cannot be used through the proposed extension date. EPA is proposing to find that the analyses provided in the Demonstration support CPS Energy's conclusions that there is no alternative disposal capacity available for the SRH Pond wastestreams and no alternative disposal capacity available off-site for the Evaporation Pond wastestreams. However, EPA is proposing that the analysis provided for the on-site alternative disposal capacity available for the Evaporation Pond wastestreams is inadequate. EPA is also proposing to find that there would be adverse impacts on the facility if the SRH and Evaporation Ponds are closed without alternative disposal capacity available for the wastestreams.

EPA then discusses CPS Energy's compliance with the other requirements of the subpart D regulations applicable to Calaveras Power Station. EPA is proposing to conclude that the Demonstration does not show compliance with the groundwater monitoring requirements. EPA has developed conditions that will address the identified issues. If CPS Energy agrees to meet the conditions, EPA may grant an extension to the cease receipt of waste date as discussed further below.

A. EPA Evaluation of CPS Energy's Claim of No Alternative Disposal Capacity On- or Off-Site

As discussed above in Section II.A., to obtain an extension of the cease receipt of waste deadline, the owner or operator must demonstrate that there is no alternative disposal capacity available on or off-site. 40 C.F.R. § 257.103(f)(1)(iv)(A). In this case, the Demonstration provides detailed analyses of the potential alternative disposal options both on- and off-site as required by the Part A Rule, and as discussed below, EPA is proposing to find that no alternative disposal capacity is available for the SRH Pond, and no alternative capacity is available off-site for the Evaporation Pond wastestreams. However, EPA is proposing that the analysis provided demonstrating no available on-site alternative disposal capacity for the Evaporation Pond wastestreams is inadequate.

1. Lack of Alternative Disposal Capacity On-site

CPS Energy's Demonstration states that it lacks current alternative disposal capacity on-site for any of the wastestreams currently disposed of in the SRH and Evaporation Ponds. Calaveras Power Station has twelve surface impoundments (both CCR and non-CCR) on site as shown in Exhibit 3.6 – Calaveras Power Station Surface Impoundments,[4] and shown below in Table 2 for ease of reference. In Table 2, Pond #7 and Pond #10 (SRH and Evaporation Ponds), are those for which CPS Energy is seeking extensions. CPS Energy states that six of the active surface impoundments are used exclusively for stormwater management, and that the two inactive surface impoundments, the North and South Bottom Ash Ponds, are currently in closure.

Table 2 – Calaveras Power Station Surface Impoundments

---

[4] See Exhibit 3.6 (pdf page 18) of the SRH Pond Demonstration or Exhibit 3.2 (pdf page 13) of the Evaporation Pond Demonstration

Name	Description	Storage Capacity (MM gallons)	Liner	Status
Pond #1	Diked Oil Storage Area	0.2	Unlined	Active
Pond #2	Coal Pile Runoff Pond (Stormwater)	32.6	Unlined	Active
Pond #3	North Bottom Ash Pond	20.5	Unlined	Inactive
Pond #4	South Bottom Ash Pond	22.5	Unlined	Inactive
Pond #5	Stormwater (Southwest Runoff Pond 3)	1.7	Unlined	Active
Pond #6	Stormwater (CRP Runoff Pond 1)	5.9	Unlined	Active
Pond #7	SRH Pond	4.0	Unlined	Active
Pond #8	Stormwater (CRP Pond 2)	2.7	Unlined	Active
Pond #9	Stormwater Runoff (Fly Ash) Pond	9.7	Unlined	Active
Pond #10	Evaporation Pond	5.1	Unlined	Active
Pond #11	Clarifier Sludge Recycling Pond	0.8	Unlined	Active
Pond #12	Stormwater (Coal conveyor area temporary holding pond)	1.1	Unlined	Active

(a) SRH Pond.

CPS Energy states that there is no existing on-site capacity that can accept the CCR and non-CCR wastestreams disposed in the SRH Pond. Demonstration Exhibit 3.7 (Table 1 above) shows the various wastestreams and their flowrates being managed in the SRH Pond. The non-CCR wastestreams include drainage sumps, transfer tower sump, and boiler area sumps. They have a total average flowrate of 0.33 million gallons per day (MGD). The CCR wastestreams are produced by the FGD system and the total average flowrate is 0.633 MGD.

CPS Energy states that they cannot use any other ponds on-site to accept the CCR and non-CCR wastestreams the SRH Pond receives. As seen in Table 2 above, there are nine active surface impoundments (CCR and non-CCR), not including the SRH Pond. CPS Energy states that six of these nine impoundments, Ponds # 2, 5, 6, 8, 9, and 12, which release to Calaveras Lake through permitted discharges, are needed for stormwater management and lack capacity for additional wastestreams.

The Evaporation Pond is one of the remaining three active surface impoundments not associated with stormwater management. This pond has triggered closure requirements because it is unlined. Thus, CPS Energy concludes the wastestreams from the SRH Pond cannot be placed into it.

CPS Energy states that the areas of the Diked Oil Storage Area and the Clarifier Sludge Recycling Pond are not large enough to handle the wastestreams managed in the SRH Pond, and therefore, they are not available.

The final two ponds, the North and South Bottom Ash Ponds, are currently in closure and can no longer receive waste. Thus, due to the lack of available capacity in any of the existing ponds at Calaveras Power Station, CPS Energy concludes that there is not capacity available for any of the wastestreams to be diverted from the SRH Pond to a different location.

EPA agrees with CPS Energy's conclusions and that there is a lack of on-site alternative disposal capacity for the SRH Pond wastestreams.

(b) Evaporation Pond.

The Demonstration states there is no existing on-site alternative disposal capacity to accept the non-CCR wastestreams disposed of in the Evaporation Pond. The Evaporation Pond receives industrial wastestreams from the Calaveras Power Station as well as other CPS Energy power generation facilities. All these wastestreams are delivered by truck. The non-CCR wastestreams include boiler cleaning, ion exchange, steam turbine cleaning liquid, plasma cutter liquid, acid/base vessel cleaning liquid, spill cleanup liquid, laboratory analyte solution liquid, air preheater basket cleaning liquid, heat exchanger condenser cleaning, and circulating water from service activities on plant equipment. During typical plant operations the non-CCR wastestreams flow volume of nonhazardous liquids to the Evaporation Pond is one to two million gallons per year.

CPS Energy states that they cannot use any of the other ponds on-site as alternative disposal capacity. There are nine active surface impoundments (CCR and non-CCR) at the Calaveras Power Station, not including the Evaporation Pond, that are potential options for on-site alternative capacity. CPS Energy states that six of these nine impoundments are needed for stormwater management and release to Calaveras Lake through permitted discharges. These six stormwater management surface impoundments are Ponds #2, 5, 6, 8, 9, and 12. CPS Energy further states these six impoundments are unavailable for additional disposals as they do not have sufficient capacity to receive wastestreams beyond their designed stormwater capacity. Moreover, the industrial wastestreams would not meet the low discharge permit limits for metals (specifically iron and copper).

The SRH Pond is one of the three remaining active surface impoundments not associated with stormwater management. This pond is triggered into closure because it is unlined, and therefore, CPS Energy concludes that additional wastestreams cannot be placed into it. CPS Energy states that the remaining two ponds, the Diked Oil Storage Area Pond and the Clarifier Sludge Recycling Pond, are not large enough to handle the industrial wastestreams managed in the Evaporation Pond and, therefore, are also not available. The final two ponds are inactive: the North and South Bottom Ash Ponds. They are currently being closed and can no longer receive waste. Based upon all of the above, CPS Energy concludes that there is no alternative disposal capacity available for any of the wastestreams to be diverted from the Evaporation Pond to a different location.

EPA is proposing to find that the Demonstration fails to support the conclusion that there is a lack of available on-site alternative disposal capacity. Since CPS Energy is requesting an alternative compliance deadline for both the Evaporation and the SRH Ponds, it intends that both will continue to receive waste. But CPS Energy failed to discuss the reasons both ponds need to operate; for example, it could divert the industrial wastestreams from the Evaporation Pond to the SRH Pond. Diverting the industrial wastestreams would expedite the closure and the cease receipt of waste date for the Evaporation Pond. Additionally, it would only require one CCR surface impoundment to continue to operate under an alternative cease receipt of waste deadline.

2. Lack of Alternative Disposal Capacity Off-site

CPS Energy states in the Demonstration that the only off-site wastewater treatment facility within 20 miles of the Calaveras Power Station is the San Antonio Waster Service (SAWS) Steven M. Clouse Water Recycling Center (Clouse WRC). There are other wastewater treatment facilities in San Antonio and in the surrounding area further than 20 miles away. These are municipal systems owned by SAWS, the San Antonio River Authority, surrounding municipalities, or private companies, and these facilities are subject to the same limitations as the SAWS Clouse WRC. CPS Energy provides a list of facilities considered in Demonstration *Exhibit 3.1 – Off-site Treatment Facilities*[5]. CPS Energy states that this list was obtained from EPA's Facility Registry Service.

(a) SRH Pond.

CPS Energy states that obtaining off-site alternative disposal capacity would require either transporting all wastestreams currently managed by the SRH Pond or isolating only CCR wastestreams for transportation and disposal to an off-site facility. CPS Energy contends that the

---

[5] See pdf page 10 of the Evaporation Pond Demonstration or pdf page 10 of the SRH Pond Demonstration

FGD wastestreams would be subject to EPA Categorical Industrial User pretreatment standards and San Antonio industrial user local limits prior to being transported off-site and introduced to the SAWS publicly-owned treatment works (POTW). CPS Energy further states that this alternative would also require it to obtain an Industrial Waste Permit from SAWS. Pretreatment of FGD wastestreams would include, at a minimum, sedimentation to remove total suspended solids (TSS), and either use of a surface impoundment or large tankage, similar to what would be needed for an on-site wastewater treatment facility. Additional treatment might be needed to remove dissolved metals (e.g., arsenic, mercury, selenium) to below applicable Categorical and Local standards. The wastewater will reduce the available hydraulic capacity of the POTW for other, more compatible wastestreams. CPS Energy concludes that the requirement of pretreatment of FGD wastestreams removes any benefit of off-site management.

CPS Energy states that the management of wastewater off-site would require intermediate on-site containment to accept the much higher instantaneous flowrates. These flowrates can be as high as 6,340 gallons per minute (gpm) for all wastestreams, or 3,800 gpm for CCR wastestreams. CPS Energy states this would require a surface impoundment or large tankage similar to what would be needed for an on-site wastewater treatment facility.

Lastly, CPS Energy states that wastewater management off-site would require transportation by tanker truck. The average daily flowrate to the SRH Pond is approximately 670 gpm. Even if CCR wastestreams could be isolated from non-CCR wastestreams to the SRH Pond, average daily CCR wastestream flowrates alone are 440 gpm. As an example of how onerous it would be to transport this wastestreams off-site, CPS Energy states 440 gpm equals one trip for a 4,000 gallon tanker truck every 9 minutes, or 160 trips per day; a logistically infeasible trip frequency and volume. The company states that it is unlikely the POTW has sufficient transportation infrastructure or staffing to accommodate this added volume of commercial traffic.

EPA is proposing to agree with CPS Energy that it is infeasible to send the SRH Pond wastestreams off-site.

(b) Evaporation Pond.

The Evaporation Pond currently manages a variety of wastewaters generated at the Calaveras Power Station. The large majority are metal cleaning wastes generated during discrete maintenance events over a relatively short period of time (estimated to be approximately 800,000 gallons annually). CPS Energy states in the Demonstration that no industrial wastewater treatment facility exists in San Antonio and the surrounding area capable of treating the wastewater currently managed in the Evaporation Pond.

CPS Energy states that the management of the Evaporation Pond wastewaters off-site are subject to EPA Categorical Industrial User pretreatment standards and San Antonio industrial user local limits prior to being transported off-site and introduced to the SAWS POTW. CPS Energy states that the available analytical data indicates concentrations of copper in the wastewater generated during these maintenance events are above the EPA Categorical standard and local limit. As a result, these wastewaters require pretreatment to remove dissolved metals before they can be treated by the POTW. CPS Energy asserts that such pretreatment would require construction of an on-site wastewater treatment facility that would remove any benefit of management of the wastewaters off-site.

EPA is proposing to agree with CPS Energy’s conclusion that the wastestreams managed in the Evaporation Pond cannot be managed off-site without significant pretreatment prior to being sent off-site to a treatment facility. The wastestreams’ volumes are potentially small enough to be trucked off-site. Using the same truck capacity as the SRH Pond, the transportation would require approximately 200 trucks per year. However, given the composition of the wastestreams and the lack of industrial wastewater treatment facilities that would not first require construction of an on-site pretreatment facility, EPA is proposing to conclude it is not realistic to consider sending the wastestreams off-site.

B. EPA Evaluation of CPS Energy's Analysis of Adverse Impacts to Plant Operations

The Part A Rule next requires that a facility provide analysis of the adverse impacts that would occur to plant operations if the CCR surface impoundment in question were no longer available. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*1*)(*ii*). CPS Energy provided a justification in their Demonstration as required, and, for the reasons discussed below, EPA is proposing to find that there would be adverse impacts to the power plant if the CCR surface impoundments could not be used after April 11, 2021.

CPS Energy states in the Demonstration that the J.K. Spruce Plant has a generation capacity of 1,410 MW. This comprises approximately 18.3% of the CPS Energy generation portfolio. The J.K. Spruce Plant is an essential part of the baseload capacity within the CPS Energy fleet, particularly during peak demand periods. CPS Energy states that, during the summer of 2019, the Electric Reliability Council of Texas (ERCOT) reported that they were forced to rely on demand response reserves to maintain reliability of the grid.

1. SRH Pond Analysis

CPS Energy states in the Demonstration that the SRH Pond receives all the FGD system wastewater and various process discharge streams. It contends the FGD system must be in operation for the J.K. Spruce Plant to comply with regulatory permits and air emission limits for sulfur dioxide. Wastewater must be discharged from the FGD system on a regular basis when the plant is in service. Operation of the J.K. Spruce Plant is dependent on the continued operation of the SRH Pond until alternative capacity is available. CPS Energy contends that if CCR and non-CCR wastestreams to the SRH Pond must cease without alternative capacity available, the J.K. Spruce Plant will not be able to continue operating.

2. Evaporation Pond Analysis

CPS Energy states in the Demonstration that the Evaporation Pond receives boiler chemical cleanouts and other chemical cleaning wastes generated during maintenance events. CPS Energy contends it must manage the wastestreams generated during these required maintenance events for the continued safe operation of the J.K. Spruce Plant and other CPS Energy power generation facilities. Maintenance needed for continued operation of the J.K. Spruce Plant and other CPS Energy power generation facilities is dependent on the continued operation of the Evaporation Pond until alternative capacity is available. CPS Energy contends that if non-CCR flows are no longer allowed to be discharged into the Evaporation Pond without alternative capacity available, the J.K. Spruce Plant and other CPS Energy power generation facilities will have to cease operation.

EPA proposes to find that if Calaveras is unable to continue using the CCR surface impoundments, and if no other on or off-site alternative capacity is available, there would be adverse impacts on the ability to run the associated boilers such that a planned temporary outage would likely be required. As discussed in Section IV, EPA disagrees with CPS Energy's claims regarding the broader impact of such an outage.

C. Evaluation of CPS Energy's Site-Specific Analysis for the Alternative Capacity Selected and Justification for Time Requested to Develop Selected Alternative

As discussed above in section II.A., the regulations require APCO to demonstrate that the time it is requesting is the fastest technically feasible time frame to develop their selected alternative capacity option, and that the development of any of the available alternatives to manage the wastestreams was not feasible prior to April 11, 2021. To support these findings, the facility must submit a detailed justification for the amount of time requested that includes: 1) a description of each option that was considered; 2) the time frame under which each potential capacity could be implemented, and 3) why the facility selected the option that it did, along with an in-depth analysis of the site and any site-specific conditions that led to the decision to implement the selected alternative capacity. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*1*)(*i*). These factors assist EPA in understanding whether the time requested is warranted.

EPA has evaluated CPS Energy's analysis and are proposing to conclude that the time requested is the fastest technically feasible time frame to develop the selected alternative capacity options, and that the development of any of the other available alternatives to manage the wastestreams was not feasible prior to April 11, 2021.

1. Analysis for the Alternative Capacity Selected

a) SRH Pond Analysis

CPS Energy evaluates multiple alternatives for new capacity on-site to replace the SRH Pond. Five are thoroughly discussed in the Demonstration: 1) constructing a new wastewater treatment facility (WWTF), 2) retrofitting an existing surface impoundment, 3) converting the FGD system to dry handling, 4) using temporary storage tanks while constructing the new CCR surface impoundment, and 5) constructing a new CCR surface impoundment.

CPS Energy first evaluates construction of a WWTF. CPS Energy states that a new WWTF would require significant storage capacity to remove and dewater suspended solids in the wastewater. The new system would involve primary and secondary dewatering to produce solids that could be landfilled and a discharge stream that is low in TSS. The dewatering equipment would include thickeners/clarifiers for the primary dewatering followed by filter or belt presses for secondary dewatering. CPS Energy includes a process flow diagram of the WWTF in Exhibit 3.3 of the SRH Pond Demonstration.[6] It states that due to the amount of storage capacity and the equipment layout, a large area would be required for the WWTF. CPS Energy states that to maintain high reliability, the WWTF would need to include two redundant systems. The closest available location is approximately 3,000 feet north of the SRH Pond. To redirect the SRH Pond flows to the WWTF, a new transfer system would be required. The transfer system would supply one of the two thicken/clarifiers in the WWTF. Additionally, an aluminum sulfate and polymer would need to be added to promote solids settling in the thickener/clarifier to meet the permitted TSS discharge limits. The filter press units would be located in the filter building and elevated above roll away bins. Dewatered solids would discharge directly into the bins and, when full, the solids would be transported to a landfill or supplied for beneficial use. The filter building would also contain an electrical room, digital control system interface, polymer feed skids, and an operator control room. CPS Energy states that the overall expected duration to complete construction and have the WWTF operational is 48 months. It states that construction of a new WWTF would be a significantly more complex alternative than others considered below. It would require long-lead vendor-engineered equipment and more extensive system infrastructure.

---

[6] See pdf page 14 of the SRH Pond Demonstration

CPS Energy did not select this alternative because the overall expected duration for the design and installation (48 months) is longer than the other alternatives.

CPS Energy's second alternative involves retrofitting an existing impoundment at Calaveras Power Station. CPS Energy states that retrofitting an existing surface impoundment to receive the SRH Pond flows is a less complex alternative. Of the twelve surface impoundments (CCR and non-CCR) at the Calaveras Power Station, none are lined in accordance with the CCR Rule. CPS Energy states that none of the existing surface impoundments are capable of handling the capacity needed for the flows into the SRH Pond. As stated previously, excluding the SRH Pond, there are nine active surface impoundments. The six surface impoundments dedicated to stormwater management do not have excess capacity to receive other wastestreams. The three remaining active impoundments are not large enough to handle the wastestreams managed in the SRH Pond in addition to their current load.

CPS Energy's third alternative would involve converting the FGD system to dry handling. The conversion of the FGD system to dry handling eliminates eight of the thirteen wastestreams that discharge to the SRH Pond, approximately 50% of the flow volume. For this alternative to be viable CPS Energy states that additional modifications or additions to the plant would be required to address the remaining five wastestreams from the boilers and various plant sumps. Even after conversion to dry handling of FGD waste, a new WWTF, retrofit of an existing impoundment, or a new CCR surface impoundment would also be required to cease all the CCR and non-CCR wastestreams to the SRH Pond. CPS Energy concludes that the reduction in the number of wastestreams associated with converting the FGD system to dry handling would have a nominal effect on the expected schedule for these other alternatives. The overall expected duration for conversion of the FGD system is 48 months. CPS Energy states that because this alternative does not, by itself, address the cessation of wastestreams to the SRH Pond and it has a longer overall expected duration to design and implement than other alternatives, converting the FGD system to dry handling is not the best option.

CPS Energy's fourth alternative is to use temporary storage tanks while a new surface impoundment is constructed. The SRH Pond has a hydraulic retention capacity of 2 million gallons. Temporary tanks are available in a range of capacities. Frack tanks can hold 21,000 gallons, while modular tanks can accommodate 1 million gallons. The maximum height of a modular tank is about 12 feet and, therefore, would require a large, flat graded area. CPS Energy states that to replace the hydraulic capacity of the SRH Pond, 100 frac tanks or five modular tanks (380,000 gallons each) would be required. However, the space to locate temporary tanks near the SRH Pond is limited. CPS Energy asserts that locating the temporary tanks remotely is not feasible due to the 13 wastestreams discharging to the SRH Pond and the hydraulic requirements of pumping these wastestreams.

CPS Energy states that due to the small capacity of the frac tanks, they would quickly fill with solids and, therefore, their use is not a viable option. It states that the wastestreams contain 0–50% solids with average flowrates ranging from 0 to 700 gpm. Under typical operating conditions, a 380,000-gallon modular tank would be full of solids in one to two months. Additionally, the company asserts that the geosynthetic membrane used for the modular tanks is susceptible to mechanical damage when removing the solids from the tanks. Thus, damage to the temporary tank liner during solids removal presents the environmental risk of uncontrolled wastewater discharge. CPS Energy states that the solids removed from the tank would need to be placed in a new containment/processing area for decanting, drying, and then loaded into trucks for transport to the landfill. It concludes that due to the limited area available for installation, requirements for dewatering the solids for landfilling, and the risks associated with solids removal, temporary tanks are not a technically feasible option.

CPS Energy's fifth alternative is the construction of a new CCR surface impoundment. CPS Energy selects this alternative because designing and constructing a new lined CCR surface impoundment is the least complex alternative, and it can be implemented in the shortest expected duration. Although the overall expected duration for design and construction is 44 months, since CPS Energy has already begun the planning process, the remaining duration from December 2020 through start-up and initial operation is only 33 months. This schedule allows for management of CCR and non-CCR wastestreams in the SRH Pond to cease by September 1, 2023.

EPA is proposing that CPS Energy adequately evaluates alternatives for their site-specific limitations. The assessment of the limited space available for the temporary storage tanks appears to be accurate. Based on the information provided by CPS Energy, EPA proposes to conclude that construction of a new lined surface impoundment is the most appropriate alternative to manage the wastestreams currently being discharged into the SRH Pond.

Selected Alternative Capacity for the SRH Pond. CPS Energy states that the wastestreams currently discharged to the SRH Pond will be transferred to a new 3-acre surface impoundment, the "Plant Drains Pond." This pond will receive wastestreams to be treated and reduce TSS, and then recycled to the FGD system or discharged through a permitted outfall. CPS Energy includes a process flow diagram in Exhibit 3.8 of the SRH Pond Demonstration.[7] The Plant Drains Pond will be located approximately 3,000 feet north of the SRH Pond, within the boundaries of the Calaveras Power Station. CPS Energy depicts this in Exhibit 3.9 of the SRH Pond

---

[7] See pdf page 21 of the SRH Pond Demonstration

Demonstration.[8] CPS Energy states that this location was selected based on geotechnical and hydrogeological information and is the closest available location for the new surface impoundment. It states that, due to the distance from the SRH Pond to the new Plant Drains Pond, a transfer system is required. The system will include: two 100% capacity Transfer Tanks, three 50% capacity Transfer Pumps, four transfer lines, and one area runoff collection sump with two sump pumps.

The Plant Drains Pond will be constructed as a single surface impoundment with an east and west cell. A manually operated gate in the separator wall will be closed during normal operation but can be opened if needed. One cell can be isolated, drained, and the solids removed while the other cell is in operation. The overall storage capacity of the Plant Drains Pond will be approximately 14 acre-feet, 7 acre-feet per cell.

CPS Energy states that the Plant Drains Pond design will comply with the criteria in the regulations (40 C.F.R. § 257.72) and will include a composite liner. It states that the pond liner system will be composed of the following layers:

- Reinforced concrete (exposed protective layer)
- Compacted fill (protective layer)
- Non-woven geotextile (protective layer)
- High density polyethylene (HDPE) geomembrane liner (upper liner component)
- Geosynthetic clay liner (lower liner component)
- Non-woven geotextile (cushion layer)
- Prepared subgrade (scarified, proof-rolled, and compacted)

---

[8] See pdf page 22 of the SRH Pond Demonstration

The reinforced concrete top layer will cover the bottom of the pond and extend approximately three feet up the sidewalls. It will be designed to protect the geomembrane liner during removal of solids from the pond. CPS Energy elaborates that above the concrete layer, the geomembrane liner will be covered with soil cement or similar aggregate material to protect it from potential damage. The Plant Drains Pond embankments will have a 3:5:1 slope and width of 20 feet at the crown. The crown will have a radius of not less than 50 feet to facilitate vehicle access for operation, maintenance, and removal of solids.

b) Evaporation Pond Analysis

CPS Energy evaluates multiple alternatives for new capacity on-site to replace the Evaporation Pond. Three alternatives are thoroughly discussed in the Demonstration: 1) retrofitting an existing surface impoundment; 2) using temporary storage tanks during the construction of the new CCR surface impoundment; and 3) constructing a new CCR surface impoundment. CPS Energy states that the primary goal of the alternatives is to consolidate wastestreams at the Calaveras Power Station so that treatment can be accomplished at a single centralized location, as opposed to the four existing wastewater treatment ponds (WWTPs) located on-site.

The first alternative CPS Energy evaluates is retrofit of an existing impoundment. CPS Energy states that retrofit of an existing surface impoundment to receive the Evaporation Pond flows is the most complex alternative. As previously stated, none of the impoundments (CCR and non-CCR) at Calaveras are lined in accordance with the CCR Rule. Excluding the Evaporation Pond, there are nine active surface impoundments. Of these, six are dedicated to stormwater management. These impoundments do not have capacity to manage the additional wastestreams from Evaporation Pond. Additionally, these impoundments would not be able to manage the industrial wastewaters from the Evaporation Pond and still meet the low discharge limits for metals (specifically iron and copper). CPS Energy states this would require a major amendment to the discharge permit renewal, which would take one to two years for approval. Two of the remaining ponds not associated with stormwater management do not have the capacity to manage the wastestreams from the Evaporation Pond. The last remaining surface impoundment is the SRH Pond, which CPS Energy concludes is unable to be retrofitted. CPS Energy states that the footprint of the Evaporation Pond is not large enough to handle both the planned sanitary and industrial wastestreams. Lastly CPS Energy states that this alternative was not selected because none of the existing surface impoundments has the capacity to handle the wastestreams managed by the Evaporation Pond.

The second alternative CPS Energy evaluates is to use temporary storage tanks while the new Evaporation Pond is constructed. The existing Evaporation Pond has a hydraulic retention capacity of over 5 million gallons. During typical plant operations, non-CCR flow volume to the existing Evaporation Pond ranges between one to two million gallons per year. The existing Evaporation Pond does not have an inlet or discharge pipe and only receives various non-CCR wastestreams via tanker trucks. CPS Energy states that in the short term, while a new Evaporation Pond is being constructed, an estimated one million gallons of storage will be required for the power plants to continue operation.

CPS Energy states that by using frac tanks with capacities of 21,000 gallons, approximately 50 frac tanks would be required. It states that finding a location for 50 frac tanks would be difficult, and the overall required footprint would be even larger due to the necessary spill containment measures. It states that an additional downside to the frac tanks is that they would not allow for evaporation of the liquids, and ultimately the contents would have to be managed by the new Evaporation Pond once it is in service.

The other option for temporary storage is modular tanks. CPS Energy states that in order to store the required volume, six-foot high tanks (assuming a water height of four feet) would require approximately 34,000 square feet of flat space. Such tanks would allow for a greater surface area for additional evaporation. CPS Energy states that the availability of a flat space of this size is limited at the site. It concludes that, due to the limited area available for installation and the risk of release to the environment, temporary storage tanks are not a technically feasible option.

The third alternative CPS Energy evaluates is constructing a new surface impoundment. CPS Energy selects this alternative because, it asserts, it is the least complex, and it can be implemented in the shortest duration. Within 22 months, this alternative will allow the cessation of non-CCR wastestreams to the Evaporation Pond (by May 26, 2022).[9] CPS Energy states that constructing a new lined surface impoundment also retains the primary operational functionality of the existing Evaporation Pond and requires minimal modifications to the existing plants. Additionally, CPS Energy states that this alternative allows for a single Evaporation Pond, constructed with a liner system compliant with State requirements, to store and treat both domestic wastewater and the industrial wastestreams. Finally, it allows for the existing Evaporation Pond to be closed in accordance with the regulations.

EPA is proposing to conclude that CPS Energy adequately evaluated alternatives to manage the wastestreams for the Evaporation Pond.

---

[9] On March 1, 2022, CPS Energy notified EPA that it has experienced delays and updated the requested date to September 30, 2022.

Selected Alternative Capacity for the Evaporation Pond. CPS Energy selected constructing a new Evaporation Pond surface impoundment. It identifies the following primary scope items for construction of the new Evaporation Pond:

- Construction of the new Evaporation Pond to store and treat domestic wastewater and industrial wastestreams. The preliminary footprint is approximately 6.5 acres and consists of two cells to assist with pond maintenance. The new Evaporation Pond will be constructed with a liner system that will be compliant with State requirements.
- Redirection of the existing industrial wastestreams to the new Evaporation Pond.
- Commencement of closure of the existing Evaporation Pond.
- Consolidation of domestic wastestreams from the four existing WWTPs. CPS Energy included a process flow diagram of this in Exhibit 3.3.[10] New pumps will be provided at each existing WWTP for pumping from the various units to the Sommer/Deely WWTP. A preliminary force main alignment is shown in Exhibit 3.4[11]; however, the Sommers/Deely WWTP will be relocated to be adjacent to the Evaporation Pond.
- Direction of WWTP flows to the new Evaporation Pond.

2. Evaluation of CPS Energy's Justification for Time Requested to Develop Selected Alternative Disposal Capacities

As discussed above in Section II.A., facilities must demonstrate that the amount of time requested in the demonstration is the fastest technically feasible time to develop the selected

---

[10] See pdf page 15 of the Evaporation Pond Demonstration

[11] See pdf page 16 of the Evaporation Pond Demonstration

alternative disposal capacity by including a visual timeline and narrative discussion to support the time requested. 40 C.F.R. § 257.103(f)(1)(iv)(A)(*1*)(*iii*) and § 257.103(f)(1)(iv)(A)(*3*).

CPS Energy developed the required timeline and narrative and, based on its evaluation, determined that the best alternative capacities for Calaveras Power Station is development of a new Evaporation Pond and a new CCR surface impoundment, the Plant Drains Pond. As discussed below, EPA is proposing to conclude that CPS Energy has justified the time requested to develop the alternative disposal capacities.

a) SRH Pond Replacement

CPS Energy requests an alternative compliance date of September 1, 2023, to continue using the SRH Pond until the new Plant Drains Pond is operational. It states that the overall project duration is 44 months. However, CPS Energy started work on the new Plant Drains Pond prior to submitting the Demonstration in November 2020. Therefore, at the time of submitting the Demonstration, the remaining project duration is 33 months. The remaining project activities are shown in Exhibit 3.13 – "Expected Durations for Remaining Project Activities of the SRH Pond Demonstration."[12] This exhibit is shown below in Table 3.

Table 3 – Expected Durations for Remaining Project Activities

Phase	Remaining Major Project Activities	Expected Durations (months)
1	Contractor Bid, Selection and Award	9
2A	Procurement and Manufacture of Engineered Equipment	14
2B	Final Detailed Design	14
2C	Construction	17
3	Start-up and Commissioning	3
4	Initial Operation and Tuning	2
	Total Project Duration from Issue of RFP	33

---

[12] See pdf page 28 of the SRH Pond Demonstration

The first phase, Contractor Bid, Selection, and Award is estimated to last 9 months, from December 8, 2020, through August 16, 2021. This phase involves the following steps:

- Contractor Bid Period – 8 weeks
- Bid Evaluation and Management Review – 8 weeks
- Contract Negotiation – 6 to 8 weeks
- CPS Energy Board Review and Approval – 8 weeks
- Contract Award – 2 to 4 weeks

The second phase has three parts: 2A Procurement and Manufacture of Engineered Equipment; 2B Full Detailed Design; and 2C Construction (time frames shown in Table 3 above). These three parts can be completed in time frames that partially overlap with each other. The phase 2A Procurement and Manufacture of Engineered Equipment is anticipated to last from September 16, 2021, through December 8, 2022. CPS Energy states in the Demonstration that this phase will include vendor-engineered equipment and fabricated components. The vendor engineered equipment will include pumps, agitators/mixers, clarifier, clarifier flocculant system and enclosure, electrical power distribution center, emergency diesel generator, distributed control system expansion, automated valves, and instruments. The fabricated components will include tanks (large, field-erected knockdown tanks and small shop fabricated tanks), structural and access steel (in general and in the clarifier area), and shop fabricated piping spools.

The timeline shows phase 2B Full Detailed Design is anticipated to last from August 17, 2021, through November 1, 2022. CPS Energy states that completion of this phase is dependent of the receipt of final information from the engineered equipment vendors. More detailed information for the equipment and components is required to develop the Issue for Construction (IFC) packages to be released to the contractor. CPS Energy states that three or more IFC packages will be issued to the construction contractor in the following stages: 1) Civil Earthworks (pond design); 2) Structural and Mechanical; and 3) Electrical, Instrumentation and Controls. Each of these IFC packages are shown on the timeline in Exhibit 3.15 of the Demonstration.[13] CPS Energy states that issuing multiple IFC packages to the contractor will allow construction to proceed with the project on the shortest feasible schedule.

The Demonstration timeline shows phase 2C Construction lasting from October 18, 2021, through March 30, 2023. The construction phase involves several steps, including civil construction of the Plant Drains Pond, civil/structural and mechanical construction of the Pond and Transfer System Areas, and Electrical and Instrumentation Construction of the Pond and the Transfer System Areas. Each of these steps are anticipated to overlap with each other to maximize the amount of work accomplished during the overall phase. The civil construction of the Plant Drains Pond involves the site prep work, including clearing debris and relocating a gravel roadway. Construction of the pond will include building the foundation and placing the liner system. The mechanical and structural construction involves installation of equipment such as pumps, piping, clarifiers, polymer skid, and enclosure of the power distribution centers. The electrical and instrumentation construction involves installation of all the electrical components and installing the instrumentation and controls for both the Pond and the Transfer System Areas.

During the final stages of construction, CPS Energy will begin working with the Texas Commission of Environmental Quality (TCEQ). TCEQ approval of the final construction is required prior to discharging wastewater into the new surface impoundment. Therefore, CPS Energy states that prior to initial operation of the Plant Drains Pond, the Engineer of Record will

---

[13] See pdf pages 35 – 37 of the SRH Pond Demonstration

submit construction test records, sealed design information, and a certification of design to TCEQ.

The timeline shows the third phase, Start-up and Commissioning, will last from March 31, 2023, to June 30, 2023. CPS Energy states that this phase will involve pre-operational testing and checkout of components, subsystems, and systems. Checkout encompasses all mechanical, electrical, instrumentation, and control components followed by functional testing of the system. CPS Energy states that this activity will be performed in series, beginning with component checks, followed by component operation, subsystem function checks, and finally, overall system checkout.

The final phase is the Initial Operation, Tuning, and Testing. CPS Energy states that two months are planned for this phase from June 30, 2023, to September 1, 2023.[14] The primary activities during this period will involve tuning the process control loops and setpoint adjustment. Control setting adjustments may include flush durations, valve speed, level setpoints, process variables controlling equipment start/stop functions, clarifier coagulant and flocculant dosage rates, instrument air pressure settings for pneumatic operators, final adjustment of electrical settings, and pump variable speed response rate. At the completion of initial operation period wastestreams to the SRH Pond will cease and be redirected to the Plant Drains Pond System.

EPA evaluated the timeline and the discussion CPS Energy provides in the Demonstration and is proposing that the time requested is reasonable, but is missing a discussion on required elements for a new CCR surface impoundment. The workplan and timeline do not include the installation of a groundwater monitoring network for the new CCR surface

---

[14] See pdf pages 35 – 37 of the SRH Pond Demonstration

impoundment, or the collection of baseline samples prior to receipt of wastestreams. Prior to initial receipt of waste into a new CCR impoundment, it is required to be in compliance with the groundwater monitoring requirements including a groundwater monitoring system, development of a groundwater monitoring sampling and analysis plan, and obtaining a minimum of eight independent samples for each background well. 40 C.F.R. § 257.90(b)(2). EPA is proposing for CPS Energy to comply with the groundwater monitoring requirements in 40 C.F.R. § 257.90(b)(2) prior to the requested cease receipt of waste date for the SRH Pond, September 1, 2023.

b) Evaporation Pond Replacement

CPS Energy started construction of the Evaporation Pond replacement on September 14, 2020, several months prior to its November 30, 2020, Demonstration submission. It states that it will take 22 months to construct a new Evaporation Pond from the date of the Demonstration submission. The new Evaporation Pond was originally proposed to be completed on September 1, 2022, with cease receipt of waste to the existing Evaporation Pond on May 26, 2022. CPS Energy notified EPA that they experienced permitting delays causing it to no longer be able to meet the requested date of May 26, 2022. CPS Energy requested an updated requested cease receipt of waste date of September 30, 2022. The timeline (Figure 3.2 of the Evaporation Pond Demonstration[15]) depicts the phases and steps that will occur to complete the new Evaporation Pond. The timeline shows the following phases: 1) Detailed Design, 2) Permitting, 3) Contractor Bid, Selection, and Award, 4) Procurement, and 5) Construction.

CPS Energy shows that the first phase, Detailed Design, lasts from September 14, 2020, until March 4, 2021. The timeline shows design, coordination, and design review meetings when

---

[15] See pdf page 26 of the Evaporation Pond Demonstration

the design is at 30%, 60%, and 90% complete. The timeline shows that all these Detailed Design steps are part of the critical timeline path.

The second phase, Permitting, is projected to last from November 26, 2020, until April 14, 2021. Therefore, most of the permitting work will happen concurrently with the Detailed Design and the Contractor Bid, Selection, and Award phases. Permitting is not shown to be on the critical timeline path. CPS Energy states that the construction drawings for the new Evaporation Pond design will be submitted to TCEQ for General Permit, Texas Pollutant Discharge Elimination, and Engineer's Certification of Surface Impoundment review and permit approval. Additionally, a Tree Survey and Cultural Resources review will be submitted to the City of San Antonio for review and approval. Lastly, the permit drawings will be submitted following the 60% review meeting. CPS Energy will issue the detailed design drawings for bid prior to receiving the permit but will not award the construction contract until the TCEQ approval is received.

The third phase, Contractor Bid, Selection, and Award, will last from January 8, 2021, until October 14, 2021. The Demonstration shows that each step within this phase is on the critical timeline path. CPS Energy states that it is composed of the following steps: 1) Develop/Issue Construction Package, 2) Contractor Bidding Period, 3) Evaluation of Bids, 4) Contract Negotiation, 5) Board of Trustees Review and Approval; and 6) Contract Award. CPS Energy states that steps one through four are each planned to last eight weeks. CPS Energy states that step five, Board of Trustees Review and Approval, requires a minimum of two months, because the Board meets once per month and the agenda being set one month in advance for each meeting. Lastly, CPS Energy states that a minimum of two weeks is needed for the Contract Award step.

The fourth phase, Procurement, lasts from October 15, 2021, until March 31, 2022.[16] The timelines shows that this phase is dependent on when the Contract Award is completed. The timeline shows that this phase includes: composite liner material procurement by the contractor, shop drawings and review for the pond, lift station equipment procurement by the contractor, and shop drawings and review for the lift station.

The fifth phase, Construction, starts at the same time as Procurement and is scheduled to be completed on September 1, 2022. Construction will proceed as follows:

- Contractor will begin construction of the new Evaporation Pond, including mobilization, site clearing, and earthwork to build the pond berms (October 2021–January 2022).
- Contractor will install TCEQ-required leak detection system and composite liner system, and protective cover over the pond bottom (January–April 2022).
- Startup and commissioning of the new Evaporation Pond (April–May 2022). At this point, CPS Energy can redirect non-CCR flows to the new Evaporation Pond and may begin closure of the existing Evaporation Pond.
- Contractor will install force main/lift stations to consolidate WWTP wastestreams and direct them to the new Sommers/Deely WWTP location (April–May 2022).
- Contractor will relocate the Sommers/Deely WWTP effluent to the new EP (May –July 2022).
- Startup and commissioning of the new force main and Sommers/Deely WWTP (August–September 2022).

---

[16] EPA is basing the review off the original Demonstration submission and realizes that there are certain items that might have already occurred. CPS Energy supplied EPA with an update on March 1, 2022, on the schedule, however it did not provide an updated timeline to show the effects on each phase or the steps.

CPS Energy states in the Demonstration that the new Evaporation Pond will be operational and finalized by May 26, 2022, which will allow for final receipt of non-CCR wastestreams into the existing Evaporation Pond. EPA evaluated the justification for the time requested by CPS Energy for the Evaporation Pond and EPA is proposing to determine that the schedule is as fast as is feasible.

Pursuant to EPA's request for an update, on March 1, 2022, CPS Energy states that they had delays with the permitting from the City of San Antonio. Due to these permitting delays, CPS Energy fell behind schedule. CPS Energy states that it is now working towards a cease receipt of waste date of September 30, 2022.

D. Evaluation of CPS Energy's Compliance Documentation

The Part A Rule requires that a facility must be in compliance with all the requirements in 40 C.F.R. part 257 subpart D in order to be approved for an extension to the cease receipt of waste deadline. 40 C.F.R. § 257.103(f)(1)(iii). In this case, as discussed below, EPA has identified deficiencies in the monitoring network, statistical analysis, and the reporting of radium results. EPA discusses these issues in detail below.

As stated in Section II.A. above, the regulations require development of a groundwater monitoring network that will identify the baseline level of constituents in the uppermost aquifer upgradient of a CCR unit, so that those levels can be compared with the levels in the wells downgradient of the CCR unit. *See* 2015 CCR rule preamble at 74 FR 21302, 21399-400. The objective of a groundwater monitoring system is to analyze groundwater to determine whether it has been contaminated by the CCR unit being monitored. Prompt contaminant detection is important in order for corrective measures to be developed to stop migration of contaminants as soon as possible.

To ensure detection of a release, the regulations establish a general performance standard that all groundwater monitoring systems must meet: all groundwater monitoring systems must consist of a sufficient number of appropriately located wells that will yield groundwater samples in the uppermost aquifer that represent the quality of the background groundwater and the quality of groundwater passing the downgradient waste boundary. 40 C.F.R. § 257.91(a)(1), (2). Because hydrogeologic conditions vary so widely from one site to another, the regulations do not prescribe the exact number, location, and depth of monitoring wells needed to achieve the general performance standard. Rather the regulation requires installation of a minimum of one upgradient and three downgradient wells, as well as any additional monitoring wells necessary to achieve the general performance standard of accurately representing the quality of the background groundwater and the groundwater passing the waste boundary. 40 C.F.R. § 257.91(c)(1), (2). The number, spacing, and depths of the monitoring wells must be determined based on a thorough characterization of the site, including a number of specifically identified factors relating to the hydrogeology of the site (e.g., aquifer thickness, groundwater flow rates and direction). 40 C.F.R. § 257.91(b). Groundwater elevation measurements must be obtained around the unit(s) at sampling events over time to calculate groundwater flow direction at those times and identify seasonal and temporal fluctuations. Further, any facility that determines that the regulatory minimum number of wells is adequate must provide a factual justification for that decision. 40 C.F.R. § 257.91(f). In essence, the regulation establishes a presumption that the minimum of one upgradient and three downgradient wells is not sufficient, and it requires the facility to rebut the presumption in order to install only this minimum.

In addition, the placement of the monitoring wells is critical to proper characterization of the groundwater, but even a sufficient number of properly placed wells will not provide adequate characterization if the sampling and analysis of data are not properly conducted.

EPA is proposing to determine that CPS Energy did not adequately demonstrate compliance with multiple portions of the regulations. First, CPS Energy failed to meet requirements in the regulations for the groundwater monitoring well placement and networks at the SRH Pond, Evaporation Pond, Fly Ash Landfill (FAL), and North and South Bottom Ash Ponds (collectively referred to as the BAPs) in accordance with 40 C.F.R. § 257.91. Second, the alternative source demonstrations are inadequate and fail to illustrate that the CCR unit is not the source in accordance with 40 C.F.R. § 257.94(e)(2) and therefore reliance on the ASDs led to noncompliance with other requirements. Third, CPS Energy failed to conduct statistical analysis in accordance with 40 C.F.R. § 257.93(h)(2). Fourth, CPS Energy did not correctly report radium 226/228 results in the Annual GWMCA Reports in accordance with Appendix IV to 40 C.F.R. part 257.

1. Groundwater Monitoring Well Placement and Network

The regulations require facilities to submit several groundwater monitoring compliance documents as part of their demonstrations so that EPA can thoroughly evaluate the groundwater monitoring network and the site hydrogeology for every CCR unit at the facility. 40 C.F.R. § 257.103(f)(1)(iv)(B)(2), (3) and (4). EPA evaluated the documentation CPS Energy provided in the Demonstration and reviewed the 2018 through 2022 Annual Groundwater Monitoring and Corrective Action (GWMCA) Reports. The Demonstration provides information for four groundwater monitoring systems: a groundwater monitoring system for the SRH Pond, Evaporation Pond, FAL, BAPs. EPA is proposing to determine that all four groundwater monitoring systems are inadequate for multiple reasons set forth below, and, therefore, do not adequately demonstrate compliance with the regulations.

a) Fly Ash Landfill (FAL)

EPA reviewed the groundwater monitoring well network for the FAL and is proposing to determine that the monitoring network is inadequate. First, the location of the background monitoring wells prevents adequate characterization of background groundwater that has not been affected by a CCR unit. Second, the downgradient well spacing does not monitor all potential contaminant pathways. Third, downgradient wells are not located at the waste boundary.

40 C.F.R. § 257.91(a)(1) requires the owner or operator to accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. The potentiometric surface maps included in the Demonstration[17] and the 2021 and 2022 Annual GWMCA reports[18] indicate that neither background monitoring wells JKS-45 nor JKS-57 are consistently upgradient of the FAL. The potentiometric surface maps dated May 2017, June 2017, August 2017, October 2017, and April 2018 show that background well JKS-45 is downgradient or side-gradient to the groundwater flow. The maps dated October 2018 and later show the monitoring well is upgradient of the FAL. Therefore, this well does not meet the requirements for a background monitoring well due to potential impacts from the FAL prior to October 2018. The potentiometric surface maps dated April 2018, October 2018, April 2020, October 2020, April 2021, and October 2021 show the background monitoring well JKS-57 as downgradient or side-gradient from the FAL. Therefore, this well is not consistently upgradient

---

[17] Appendix D: Groundwater Flow Direction Maps. Pages 145-153 of the Evaporation Pond Demonstration and pages 163-171 of the SRH Pond Demonstration.

[18] See FAL January 2021 – Annual Groundwater Monitoring Report and FAL January 2022 – Annual Groundwater Monitoring Report.

and is not a proper background monitoring well due to potential effects of a CCR unit. Based on the review of the potentiometric surface maps, the ideal location to obtain the most accurate background data is the north-west corner of the FAL.

Additionally, the potentiometric surface maps show that the spacing between downgradient monitoring wells JKS-45 and JKS-60 at the northeast corner of the FAL is leaving potential contaminant pathways unmonitored. The flow pattern shows this area as being the central downgradient point. This corner of the FAL contains JKS-59, a groundwater elevation observation well that is not used to monitor groundwater quality but potentially could be.

Lastly, the downgradient monitoring wells are not placed at the CCR unit waste boundary. 40 C.F.R. § 257.91(a)(2) requires the downgradient monitoring system to be installed at the waste boundary to ensure detection of groundwater contamination in the uppermost aquifer. In two of the potentiometric surface maps, dated October 2017 and October 2018, the FAL is shown to be only the larger square, and the two areas to the east and south-east are not part of the FAL. However, Demonstration Figure 3.1 – Surface Impoundment Location Map – shows the area directly east as also being part of the FAL.[19] The area to the south-east is the Fly Ash Runoff Pond. Due to the uncertainty about the location of the CCR unit boundary, EPA cannot determine whether JKS-60 or JKS-46 are located at the unit boundary. It is clear that JKS-31 and JKS-33 are not located at the unit boundary but rather are next to the Fly Ash Runoff Pond, instead of the FAL. This is not in compliance with 40 C.F.R. § 257.91(a)(2).

b) Evaporation Pond

EPA is proposing to determine that the monitoring network at the Evaporation Pond is inadequate due to the location of the background monitoring well. 40 C.F.R. § 257.91(a)(1)

---

[19] See pdf page 44 in the SRH Demonstration or pdf page 25 in the Evaporation Pond Demonstration

requires the owner or operator to obtain samples that accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. The Evaporation Pond groundwater monitoring network utilizes JKS-47 and JKS-63, which was replaced by JKS-63R in May 2019, and JKS-64 as background monitoring wells.

JKS-63/63R have yielded samples that have very high levels of total dissolved solids (TDS) and other constituents. This suggests it may be affected by the Evaporation Pond, possibly that sampling errors have occurred (e.g., not being properly purged prior to sampling), or the integrity of the well is compromised.[20] The TDS concentrations are significantly higher than the other monitoring wells around the Evaporation Pond and the nearby well JKS-64. These concentrations range from 4,700 to 7,240 mg/L for JKS 63/63R, while other monitoring wells for the Evaporation Pond detect TDS at concentrations ranging from 514 to 2,000 mg/L. Additionally, the concentration levels of chromium, cobalt, lithium, and radium 226 and 228 are elevated at MW-JKS 63/63R, compared to samples from JKS-64 and the downgradient monitoring wells, which do not yield respective elevated levels of these constituents.

JKS-47 has also yielded elevated levels of calcium, chloride, sulfate, and TDS compared to the other background well, JKS-64. JSK-47 has calcium levels ranging from 26.2 mg/L to 168 mg/L while JSK-64 has levels ranging from 20.6 mg/L to 31.4 mg/L. JKS-47 has sulfate concentrations ranging from 171 to 369 mg/L while JKS-64 has concentrations 164 mg/L to 196 mg/L. This could indicate that JKS-47 is impacted by the CCR unit.

Several potentiometric surface maps and associated groundwater elevations included in the Demonstration and the 2022 Annual GWMCA report[21] (e.g., June 2017, April 2018, April 2021) indicate that groundwater mounding and radial flow is occurring beneath the Evaporation

---

[20] See Appendix E: Constituent Concentrations Summary Tables in the Demonstration.

[21] Evaporation Pond 2022 Annual GWMCA Report

Pond. This indicates leakage from the Evaporation Pond into the underlying, uppermost aquifer. Such groundwater mounding and radial flow from the Evaporation Pond towards JKS-47 and JKS-63/63R would make them downgradient, not upgradient.

Based on these reasons, EPA is proposing to determine that JKS-63/63R and JKS-47 have been affected by the Evaporation Pond or that sampling errors may be resulting in elevated detections of constituents. Therefore, this is not in compliance with 40 C.F.R. § 257.91(a)(1). EPA is proposing that CPS Energy evaluate the background wells of the groundwater monitoring network for the Evaporation Pond according to the criteria in the regulation.

c) SRH Pond

EPA reviewed the groundwater monitoring well network for the SRH Pond and is proposing to determine that the monitoring network fails to comply with the regulations for a number of reasons. First, background well JKS-49 appears to be potentially impacted by the SRH Pond. Second, portions of the downgradient waste boundary have no monitoring wells and potential contaminant pathways are unmonitored. Third, the groundwater monitoring system has been amended and the revised monitoring system has not been certified by a Professional Engineer (P.E.) to be in compliance with the requirements of 40 C.F.R. § 257.91.

The background well JKS-49 is not consistently depicted as upgradient of the SRH Pond. In the 2020 through 2022 Annual GWMCA Reports,[22] JKS-49 is depicted as downgradient of the SRH Pond. In the Demonstration, the potentiometric surface maps and the constituent concentrations of background wells JKS-49 and JKS-51[23] suggest that neither well may accurately represent the water quality that is not impacted by the SRH Pond. JKS-51 shows

---

[22] See SRH Pond January 2020, 2021, and 2022 – Annual Groundwater Monitoring Reports in the Docket

[23] Appendix D: Groundwater Flow Direction Maps to the Demonstrations and Appendix E: Constituent Concentrations. Pages 172–181 of the SRH Pond Demonstration and page 154–163 of the Evaporation Pond Demonstration

lower levels of boron but increasingly higher levels of sulfate and TDS that are not seen in the downgradient wells. JKS-49 has high concentrations of boron and a higher pH than what is found in the downgradient wells. This information shows that these background wells might be impacted by a CCR unit and therefore are not providing representative background groundwater data. Based on this information, EPA is proposing that a new background well be installed further upgradient from the SRH Pond to the northwest. EPA is proposing to conclude that the groundwater monitoring network for the SRH Ponds fails to meet the requirements of 40 C.F.R. § 257.91(a).

The potentiometric surface maps in Appendix D to the Demonstration indicate that the downgradient wells do not monitor all potential contaminant pathways from the SRH Pond, as required by 40 C.F.R. § 257.91(a)(2). Groundwater flow direction from October 2017 to April 2019 is depicted from the northeast to the south.[24] Since October 2019, the groundwater flow direction has shifted. It is depicted to be more radial, generally from west to east.[25] Therefore, the eastern boarder of the SRH Pond is downgradient, and a lack of monitoring wells along this boundary means that all potential contaminant pathways are not monitored.

Additionally, the downgradient eastern border of the SRH Pond is upgradient of the BAPs. Due to the proximity to the BAPs and the fact that the monitoring network is not a multiunit system for the SRH Pond and BAPs, the boundary between the CCR units needs to be monitored in order to characterize groundwater quality between those units and to accurately identify the source of any potential release. Therefore, this downgradient eastern boundary of the SRH Ponds is required to be monitored.

---

[24] Appendix D: Groundwater Flow Direction Maps to the Demonstrations. Pages 172-178 of the SRH Pond Demonstration and pages 154-160 of the Evaporation Pond Demonstration.

[25] SRH Pond January 2020, 2021, and 2022 Annual GWMCA Reports

In the groundwater monitoring system certification,[26] JKS-49 is not included in the monitoring network. However, in the 2018 through 2022 Annual GWMCA Reports, CPS Energy includes this well as part of the analysis to calculate background levels of constituents in 40 C.F.R. Part 257, Appendix III and IV. Adding a background well to a groundwater monitoring system could result in failure to meet the requirements of 40 C.F.R. § 257.91 if, for example, the new well is impacted by a CCR unit and its data would artificially elevate background levels of any constituents, resulting in inaccurate representation of groundwater quality. If a background well were to be added to the groundwater monitoring network after the initial P.E. certification required by 40 C.F.R. § 257.91(f), that prior certification would not be relevant for the revised groundwater monitoring system. The previous certification would need to be updated so that a P.E. could review the well placement and determine whether it met the requirements of 40 C.F.R. § 257.91(a)(1). For these reasons, EPA is proposing to conclude that the groundwater monitoring network for the SRH Ponds fails to meet the requirements of 40 C.F.R. § 257.91(f).

d) Bottom Ash Ponds (BAPs)

EPA reviewed the groundwater monitoring well network for the BAPs and is proposing to determine that the monitoring network fails to meet the requirements of 40 C.F.R. § 257.91(a)(2). EPA is proposing that the number and spacing of the monitoring wells is insufficient to monitor all potential contaminant pathways.

EPA reviewed the potentiometric surface maps found in both Appendix D to the Demonstration and the 2021 and 2022 Annual GWMCA Reports.[27] Based on this review, EPA is proposing that the groundwater flow is not fully characterized. Due to the lack of groundwater observation wells or monitoring wells along the northern boundary of the North BAP, the

---

[26] Calaveras Power Station Groundwater Monitoring System 2017

[27] BAP January 2021 and January 2022 – Annual Groundwater Monitoring Report

potentiometric maps do not show the complete groundwater flow pattern along this boundary of the CCR unit. The potentiometric surface maps show that the northern boundary of the North BAP could be downgradient, however the contour lines end at this part of the unit boundary, making it impossible to determine what the flow pattern is beyond the unit. EPA is proposing that CPS Energy define the groundwater flow along the northern boundary of the North BAP to determine if it is downgradient. If it is in fact downgradient, groundwater monitoring wells should be installed in order to monitor all potential contaminant pathways. EPA is proposing that there should be at least one downgradient monitoring well along the northern boundary of the North BAP to characterize the groundwater flow, the quality of groundwater passing the waste boundary, and to monitor all potential contaminant pathways.

Additionally, background well JKS-49 is not consistently depicted as upgradient of the BAPs. In the 2020 through 2022 Annual GWMCA Reports, JKS-49 is depicted as downgradient. The boron levels of JKS-49 are elevated (approximately 3 mg/L) compared to upgradient well JKS-51 (approximately 0.51 mg/L). Given the depiction of JKS-49 as downgradient of the BAPs in the 2020-2022 Annual GWMCA Report and the elevated boron levels, EPA is proposing that JKS-49 should be considered a downgradient well and that background conditions should be determined by a well clearly not impacted by the unit.

In the groundwater monitoring system P.E. certification,[28] JKS-51 was not included in the monitoring network. However, in the 2018 through 2022 Annual GWMCA Reports, CPS Energy included data from this well to calculate background levels of constituents in Appendix III and IV to 40 C.F.R. Part 257. If a background well were to be added to the groundwater monitoring network after the initial P.E. certification required by 40 C.F.R. § 257.91(f), that

---

[28] Calaveras Power Station - Groundwater Monitoring System 2017

prior certification would not be relevant for the revised groundwater monitoring system. The previous certification would need to be updated so that a P.E. could review its placement and determine whether it met the requirements of 40 C.F.R. § 257.91(a)(1).

2. Alternate Source Demonstrations

If it is determined that there was a statistically significant increase (SSI) over background levels for one or more of the constituents in Appendix III to 40 C.F.R. part 257 at a monitoring well at the downgradient waste boundary, CPS Energy could complete an alternative source demonstration (ASD) to show that a source other than the unit was the cause of the SSI. 40 C.F.R. § 257.94(e)(2). If a successful ASD for an SSI is not completed within 90 days, an assessment monitoring program must be initiated. A successful ASD will demonstrate that a source other than the CCR unit is responsible for the SSI. In order to rebut the site-specific monitoring data and analysis that resulted in an SSI, an ASD requires conclusions that are supported by site-specific facts and analytical data. Merely speculative or theoretical bases for the conclusions are insufficient.

At the Calaveras Power Station, SSIs were detected in the BAPs, Evaporation Pond, and FAL for constituents in Appendix III to 40 C.F.R. 257 in sampling events in October 2017 through 2021. SSIs of boron and fluoride were detected in four wells at the BAPs (JKS-48, JKS-50R, JKS-55, and JKS-56). Boron, fluoride, and pH SSIs were detected in three Evaporation Pond wells (JKS-36, JKS-61, and JKS-62). SSIs of calcium, pH, and chloride were detected in four FAL wells (JKS-31, JKS-33, JKS-46, and JKS-60). For each SSI, an ASD was conducted.[29] Each of the ASDs concluded that the monitored unit was not the source of the SSIs. No alternative source was identified in any of the ASDs other than natural variability. EPA is

---

[29] See Calaveras Alternate Source Demonstration 2018, 2019, 2020, and 2021 in the docket

proposing to determine that the ASDs did not provide sufficient evidence to substantiate that natural variability was the source of the SSIs and that the BAPs, Evaporation Pond, and FAL were not the sources.

Generally, the ASDs attribute the SSIs to natural variability and claim that the SSIs could not have come from the monitored units. The following lines of evidence are presented: 1) historically measured concentrations of pH and fluoride are of a similar range to SSIs measured downgradient of the Evaporation Pond and FAL, therefore reflecting natural variation in the area; 2) effluent from the BAPs has lower concentrations of constituents than were detected in the wells with SSIs; and 3) a lack of SSIs for other Appendix III constituents in the well with the boron SSI indicates that the source is not coal ash.

The ASDs claim that variability resulting from "naturally occurring" sources is responsible for all of the constituents with SSIs. The ASDs did not identify a particular naturally occurring source as the cause. No evidence is provided to show any alternate sources actually exist at the facility and are hydraulically connected to the downgradient compliance wells and are the cause of the SSIs. Further, no sampling data from actual upgradient background wells are provided to show that elevated concentrations are typical of the aquifer. The historical data provided in the ASDs also provide an incomplete record of groundwater quality and geochemistry in the wells identified as "background." The time periods used for the data comparisons do not span the entire time period from the start of sampling in 1988 to the present. First, it is unclear why monitoring data would have been collected only on the dates for which data were provided. This incomplete data set is insufficient to document historic natural variability and raises questions about whether the data presented could have been chosen selectively for the narrative of the ASD. Second, the North and South BAPs were constructed in

1977; the FAL was constructed in 1992; and the Evaporation Pond was installed as a landfill prior to 1990, then converted to a pond in 1996.[30] In order to provide sufficient evidence for an ASD for a particular impoundment, relevant data would need to be presented to confirm the validity of the upgradient location determination. Assuming this has first been done, comparisons or attributions of geochemical conditions in valid upgradient monitoring wells to "natural" and/or "background" conditions must be based on a data set that includes representative data under the range of typical hydraulic conditions at that location. Since the comparisons were not based on data with such conditions, the ASDs are insufficient.

As discussed previously, the current monitoring well system is also insufficient to characterize groundwater quality at the downgradient boundary of both the BAP and the FAL. Groundwater flow maps show that in the BAPs, flow direction changes and the upgradient wells are at least occasionally downgradient (Figure 2B).[31] The groundwater flow maps for the FAL show that one of the upgradient wells, JKS-57, is downgradient of the FAL.[32] Therefore, the high concentrations of CCR constituents in upgradient wells is more likely indicative of contamination of the background wells by the units. If poor well placement resulted in groundwater samples that fail to accurately characterize background groundwater concentrations, then the groundwater monitoring system would need to be modified to replace the wells and reclassify wells as downgradient as appropriate.

The argument presented in the ASD, regarding the comparison between boron concentrations in grab samples of pond water to those detected in the downgradient well JKS-50R is inconclusive because it assumes no chemical reactions happen in the aquifer matrix below

---

[30] 2015 Annual Inspection Report, Calaveras Power Station, January 15, 2016, p. 3
[31] Annual GWMCA Report BAP 2021 pdf page 24
[32] Annual GWMCA Report FAL 2021 pdf page 22 and 23

the landfill, and that samples from the pond are representative of groundwater. Chemical processes (e.g., ion exchange, precipitation) may occur in the aquifer below the unit as groundwater travels from upgradient to downgradient wells. Other geochemical differences between effluent and the groundwater samples (e.g., oxidation reduction potential, dissolved oxygen) can affect the solubility and leachability of chemicals. Effluent composition may be different than that of contaminated groundwater because of longer contact time and lower ratio of water to solid material. There is no reason to think the concentration of boron in the effluent should be maintained in the groundwater until it travels to the downgradient well. Therefore, water quality of the effluent is not a reasonable proxy for groundwater quality.

The ASD further contends that a lack of other SSIs in well JKS-50R is evidence that the SSI detected must come from an alternative source and not the BAPs. However, as discussed previously, background well JKS-49 is periodically hydraulically downgradient of the BAP and elevated boron and other constituents at JKS-49 may reflect leakage from the BAP rather than natural variation. Therefore, if JKS-49 results are used as background they could yield unrepresentative data that mask detection of additional SSIs in downgradient wells. Thus, the lack of additional SSIs at JKS-50R could be more reflective of improper background selection and statistics than it is of natural variation of background groundwater quality.

3. Failure To Conduct Statistical Analysis

As required under 40 C.F.R. § 257.94(b), the owner or operator is required to sample on at least a semi-annual basis while in detection monitoring. Then, as required under 40 C.F.R. § 257.93(h)(2), the owner or operator must determine within 90 days after sampling and analysis whether there is an SSI over background for each constituent in the monitoring program that applies to the CCR unit. Upon review of Calaveras Power Station's 2018 through 2021 Annual

GWMCA Reports for the BAPs, SRH Pond, Evaporation Pond, and FAL, EPA is proposing to determine that CPS Energy failed to provide evidence of statistical analysis for the spring sampling events. CPS Energy appears to have only conducted statistical analysis, and subsequent ASDs, for the fall sampling events. This does not comply with 40 C.F.R. § 257.93(h)(2). EPA is proposing this lack of statistical analyses results in failure to comply with 40 C.F.R. § 257.93(h)(2) at the SRH Pond, BAPs, Evaporation Pond, and FAL.

4. Incorrect Reporting of Radium

Appendix IV to 40 C.F.R. part 257 contains constituents that are found in CCR and were found to present a reasonable probability of adverse impacts on health or the environment. One of these constituents is radium 226/228 combined. In the review of Appendix E of the Demonstration for all the groundwater monitoring wells for the BAPs, SRH Pond, Evaporation Pond, and the FAL, EPA found that the radium reported was not a combined level and some of the results are a negative value for example -1.37 picocuries per liter.

The levels of individual radium 226 and radium 228 were quantified in the 2016 and 2017 baseline samples. Appendix IV specifies that a combined level and analysis is required to show a statistical comparison between compliance well samples and background levels for radium 226/228 combined concentrations. EPA is proposing that CPS Energy correct the reported radium levels in the Annual GWMCA Reports to include radium 226/228 combined concentrations.

Additionally, there are several results for radium 226 and 228 that were reported with a negative value. Some examples of these results are JKS-49 Feb 2017 for radium 228, JKS-51 May and June 2017 for radium 228, JKS-50R Feb 2017 for radium 228, and March 2017 for radium 226. A negative result could be considered a valid result when the magnitude of the negative result is greater than 1.65 times the reported combined standard uncertainty. In such a case, a valid "negative" value would be considered a non-detect concentration. However, the reported laboratory result may be determined to be invalid for a variety of laboratory QA/QC reasons including nonrepresentative instrument background or blank signal or an inaccurate determination of radionuclide interferences. Due to the lab reports not being included in the Annual GWMCA reports, EPA cannot confirm if the negative reported values are valid or invalid. EPA is proposing that CPS Energy correct the reported values to show if they are valid or invalid results. EPA recognizes that the negative reported values might be corrected when the combined levels are reported rather than individual isotopes.

IV. EPA's Proposed Action

A. Proposed Conditional Approval

On January 11, 2022, EPA proposed to conditionally approve the request submitted for Spurlock Power Station to extend the cease receipt of waste date for an unlined CCR surface impoundment. See "Conditional Approval of an Alternative Closure Deadline for H.L. Spurlock Power Station, Maysville, Kentucky" (Spurlock proposal) (Docket ID No. EPA-OLEM-HQ-2021-0595). EPA explained in that proposed action that the Agency was clarifying and revising its original interpretation of the regulations at 40 C.F.R. § 257.103(f)(3) to allow the Agency to issue conditional approvals in certain limited circumstances. EPA proposed to limit conditional approvals to situations where the actions necessary to address the noncompliance are straightforward and the facility will be able to take the necessary actions well before the extended deadline that it requested. EPA further described the situations where a conditional approval might be appropriate as those that involve relatively straightforward technical issues where the remedies for the noncompliance are easily identified and quickly implemented. In such cases, EPA noted that conditions can be readily developed to bring the facilities into compliance and allow EPA to evaluate whether the conditions are met based on appropriate documentation.

EPA then identified specific examples of situations in which the Agency anticipated that the characteristics necessary to support a conditional approval might (and might not) be present. Spurlock proposal pgs. 9-13. Specifically, EPA stated in the Spurlock proposal that the Agency did not anticipate issuing conditional approvals in cases where "the noncompliance involves more complicated technical issues where the specific actions necessary to come into compliance cannot be easily identified and/or cannot be remedied quickly." Spurlock Proposal pg. 13. EPA further stated that the necessary conditions to bring a facility into compliance are likely to be more complicated and time-consuming where a facility is not in compliance with corrective action requirements or where a facility is out of compliance with several regulatory requirements. Id. EPA concluded by stating that "[i]n situations in which there is affirmative evidence of harm at the site, such as where a facility has delayed corrective action, EPA cannot grant additional time for the impoundment to operate without some evidence that these risks are mitigated," and that the Agency would evaluate each demonstration on a case-by-case basis to determine whether a conditional approval is warranted based on the facts surrounding each facility. Id.[33]

EPA is incorporating the justification for granting conditional approvals set forth in the proposed Spurlock decision.

---

[33] See Mountaineer (Docket ID No EPA-HQ-OLEM-2021-0842) proposal wherein EPA is proposing to find that Mountaineer meets the criteria discussed in Spurlock for a conditional approval even though its situation has some characteristics that EPA warned in Spurlock might make it difficult to meet the criteria for a conditional approval (e.g. corrective action issues).

For Calaveras Power Station, EPA conducted a thorough review of its Demonstration and additional information from CPS Energy. Based on that review, EPA developed conditions, and believes that compliance with the proposed conditions can be evaluated based on the documentation we propose to require. In addition, the conditions EPA developed will require compliance in a short enough time period after the final decision that the conditional approval would not authorize a sustained period of continued operation of a deficient CCR surface impoundment without evidence that the risks are being adequately mitigated.

For these reasons, EPA is proposing to conditionally approve an extension request of the cease receipt of waste date to use the SRH Pond until September 1, 2023, provided that the following conditions are met:

1. Within 30 days of the date of EPA's final decision,[34] CPS Energy shall post on its public CCR website a statement committing to meet all the conditions to qualify for the conditional approval.
2. No later than five days after the date of EPA's final decision CPS Energy shall cease receipt of waste into the Evaporation Pond.
3. No later than 60 days after the date of EPA's final decision, CPS Energy shall submit to EPA a revised plan for the groundwater monitoring systems for the SRH Ponds, North and South BAPs, Evaporation Pond, and the FAL that meet the performance standard required by 40 C.F.R. § 257.91. This condition will not be met until EPA approves the revised plan. The plan must address the following items:
    a) Characterization of groundwater flow direction around the CCR units, taking into account seasonal or temporal fluctuations and any effects of extraction

---

[34] The date of EPA's final decision means the date that the decision is signed, not the effective date of the decision.

    wells, supported by a sufficient number of groundwater elevation measurements, appropriately located and spaced, to support a determination that the proposed groundwater monitoring systems meet the criteria in 40 C.F.R. § 257.91(a) and (b);

    b) Identification of wells or the installation of new wells that characterize background groundwater quality and their locations;
        i. CPS Energy shall provide information about samples used to calculate background levels to demonstrate that they meet the performance standard in 40 C.F.R. § 257.91(a)(1)(ii), including when they were obtained, operational status of the CCR unit at that time, and the sampling and analytical results and procedures used;
    c) Installation of wells at the downgradient waste boundary of the CCR units, with sufficient number and adequate spacing to monitor all potential contaminant pathways, consistent with the performance standard in 40 C.F.R. § 257.91(a)(2) based on criteria in 40 C.F.R. § 257.91(b); and
    d) P.E. certifications that document how the revised groundwater monitoring systems meet the performance standard in 40 C.F.R. § 257.91.
4. No later than 60 days after the date of EPA's approval of the revised plan of the groundwater monitoring system at each CCR unit, CPS Energy shall complete installation of new wells at that unit.
5. No later than 90 days after the date of EPA's approval of both the groundwater monitoring system and the sampling and analysis plan for each CCR unit, CPS Energy shall sample all wells in the revised groundwater monitoring systems at all

CCR units in accordance with 40 C.F.R. § 257.95(b). All groundwater sampling and data analyses shall be conducted in accordance with the requirements of 40 C.F.R. §§ 257.93 through 257.95.

6. No later than 30 days after the date of EPA's final decision, CPS Energy will post amended Annual Groundwater Monitoring and Corrective Action Reports to include combined radium 226/228 results and validating the negative radium values.
7. No later than September 1, 2023, and prior to initial operation of the Plant Drains Pond, CPS Energy will comply with the groundwater monitoring requirements of a new CCR surface impoundment in accordance with 40 C.F.R. § 257.90(b)(2).

<u>Proposed Procedures.</u>

EPA does not intend that the addition of these conditions establish independently enforceable requirements. Rather, existing statutory and regulatory requirements remain enforceable in accordance with their terms and any past or future noncompliance could be the basis for penalty assessment. These added conditions must be met for CPS Energy to obtain, and maintain, approval for an alternative deadline pursuant to 40 C.F.R. § 257.103(f)(1). This means that failure to meet the conditions would result in revocation of the conditional approval, but that failure would not itself be grounds for enforcement action. CPS Energy may be subject to enforcement of the underlying noncompliance upon which the conditions were premised, and CPS Energy would be subject to enforcement for noncompliance if it continued to use the surface impoundment past the new deadline to cease receipt of waste, as well as for any other noncompliance either identified in the final decision or detected apart from this process.

EPA is further proposing that, if CPS Energy fails to meet any of the conditions in the final decision, the conditional authorization will be automatically revoked and will convert to a denial. In such an event, EPA is proposing that CPS Energy's deadline would revert to 135 days from the date of EPA's final decision, which is the deadline that would have been established had EPA originally denied the extension request. See Section IV.B.2 of this document for further discussion of the basis for that deadline. In addition, if EPA notifies CPS Energy that a submission required under any of the conditions listed above does not meet the relevant performance standards, EPA is proposing that the conditional approval would automatically convert to a denial as of the date of the notification to CPS Energy. In this case, the new deadline to cease receipt of waste would be 135 days from the date of the notification.

EPA is proposing that CPS Energy post a notice on its public CCR website within 5 days of meeting each condition. EPA is not proposing to provide an opportunity for notice and comment or to otherwise establish any process to further adjudicate issues relating to CPS Energy's compliance with the conditions. EPA may approve a submitted plan with or without comments or may deny the plan outright. In either case EPA does not intend to provide any opportunity for further consultation. EPA will notify CPS Energy if the Agency determines that a condition has not been met but has not yet determined the form or timing of the notification. One option that EPA is considering would be to send a letter to CPS Energy and post a notice on the Agency's website. EPA requests comment on whether these procedures would be appropriate, and on whether there are alternative mechanisms that would be more appropriate.

Although EPA is proposing a conditional approval, EPA is also taking comment on whether it should deny the extension request on the grounds that it fails to meet the requirements of 40 C.F.R. § 257.103(f)(1)(iv) based on the proposed findings of noncompliance identified in Section III above. EPA is doing so in case it determines that the regulations should not be interpreted to allow conditional approvals or that circumstances make a conditional approval inappropriate in this case. Such circumstances might include: substantial disagreement about the conditions that would be necessary to come into compliance, CPS Energy's indication that it is not interested in a conditional approval, or the actions necessary to come into compliance would take longer than the amount of time that would be granted to continue operation of the unit. If EPA determines that a conditional approval is not appropriate, EPA will issue a denial as its final decision.

B. Deadline to Cease Receipt of Waste

1. Conditional Approval

EPA is proposing that CPS Energy's deadline to cease receipt of waste will be September 1, 2023, for the SRH Pond, provided CPS Energy meets all the conditions described above. If CPS Energy fails to meet all the specified conditions, or ceases to comply with any of the conditions, then its conditional approval would automatically convert to a denial. EPA is proposing that in such an event CPS Energy's deadline to cease receipt of waste would be determined as set forth below for a denial.

2. Denial

This section proposes the new deadline to cease receipt of waste in the event EPA's final decision denies CPS Energy's request for an extension or EPA issues a conditional approval that converts to a denial. EPA is proposing that CPS Energy would be required to cease receipt of waste to the Evaporation Pond within fourteen days of the date of the Agency's final decision.

EPA is also proposing that CPS Energy would be required to cease receipt of waste of the SRH Pond within 135 days of the date of the Agency's final decision establishing the revised deadline. EPA is further proposing that, under certain circumstances described below, EPA could authorize additional time for CPS Energy to continue to use the impoundment to the extent necessary to address demonstrated grid reliability issues. Those circumstances are that 1) CPS Energy submits a planned outage request to the Electric Reliability Council of Texas (ERCOT) within 15 days of EPA's final decision and 2) CPS Energy provides the ERCOT determination disapproving the planned outage and the formal reliability assessment upon which it is based to EPA within 10 days of receiving them.[35]

The regulations state that when EPA denies an application for an extension, the final decision will include the facility's deadline to cease receipt of waste, but the regulations do not provide direction on what the new deadline should be. 40 C.F.R. § 257.103(f)(3). EPA is proposing to set a new deadline for CPS Energy to cease receipt of waste that would be 135 days from the date of the final decision on CPS Energy's Demonstration. This would provide CPS Energy the same amount of time that would have been available to the facility had EPA issued a denial immediately upon receipt of the Demonstration (i.e., from November 30, 2020, when EPA received the submission, to April 11, 2021, the regulatory deadline to cease receipt of waste). This amount of time thus puts the facility in the same place it would have been had EPA immediately acted on the Demonstration, and therefore adequately accounts for any equitable reliance interest CPS Energy may have had after submitting its Demonstration. Moreover, as discussed further below, this date should provide CPS Energy with adequate time to coordinate with and obtain any necessary approvals from ERCOT for any outage of the coal-fired boiler(s) that may be necessary. This proposed deadline for CPS Energy to cease receipt of waste is the same as the proposed effective date of EPA's final decision (*see* Section VI below).

---

[35] EPA is proposing the same process for evaluating electric reliability impacts as set forth in the proposed Part A decisions issued on January 11, 2022. EPA received comments on the process for determining electric reliability impacts. EPA continues to evaluate those comments and will respond to them when EPA issues a final decision on one or more of the January 11, 2022, proposed determinations. This proposed action is not a response to those comments and no final decision has been made to date.

Given that this proposed deadline (135 days from the date of EPA's final decision) is sooner than the deadline requested by CPS Energy, EPA understands that it is likely that the coal-fired boiler(s) associated with the CCR units will temporarily need to stop producing waste (and therefore power) until either construction of the alternative disposal capacities is completed and commercially operational or some other arrangements are made to manage its CCR and/or non-CCR wastestreams. *See* discussion of adverse effects above in Section III.B. In CPS Energy's Demonstration it noted that if the requested deadline were not granted, it "might" affect the reliability of the electricity grid. CPS Energy provided no information or evidence to support the statement.

This facility operates as part of the ERCOT system. ERCOT is a regional transmission organization (RTO) that is responsible for managing the flow of electric power for approximately 90% of Texas's electric load. Comments submitted by other RTOs on the Part A decisions proposed on January 11, 2022, indicate that, depending on the timing of the outage, it is possible that a temporary outage could have an adverse, localized impact on electric reliability, or otherwise adversely affect the reliability of the grid. But whether a particular outage would actually adversely affect reliability must be determined based on the fact-specific circumstances associated with the proposed outage. EPA expects this would also be the case for facilities operating as part of the ERCOT system.

EPA does not currently have an evaluation from Calaveras Power Station's transmission authority (i.e. ERCOT) supporting CPS Energy's assertions that the temporary outage of the coal-fired boiler at Calaveras Power Station would trigger local reliability violations[36] or would

---

[36] A local reliability violation might occur, for example, if transmission line constraints limit the amount of power that can get to an area from plants outside that area.

otherwise adversely affect resource adequacy requirements. In addition, especially with advance notice, there are a wide array of tools available to utilities, system operators, and State and Federal regulators to address situations where the outage of a generating unit might otherwise affect local electric reliability conditions.

EPA is sensitive to the importance of maintaining enough electricity generating capacity to meet the region's energy needs, including meeting specific, localized issues. EPA understands that in some instances temporarily taking generating units (including coal-fired units) offline could have an adverse, localized impact on electric reliability (e.g., voltage support, local resource adequacy). If a generating asset were needed for local reliability requirements, the grid operator (e.g., ERCOT) might not approve a request for a planned outage. In such instances, the owners/operators of the generating unit could find themselves in the position of either operating in noncompliance with RCRA or halting operations and thereby potentially causing adverse reliability conditions.

EPA is obligated to ensure compliance with RCRA to protect human health and the environment. Where there is a conflict between timely compliance and electric reliability, EPA intends to carefully exercise its authorities to ensure compliance with RCRA while taking into account any genuine, demonstrated risks to grid reliability identified through the process established by ERCOT that governs owner and operator requests for planned outages.[37]

Accordingly, EPA is proposing to rely on established processes and authorities used by ERCOT to determine whether a planned outage necessary to meet the new deadline would cause a demonstrated reliability issue. ERCOT is responsible for coordinating and approving requests

---

[37] *See,* ERCOT protocols, Section 3: Management Activities for the ERCOT System, June 1, 2022, available for download at https://www.ercot.com/mktrules/nprotocols/current.

for planned outages of generation and transmission facilities, as necessary, for the reliable operation of the ERCOT RTO. In ERCOT, power plants are required to submit a request at least 3 days (or 30 days for a Black Start facility) in advance of a planned outage to allow ERCOT to evaluate whether the resource is needed to maintain grid reliability, among other scheduling considerations. ERCOT will request the event be rescheduled if it determines that the planned outage would adversely affect reliability. If ERCOT approves a planned outage request, the outage may proceed and there would be no reason to expect that the outage would affect reliability. However, if a request would cause reliability issues, ERCOT will work with the generation owner to implement appropriate solutions. The ERCOT member may also request ERCOT's assistance in scheduling a planned outage.

ERCOT may rely on different bases in determining whether to request the generating facility to reschedule a planned outage. For example, a reschedule request may be issued because of timing considerations taking into account previously approved planned outage requests, in which case EPA would expect the plant owner to work with ERCOT to plan an outage schedule that can be approved by ERCOT and also satisfies the plant owner's RCRA obligations, without regard to any cost implications (e.g., in meeting any contractual obligations with third parties) that may result for the plant owner under a revised proposed outage schedule.

However, in some cases ERCOT might determine that the planned outage could not occur without triggering operational reliability violations. In such cases, the system operator might determine that the generating unit would need to remain in operation until remedies are implemented. EPA is aware of no evidence that such is the case with Calaveras Power Station.

For CPS Energy, EPA is proposing to rely on ERCOT's procedures for reviewing planned maintenance outage and similar requests. Accordingly, EPA is proposing that, if

ERCOT approves CPS Energy's request, EPA would not grant any further extension of the deadline to cease receipt of waste (i.e., the deadline would be 135 days from the date of EPA's final decision). If, however, ERCOT requests that CPS Energy move its planned outage or requires alternative solutions to be implemented prior to an outage that exceeds the compliance timeline allowable under RCRA based on a technical demonstration of operational reliability issues, EPA is proposing that, based on its review of that decision and its basis, EPA could grant a further extension (i.e., beyond 135 days of the date of EPA's final decision). EPA is further proposing that such a request could only be granted if it were supported by the results of the formal reliability assessment(s) conducted by ERCOT that established that the temporary outage of the boiler during the period needed to complete construction of alternative disposal capacity would have an adverse impact on reliability. In such a case EPA is proposing that, without additional notice and comment, it could authorize continued use of the impoundments for either the amount of time provided in an alternative schedule proposed by ERCOT or the amount of time EPA determines is needed to complete construction of the alternative disposal capacity based on its review of the Demonstration, whichever is shorter. EPA is further proposing that a request from ERCOT to move a requested outage until other solutions are in place without a finding of technical infeasibility for demonstrated reliability concerns would not support EPA's approval of an extension of the date to cease receipt of waste because any concern about outage schedules and their implications for plant economics could be resolved without an extension of RCRA compliance deadlines (e.g., through provision of replacement power and/or capacity; rearranging plant maintenance schedules; reconfiguration of equipment).

To obtain an extension, EPA is proposing that CPS Energy must submit a request for an outage to ERCOT within 15 days of EPA's final decision. To avoid the need for serial requests and submissions to ERCOT, EPA is proposing to require CPS Energy to contact ERCOT and request assistance in scheduling the planned outage so that CPS Energy and ERCOT can determine the shortest period of time during an overall planned outage period in which the generating unit must be online to avoid a reliability violation. EPA expects that CPS Energy and ERCOT will plan the outage(s) and return-to-service periods—and any other needed accommodations—in ways that minimize the period of actual plant operations.

Finally, to obtain an extension from EPA, CPS Energy must submit a copy of the request to ERCOT and the ERCOT determination (including the formal reliability assessment) to EPA within 10 days of receiving the response from ERCOT. EPA would review the request and, without further notice and comment, issue a decision.

One hundred and thirty-five days should normally provide adequate time to obtain a decision from ERCOT. According to the ERCOT Outage Scheduling Manual, the normal process for obtaining approval for a planned outage occurs within two months or less.[38] If a generating facility submits a request for a planned outage at least 45 days prior to the planned outage, ERCOT will accept the request, but may discuss alternatives to minimize reliability and cost impacts. If a generating facility submits a request less than 45 days in advance of the planned outage, ERCOT will approve or reject the request within 1-5 business days. However, EPA solicits comment on whether 135 days from the date of the final decision provides sufficient time to accommodate the normal process of obtaining approval for a planned outage.

V. Conclusion

EPA is proposing to conditionally approve the extension request in the Demonstration submitted by CPS Energy for the SRH Pond at Calaveras Power Station. Additionally, EPA is

---

[38] ERCOT, Nodal Protocols, Section 3: Management Activities for the ERCOT System, June1, 2022, pages 3-23 to 3-24, available for download at https://www.ercot.com/mktrules/nprotocols/current.

proposing that CPS Energy failed to explain the lack of on-site alternative capacity available for the Evaporation Pond wastestreams. If EPA's final action is a denial, CPS Energy must cease receiving waste within 14 days for the Evaporation Pond and 135 days for the SRH Pond of the date of the Agency's final decision. If EPA determines circumstances warrant a conditional approval, as described above, and CPS Energy provides appropriate commitments in response to this proposal that it is interested in accepting a conditional approval, EPA is proposing to condition this approval on CPS Energy timely taking those actions specified in Section IV.A of this proposed decision. If finalized, a conditional approval would allow CPS Energy to continue placing CCR and non-CCR wastestreams into the SRH Pond until September 1, 2023, and require CPS Energy to cease receipt of waste in the Evaporation Pond within five days of the final decision. If at any time CPS Energy fails to comply (or ceases compliance with) any of the conditions, the proposed conditional approval would terminate and revert to a denial. In such a case the deadline to receipt of waste would be as discussed in Section IV.B.2 above.

VI. Effective Date of a Denial

EPA is proposing to establish an effective date for the final decision on CPS Energy's Demonstration of 135 days after the date the final decision is signed. EPA is proposing to align the effective date with the new deadline that EPA is proposing to establish for CPS Energy to cease receipt of waste. EPA is doing so for all the reasons discussed as the basis for proposing to establish the new cease receipt of waste discussed in Section IV of this document.

07/12/2022

Date

Barry N. Breen
Acting Assistant Administrator

Attachment 27-3

September 23, 2022

SUBMITTED VIA E-DOCKET (REGULATIONS.GOV)

Richard Huggins Jr., Chief
Office of Resource Conservation and Recovery
Materials Recovery and Waste Management Division
Environmental Protection Agency
1200 Pennsylvania Avenue
Washington DC 20460

Subject: CPS Energy Comments and Responses to the Proposed Conditional Approval of Alternative Closure Deadline for the Calaveras Power Station (Proposed Decision)
Docket ID No. EPA-HQ-OLEM-2022-0333

Dear Mr. Huggins:

CPS Energy is in receipt of your July 12, 2022 communication requesting comments/responses to the Proposed Conditional Approval of Alternative Closure Deadline for the Calaveras Power Station (Proposed Decision). CPS Energy is pleased to submit the following comments/responses to the request.

Introduction

On November 30, 2020, CPS Energy submitted two alternative capacity infeasibility demonstrations (collectively referred to as the "Demonstration") to the Environmental Protection Agency (EPA), one for the SRH Pond and one for the Evaporation Pond, at the Calaveras Power Station in Bexar County, Texas. Based on the lack of available on-site capacity and the need to construct additional storage units, CPS Energy sought extensions pursuant to 40 Code of Federal Regulations (CFR) § 257.103(f)(1) to continue to receive CCR and non-CCR wastestreams through September 1, 2023 for the SRH Pond and through May 26, 2022 for the Evaporation Pond. Due to unavoidable construction delays, CPS Energy requested an updated alternative closure deadline of September 30, 2022, for the Evaporation Pond in its March 1, 2022 response to EPA's February 14, 2022 request for additional information. Based on EPA's statements in the Proposed Decision, CPS Energy understands that EPA considered the information conveyed March 1, 2022, and other information provided by CPS Energy in response to EPA review, as part of the Proposed Decision.

On January 11, 2022, EPA notified CPS Energy that the Demonstration was complete. On July 12, 2022, EPA released its Proposed Decision on CPS Energy's Demonstration. The Proposed Decision proposes to grant in part and deny in part CPS Energy's request for alternative closure deadlines, as follows:

First, EPA is proposing to conditionally approve the extension request to allow for continued placement of CCR and non-CCR wastestreams in the SRH Pond until September 30, 2023. EPA, however, proposes to condition its approval on CPS Energy's timely commitment to the conditions identified in the final decision judged by EPA as necessary to satisfy the conditional approval. CPS Energy supports EPA's proposed approval of its request for the SRH Pond. While CPS Energy believes that its Demonstration supports an unconditional approval, and urges EPA to withdraw the conditions to its approval, CPS Energy intends to provide the requested commitment to EPA necessary to support the conditional approval, subject to review of the final decision and conditions contained therein.

Second, EPA is proposing to find that CPS Energy "failed to adequately explain the lack of available on-site alternative capacity for the Evaporation Pond wastestreams." CPS Energy objects to EPA's proposed finding that it failed to adequately support its request for an alternative closure deadline for the Evaporation Pond in its Demonstration and responses to EPA. Nevertheless, CPS Energy has provided additional information in this response to further support its request for an alternative closure deadline for the Evaporation Pond. The original information provided in the Demonstration, as supplemented by the additional information contained in these comments, fully demonstrates a lack of available on-site alternative capacity for the wastestreams managed in the Evaporation Pond. In this letter, CPS Energy is providing responses to only those proposals presented by the EPA in the Proposed Decision that warrant a comment or clarification. For review purposes, the EPA Proposals are presented below in italics followed by a corresponding CPS Energy response in regular text.

EPA Proposal 1

> *EPA is proposing to find that the Demonstration fails to support the conclusion that there is a lack of available on-site alternative disposal capacity for the Evaporation Pond (EP). Since CPS Energy is requesting an alternative compliance deadline for both the Evaporation and the SRH Ponds, it intends that both will continue to receive waste. But CPS Energy failed to discuss the reasons both ponds need to operate; for example, it could divert the industrial wastestreams from the Evaporation Pond to the SRH Pond. Diverting the industrial wastestreams would expedite the closure and the cease receipt of waste date for the Evaporation Pond. Additionally, it would only require one CCR surface impoundment to continue to operate under an alternative cease receipt of waste deadline.*

CPS Energy Response 1

Diverting the industrial wastestreams from the Evaporation Pond (EP) to the SRH Pond is not a feasible option for the reasons discussed below, and CPS Energy needs to continue to use both ponds to maintain operations until alternative capacity for the EP is completed and operational.

The primary operational function of the EP is to receive non-CCR flows (industrial wastestreams) by tanker truck for evaporation. The non-CCR industrial wastestreams are generated by CPS Energy's J.K. Spruce Plant and other CPS Energy power generation facilities. The EP does not receive any CCR wastestreams.

The SRH Pond in contrast receives CCR and non-CCR flows from various sources within the J.K. Spruce Plant and all flows are co-mingled in the SRH Pond. TPDES Industrial Wastewater Permit WQ0001514000 specifies what flows may be routed to the SRH Pond and requires all wastewater discharged from the SRH Pond to be treated in a clarifier to reduce the total suspended solids (TSS). In lieu of discharge, the permit allows CPS Energy to recycle wastewater treated in the SRH Pond back to the J.K. Spruce Flue Gas Desulfurization (FGD) system.

CPS Energy evaluated whether the SRH Pond could manage the non-CCR wastestreams managed in the EP and concluded that it could not for two reasons. First, TPDES Industrial Wastewater Permit WQ0001514000 does not authorize these wastestreams to be placed in the SRH Pond and, second, the SRH Pond treatment systems are not physically able to treat them if CPS Energy could obtain authorization for them to be placed in the SRH Pond.

By way of further description, the large majority of the non-CCR wastestreams managed by the EP are metal cleaning wastes. These wastestreams average approximately 800,000 gallons annually and are typically generated during discrete maintenance events over a relatively short period of time. These wastestreams would require pretreatment to remove dissolved metals before they could be discharged or recycled; however, the SRH Pond is not equipped with the necessary pretreatment system. The existing clarifier is designed to reduce TSS using settling and clarification and is not designed to treat or remove dissolved metals. Moreover, the allowable discharges under the TPDES Industrial Wastewater Permit for the SRH Pond do not cover the types of wastestreams currently discharged into the EP. CPS Energy is not allowed, under any circumstances, to discharge metal cleaning wastewater or chemical cleaning wastewater from the SRH Pond, therefore, these wastewaters cannot be diverted to the SRH Pond. Even if a SRH Pond treatment system could physically treat the EP wastestreams, modification of the permit would take at least a year and likely longer, making this option impracticable given that alternative capacity for the EP wastestreams is expected to be completed before then.

EPA Proposal 2

EPA is proposing to find that there would be adverse impacts to the power plant if the CCR surface impoundments could not be used after April 11, 2021. EPA proposes to find that if Calaveras is unable to continue using the CCR surface impoundments, and if no other on or off-site alternative capacity is available, there would be adverse impacts on the ability to run the associated boilers such that a planned temporary outage would likely be required. As discussed in Section IV, EPA disagrees with CPS Energy's claims regarding the broader impact of such an outage.

CPS Energy Response 2

CPS Energy agrees that there would be adverse impacts to the power plant if the SRH Pond and/or the EP could not continue to receive wastestreams prior to the completion of construction of new on-site alternative capacity, and that there would specifically be adverse impacts on the ability to run the associated boilers such that a temporary outage would likely be required.

With respect to broader impacts of such an outage, however, the broader impacts of an outage were not addressed in the Demonstration package because this analysis was not required under 40 C.F.R. § 257.103. CPS Energy has now initiated conversations with Electric Reliability Council of Texas (ERCOT) to demonstrate the potential adverse impacts from an outage if the J.K. Spruce Plant were not able to continue operating. If EPA proceeds with its conditional approval, however, an unplanned outage would not be necessary. Accordingly, CPS Energy's comments related to the broader negative consequences of a denial of the Demonstration request, and ERCOT's determinations related to adverse impacts on grid reliability due to such outage, are separately provided in **CPS Energy Response 8** below.

EPA Proposal 3

EPA evaluated the timeline, and the discussion CPS Energy provides in the Demonstration and is proposing that the time requested is reasonable, but is missing a discussion on required elements for a new CCR surface impoundment. The workplan and timeline do not include the installation of a groundwater monitoring network for the new CCR surface impoundment. EPA is proposing for CPS Energy to comply with the groundwater monitoring requirements in 40 C.F.R. § 257.90(b)(2) prior to the requested cease receipt of waste date for the SRH Pond, September 1, 2023.

CPS Energy Response 3

CPS Energy will comply with the groundwater monitoring requirements in 40 C.F.R. § 257.90(b)(2) for the new surface impoundment, the Plant Drains Pond, prior to September 1, 2023. In fact, CPS Energy already installed three (3) monitor wells in August 2020 and two (2) additional monitor wells in July 2022 that will be included in the groundwater monitoring network for the new Plant Drains Pond and a schedule for the collection and analysis of eight (8) independent samples from each background well has been developed. CPS Energy's current Groundwater Monitoring System document is dated October 2017 and available on its publicly available CCR website, and this document was also submitted to TCEQ on January 24, 2022 as part of the Registration Application for Coal Combustion Residuals (CCR) Waste Management (2022 TCEQ Registration Application). Well information and groundwater results from the three initial monitor wells was included as additional information submitted to the TCEQ on June 30, 2022.

CPS Energy currently anticipates that the October 2017 Groundwater Monitoring System document will be revised to include discussion of the installation activities related to the five (5) new wells around the Plant Drains Pond no later than 60 days after the date of EPA's final conditional approval.

EPA Proposal 4

Evaluation of CPS Energy's Compliance Documentation - EPA is proposing to determine that CPS Energy did not adequately demonstrate compliance with the following portions of the regulations:

a. CPS Energy failed to meet requirements in the regulations for the groundwater monitoring well placement and networks at the SRH Pond, EP, Fly Ash Landfill (FAL), and North and South Bottom Ash Ponds (collectively referred to as the BAPs) in accordance with 40 C.F.R. § 257.91.

b. Alternative Source Demonstrations (ASDs) are inadequate and fail to illustrate that the CCR unit is not the source in accordance with 40 C.F.R. § 257.94(e)(2) and therefore reliance on the ASDs led to noncompliance with other requirements.

c. CPS Energy failed to conduct statistical analysis in accordance with 40 C.F.R. § 257.93(h)(2).

d. CPS Energy did not correctly report radium 226/228 results in the Annual GWMCA Reports in accordance with Appendix IV to 40 C.F.R. § 257.

CPS Energy Response 4

Responses to EPA's proposed determination that certain portions of the federal regulations have not been met are addressed in the individual responses below. As a preliminary matter, all of CPS Energy's groundwater monitoring activities have been conducted in accordance with the October 2017 Groundwater Monitoring System document discussed above, and that document and the associated Annual Ground Water Monitoring and Corrective Actions (GWMCA) Reports demonstrate compliance with the CCR Rule. As part of CPS Energy's compliance efforts, the company has evaluated new data as it is available to assess whether changes in the monitoring network may be appropriate or whether additional information may be necessary. CPS Energy believes that this is part of an appropriate iterative process and does not demonstrate non-compliance with the CCR Rule.

In fact, regarding EPA's comments about groundwater flow directions and the groundwater monitoring well networks, CPS Energy noted similar inconsistencies in groundwater flow directions in the Annual GWMCA Reports (2020 reporting year). Also noted in those Reports, CPS Energy's initiated a Water Level Study to better understand these inconsistencies. The Water Level Study was completed in 2021 and recommendations from the Study were included in the subsequent Annual GWMCA Reports (2021 reporting year). Additional information generated from the recommendations and responses to specific EPA proposals/comments will be presented in the revised document for the groundwater monitoring systems for the units and in the subsequent Annual GWMCA Reports (2022 reporting year).

Further, although CPS Energy is providing responses to the individual alleged compliance issues identified by EPA in the Proposed Decision below and intends to address such issues, CPS Energy notes that EPA published its final partial approval of the Texas state CCR permit program in June 2021. See Texas: Approval of State Coal Combustion Residuals Permit Program, 86 Fed. Reg. 33,892 (June 28, 2021). Pursuant to EPA's approval, "[t]he Texas CCR permit program [operates] in lieu of the Federal CCR program, (40 CFR part 257, subpart D) with the exception of the provisions for which the state did not seek approval." 86 Fed. Reg. at 33,893. Texas did not seek approval for 30 TAC section 352.1231, the state analog to 40 CFR 257.103 (containing the alternative closure requirements related to requests for extensions to operate certain units beyond April 2021). However, Texas sought and received approval for its groundwater monitoring provisions, including the state corollaries to the provisions noted above contained within 40 C.F.R. 257.90 to 257.98, which is the primary subject matter area for which EPA seeks additional compliance actions. Given that the Texas program now operates "in lieu of the Federal CCR program" specifically with respect to the groundwater monitoring provisions, the federal groundwater provisions at 257.90 to 257.98 would not appear to remain applicable in Texas as part of a compliance review and extension determination conducted by EPA for Texas facilities under 257.103(f)(1)(iii). EPA's proposal to require compliance with 257.90 to 257.98 for companies within Texas seeking extensions of the April 2021 disposal deadline also creates logistical and practical difficulties – specifically, potentially competing regulatory obligations in the event the state interprets the applicable state groundwater monitoring provisions differently than EPA interprets compliance with 257.90 to 257.98.

Nevertheless, CPS Energy at this time is providing substantive responses to EPA's proposed findings related to its compliance with the federal provisions noted above. Although CPS Energy does not believe EPA's proposed conditions are necessary or appropriate, CPS Energy is planning to commit to meet EPA's proposed conditions pending review of EPA's final decision on the Demonstration.

EPA Proposal 4a FAL

Regarding the FAL groundwater monitoring network, EPA has specifically identified the following:

- *Location of the background monitoring wells prevents adequate characterization of background groundwater that has not been affected by a CCR unit.*
    - *Neither background monitoring wells JKS-45 nor JKS-57 are consistently upgradient of the FAL.*
    - *JKS-45 is downgradient or sidegradient to the groundwater flow during various sampling events.*
    - *JKS-57 is downgradient or sidegradient to the FAL during various sampling events.*
- *Downgradient well spacing does not monitor all potential contaminant pathways. Spacing between downgradient monitoring wells JKS-45 and JKS-60 at the northeast corner of the FAL is leaving potential contaminant pathways unmonitored.*
- *Downgradient monitoring wells are not placed at the CCR unit waste boundary.*

CPS Energy Response 4a FAL

As noted above, groundwater monitoring at the FAL was performed in accordance with the 2017 Groundwater Monitoring System document, which is in compliance with the applicable state program regulations. Nevertheless and as previously indicated in the Annual GWMCA Reports, CPS Energy conducted a Water Level Study to determine if refinements to the groundwater monitoring program are appropriate. CPS Energy plans to implement the recommendations presented in the Water Level Study and has already installed two (2) additional soil borings (dry monitor wells) to address some of the recommendations.

EPA Proposal 4a EP

Regarding the EP groundwater monitoring network, EPA has specifically identified the following:

- *Inadequate due to the location of the background monitoring well. EPA is proposing to determine that JKS-63/63R and JKS-47 have been affected by the Evaporation Pond or that sampling errors may be resulting in elevated detections of constituents.*

CPS Energy Response 4a EP

As noted above, groundwater monitoring at the EP was performed in accordance with the 2017 Groundwater Monitoring System document, which is in compliance with the applicable state program regulations. Nevertheless and as previously indicated in the Annual GWMCA Reports, CPS Energy conducted a Water Level Study to determine if refinements to the groundwater monitoring program are appropriate. CPS Energy plans to implement the recommendations presented in the Water Level Study.

EPA Proposal 4a SRH Pond

Regarding the SRH Pond groundwater monitoring network, EPA has specifically identified the following:

- *EPA reviewed the groundwater monitoring well network for the SRH Pond and is proposing to determine that the monitoring network fails to comply with the regulations.*
    - *Background well JKS-49 appears to be potentially impacted by the SRH Pond.*
    - *Portions of the downgradient waste boundary have no monitoring wells and potential contaminant pathways are unmonitored.*
    - *Groundwater monitoring system has been amended and the revised monitoring system has not been certified by a Professional Engineer (P.E.) to be in compliance with the requirements of 40 C.F.R. § 257.91.*
    - *Downgradient eastern border of the SRH Pond is upgradient of the BAPs, and therefore, this downgradient eastern boundary of the SRH Ponds is required to be monitored.*
    - *EPA is proposing to conclude that the groundwater monitoring network for the SRH Ponds fails to meet the requirements of 40 C.F.R. § 257.91(f).*

CPS Energy Response 4a SRH Pond

As noted above, groundwater monitoring at the SRH Pond was performed in accordance with the 2017 Groundwater Monitoring System document, which is in compliance with the applicable state program regulations. Nevertheless and as previously indicated in the Annual GWMCA Reports, CPS Energy conducted a Water Level Study to determine if refinements to the groundwater monitoring program are appropriate. CPS Energy plans to implement the recommendations presented in the Water Level Study and has already installed one (1) additional monitor well to address some of the recommendations.

EPA Proposal 4a BAPs

Regarding the BAP groundwater monitoring network, EPA has specifically identified the following:

- *EPA is proposing that the number and spacing of the monitoring wells is insufficient to monitor all potential contaminant pathways and that the groundwater flow is not fully characterized.*
    - *EPA is proposing that CPS Energy define the groundwater flow along the northern boundary of the North BAP to determine if it is downgradient and that there should be at least one downgradient monitoring well along the northern boundary of the North BAP to characterize the groundwater flow, the quality of groundwater passing the waste boundary, and to monitor all potential contaminant pathways.*
- *Background well JKS-49 is not consistently depicted as upgradient of the BAPs.*

- *EPA is proposing that JKS-49 should be considered a downgradient well and that background conditions should be determined by a well clearly not impacted by the unit.*

CPS Energy Response 4a BAPs

As noted above, groundwater monitoring at the BAPs was done in accordance with the 2017 Groundwater Monitoring System document, which is in compliance with the applicable state program regulations. Nevertheless and as previously indicated in the Annual GWMCA Reports, CPS Energy conducted a Water Level Study to determine if refinements to the groundwater monitoring program are appropriate. CPS Energy plans to implement the recommendations presented in the Water Level Study and has already installed one (1) additional monitor well to address some of the recommendations.

EPA Proposal 4b

EPA is proposing to determine that the ASDs did not provide sufficient evidence to substantiate that natural variability was the source of the SSIs and that the BAPs, Evaporation Pond, and FAL were not the sources.

In order to provide sufficient evidence for an ASD for a particular impoundment, relevant data would need to be presented to confirm the validity of the upgradient location determination. Since the comparisons were not based on data with such conditions, the ASDs are insufficient.

CPS Energy Response 4b

Although CPS Energy believes that the ASDs are sufficiently supported, CPS Energy plans to provide additional evidence and relevant data to confirm the validity of the natural variability and the validity of the upgradient location determination. As noted above, some of this additional information is currently being collected and evaluated and will be presented in more detail in the subsequent Annual GWMCA Reports (2022 reporting year).

EPA Proposal 4c

EPA is proposing to determine that CPS Energy failed to provide evidence of statistical analysis for the spring sampling events.

EPA is proposing this lack of statistical analyses results in failure to comply with 40 C.F.R. § 257.93(h)(2) at the SRH Pond, BAPs, Evaporation Pond, and FAL.

CPS Energy Response 4c

Contrary to EPA's proposed determination, spring sampling results were compared to statistically generated prediction limits and these sampling results were presented as Attachment C in the Annual GWMCA Reports (2018, 2019, and 2020 reporting years) and as Attachment D in the Annual GWMCA reports (2021 reporting year) for the various units. These results were also presented in the 2022 TCEQ Registration Application and CPS Energy is currently addressing requests for additional information from TCEQ.

EPA Proposal 5

EPA is proposing that CPS Energy correct the reported radium levels in the Annual GWMCA Reports to include radium 226/228 combined concentrations.

EPA is proposing that CPS Energy correct the reported values to show if they are valid or invalid results (in response to negative results).

CPS Energy Response 5

Groundwater samples were collected and analyzed for Radium 226 and 228 during the eight background sampling events for the various units. CPS Energy is currently addressing EPA's proposal and no later than 30 days after the date of EPA's final decision, CPS Energy plans to correct the reported radium values in the Annual GWMCA Reports (2021 reporting year) for the various units.

EPA Proposal 6

For these reasons presented in the Proposed Decisions, EPA is proposing to conditionally approve an extension request of the cease receipt of waste date to use the SRH Pond until September 1, 2023, provided that the following conditions are met:

a. Within 30 days of the date of EPA's final decision, CPS Energy shall post on its public CCR website a statement committing to meet all the conditions to qualify for the conditional approval.

b. No later than five days after the date of EPA's final decision, CPS Energy shall cease receipt of waste into the Evaporation Pond.

c. No later than 60 days after the date of EPA's final decision, CPS Energy shall submit to EPA a revised plan for the groundwater monitoring systems for the SRH Ponds, North and South BAPs, Evaporation Pond, and the FAL that meet the performance standard required by 40 C.F.R. § 257.91. This condition will not be met until EPA approves the revised plan. The plan must address the following items:

  i. Characterization of groundwater flow direction around the CCR units, taking into account seasonal or temporal fluctuations and any effects of extraction wells, supported by a sufficient number of groundwater elevation measurements, appropriately located and spaced, to support a determination that the proposed groundwater monitoring systems meet the criteria in 40 C.F.R. § 257.91(a) and (b);

  ii. Identification of wells or the installation of new wells that characterize background groundwater quality and their locations;

    - *CPS Energy shall provide information about samples used to calculate background levels to demonstrate that they meet the performance standard in 40 C.F.R. § 257.91(a)(1)(ii), including when they were obtained, operational status of the CCR unit at that time, and the sampling and analytical results and procedures used;*

iii. Installation of wells at the downgradient waste boundary of the CCR units, with sufficient number and adequate spacing to monitor all potential contaminant pathways, consistent with the performance standard in 40 C.F.R. § 257.91(a)(2) based on criteria in 40 C.F.R. § 257.91(b); and

iv. P.E. certifications that document how the revised groundwater monitoring systems meet the performance standard in 40 C.F.R. § 257.91.

d. No later than 60 days after the date of EPA's approval of the revised plan of the groundwater monitoring system at each CCR unit, CPS Energy shall complete installation of new wells at that unit.

e. No later than 90 days after the date of EPA's approval of both the groundwater monitoring system and the sampling and analysis plan for each CCR unit, CPS Energy shall sample all wells in the revised groundwater monitoring systems at all CCR units in accordance with 40 C.F.R. § 257.95(b). All groundwater sampling and data analyses shall be conducted in accordance with the requirements of 40 C.F.R. § 257.93 through 257.95.

f. No later than 30 days after the date of EPA's final decision, CPS Energy will post amended Annual Groundwater Monitoring and Corrective Action Reports to include combined radium 226/228 results and validating the negative radium values.

g. No later than September 1, 2023, and prior to initial operation of the Plant Drains Pond, CPS Energy will comply with the groundwater monitoring requirements of a new CCR surface impoundment in accordance with 40 C.F.R. § 257.90(b)(2).

CPS Energy Response 6

Pending review of EPA's final conditional approval, CPS Energy plans to commit to addressing conditions a., c., d., e., f., and g. presented above and to resolve these conditions within the time commitments identified for the individual conditions. As noted previously, however, CPS Energy does not believe the proposed conditions are necessary or appropriate, and urges EPA to reconsider those conditions based on the material in the application and the responses contained herein.

Regarding condition b. presented above, CPS Energy has provided additional information in **CPS Energy Response 1** that if wastewaters generated during maintenance events were diverted to the SRH Pond, these wastewaters would require pretreatment to remove dissolved metals before they could be discharged; however, the SRH Pond is not equipped with a pretreatment system. In addition, the allowable discharges under the existing and proposed Industrial Wastewater Permit for the SRH Pond do not cover the types of wastestreams currently discharged into the EP. CPS Energy is not allowed, under any circumstances, to discharge metal cleaning wastewater or chemical cleaning wastewater from the SRH Pond, therefore, these wastestreams cannot be diverted to the SRH Pond.

As such, CPS Energy requests EPA to conditionally approve an updated alternative closure deadline of September 30, 2022, for the EP based on the additional information provided in

CPS Energy Response 1 regarding the inability of the SRH Pond to receive metal cleaning wastestreams.

EPA Proposal 7

Proposed Procedures

EPA does not intend that the addition of these conditions establish independently enforceable requirements.

These added conditions must be met for CPS Energy to obtain, and maintain, approval for an alternative deadline pursuant to 40 C.F.R. § 257.103(f)(1). This means that failure to meet the conditions would result in revocation of the conditional approval, but that failure would not itself be grounds for enforcement action.

EPA is further proposing that, if CPS Energy fails to meet any of the conditions in the final decision, the conditional authorization will be automatically revoked and will convert to a denial. In such an event, EPA is proposing that CPS Energy's deadline would revert to 135 days from the date of EPA's final decision, which is the deadline that would have been established had EPA originally denied the extension request.

In addition, if EPA notifies CPS Energy that a submission that is required under any of the conditions listed above does not meet the relevant performance standards, EPA is proposing that the conditional approval would automatically convert to a denial as of the date of the notification to CPS Energy. In this case, the new deadline to cease receipt of waste would be 135 days from the date of the notification.

EPA is proposing that CPS Energy post a notice on its public CCR website within 5 days of meeting each condition. EPA is not proposing to provide an opportunity for notice and comment or to otherwise establish any process to further adjudicate issues relating to CPS Energy's compliance with the conditions. EPA may approve a submitted plan with or without comments or may deny the plan outright. In either case EPA does not intend to provide any opportunity for further consultation. EPA will notify CPS Energy if the Agency determines that a condition has not been met but has not yet determined the form or timing of the notification. One option that EPA is considering would be to send a letter to CPS Energy and post a notice on the Agency's website. EPA requests comment on whether these procedures would be appropriate, and on whether there are alternative mechanisms that would be more appropriate.

CPS Energy Response 7

CPS Energy agrees that the conditions proposed by EPA, if finalized, do not create independently enforceable requirements. This is especially the case here, where Texas has an EPA-approved CCR permit program that operates "in lieu of the Federal CCR program" on which EPA's proposed conditions are based. See also **CPS Energy Response 4** above.

As noted in these comments, although CPS Energy does not believe the conditions are necessary or appropriate, CPS Energy is nevertheless planning to commit both to meeting EPA's proposed conditions and to posting a notice on its public CCR website within 5 days of meeting conditions a., c., d., e., f., and g. presented above, pending review of EPA's final conditional approval. In order to ensure sufficient due process once CPS Energy provides its notice within 30 days of the final conditional approval to meet the identified conditions, however, any withdrawal of the conditional approval from EPA should not establish a new cease waste receipt deadline that is any earlier than 150 days from the date of EPA's notice to CPS Energy that a condition or submission has not been met or does not meet the relevant performance standards. As noted in **CPS Energy Response 8** below, discussions with ERCOT regarding reliability impacts are underway, and a period of no less than 150 days may be necessary in the future to notify ERCOT of an outage and/or determine if an outage request will be denied due to grid reliability concerns.

In addition, CPS Energy respectfully requests the opportunity to engage with the Agency on whether the submissions identified in conditions a., c., d., e., f., and g above meet the relevant performance standards before receiving a notice that the conditional approval has been revoked. In some instances, there may be simple and easily correctable miscommunications that could be addressed through engagement; in others, there may be interpretative issues regarding compliance with the conditions that required further direction from EPA.

<u>EPA Proposal 8</u>

EPA could authorize additional time for CPS Energy to continue to use the impoundment to the extent necessary to address demonstrated grid reliability issues.

CPS Energy must submit a planned outage request to ERCOT within 15 days of EPA's final decision and CPS Energy provides the ERCOT determination disapproving the planned outage and the formal reliability assessment.

However, in some cases ERCOT might determine that the planned outage could not occur without triggering operational reliability violations. EPA is aware of no evidence that such is the case with Calaveras Power Station.

<u>CPS Energy Response 8</u>

CPS Energy has initiated conversations with ERCOT to address claims regarding adverse impacts from an outage if the J.K. Spruce Plant was not able to continue operating. See also **CPS Energy Response 2** above. As noted below, however, due to import limitations, CPS Energy currently expects that an extended outage of Spruce 1 & 2 would cause reliability issues to the grid.

In the event that EPA ultimately denies this Demonstration, CPS Energy will commit to submitting a planned outage request within 15 days of EPA's final decision and to providing the ERCOT determination. It is not clear, however, if this outage would be considered a planned outage, a maintenance outage, or a forced outage, and it further does not appear that 120 days (135 days less the 15 days to provide notice) would be sufficient pursuant to existing ERCOT requirements.

Specifically, the Notification of Suspension of Operations (NSO) provide that, except for the occurrence of a Forced Outage, CPS Energy must notify ERCOT in writing <u>no less than 150 days</u> prior to the date on which the Resource Entity intends to cease or suspend operation of a Generation

Resource for a period of greater than 180 days. Accordingly, unless the outage is treated as a Forced Outage, 135 days is not sufficient time to comply with ERCOT's notice requirements.

Also note the due to import limitations to San Antonio that CPS Energy is experiencing during the high peak demand conditions of Summer 2022, the extended outages of Spruce 1 & 2 (Total 1410 MW capacity) are expected to cause reliability issues to the grid and CPS Energy does not have enough Demand Response Capacity to cover the unavailability of 1410 MW if Spruce 1 & 2 were not in operation. A detailed analysis would need to be performed by ERCOT to determine full reliability impact which could include, but not limited to, addressing overloaded transmission element due to contingency event, addressing potential voltage criteria violations, and transient voltage stability concerns.

Finally, per EPA's statement that the denial procedures identified in the Proposed Decision apply in the event that "EPA issues a conditional approval that converts to a denial", CPS Energy understands and agrees that ERCOT should have the opportunity to determine that CPS Energy must delay a planned outage if necessary to avoid a reliability violation. For the reasons noted above, however, 135 days from the date the conditional approval is converted to a denial may be insufficient to provide proper notice of an outage to ERCOT and conduct a fulsome reliability assessment, so CPS Energy respectfully requests that the 135 day deadline to cease waste receipt (running from a final denial or conversion of a conditional approval to a denial) be lengthened to at least 150 days.

Please call me at (210) 353-3625 with any questions.

Sincerely,

Michael M. Malone, P.E., LEED Green Associate, R.E.M.
CPS Energy Senior Manager
Environmental Management

cc: Kirsten Hillyer (via email)
Frank Behan (via email)

Attachment 28 Evaporation Pond Closure Drawings and Specifications

Attachment 28-1

J.K. SPRUCE POWER PLANT
EVAPORATION POND CLOSURE
Bexar County, TX

FEBRUARY 2021

116817

Contract Drawings

GENERAL DRAWINGS

DWG. NO.	TITLE
CG000	COVER - INDEX
CG001	LEGEND, ABBREVIATIONS, VICINITY MAP & GENERAL NOTES

DEMOLITION DRAWINGS

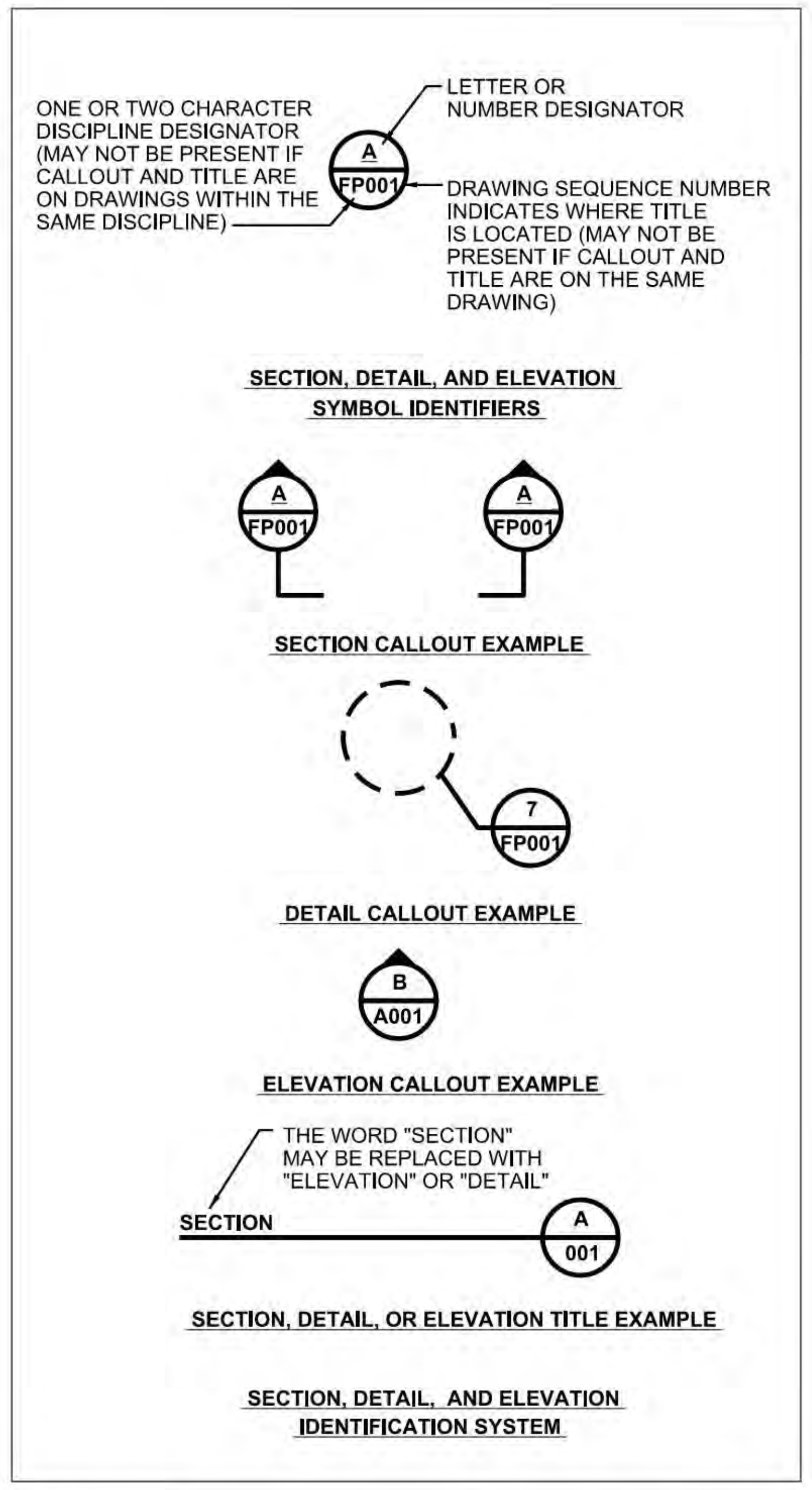
DWG. NO.	TITLE
CD000	DEMOLITION PLAN

CIVIL DRAWINGS

DWG. NO.	TITLE
CS000	HAUL ROUTE PLAN
CG002	SITE PLAN
CG003	KEY PLAN
CG004	EXISTING CONDITIONS
CG005	NOT USED
CG006	EROSION CONTROL PLAN
CP000	SURFACING PLAN
CG007	SITE FINISHING GRADING PLAN - SHEET 1
CG008	SITE FINISHING GRADING PLAN - SHEET 2
CG009	GRADING SECTIONS
CG010	DETAILS - SHEET 1
CG011	DETAILS - SHEET 2

REFERENCE DRAWINGS

DWG. NO.	TITLE
D/S-1547	ASH DISPOSAL PIT #4
D/S-1554	ASH DISPOSAL PIT #4 ELEVATION VIEWS



JOSEPH A. CHITTET
128620
03/02/2021

PRELIMINARY - NOT FOR CONSTRUCTION

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

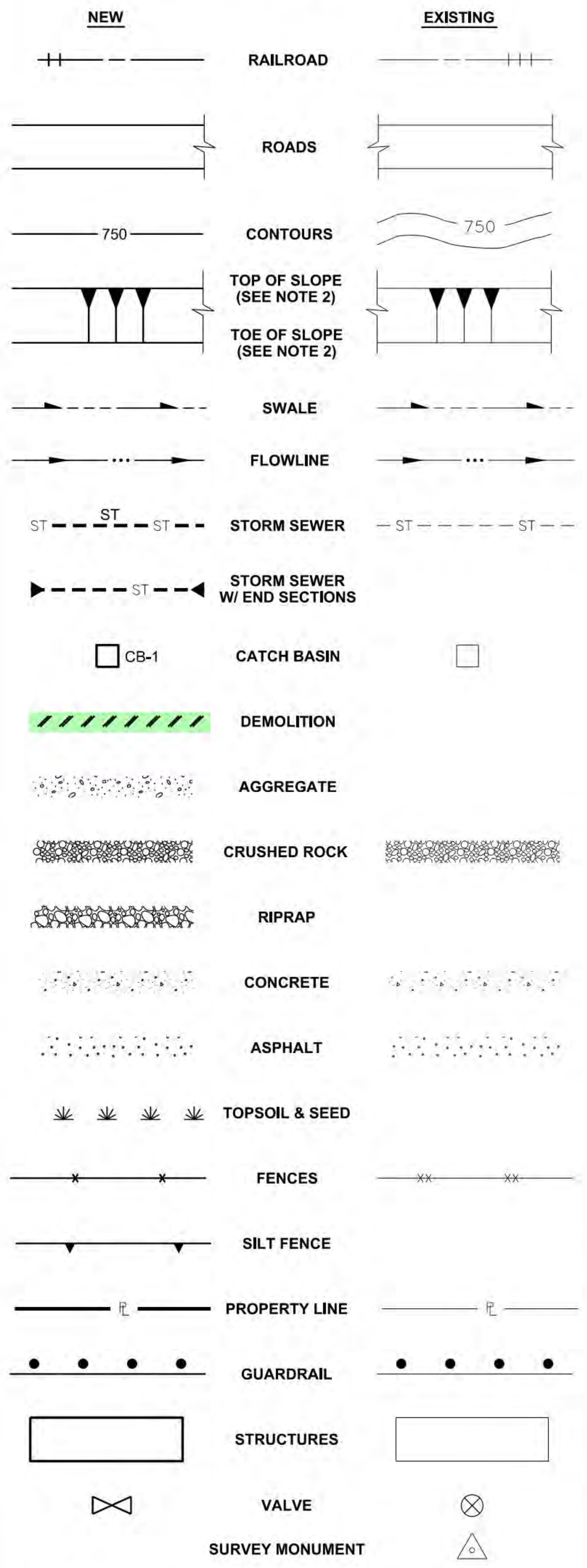
no.	date	by	ckd	description	no.	date	by	ckd	description
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW	D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW					
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE					

BURNS
McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

EVAPORATION POND CLOSURE

Cover - Index

LEGEND



NOTES:

1. ALL SYMBOLS ARE STANDARD WITHOUT RESPECT TO CONTRACTS.
2. TOP OR TOE OF SLOPE TO MATCH EXIST GRADE UNLESS AN ELEVATION OR SLOPE IS INDICATED.

ABBREVIATIONS

ABBREVIATION	TERM	ABBREVIATION	TERM
@	AT	MIN	MINIMUM
AHD	AHEAD	MISC	MISCELLANEOUS
ASPH	ASPHALT	M.O.	MID-ORDINATE
AUX	AUXILIARY	MW	MONITORING WELL
BK	BACK	N	NORTH
BLDG	BUILDING	NO	NUMBER
BM	BENCHMARK	OD	OUTSIDE DIAMETER
BMCD	BURNS & MCDONNELL	OPNG	OPENING
BOT	BOTTOM	±	PLUS OR MINUS
CB	CATCH BASIN	PC	POINT OF CURVE
CDOT	COLORADO DEPARTMENT OF TRANSPORTATION	PCC	PORTLAND CEMENT CONCRETE
C TO C	CENTER TO CENTER	PI	POINT OF INTERSECTION
CL	CENTERLINE	PL	PROPERTY LINE
CHDPE	CORRUGATED HIGH DENSITY POLYETHYLENE	PSI	POUNDS PER SQUARE INCH
CJ	CONSTRUCTION JOINT	PT	POINT OF TANGENT
CMAP	CORRUGATED METAL ARCH PIPE	P.R.C.	POINT OF REVERSE CURVE
CMP	CORRUGATED METAL PIPE	P.V.C.	POINT OF VERTICAL CURVE
CONC	CONCRETE	P.V.I.	POINT OF VERTICAL INTERSECTION
CPT	CORRUGATED POLYETHYLENE TUBING	P.V.R.C.	POINT OF VERTICAL REVERSE CURVE
DBL	DOUBLE	P.V.T.	POINT OF VERTICAL TANGENT
DET	DETAIL	R	RADIUS
DI	DROP INLET	RD	ROAD
DIA	DIAMETER	RPT	RADIUS POINT
DWG	DRAWING	RCP	REINFORCED CONCRETE PIPE
ECB	EXISTING CATCH BASIN	RR	RAILROAD
EDB	ELECTRICAL DUCT BANK	RT	RIGHT
E	EAST	ROW	RIGHT-OF-WAY
EF	EACH FACE	S	SOUTH
EJ	EXPANSION JOINT	SG	SUBGRADE
EL	ELEVATION	SLP	SLOPE
EMH	ELECTRICAL MANHOLE	SHLDR	SHOULDER
EQN	EQUATION	SS	STAINLESS STEEL
EXIST	EXISTING	STD	STANDARD
EW	EACH WAY	ST	STORM SEWER
FBD	FLAT BOTTOM DITCH	STA	STATION
FLL	FLOWLINE	SWG	SWING
FO	FIBER OPTIC	T&B	TOP AND BOTTOM
GA	GAGE	TEMP	TEMPORARY
GALV	GALVANIZED	TOA	TOP OF ASPHALT
GCP	GROUND CONTROL POINT	TOC	TOP OF CONCRETE
HDPE	HIGH DENSITY POLYETHYLENE	TO GRATING	TOP OF GRATING
HORIZ	HORIZONTAL	TOM	TOP OF MANHOLE
HPT	HIGH POINT	TOP	TOP OF PAVEMENT
HWY	HIGHWAY	TOR	TOP OF RAIL
ID	INSIDE DIAMETER	TOSB	TOP OF SUBBALLAST
IF	INSIDE FACE	TOSG	TOP OF SUBGRADE
INTSCT	INTERSECTION	TYP	TYPICAL
INV	INVERT	UON	UNLESS OTHERWISE NOTED
L	LONG	UP	UTILITY POLE
LCP	LEACHATE COLLECTION PIPE	VC	VERTICAL CURVE
LF	LINEAR FEET	VERT	VERTICAL
LT	LEFT	W	WEST
MAX	MAXIMUM	W/	WITH
MH	MANHOLE	W/O	WITH OUT
		WWF	WELDED WIRE FABRIC

NOTES:

1. ALL ABBREVIATIONS ARE BURNS & McDONNELL STANDARDS WITHOUT RESPECT TO CONTRACTS.
2. ABBREVIATIONS ARE APPLICABLE TO ALL DWGS.

VICINITY MAP
NOT TO SCALE

SITE ADDRESS
12940 US-181
SAN ANTONIO, TX
78223

EXISTING CONDITIONS NOTES:

1. THE LOCATIONS OF STRUCTURES AND UNDERGROUND UTILITIES AS INDICATED HAVE BEEN OBTAINED FROM EXISTING RECORDS AND FIELD SURVEYS. UNDERGROUND STRUCTURES AND UTILITIES MAY BE PRESENT WHICH ARE NOT DOCUMENTED OR LOCATED.
2. CONTRACTOR SHALL FIELD-CHECK ALL EXISTING CONDITIONS AND BE THOROUGHLY FAMILIAR WITH THE SITE BEFORE ANY WORK COMMENCES. ANY DISCREPANCIES IN THE DRAWINGS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND CONSTRUCTION FIELD REPRESENTATIVE BEFORE ANY FURTHER WORK COMMENCES.
3. CONTRACTOR SHALL FIELD-VERIFY EXISTING STRUCTURES, UTILITIES, AND SURVEY INFORMATION, AND TAKE NECESSARY PRECAUTIONS DURING DEMOLITION AND CONSTRUCTION. CONTRACTOR SHALL VERIFY EXISTING AND MARKED LOCATIONS OF ALL UTILITIES, INCLUDING SERVICE CONNECTIONS TO UNDERGROUND UTILITIES, PRIOR TO BEGINNING WORK. CONTRACTOR SHALL CONTACT THE OWNER AND ALL ASSOCIATED UTILITY COMPANIES AND AGENCIES TO IDENTIFY THE LOCATION OF UTILITIES. THERE IS NO GUARANTEE, EITHER EXPRESSED OR IMPLIED, THAT THE LOCATIONS, SIZE, AND TYPE OF MATERIAL OF EXISTING UNDERGROUND UTILITIES INDICATED ARE REPRESENTATIVE OF THOSE TO BE ENCOUNTERED DURING CONSTRUCTION.
4. CONTRACTOR SHALL NOTIFY TEXAS 811 48 HOURS BEFORE PROCEEDING WITH ANY EXCAVATION.
5. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE OWNER OF OPERATIONAL PLANS. IN THE EVENT AN UNEXPECTED UTILITY OR STRUCTURE INTERFERENCE OR CONFLICT IS ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER. ANY UTILITY SERVICES OR STRUCTURES DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED IMMEDIATELY AT CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE OWNER.
6. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING ITEMS NOT TO BE DAMAGED DURING DEMOLITION AND CONSTRUCTION. THE CONTRACTOR SHALL REPAIR OR REPLACE DAMAGED OR DISTURBED ITEMS TO THE SATISFACTION OF THE OWNER.

GENERAL NOTES:

1. COORDINATES SHOWN ARE SURFACE VALUES DISPLAYED IN U.S. SURVEY FEET, BASED ON THE NORTH AMERICAN DATUM OF 1983 (NA2011) EPOCH 2010.00 FROM THE TEXAS COORDINATE SYSTEM ESTABLISHED FOR THE SOUTH CENTRAL ZONE, WITH A SURFACE ADJUSSTMENT FACTOR OF 1.00017 APPLIED. ELEVATIONS SHOWN ARE BASED ON NAVD88 (GEOID 03).
2. CONTRACTOR SHALL RE-ESTABLISH ALL CONTROL POINTS DISTURBED AND/OR REMOVED DURING CONSTRUCTION. CONTROL POINTS SHALL BE IN APPROXIMATE LOCATION OF THE DISTURBED CONTROL POINT AND SET BY A REGISTERED LAND SURVEYOR IN THE STATE OF TEXAS. SUBMIT ALL COORDINATES AND ELEVATIONS TO OWNER. PERMANENT BENCHMARKS SHALL NOT BE DISTURBED BY CONTRACTORS. OPERATIONS NOTIFY OWNER IF PERMANENT BENCHMARK IS FOUND TO BE IN CONFLICT.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MEANS AND METHODS OF CONSTRUCTION UNLESS NOTED OTHERWISE. CONTRACTOR SHALL FURNISH ALL LABOR, EQUIPMENT, MATERIALS, AND TOOLS NECESSARY TO COMPLETELY PERFORM THE WORK IN SAFE, EXPEDITIOUS, AND WORKMAN LIKE MANNER. CONTRACTOR SHALL COORDINATE SCHEDULE OF THE WORK WITH OWNER. THE CONTRACTOR ACCEPTS FULL RESPONSIBILITY FOR PROPER HANDLING AND INSTALLATION OF MATERIALS.
4. CONTRACTOR SHALL UNDERTAKE ALL NECESSARY MEASURES TO ENSURE SAFETY OF ALL PERSONS AND STRUCTURES AT THE SITE AND ADJACENT TO THE SITE. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY CLAIMS RESULTING FROM CONTRACTOR OR SUBCONTRACTOR ACTIVITIES. VISITS TO THE SITE BY THE ENGINEER OR OWNER SHALL NOT RELIEVE THE CONTRACTOR OF SUCH RESPONSIBILITY.
5. THE CONTRACTOR SHALL ACCEPT FULL RESPONSIBILITY FOR MATERIALS THROUGH PROJECT COMPLETION. CONTRACTOR SHALL STORE MATERIALS IN A SECURE LOCATION (ON OR OFF-SITE).
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER SAFEGUARDING OF THE INSTALLATION AND MATERIALS STORED ON THE SITE TO PREVENT THEFT, VANDALISM OR DAMAGE.
7. CONTRACTOR SHALL NOT DISTURB ADJACENT PROPERTIES THAT ARE NOT THE PROPERTY WHERE THE PROJECT IS LOCATED UNLESS OTHERWISE SHOWN IN THESE PLANS AND ALL PERMISSION HAS BEEN GRANTED BY LAND OWNER AND GOVERNING AUTHORITY.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL CONSTRUCTION PERMITS REQUIRED TO PERFORM THE WORK. CONTRACTOR SHALL PROVIDE CERTIFICATES OF INSURANCE AND OTHER DOCUMENTATION REQUIRED BEFORE PERFORMING THE WORK.
9. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH OSHA
10. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
11. THESE NOTES AND OTHER DRAWING NOTES CONTAINED HEREWITH ARE PROVIDED TO MEET SPECIFIC REQUIREMENTS AND TO SUPPLEMENT THE CONTRACT DOCUMENTS. THESE NOTES NEITHER REPLACE NOR OVERRIDE THE PROVISIONS AND REQUIREMENTS OF THE CONTRACT DOCUMENTS.
12. UNKNOWN SITUATIONS OR CONDITIONS NOT COVERED IN THE CONTRACT DOCUMENTS MAY ARISE DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE OWNER IF SUCH A CONDITION IS IDENTIFIED.
13. ALL DIMENSIONS, ELEVATIONS, AND CONDITIONS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR AND ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER FOR CLARIFICATION BEFORE PROCEEDING WITH THE AFFECTED PART OF WORK.
14. THE CONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF/HERSELF WITH THE EXISTING CONDITIONS BEFORE SUBMITTING HIS/HER BID.
15. IF CERTAIN FEATURES ARE NOT FULLY SHOWN OR CALLED FOR ON THE CONTRACT DRAWINGS OR SPECIFICATIONS, THEIR CONSTRUCTION SHALL BE OF THE SAME CHARACTER AS FOR SIMILAR CONDITIONS THAT ARE SHOWN OR CALLED FOR, SUBJECT TO THE APPROVAL OF THE ENGINEER AND THE OWNER.
16. ALL WORK SHALL BE DONE TO THE LINES, SLOPES, THICKNESS, AND GRADES INDICATED IN THE CONTRACT DRAWINGS. MAXIMUM SLOPE SHALL BE 3H:1V UNLESS INDICATED OTHERWISE. ALL ESTABLISHED MONUMENTS, BENCHMARKS, REFERENCE POINTS, STAKES, AND OTHER CENTRAL POINTS SHALL BE CAREFULLY PRESERVED BY THE CONTRACTOR. CONTRACTOR SHALL NOTIFY OWNER IN WRITING OF BENCHMARKS, REFERENCE LINES, OR OTHER CONTROL POINTS WHICH MAY HAVE BEEN DISTURBED OR WHICH APPEAR TO BE OFF LINE OR GRADE.
17. ONCE THE WORK HAS BEEN STARTED, THE CONTRACTOR SHALL COMPLETE THE WORK WITHOUT ANY INTERRUPTIONS.
18. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING POTABLE WATER AND TEMPORARY SANITARY FACILITIES FOR CONTRACTOR'S PERSONNEL. CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR INSTALLING AND REMOVING ANY REQUIRED TEMPORARY UTILITY CONNECTIONS.
19. GRADES AND ELEVATIONS SHOWN ARE FINISHED SURFACING UNLESS OTHERWISE INDICATED.
20. INSTALL EROSION CONTROL MEASURES PER THE SWPPP AND AS NECESSARY TO PERFORM WORK IN ACCORDANCE WITH ALL APPLICABLE LAND DISTURBANCE ORDINANCES AND REGULATIONS.
21. CONTRACTOR IS RESPONSIBLE FOR MANAGING STORMWATER FOR THE PROJECT SITE. NO STORMWATER SHALL BE PONDED ON-SITE DURING OR AFTER CONSTRUCTION WITH EXCEPTION OF THE EXISTING LARGE BODY OF WATER.

VOLTAGE (NOMINAL, kV, ALTERNATING CURRENT)	MINIMUM CLEARANCE DISTANCE (FEET)
UP TO 50	15
OVER 50 TO 200	20
OVER 200 TO 350	25
OVER 350 TO 500	30
OVER 500 TO 750	40
OVER 750 TO 1,000	50
OVER 1,000	(AS ESTABLISHED BY THE UTILITY OWNER/OPERATOR OR REGISTERED PROFESSIONAL ENGINEER WHO IS A QUALIFIED PERSON WITH RESPECT TO ELECTRICAL POWER TRANSMISSION AND DISTRIBUTION).

NOTE: THE VALUE THAT FOLLOWS "TO" IS UP TO AND INCLUDES THAT VALUE. FOR EXAMPLE, OVER 50 TO 200 MEANS UP TO AND INCLUDING 200kV.

JOSEPH A. CHITTET
128620
03/02/2021

PRELIMINARY - NOT FOR CONSTRUCTION

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description	no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE					
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE					
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW					
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW					

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed: M. BLEYTHING
detailed: S. NICHOLS

cps ENERGY

J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
LEGEND, ABBREVIATIONS,
VICINITY MAP & GENERAL NOTES

project: 116817
contract:
drawing: CG001
rev.: — D
sheet of sheets
file116817CG001.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CG001.dgn

2/12/2021 $USERNAME$TIME$

FIGURE 1

FIGURE 2

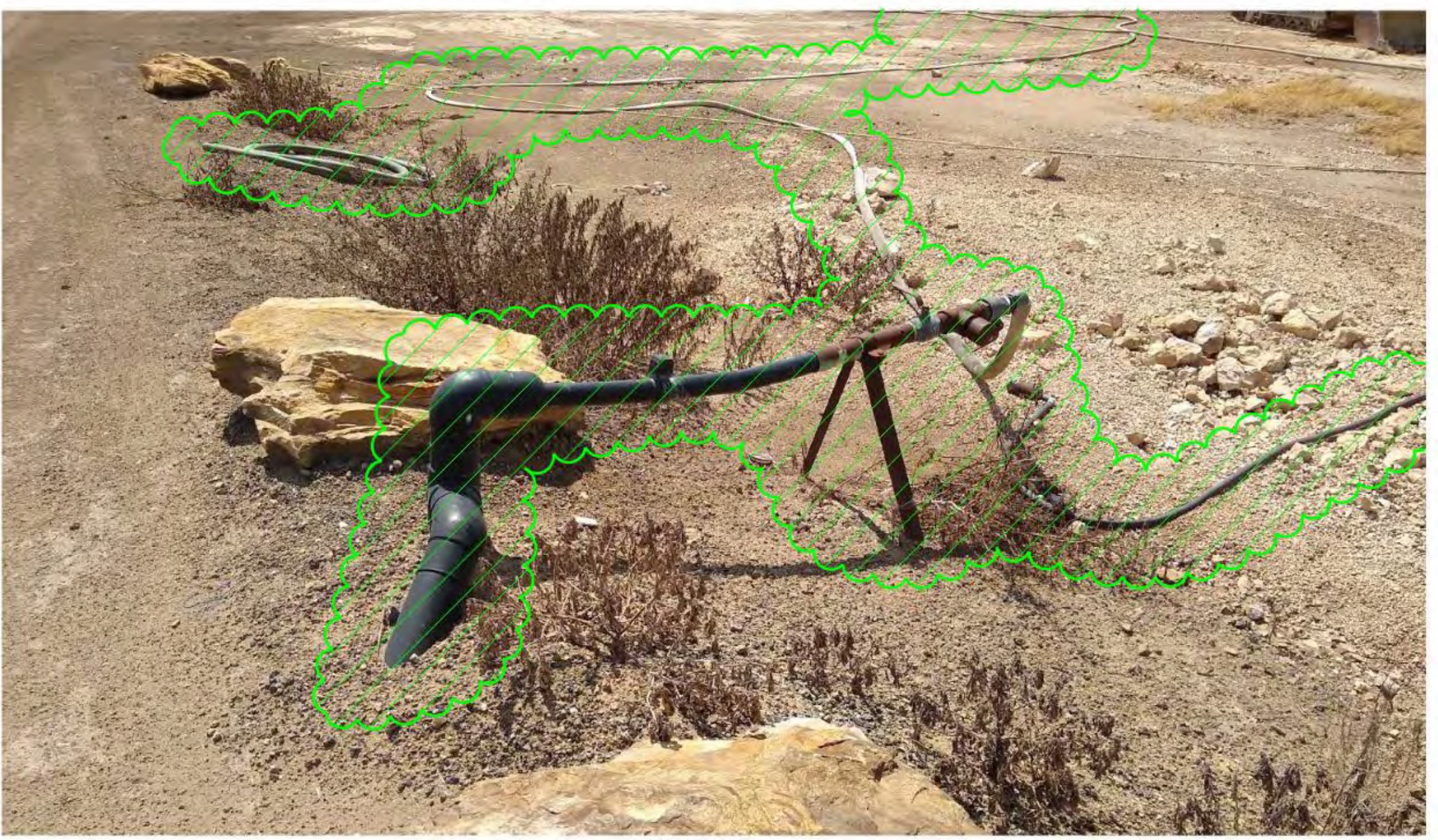


FIGURE 3

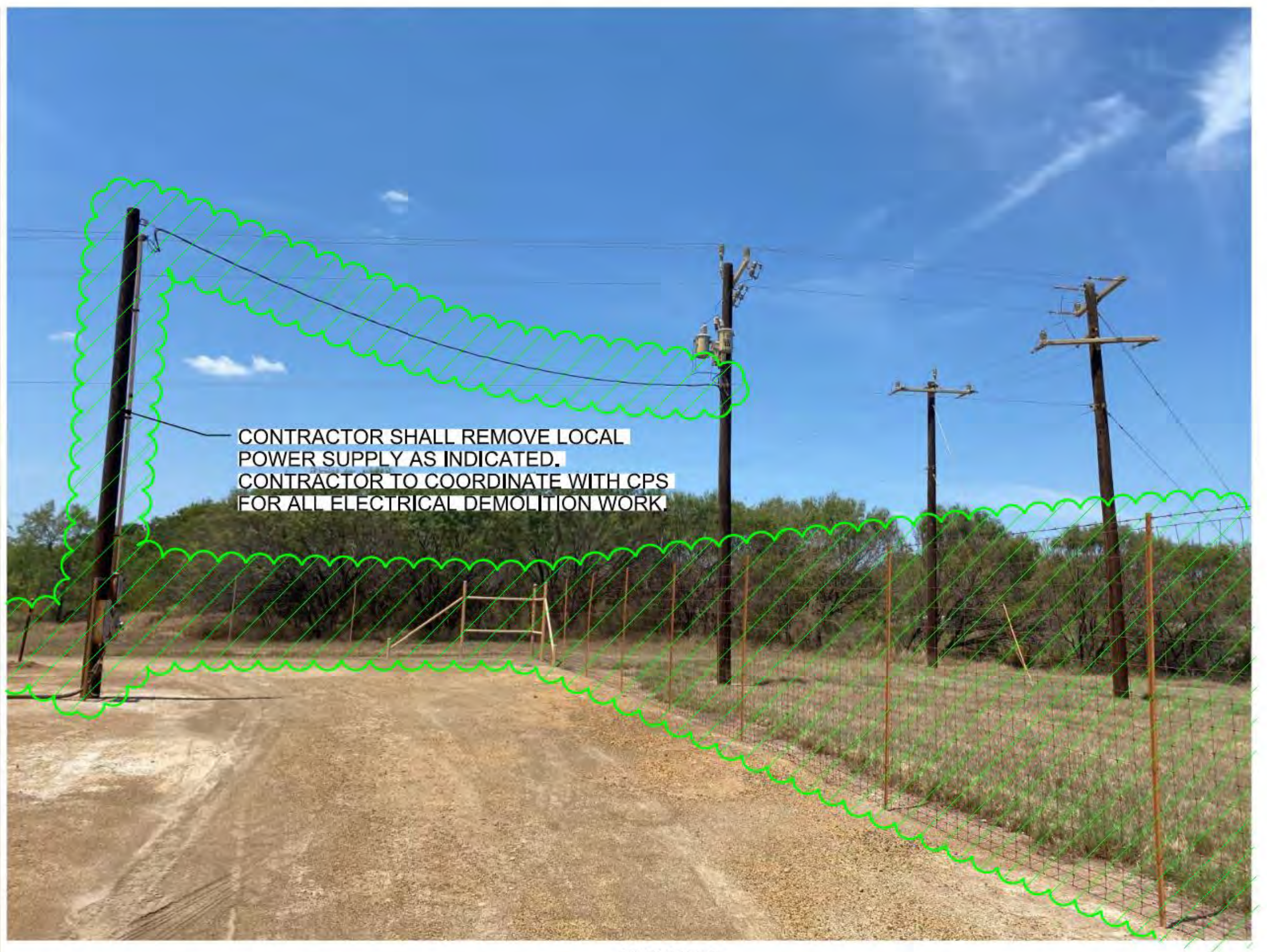


FIGURE 4

FIGURE 5

NOTES:

1. ALL MATERIAL REMOVED FOR DEMOLITION WILL BE DISPOSED OF AT CONTRACTORS EXPENSE.
2. SEE EXISTING DRAWING D/S - 1547 FOR APPROXIMATE WATERLINE LOCATIONS.
3. SEE DEMOLITION SPECIFICATION FOR FURTHER INFORMATION.

NORTH

0 40' 80'
SCALE IN FEET

PRELIMINARY - NOT FOR CONSTRUCTION

STATE OF TEXAS
JOSEPH A. CHITTET
128620
LICENSED PROFESSIONAL ENGINEER
03/02/2021

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description	no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE					
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE					
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW					
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW					

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed M. BLEYTHING
detailed S. NICHOLS

cps ENERGY™
J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
DEMOLITION PLAN

project 116817
contract
drawing **CD000** — rev. **D**
sheet of sheets
file116817CD000.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CD000.dgn

2/12/2021 $USERNAME$TIME$

NOTES:

1. CONTRACTOR TO USE THE PROPOSED HAUL ROUTE FOR HAUL OF BOTTOM ASH MATERIAL FROM BOTTOM ASH PONDS TO EVAPORATION POND.
2. CONTRACTOR TO UPGRADE ROAD AS NEEDED FOR CONSTRUCTION ACTIVITY.
3. ROAD SHALL BE IN EQUAL OR BETTER CONDITION, AT THE COMPLETION OF CONSTRUCTION. CONTRACTOR TO DOCUMENT CONDITION OF ROAD PRIOR TO CONSTRUCTION.
4. CONTRACTOR WILL BE RESPONSIBLE FOR DUST CONTROL AND ROAD MAINTENANCE DURING CONSTRUCTION.

NORTH

0 300' 600'
SCALE IN FEET

PRELIMINARY - NOT FOR CONSTRUCTION

JOSEPH A. CHITTET
128620

03/02/2021

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description
C	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE
B	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE
A	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW

no.	date	by	ckd	description

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed M. BLEYTHING
detailed S. NICHOLS

cps ENERGY™

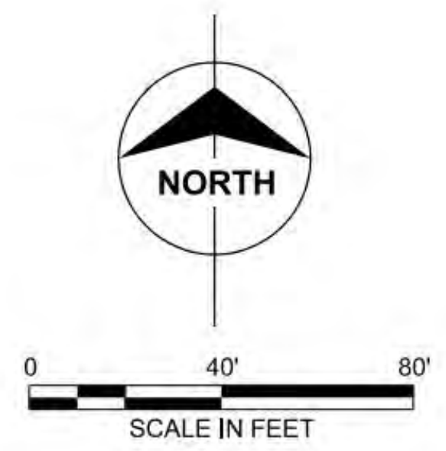
J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
HAUL ROUTE PLAN

project 116817
contract
drawing **CS000** — rev. **C**
sheet of sheets
file 116817CS000.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CS000.dgn

2/12/2021 $USERNAME$TIME$



JOSEPH A. CHITTET
128620
03/02/2021

PRELIMINARY - NOT FOR CONSTRUCTION

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW

no.	date	by	ckd	description

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed M. BLEYTHING
detailed S. NICHOLS

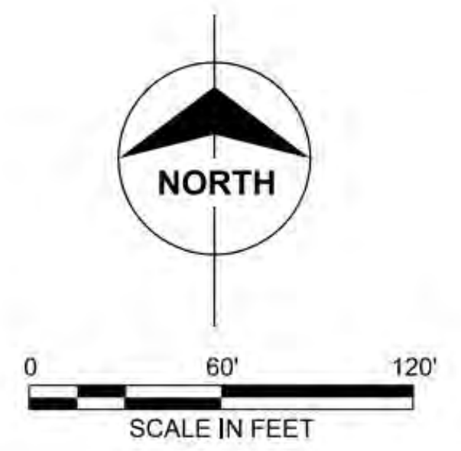
J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
SITE PLAN

project 116817
contract
drawing **CG002** — rev. **D**
sheet of sheets
file116817CG002.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CG002.dgn

2/12/2021 sknichols 11:02:49 AM



JOSEPH A. CHITTET
128620
03/02/2021

PRELIMINARY - NOT FOR CONSTRUCTION

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW

no.	date	by	ckd	description

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed M. BLEYTHING
detailed S. NICHOLS

J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
KEY PLAN

project 116817
contract ______
drawing **CG003** — rev. **D**
sheet of sheets
file116817CG003.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CG003.dgn

2/12/2021 sknichols 10:54:59 AM

AFTER COMPLETION OF EVAP POND USAGE, PRIOR TO MOBILIZATION CONTRACTOR WILL PERFORM TEST PITS TO VERIFY MOISTURE AND STABILIZATION OF MATERIAL IN UPPER SIX FEET. IT IS EXPECTED THAT NEARLY ALL FREE WATER WILL BE EVAPORATED OUT OF THE POND. CONTRACTOR TO FINALIZE DEWATERING PLAN AFTER TEST PITS.

NOTES:

1. SEE EXISTING DRAWING D/S - 1547 FOR APPROXIMATE WATERLINE LOCATIONS.
2. SEE EXISTING DRAWING D/S - 1554 FOR POND CONSTRUCTION DRAWINGS.
3. EVAPORATOR POND SIDE AND BOTTOM LINER CONSIST OF A ONE-FOOT LAYER OF COHESIVE SOIL OVERLYING A 30-MIL POLYVINYL CHLORIDE GEOMEMBRANE AND AN ADDITIONAL ONE-FOOT OF COHESIVE SOIL.

NORTH

0 40' 80'
SCALE IN FEET

PRELIMINARY - NOT FOR CONSTRUCTION

JOSEPH A. CHITTET
128620

03/02/2021

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description	no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE					
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE					
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW					
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW					

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed: M. BLEYTHING
detailed: S. NICHOLS

CPS ENERGY

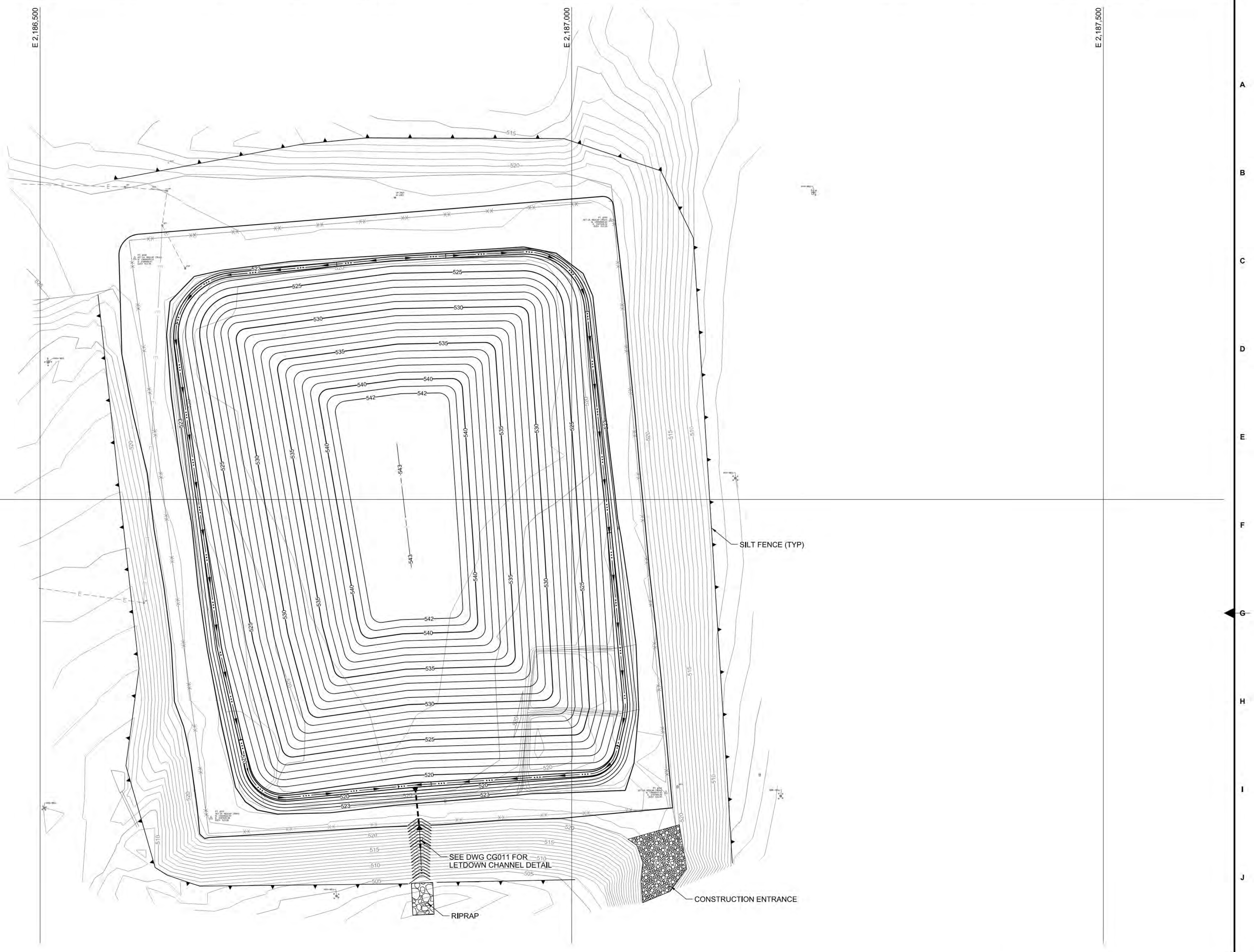
J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
EXISTING CONDITIONS

project: 116817
contract: ----------
drawing: **CG004** — rev. **D**
sheet of sheets
file116817CG004.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CG004.dgn

2/12/2021 sknichols 10:57:19 AM

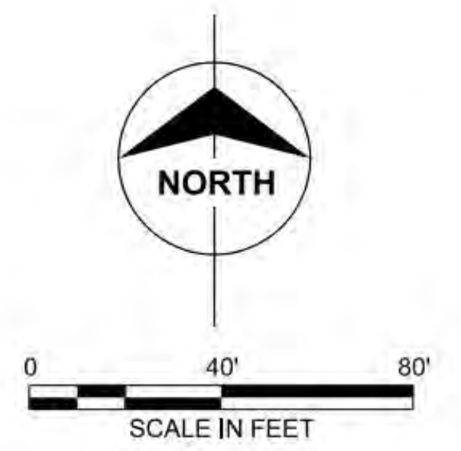


STORMWATER NOTES:

1. STORMWATER THAT HAS BEEN IN CONTACT WITH CCR SHALL NOT BE ALLOWED TO DISCHARGE OFFSITE.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR DEWATERING DURING CONSTRUCTION. WATER TO DISCHARGE FROM THE EXISTING CULVERT ON THE EAST LEVEE SHALL ADHERE TO PLANT NPDES DISCHARGE REQUIREMENTS.

EROSION AND SEDIMENT CONTROL NOTES:

1. ALL SEDIMENT AND EROSION CONTROL ITEMS SHALL BE COORDINATED AS THE PHASES OF THE PROJECT PROGRESSES.
2. CONSTRUCTION ACTIVITY POLLUTION PREVENTION IS REQUIRED FOR THIS PROJECT. PREVENTION OF POLLUTION RESULTING FROM CONSTRUCTION ACTIVITIES SHALL BE ACCOMPLISHED BY CONTROLLING SOIL EROSION, WATERWAY SEDIMENTATION, AND AIRBORNE DUST GENERATION. CONTRACTOR SHALL ENSURE THAT NO SEDIMENT RESULTING FROM CONSTRUCTION ACTIVITIES INFRINGES ONTO ADJACENT PROPERTIES. CONTRACTOR SHALL COORDINATE EROSION AND SEDIMENT CONTROL MEASURES WITH OTHER CONSTRUCTION ENTITIES PERFORMING WORK ON ADJACENT PROPERTIES.
3. THE CONTRACTOR SHALL CONTROL EROSION AND SEDIMENTATION TO THE EXTENT PRACTICABLE. ALL APPLICABLE SOIL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED AND MAINTAINED THROUGHOUT THE DURATION OF CONSTRUCTION ACTIVITIES. PRIOR TO INITIATING CONSTRUCTION IN AN AREA, ALL APPLICABLE TEMPORARY EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE IN PLACE. UPON PROJECT COMPLETION ALL TEMPORARY SOIL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED AFTER FINAL SURFACING HAS BEEN ESTABLISHED.
4. THE CONTRACTOR SHALL UTILIZE APPROPRIATE BEST MANAGEMENT PRACTICES (BMPs). THOSE BMPs SHALL CONSIST OF ROCK CHECK DAMS, FIBER LOGS, STRAW WATTLES, SILT FENCE OR OTHER MEANS TO CONTROL EROSION AS NEEDED. THE CONTRACTOR SHALL PROVIDE AND FOLLOW THE EROSION AND STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PLANS AS NEEDED.
5. CONTRACTOR SHALL PLACE BMPS AS SHOWN PRIOR TO BEGINNING WORK. THE DEVICES SHALL BE PLACED DOWN-SLOPE OF DISTURBED AREAS WHERE SHEET EROSION WOULD OCCUR. SILT SHALL BE REMOVED AS REQUIRED. AFTER SIGNIFICANT RUNOFF EVENTS, THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL STRUCTURES FOR SILT BUILD-UP THAT INTERFERES WITH THE PERFORMANCE OF THE EROSION CONTROL STRUCTURE AND REPAIR OR REPLACE THOSE STRUCTURES, AS NECESSARY.
6. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL ITEMS AS NECESSARY TO CONTROL AND COLLECT SEDIMENT. PER THE REQUIREMENTS OF THE STORMWATER POLLUTION PREVENTION PLAN SEE THE IOWA CONSTRUCTION SITE EROSION CONTROL MANUAL FOR ADDITIONAL EROSION CONTROL TECHNIQUES AND REQUIREMENTS.
7. LOCATIONS OF SILT FENCE AS SHOWN ON THE DRAWINGS ARE THE MINIMUM REQUIREMENTS. CONTRACTOR SHALL RELOCATE THEM OR ADD ADDITIONAL EROSION CONTROL FACILITIES AS REQUIRED TO MEET THE EROSION AND SEDIMENT CONTROL REQUIREMENTS INCLUDING THE NPDES GENERAL STORMWATER PERMIT FOR CONSTRUCTION ACTIVITIES.
8. ALL EROSION CONTROL FEATURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN (7) DAYS AND AFTER EVERY 1/2-INCH OR GREATER RAINFALL EVENT AS REQUIRED BY THE CURRENT NPDES PERMIT FOR THE PROJECT.



JOSEPH A. CHITTET
128620
03/02/2021

PRELIMINARY - NOT FOR CONSTRUCTION

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description	no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE					
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE					
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW					
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW					

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed M. BLEYTHING
detailed S. NICHOLS

J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
EROSION CONTROL PLAN

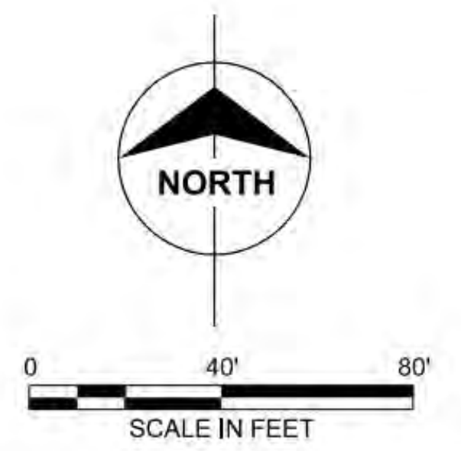
project 116817
contract ______
drawing **CG006**
rev. — **D**
sheet of sheets
file116817CG006.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CG006.dgn

2/12/2021 sknichols 11:00:24 AM

LEGEND

⋇	6" TOPSOIL AND SEED
▨	RIPRAP
▩	8" CRUSHED ROCK
▬	FLEXAMAT LINED CHANNEL



PRELIMINARY - NOT FOR CONSTRUCTION

STATE OF TEXAS
JOSEPH A. CHITTET
128620
LICENSED
PROFESSIONAL ENGINEER
03/02/2021

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description	no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE					
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE					
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW					
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW					

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed
M. BLEYTHING

detailed
S. NICHOLS

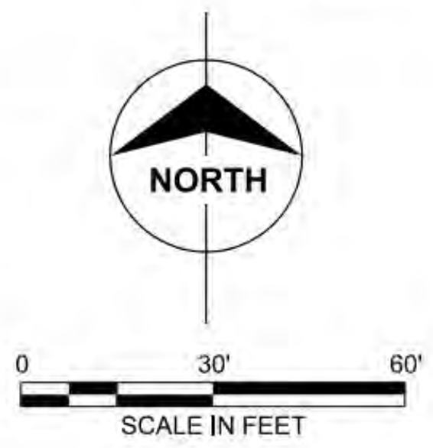
J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
SURFACING PLAN

project 116817
contract ______
drawing CP000 — rev. D
sheet of sheets
file 116817CP000.DGN

2/12/2021 sknichols 10:58:27 AM

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CP000.dgn



JOSEPH A. CHITTET
128620
03/02/2021

PRELIMINARY - NOT FOR CONSTRUCTION

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW

no.	date	by	ckd	description

BURNS
McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed: M. BLEYTHING
detailed: S. NICHOLS

CPS ENERGY
J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
SITE FINISHING GRADING PLAN
SHEET 1

project: 116817
contract: ______
drawing: **CG007**
rev.: — **D**
sheet of sheets
file116817CG007.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CG007.dgn

2/12/2021 sknichols 11:05:59 AM

NORTH

0 30' 60'
SCALE IN FEET

PRELIMINARY - NOT FOR CONSTRUCTION

STATE OF TEXAS
JOSEPH A. CHITTET
128620
LICENSED PROFESSIONAL ENGINEER
03/02/2021

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description	no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE					
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE					
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW					
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW					

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

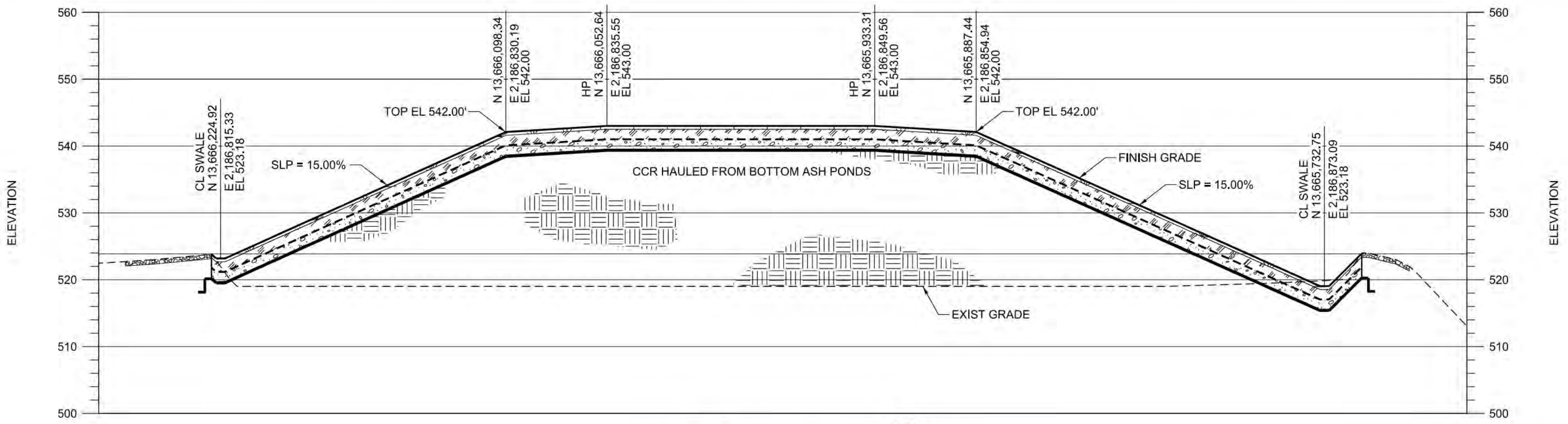
designed: M. BLEYTHING
detailed: S. NICHOLS

CPS ENERGY

J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
SITE FINISHING GRADING PLAN
SHEET 2

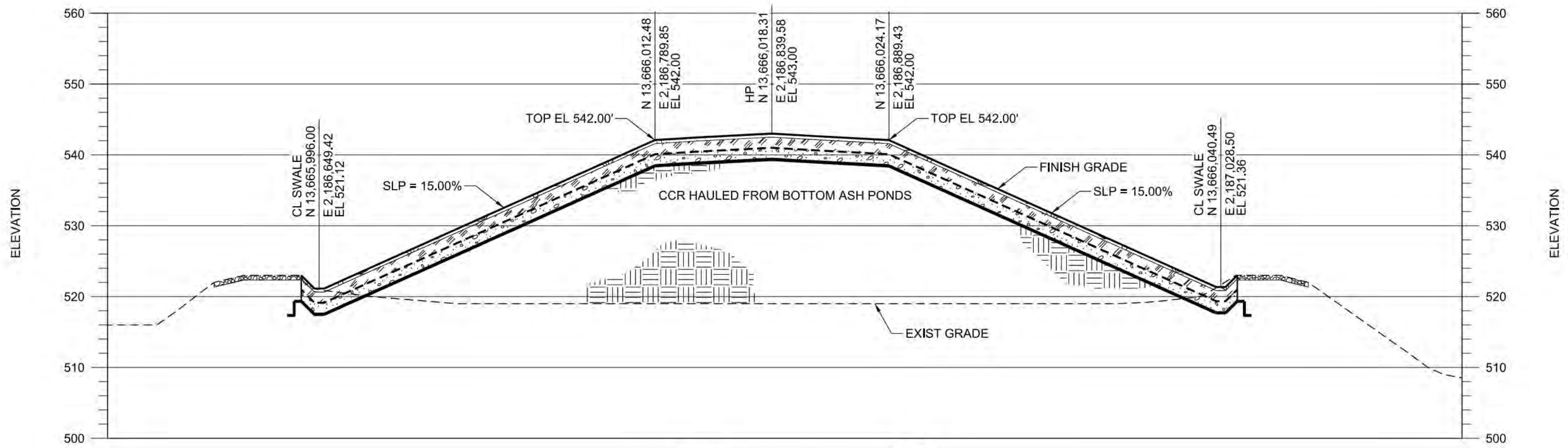
project: 116817
contract: ____
drawing: CG008
rev.: D
sheet — of — sheets
file116817CG008.DGN



SECTION A CG007 CG008

HORIZ: 0 30' 60' SCALE IN FEET

VERT: 0 10' 20' SCALE IN FEET



SECTION B CG007

HORIZ: 0 30' 60' SCALE IN FEET

VERT: 0 10' 20' SCALE IN FEET

STATE OF TEXAS
JOSEPH A. CHITTET
128620
LICENSED
PROFESSIONAL ENGINEER
03/02/2021

PRELIMINARY - NOT FOR CONSTRUCTION

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed M. BLEYTHING
detailed S. NICHOLS

CPS ENERGY

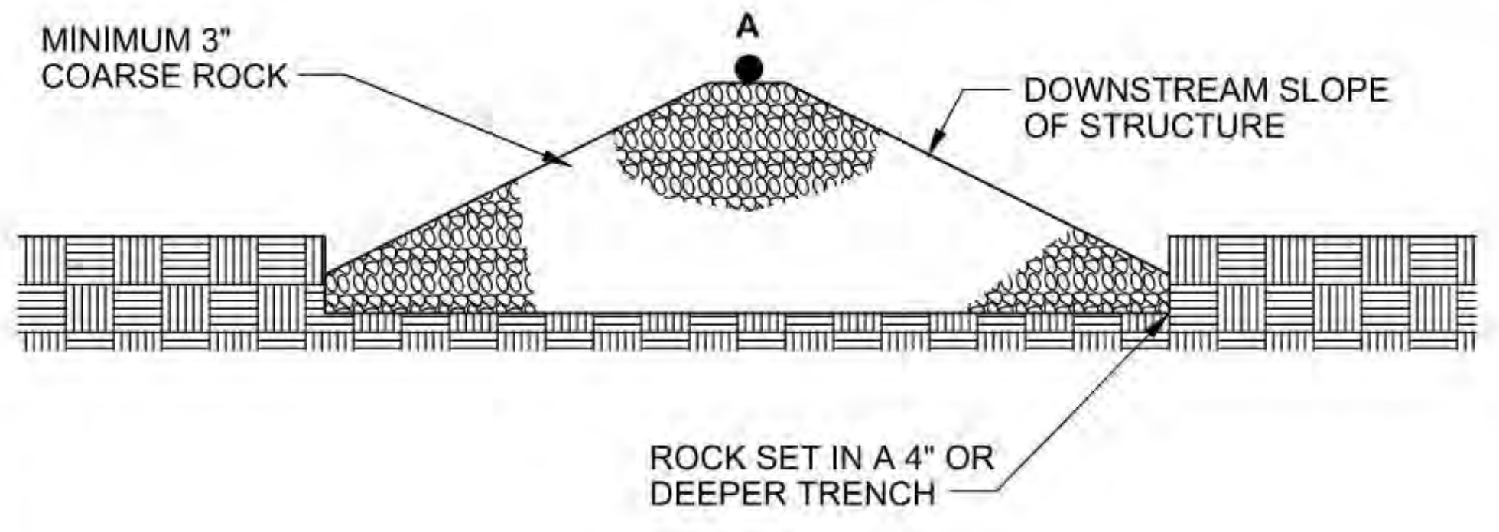
J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
GRADING SECTIONS

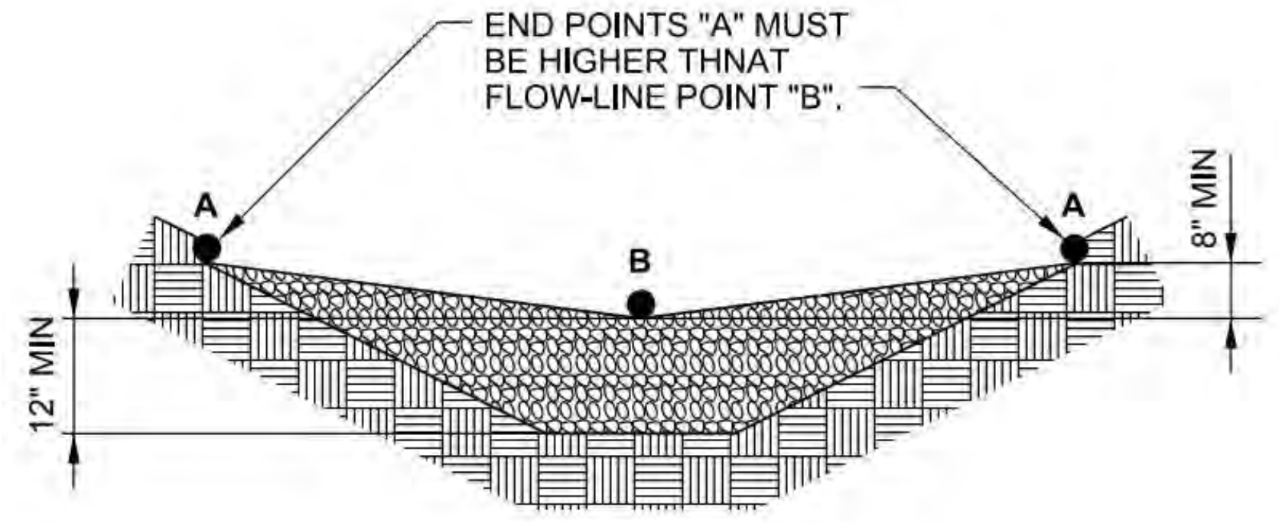
project 116817
contract
drawing **CG009** — rev. **D**
sheet of sheets
file116817CG009.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CG009.dgn

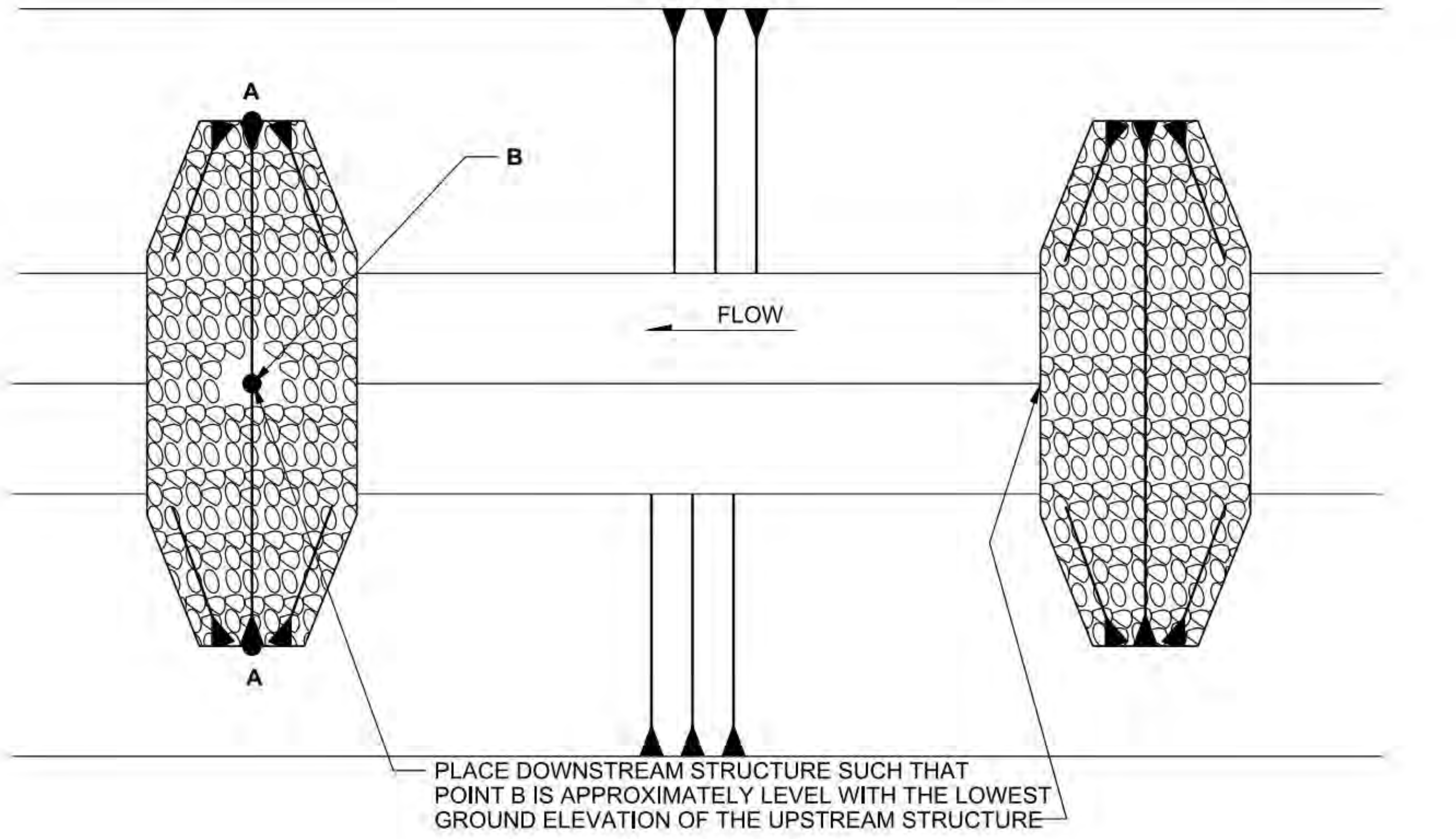
2/12/2021 sknichols 11:04:04 AM



SIDE VIEW
NOT TO SCALE

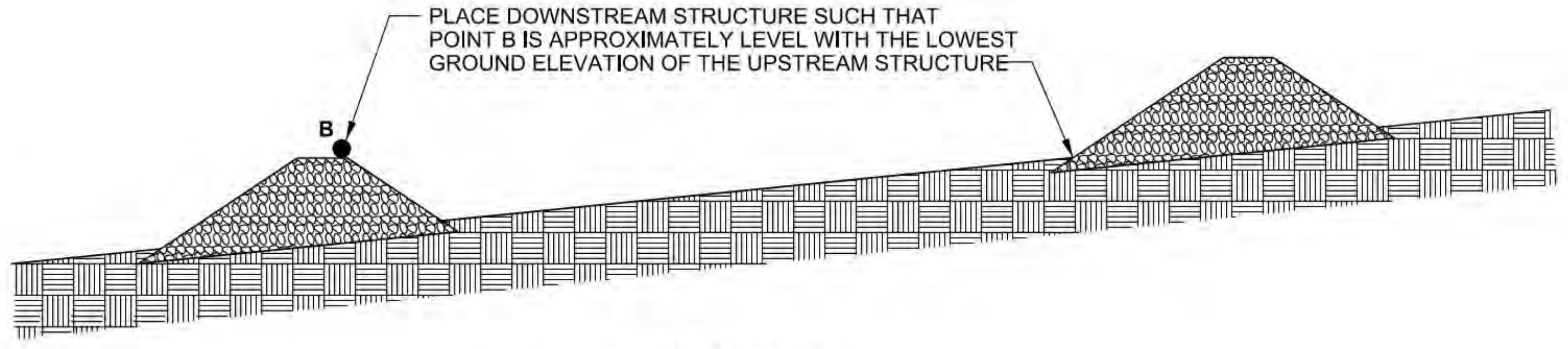


FRONT VIEW
NOT TO SCALE



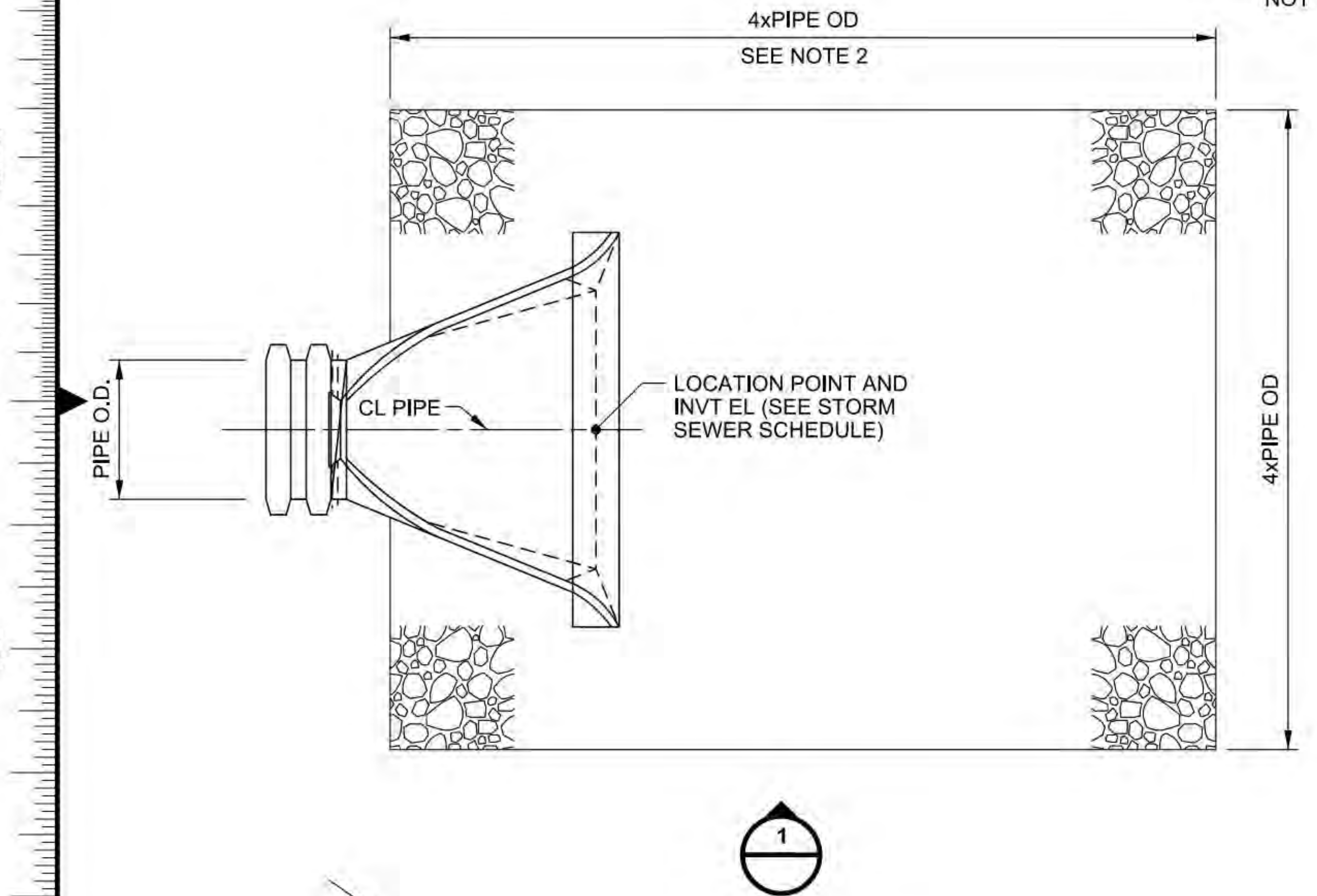
PLAN VIEW
NOT TO SCALE

D50 OF ROCK (MM)	SUGGESTED ROCK DIAMETER AND FLOW DEPTHS DOWNSTREAM FACE OF STRUCTURE					
	35%	30%	25%	20%	15%	10%
	MAXIMUM FLOW DEPTH ON ROCK (MM)					
75	150	180	200	250	330	500
150	300	360	400	500	660	1000

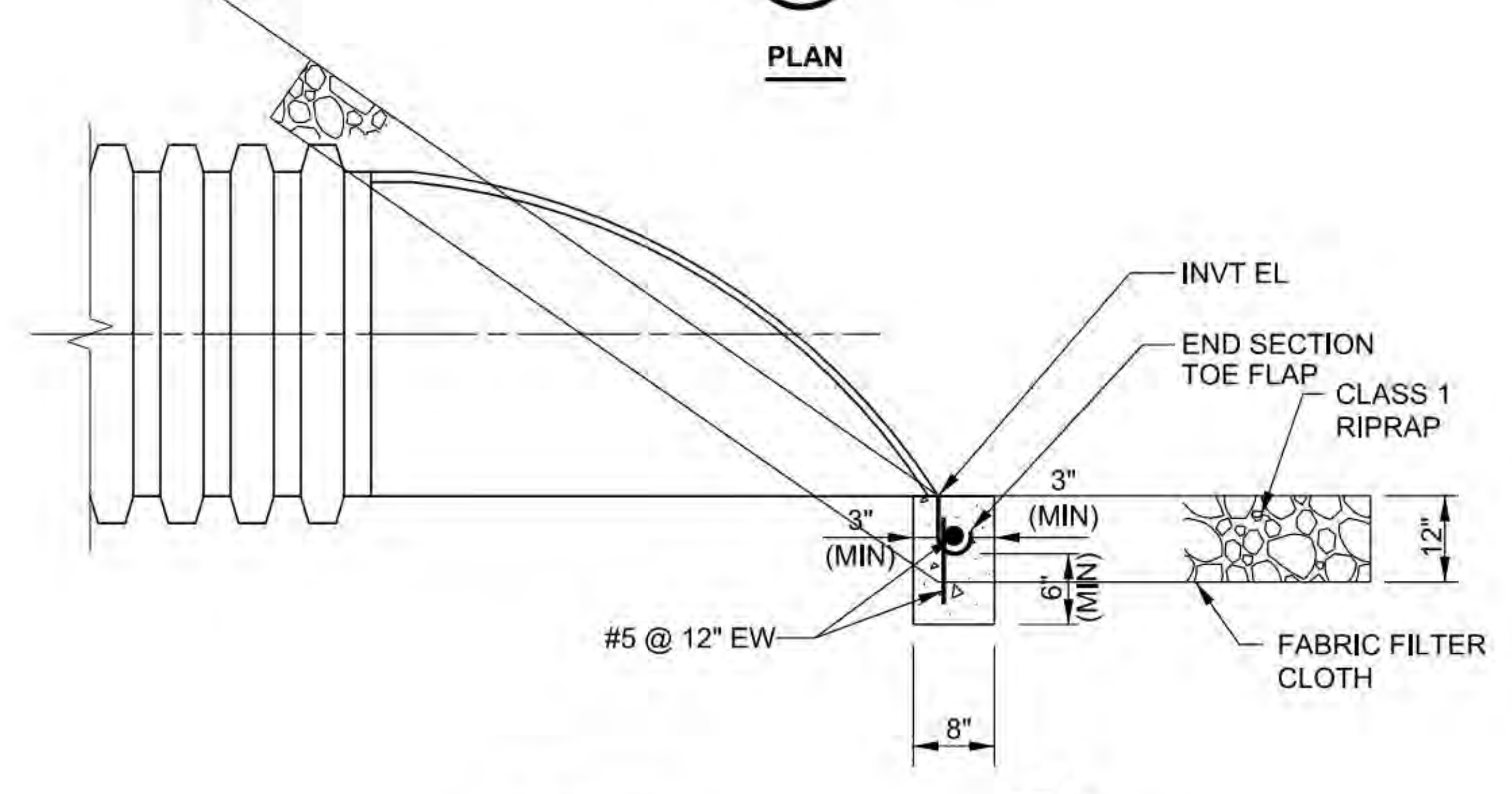


FLOWLINE PROFILE
NOT TO SCALE

ROCK CHECK DAM IN DITCH
NOT TO SCALE



PLAN

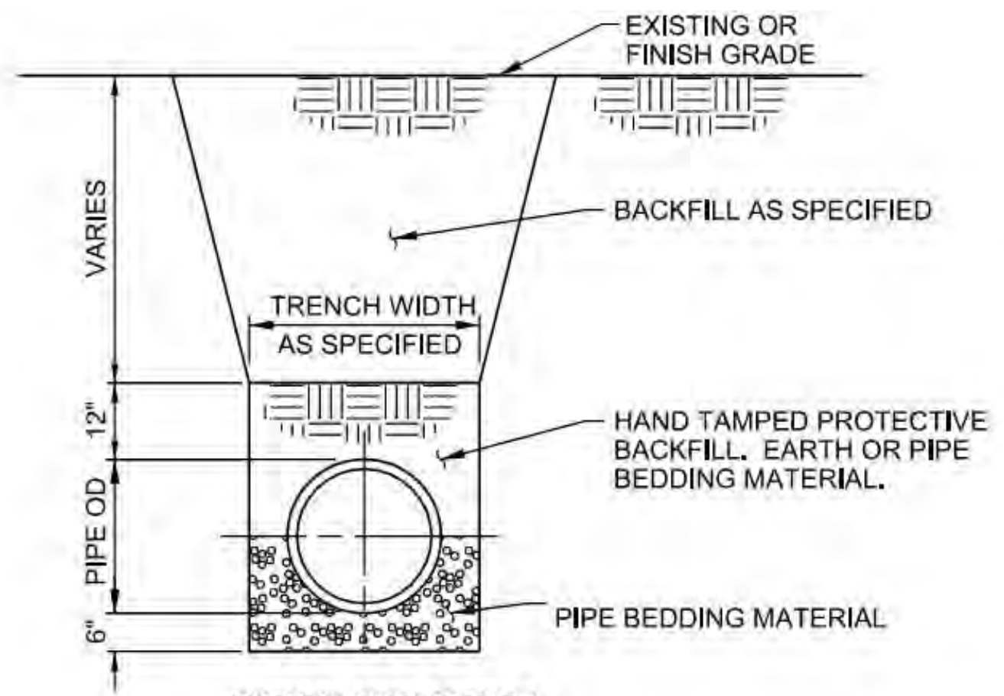


ELEVATION 1

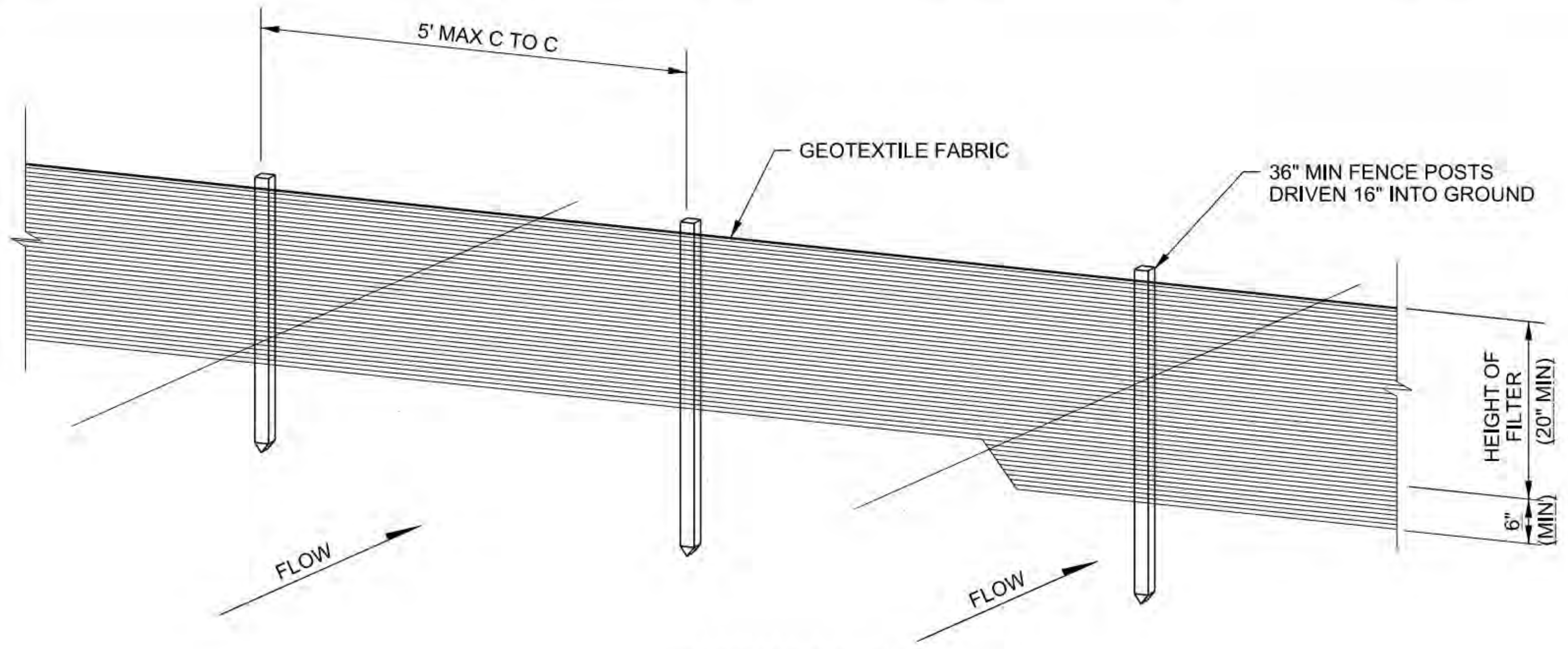
NOTES: (RIPRAPPED CHDPE END SECTION)

1. VERTICAL REBAR SHALL EXTEND THROUGH END SECTION TOE FLAP.
2. PLACE RIPRAP AT ALL END SECTIONS UNLESS LOCATED IN A CONCRETE LINED DITCH.

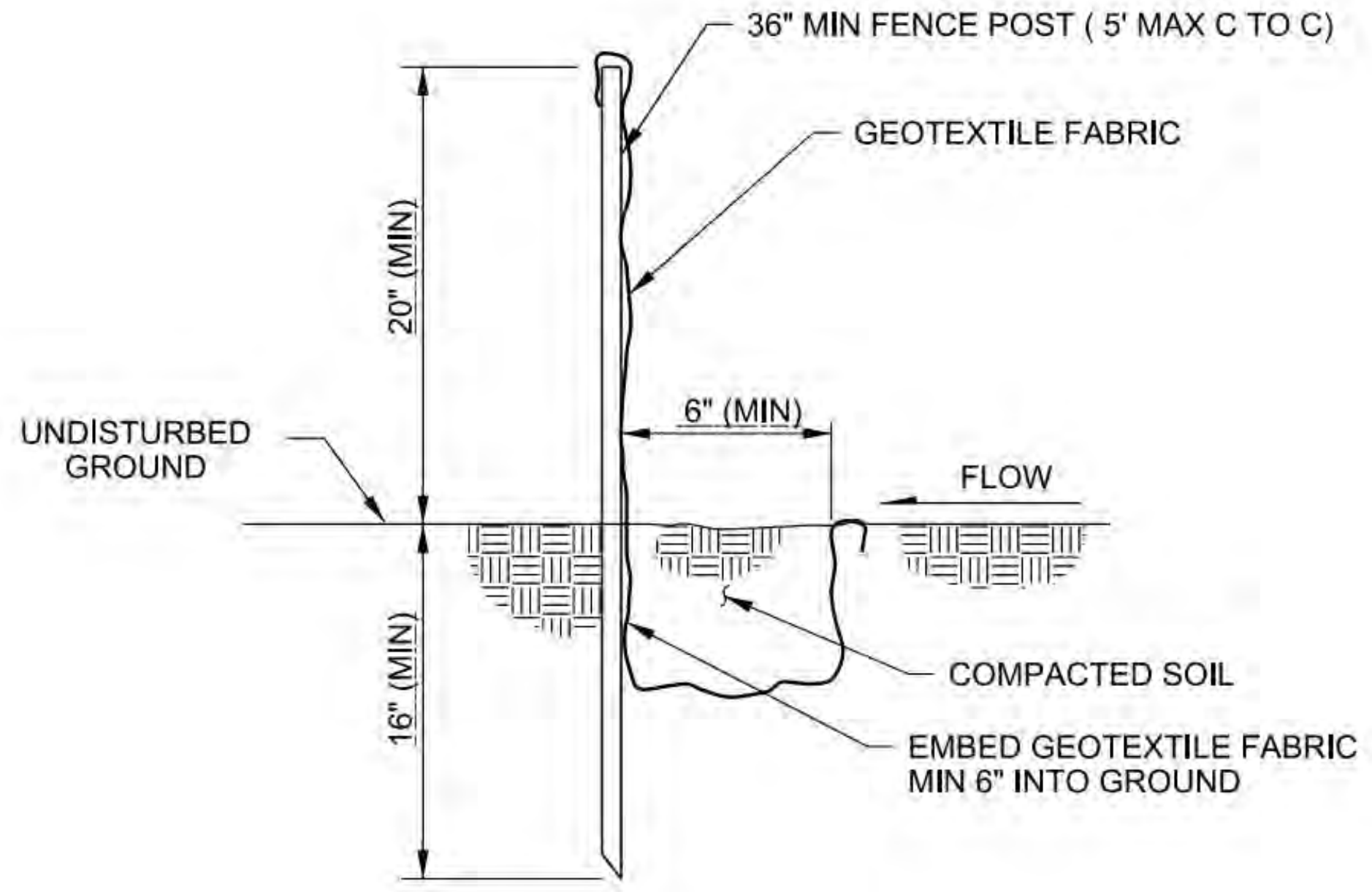
RIPRAPPED CHDPE END SECTION
NOT TO SCALE



TYPICAL PIPE TRENCH
NOT TO SCALE



PERSPECTIVE VIEW

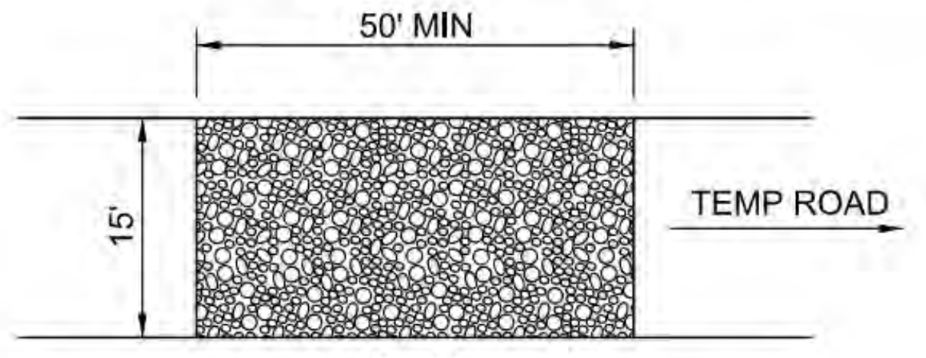


SILT FENCE TRENCH INSTALLATION DETAIL
NOT TO SCALE

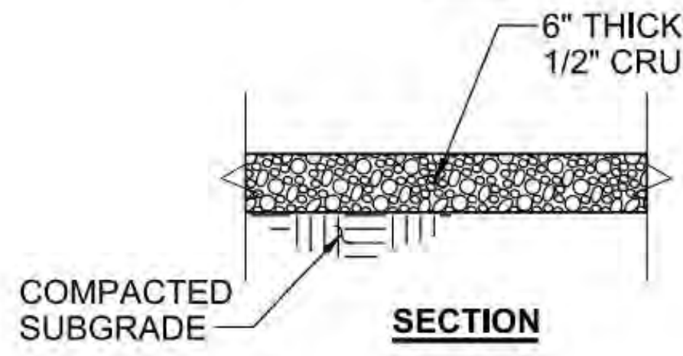
CONSTRUCTION NOTES FOR FABRICATED SILT FENCE

1. GEOTEXTILE FABRIC TO BE FASTENED SECURELY TO TO FENCE POSTS WITH STAPLES.
2. WHEN TWO SECTIONS OF GEOTEXTILE FABRIC ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED.
3. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

POSTS:	STEEL EITHER "T" OR "U" TYPE OR 2" HARDWOOD.
GEOTEXTILE FABRIC:	FILTER X, MIRAFI 100X, STABILINKA T140N OR APPROVED EQUAL.
PREFABRICATED UNIT:	________ OR APPROVED EQUAL



PLAN



SECTION

STABILIZED CONSTRUCTION ENTRANCE
NOT TO SCALE

CONSTRUCTION SPECIFICATIONS
(STABILIZED CONSTRUCTION ENTRANCE)

1. STONE SIZE - USE 2" STONE, RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIZE (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY -FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. FILTER CLOTH - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

JOSEPH A. CHITTET
128620
03/02/2021

PRELIMINARY - NOT FOR CONSTRUCTION

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW

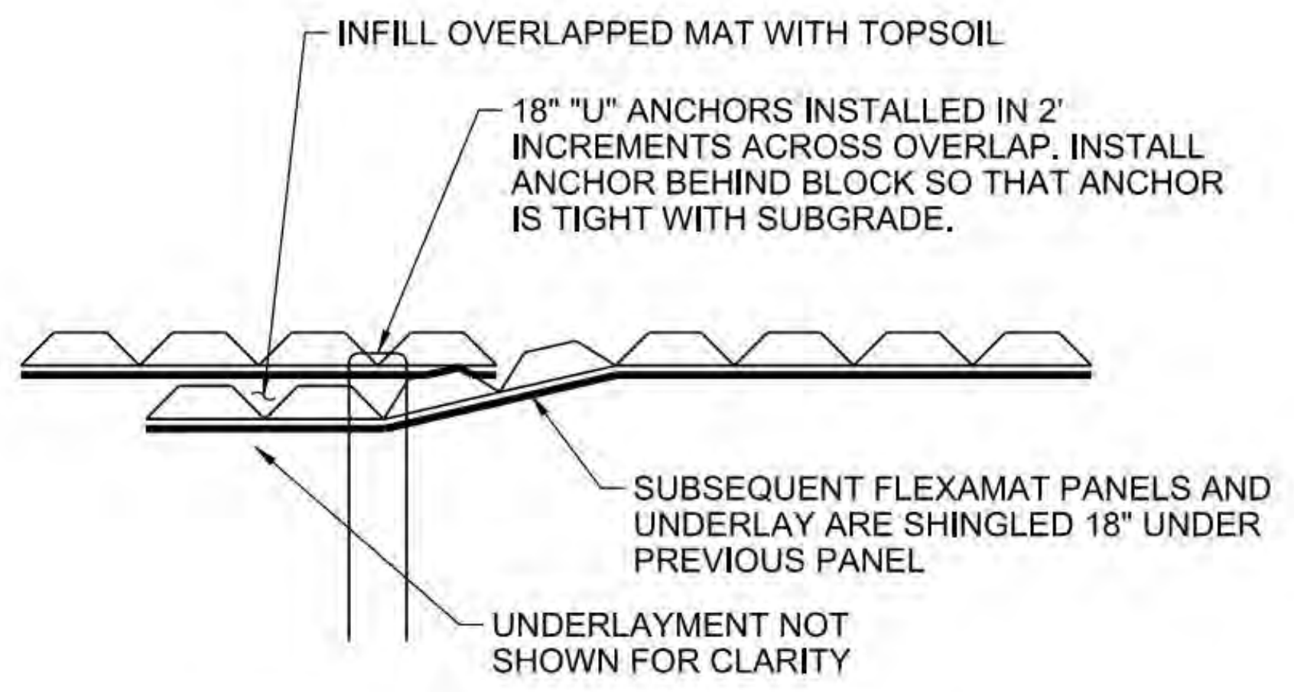
BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed: M. BLEYTHING
detailed: S. NICHOLS

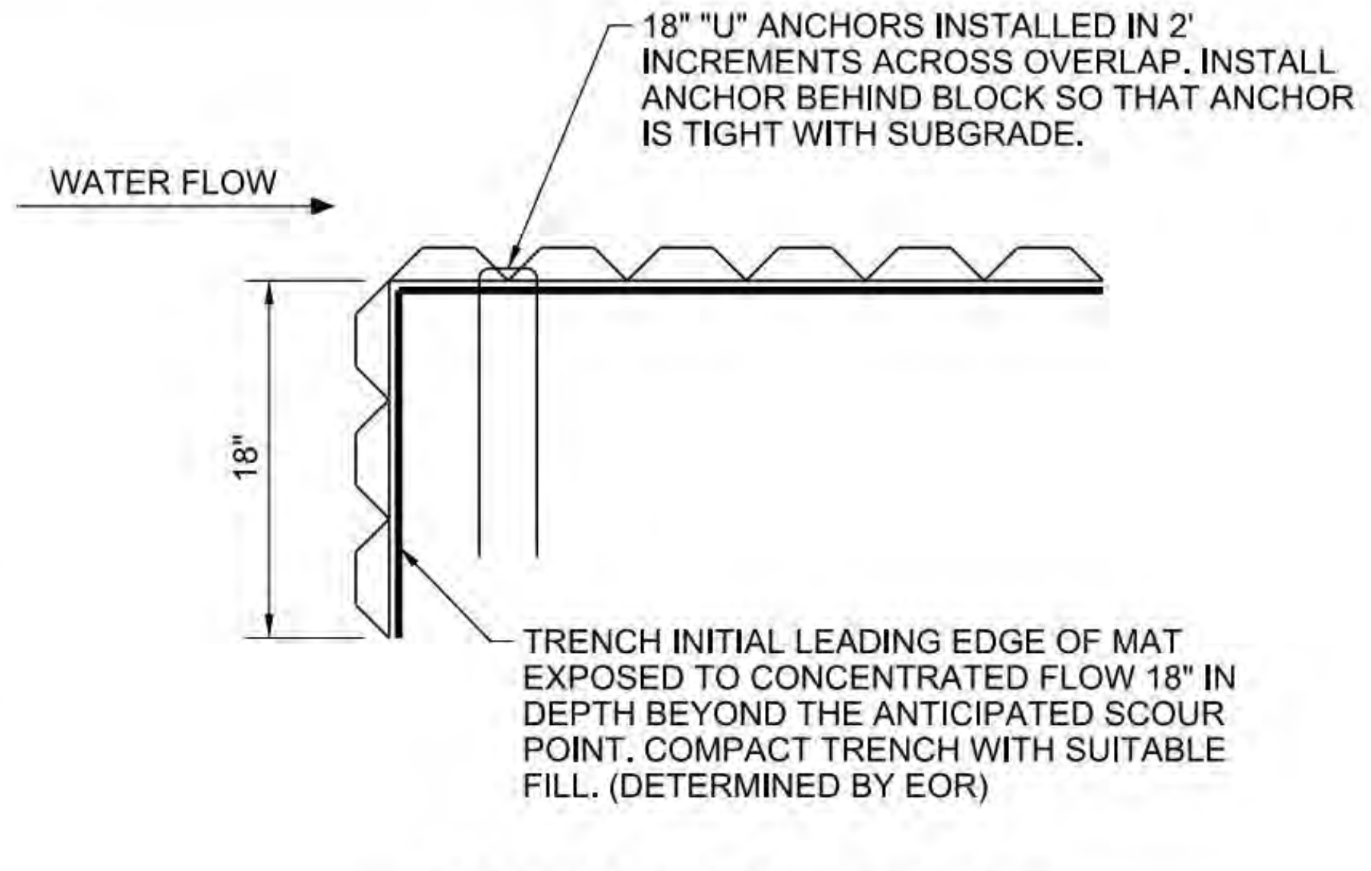
J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
DETAILS
SHEET 1

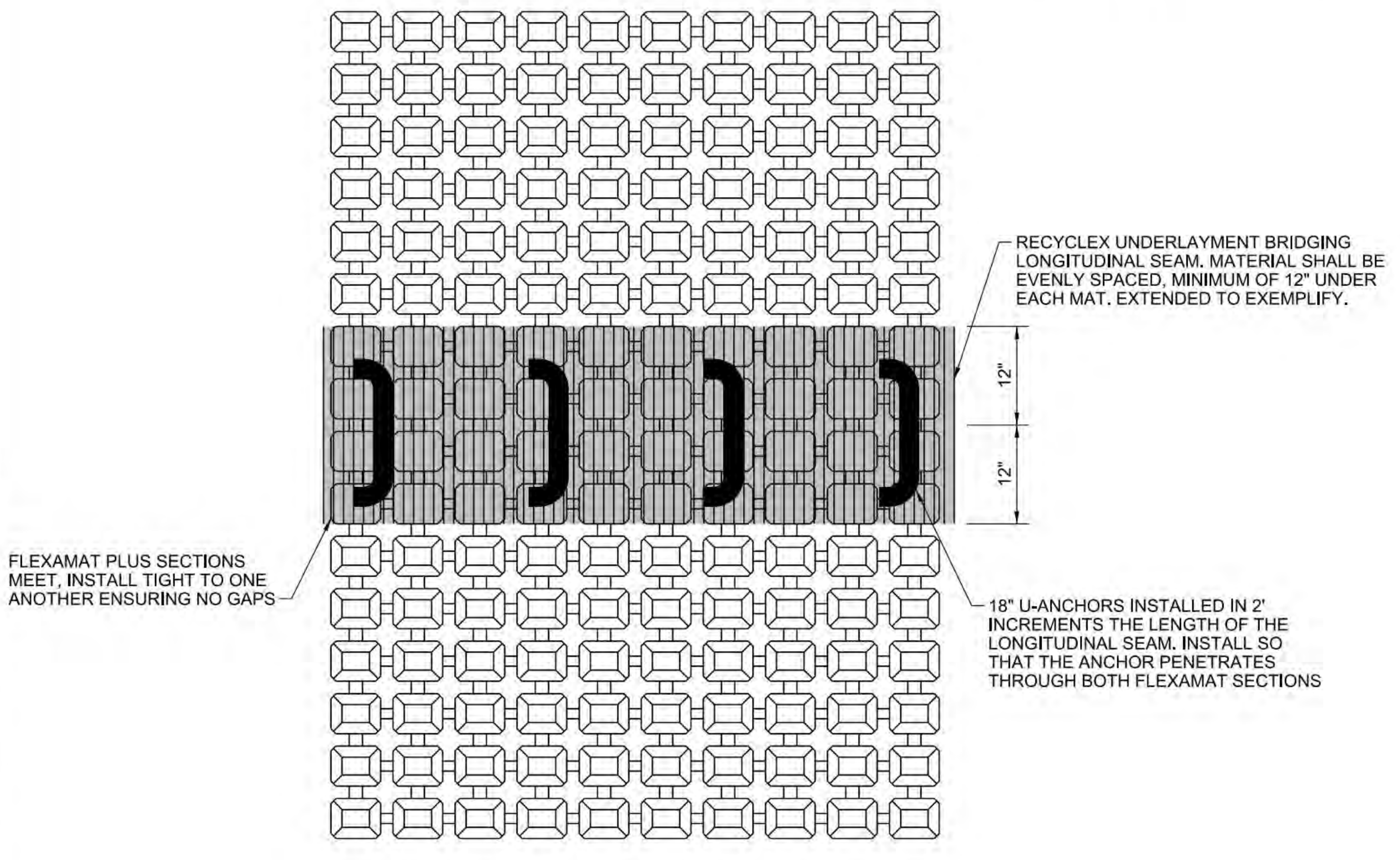
project: 116817
contract: ______
drawing: **CG010**
rev.: — **D**
sheet of sheets
file116817CG010.DGN



FLEXAMAT PERPENDICULAR OVERLAP DETAIL

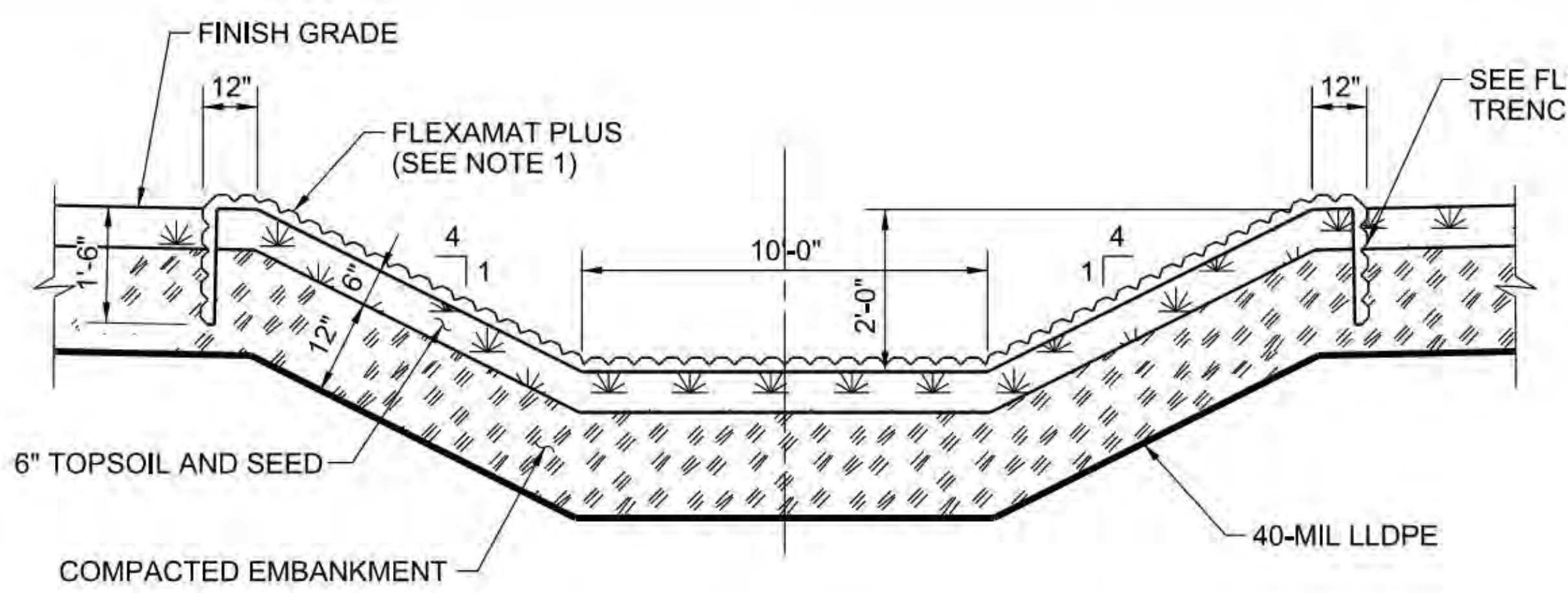


FLEXAMAT ANCHOR TRENCH DETAIL



LONGITUDINAL SEAM PROFILE

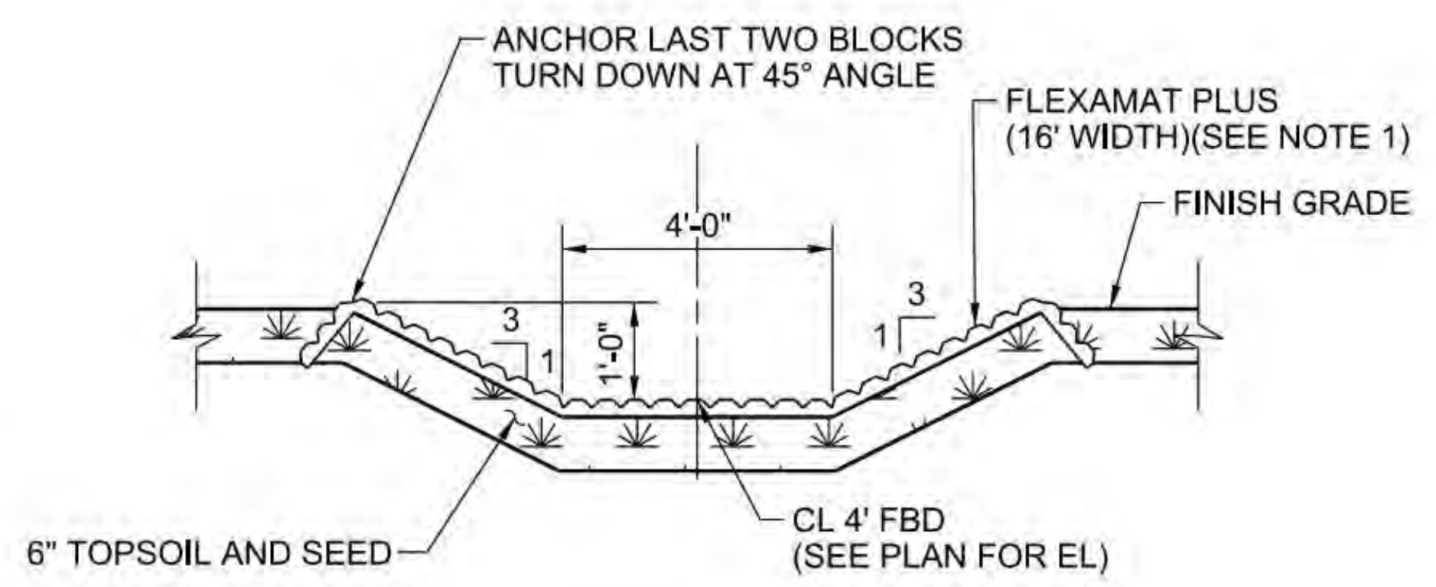
FLEXAMAT PLUS DETAILS
NOT TO SCALE



NOTES:

1. SEE SURFACING PLANS FOR EXTENTS OF FLEXAMAT PLUS. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

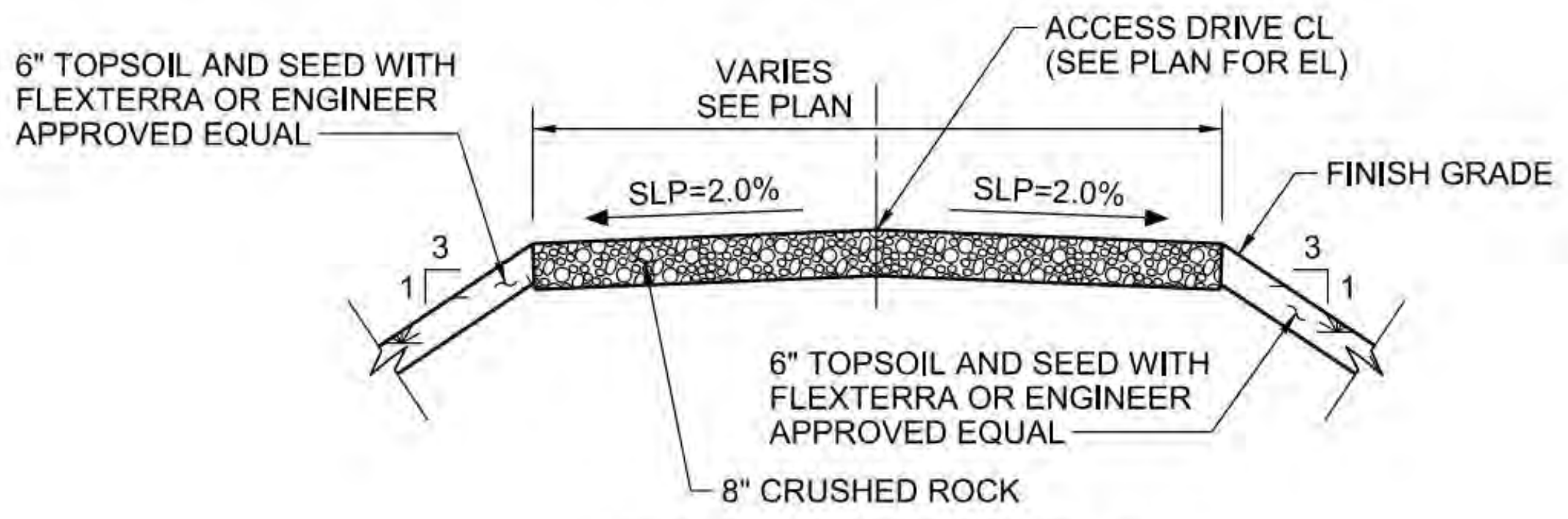
TYPICAL LETDOWN CHANNEL SECTION
NOT TO SCALE



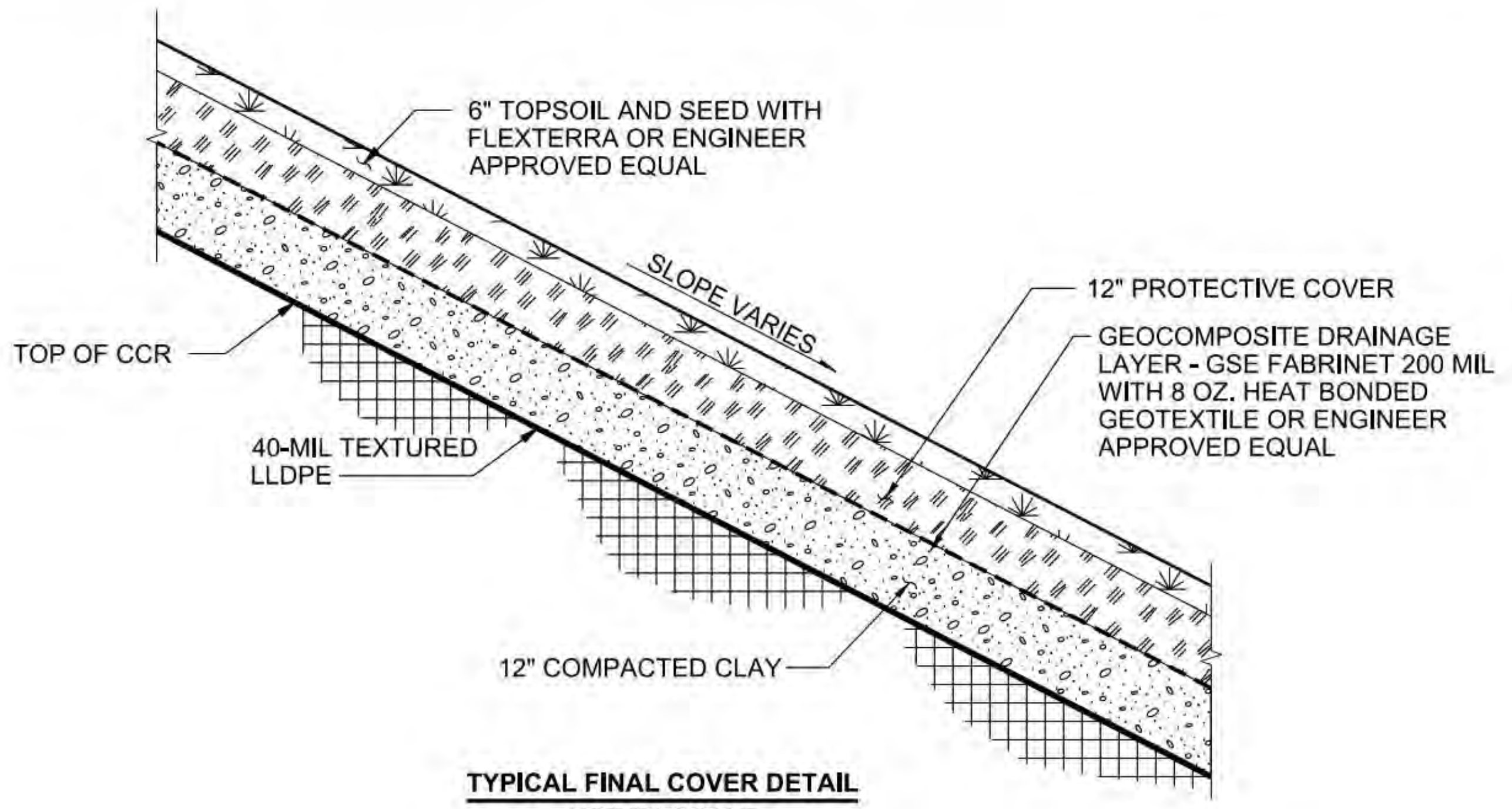
NOTES:

1. SEE SURFACING PLANS FOR EXTENTS OF FLEXAMAT PLUS. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

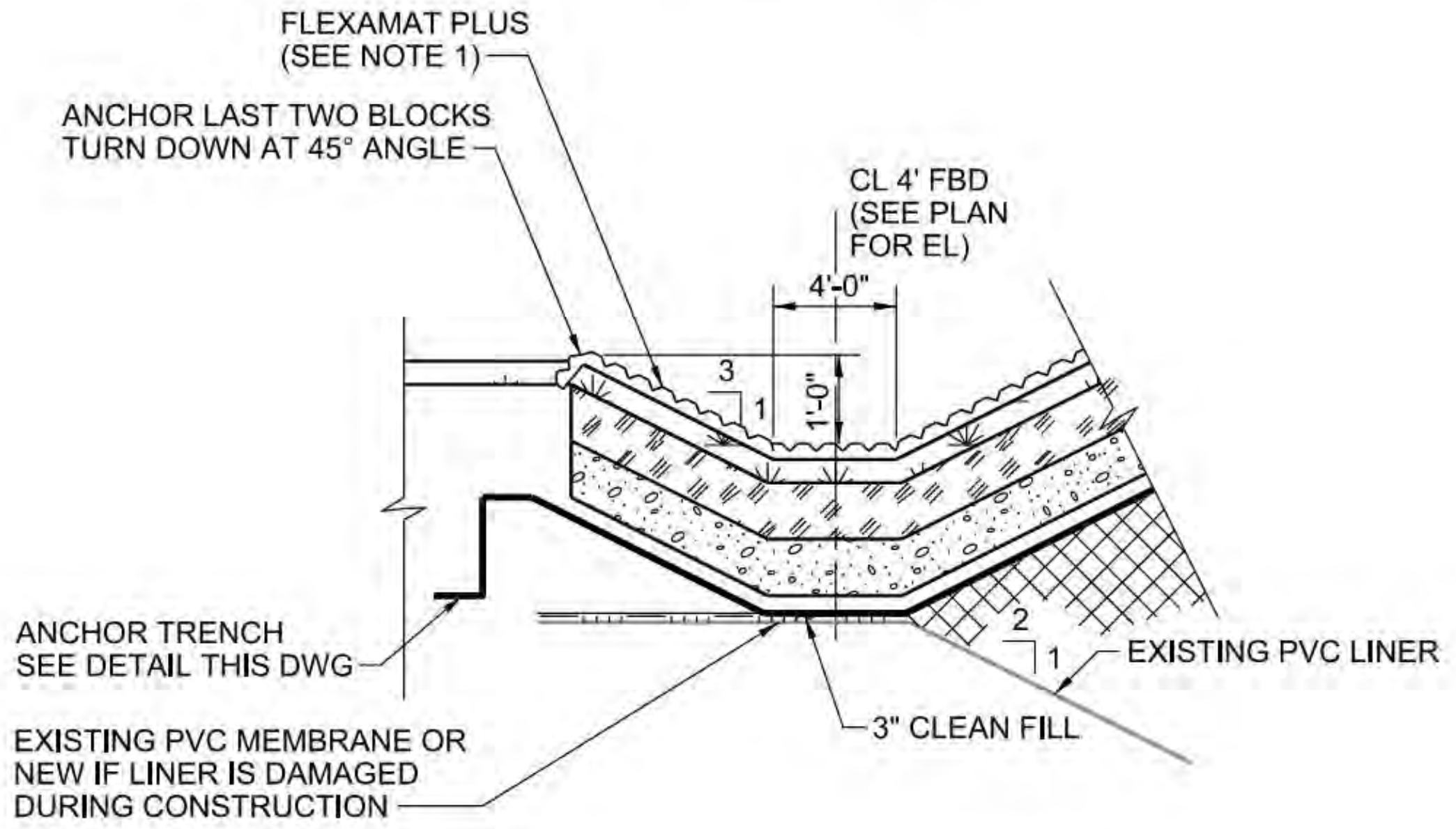
TYPICAL 4' FBD WITH FLEXAMAT PLUS
NOT TO SCALE



TYPICAL ACCESS DRIVE DETAIL
NOT TO SCALE



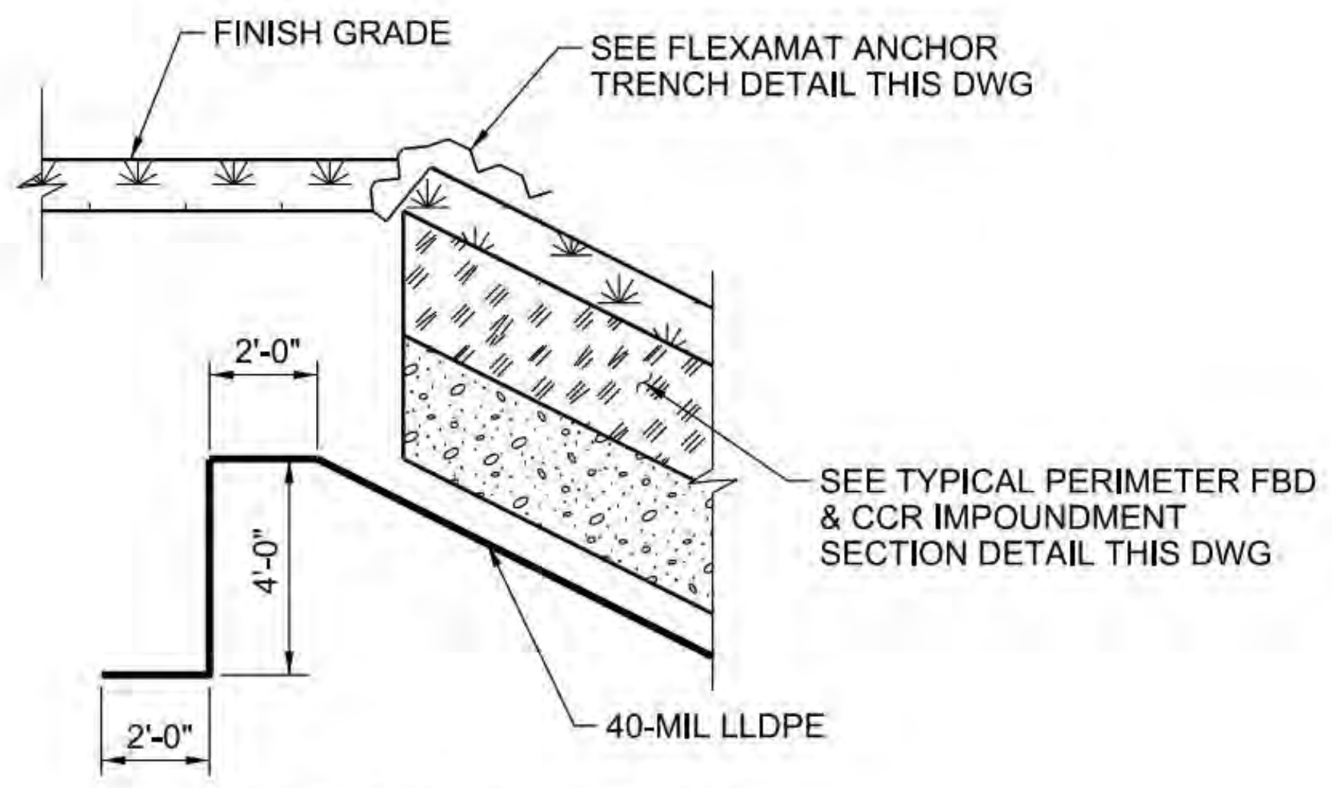
TYPICAL FINAL COVER DETAIL
NOT TO SCALE



NOTES:

1. SEE SURFACING PLANS FOR EXTENTS OF FLEXAMAT PLUS. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

TYPICAL PERIMETER FBD & CCR IMPOUNDMENT SECTION
NOT TO SCALE



TYPICAL ANCHOR TRENCH DETAIL
NOT TO SCALE

Millimeters
Scale For Microfilming
Inches

JOSEPH A. CHITTET
128620
03/02/2021

PRELIMINARY - NOT FOR CONSTRUCTION

THIS 100% DESIGN DOCUMENT IS RELEASED FOR OWNER REVIEW UNDER THE AUTHORITY OF RANDELL LEE SEDLACEK, P.E. 99056 ON THE DATE SHOWN. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

This document has been digitally signed and sealed February 15, 2021.

no.	date	by	ckd	description
D	02/15/21	MDB	ETT	ISSUED FOR FINAL DESIGN PACKAGE
C	12/22/20	MDB		ISSUED FOR FINAL DESIGN PACKAGE
B	10/16/20	MDB		ISSUED FOR 90% DESIGN REVIEW
A	09/01/20	MDB		ISSUED FOR 60% DESIGN REVIEW

no.	date	by	ckd	description

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Co, Inc.
FIRM REG. NO. F-845

designed M. BLEYTHING
detailed S. NICHOLS

CPS ENERGY
J.K. SPRUCE POWER PLANT
BEXAR COUNTY, TEXAS

EVAPORATION POND CLOSURE
DETAILS
SHEET 2

project 116817
contract ______
drawing **CG011** — rev. **D**
sheet of sheets
file116817CG011.DGN

Z:\Clients\ENR\CPSEnr\116817_JTDPondClosure\Design\Civil\Dwgs\New\Contract\Evp Pond\116817-CG011.dgn

2/12/2021 sknichols 11:06:44 AM

Attachment 28-2

Specifications For Evaporation Pond Closure Project

J.K. Spruce Power Plant
Bexar County, Texas

Rev B

Project No. 116817

December 23, 2020

CPS Energy
J.T. Deely Power Plant
Project 116817
North and South Bottom Ash Pond Closure Project

INDEX AND CERTIFICATION PAGE

INDEX

DIVISION	DESCRIPTION	NUMBER OF PAGES
Division 1	General Requirements	51
Division 2	Existing Conditions / Site Work	4
Division 3	Concrete	6
Division 31	Earthwork	15
Division 32	Exterior Improvements	18
Division 33	Utilities	2

CERTIFICATION

STATE OF TEXAS
JOSEPH A. CHITTET
128620
LICENSED
PROFESSIONAL ENGINEER

03/02/2021

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section summarizes the Work covered in detail in the complete Contract Documents.

B. Owner: CPS Energy. J.K. Spruce Power Plant.

1. Project Identification: Project 116817 – Evaporation Pond Closure Project.
2. Work Site Location: J.K. Spruce Power Plant, 12940 US-18, San Antonio TX 78223.

C. Engineer: The Contract Documents were prepared by Burns & McDonnell Engineering Company, Inc., 9400 Ward Parkway, Kansas City, Missouri 64114.

1.02 PROJECT DESCRIPTION:

The Company's Scope of Work (SOW) is to provide all specified labor, equipment, and materials in order to perform preliminary duties; demolition of water line, valves, evaporator, power panel and fencing associated with the Evaporation Pond (EP), consolidate all Coal Combustion Residual (CCR) and CCR-impacted soil including 65,100 cubic yards from the North and South Bottom Ash Ponds; grade material to drain, construct cover system and restore site to specified conditions. The site work is anticipated to be conducted in Level D, which includes: appropriate work clothes, steel toed boots, safety glasses, hard hat, reflective vests, and hearing protection per CPS Energy requirements. The major tasks anticipated at the site under the Company's responsibility include:

- Maintain operational condition of the Work Site;
- Locate and protect utilities;
- Installation and maintenance of silt fence around construction areas for erosion control purposes;
- Installation and maintenance of silt traps on storm water inlets according to the Storm Water Pollution Prevention Plan (SWPPP);
- Remove water line, valves, evaporator, power panel and fencing associated with the EP;
- Consolidate all CCR and CCR-impacted soil including 65,100 cubic yards from the North and South Bottom Ash Ponds;
- Grade material to drain;
- Construct cover system;
- Restore site to specified conditions;

Prior to intrusive activities, Company shall perform preliminary duties including location and protection of utilities, installing silt fence and silt traps.

Company shall remove water lines, valves, evaporator, power panel and fencing associated with the Evaporation Pond (EP). Details are provided in Evaporation Pond drawing set. Any piping that is located below ground and cannot be removed shall be abandoned in place.

Company shall consolidate approximately 65,100 cubic yards of CCR and CCR-impacted soil from the North and South Bottom Ash Ponds within the EP footprint. The material shall be graded to allow surface drainage. The design grade includes 15% side slopes for approximately 20 vertical feet with a 2% slope across the top to a highpoint running approximately north-south across the pond. The proposed grading plan is also provided in Evaporation Pond drawing set.

After the CCR and CCR-impacted material is graded, the cover system shall be installed. The cover system consists of a 12-inch infiltration layer (i.e. compacted clay) overlain by a 40-mil LLDPE geomembrane liner, 200-mil geocomposite drainage layer, 12-inch protective soil cover, and 6-inch erosion layer (i.e. vegetative soil). The cover system design is included in the Evaporation Pond drawing set. After cover system is complete, the area will be covered with topsoil and vegetated to minimize erosion.

1.03 WORK BY OTHERS:

A. Overall Project planning includes several primary work areas that are outside the scope of this Contract but that require coordination between the Company and others.

B. Work Under Other Contracts: None

C. Work by CPS Energy:

1. CPS Energy will provide Facility operations and maintenance personnel to operate the Facility.
2. CPS Energy will provide utilities as specified in SECTION 015100 – Temporary Utilities and Facilities.

1.04 COMPANY’S USE OF PREMISES:

A. Limited Use:

1. Before conducting any field work, Company must obtain CPS Energy approval.
2. Coordinate with CPS Energy to avoid interference with existing plant, switchyard, landfill operations or facility operations.
3. Conduct operations so as to ensure the least inconvenience to CPS Energy and the general public.
4. Comply with security requirements and policies of plant.
5. Available laydown space shall be as indicated and as designated by the CPS Energy.
6. Vehicle access to the Site is through main entrance as indicated. This entrance will be shared with the CPS Energy and other site contractors, and it will be controlled by the CPS Energy’s Site security force.

B. Temporary Erosion and Settlement Controls: Furnish, install, construct, and maintain temporary measures to control erosion and minimize the siltation of intermittent streams and the pollution of private properties. Temporary erosion and sediment control measures shall be constructed in substantial compliance with local, state, federal, and jurisdictional agency’s regulations and the Project Storm Water Pollution Prevention Plan (SWPPP). CPS Energy shall inspect controls as required by the SWPPP. Temporary erosion and sediment control measures shall be maintained until completion of the Work. Temporary measures shall be removed as indicated in SECTION 312000.

1.05 CPS ENERGY'S USE OF PREMISES:

A. Partial Occupancy: The CPS Energy reserves the right to occupy and to place and install equipment in completed areas of the Plant and Facilities, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1.06 WORK SEQUENCE:

A. General: Construction sequence shall be determined by Company subject to CPS Energy's need for continuous operation of existing facilities.

B. Continuous Service of Existing Facilities: Exercise caution and schedule operations to ensure that functioning of present facilities will not be disrupted. Shutdown of CPS Energy's operating facilities to perform the Work shall be held to a minimum length of time and shall be coordinated with CPS Energy who shall have control over the timing and schedules of such shutdowns.

C. Project Milestone Schedule dates are as follows:
   1. Company to provide milestone schedule that meets the end date identified in the RFP Documents.

1.07 MEASUREMENT AND PAYMENT:

A. See RFP Documents.

1.08 COPIES OF DOCUMENTS:

A. Furnished Copies: After execution of Agreement, Company will be furnished at no cost, one bound executed paper copy and one electronic *.pdf file of the Contract Documents.

1.09 LIST OF DRAWINGS:

A. Contract Drawings:
   1. Individual sheet numbers and titles are as stated on Index Sheet under "Contract Drawings".

B. Reference Drawings:
   1. Individual sheet numbers and titles are as stated on Index Sheet under "Reference Drawings".

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION – Not Applicable.

END OF SECTION 011100

SECTION 013100 - PROJECT COORDINATION AND MEETINGS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Preconstruction Conference.
   2. Coordination drawings.
   3. Project meetings.
   4. Requests for information (RFIs).

B. Each Company shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific Company.

C. Related Work Specified Elsewhere:
   1. For preparing and submitting Company's construction progress schedule: SECTION 013200.
   2. For Submittal Requirements: SECTION 013300.
   3. For coordinating closeout of the Contract: SECTION 017800.

1.02 DEFINITIONS:

A. RFI: Request for information prepared by Company and submitted to Engineer seeking interpretation or clarification of the Contract Documents.

1.03 COORDINATION:

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.

B. Coordination: Each Company shall coordinate its construction operations with those of other Companies, CPS Energy, and other entities to ensure efficient and orderly installation of each part of the Work. Each Company shall coordinate its operations with operations, included in different Sections, which depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other Companies to allow optimum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. Where availability of space is limited, coordinate installation of different components to allow optimum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for CPS Energy and separate Companies if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of others to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of construction progress schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of Submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

1.04 SUBMITTALS:

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    a. Indicate functional and spatial relationships of components of structural, civil, mechanical, and electrical systems.
    b. Indicate required installation sequences.
    c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted Equipment and minimum clearance requirements. Provide alternate sketches to Engineer for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
    d. Crane or other construction equipment placement and motion space required.
2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
3. Number of Copies: Submit one electronic copy of each Submittal to Engineer. Engineer will return comments electronically
4. Refer to individual Sections for coordination drawing requirements for Work in those Sections.

1.05 PROJECT MEETINGS:

A. Preconstruction Conference:

1. CPS Energy-will conduct a meeting within 10 days prior to Company starting work at the Site to review items stated in the following agenda and to establish a working understanding between the parties as to their relationships during performance of the Work.
2. Preconstruction conference shall be attended by:
    a. Representative(s) of Company including Company's superintendent.
    b. Engineer.
    c. Representative(s) of CPS Energy.
    d. At CPS Energy's option, representatives of principal Subcontractors and Suppliers.
    e. CPS Energy's third-party CQA personnel.
3. Meeting Agenda:
    a. Construction schedules.
    b. Phasing.

        c. Critical Work sequencing and long-lead items.
        d. Designation of key personnel and their duties; lines of communication.
        e. Project coordination.
        f. Procedures and Processing of:
            (1) RFIs.
            (2) Field decisions.
            (3) Substitutions.
            (4) Submittals.
            (5) Change Orders.
            (6) Applications for Payment.
        g. Procedures for testing.
        h. Procedures for preparing and maintaining record documents.
        i. Use of Premises:
            (1) Office, work, storage, laydown, and parking areas.
            (2) CPS Energy's requirements.
            (3) Work restrictions and hours.
        j. Construction facilities, controls, and construction aids.
        k. Temporary utilities.
        l. Safety and first-aid.
        m. Security.
        n. Deliveries of Equipment and Materials.
    4. Location of Meeting: Jeffrey Energy Center.
    5. Reporting:
        a. Within 10 working days after the meeting, Company will prepare and distribute minutes of the meeting to all parties.
        b. Company shall provide copies to Subcontractors and major Suppliers.

B. Coordination Schedules:
    1. Company will conduct a meeting at least ten days before submission of the first Application for Payment to finalize the initial coordination schedules requested under SECTION 013200 - CONSTRUCTION PROGRESS SCHEDULES AND REPORTS.
    2. The meeting shall be attended by:
        a. Representative(s) of Company including Company’s superintendent (and scheduler).
        b. At CPS Energy's option, representatives of principal Subcontractors and Suppliers.
        c. Engineer.
        d. Representative(s) of CPS Energy.

C. Construction Progress Meetings:
    1. CPS Energy will schedule and conduct a meeting at least monthly and at other times as necessary. Representatives of the CPS Energy, CPS Energy’s third-party CQA personnel, and Company shall be present at each meeting. With CPS Energy's concurrence, Company may request attendance by representatives of Subcontractors, Suppliers, or other entities concerned with current program or involved with planning, coordination, or performance of future activities. All participants in the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.
    2. Company and each Subcontractor represented shall be prepared to discuss the current construction progress report and any anticipated future changes to the schedule. Each Subcontractor shall comment on the schedules of Company and other Subcontractors and advise if their current progress or anticipated activities are compatible with that Subcontractor's Work.

3. If one Subcontractor is delaying another, Company shall issue such directions as are necessary to resolve the situation and promote construction progress.
4. Meeting Agenda:
    a. Safety Issues and Topics
    b. Review of construction progress since previous meeting.
    c. Review of Planned, Earned, and Spent Earned Value Analysis.
    d. Review of construction progress since previous meeting.
    e. Field observations, interface requirements, conflicts.
    f. Issues which may impede construction schedule.
    g. Off-Site fabrication.
    h. Delivery schedules.
    i. Submittal schedules and status.
    j. Site use; coordination with other contractors.
    k. Temporary facilities, controls, and services.
    l. Hours of Work.
    m. Hazards and risks.
    n. Housekeeping.
    o. Quality and Work standards.
    p. RFIs.
    q. Status of Change Orders.
    r. Documentation of information for payment requests.
    s. Corrective measures and procedures to regain construction schedule if necessary.
    t. Revisions to construction schedule.
    u. Review of proposed activities for succeeding Work period.
    v. Review proposed Contract modifications for:
        (1) Effect on construction schedule and on completion date.
        (2) Effect on other contracts of the Project.
    w. Other business.
5. Location of Meetings: Jeffrey Energy Center.
6. Reporting:
    a. Within 5 (five) working days after each meeting, Company will prepare and distribute minutes of the meeting to CPS Energy with action items listed for each party.
    b. Company shall distribute copies to principal Subcontractors and Suppliers.

D. Weekly Construction Progress Meetings:
1. Company will schedule and conduct a meeting at least once each week after mobilization by Company to the site. CPS Energy, CPS Energy's third-party CQA personnel, and Company shall be present at each meeting. All participants in the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.
2. Company and each Subcontractor represented shall be prepared to discuss the current construction progress in detail and the earned value analysis for the previous week.
3. Meeting Agenda:
    a. Safety Issues and Topics.
    b. Review of Planned, Earned, and Spent Earned Value Analysis.
    c. Field observations, interface requirements, conflicts.
    d. Problems impeding construction schedule (if any).
    e. Off-site fabrication.
    f. Delivery schedules.
    g. Submittal schedules and status.
    h. Site utilization.

        i. Temporary facilities and services.
        j. Hours of Work.
        k. Hazards and risks.
        l. Housekeeping.
        m. Quality and Work standards.
        n. Corrective measures and procedures to regain construction schedule if necessary.
        o. Review of proposed activities for succeeding Work period.
        p. Other business.
    4. Location of Meetings: Jeffrey Energy Center.
E. Pre-installation Conferences:
    1. Company shall conduct a preinstallation conference at the Project Site before each construction activity that requires coordination with other construction and where required in DIVISIONS 2 through 48.
    2. Installer and representatives of manufacturers and fabricators, of products furnished by this Contract or by others, involved in or affected by the installation Work and its coordination or integration with other materials and installations, shall attend the meeting. Advise CPS Energy of scheduled meeting dates.
    3. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including installation procedures and requirements for the following:
        a. Contract Documents.
        b. Options.
        c. Related Change Orders.
        d. Purchases.
        e. Deliveries.
        f. Shop Drawings, product data, and quality control Samples.
        g. Review of mockups.
        h. Possible conflicts.
        i. Compatibility problems.
        j. Time schedules.
        k. Weather limitations.
        l. Manufacturer's recommendations.
        m. Warranty requirements.
        n. Acceptability of substrates.
        o. Temporary facilities and controls.
        p. Space and access limitations.
        q. Governing regulations.
        r. Safety.
        s. Inspecting and testing requirements.
        t. Required performance results.
        u. Recording requirements.
        v. Protection of construction, personnel, and adjacent work.
    4. Record significant discussions and agreements and disagreements of each conference. Distribute the minutes of the meeting within 3 working days after the meeting to everyone concerned, including CPS Energy and CPS Energy’s third-party CQA personnel.
    5. Do not proceed with the installation if disagreements arise during the conference which cannot be successfully resolved at the time. Company shall take actions necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.06 REQUESTS FOR INFORMATION (RFIs):

- A. Procedure: Promptly on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI with the content specified.
  - 1. RFIs shall originate with Company. RFIs submitted by entities other than Company will be returned with no response.
  - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Company's Work or work of Subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
  - 1. Project name.
  - 2. Date.
  - 3. Name of Company.
  - 4. Contract number and title.
  - 5. Name of Engineer.
  - 6. RFI number, numbered sequentially.
  - 7. Specification Section number and title and related paragraphs, as appropriate.
  - 8. Drawing number and detail references, as appropriate.
  - 9. Field dimensions and conditions, as appropriate.
  - 10. Company's suggested solution(s). If Company's solution(s) impact the Contract Times or the Contract Price, Company shall state impact in the RFI.
  - 11. Company's signature.
  - 12. Attachments: Include drawings, descriptions, measurements, photos, product data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
- C. Hard-Copy RFIs:
  - 1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
  - 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Engineer's Action: Engineer will review each RFI, determine action required, and return it. Allow three working days for Engineer's response for each RFI. RFIs received after 1:00 p.m. local time will be considered as received the following working day.
  - 1. The following RFIs will be returned without action:
    - a. Requests for approval of Submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for coordination information already indicated in the Contract Documents.
    - d. Requests for adjustments in the Contract Times or the Contract Price.
    - e. Requests for interpretation of Engineer's actions on Submittals.
    - f. Incomplete RFIs or RFIs with numerous errors.
  - 2. Multiple RFIs addressing similar or identical issues may be addressed by Engineer with a single broad response.
  - 3. Engineer's action may include a request for additional information, in which case Engineer's time for response will start again upon Company's response and resubmittal.
  - 4. If Company believes the RFI response warrants change in the Contract Times or the Contract Price, notify Engineer in writing within five days of receipt of the RFI response.

F. On receipt of Engineer's action, update the RFI log and promptly distribute the RFI response to affected parties. Review response and notify Engineer within three days if Company disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Electronic log with not less than the following:
  1. Project name.
  2. Name and address of Company.
  3. Company representative name and telephone number.
  4. Name and address of Engineer.
  5. RFI number including RFIs that were dropped and not submitted.
  6. RFI description.
  7. Date the RFI was submitted.
  8. Date Engineer's response was received.
  9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable.

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS SCHEDULES AND REPORTS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Preliminary construction progress schedule.
   2. Construction progress schedule.
   3. Schedule of Submittals.
   4. Schedule of values.
   5. Construction progress reports.
   6. Daily construction reports.
   7. Equipment and Material location reports.
   8. Field condition reports.
   9. Special reports.

B. Related Work Specified Elsewhere:
   1. For submitting and distributing meeting and conference minutes: SECTION 013100 - Project Coordination and Meetings.
   2. For submitting schedules and reports: SECTION 013300 - Submittals.

1.02 REFERENCES:

A. Associated General Contractors of America (AGC):
   1. Construction Planning and Scheduling.

1.03 DEFINITIONS:

A. Activity: A discrete part of a contract that can be identified for planning, scheduling, monitoring, and controlling the construction Work. Activities included in a construction schedule consume time and resources, but shall not include planned work stoppages. Activities shall not normally reflect the Work of more than one trade.
   1. Critical activities are activities on the critical path and have zero or negative float. Critical activities must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. "Baseline" Schedule: The schedule submitted and accepted by the CPS Energy for the Work.

C. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Price, unless otherwise approved by the CPS Energy.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Contract duration and contains no float.

E. Event: The starting or ending point of an activity. An event has no duration.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either CPS Energy or Company, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting an intermediate deadline or the planned Contract completion date.

G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

H. Milestone: A key or critical point in time for reference or measurement. A milestone has no duration.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

J. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.04 SUBMITTALS:

A. Qualification Data: For scheduling consultant.

B. Schedule of Submittals: Submit in specified electronic format. Arrange the following information in a tabular format:
  1. Scheduled date for first submittal.
  2. Specification Section number and title.
  3. Submittal category (technical or informational).
  4. Name of Subcontractor or Supplier.
  5. Description of the Work covered.
  6. Scheduled date for CPS Energy’s final release or approval.

C. Preliminary Construction Progress Schedule: Submit in specified electronic format.
  1. Acceptance of cost-loaded preliminary construction schedule will not constitute acceptance of schedule of values for cost-loaded activities.

D. Construction Progress Schedule: Submit initial schedule, large enough to show entire schedule for entire construction period to CPS Energy for review and acceptance.
  1. Submit electronically, using software indicated, labeled to comply with requirements for Submittals. Include type of schedule (Initial or Updated) and date.

E. Schedule of Values: Submit with initial construction progress schedule to CPS Energy for review and approval in specified electronic format.

F. Construction Progress Reports: Submit in specified electronic format at monthly intervals.

G. Daily Construction Reports: Submit electronic copies at weekly intervals.

H. Special Reports: Submit electronically at time of unusual event.

1.05 QUALITY ASSURANCE:

A. Prescheduling Conference: Conduct conference at Project Site to comply with requirements in SECTION 013100 - PROJECT COORDINATION AND MEETINGS. Review methods and procedures related to the preliminary construction schedule and "baseline" construction progress schedule, including, but not limited to, the following:
  1. Review software limitations and content and format for reports.
  2. Verify availability of qualified personnel needed to develop and update schedule.
  3. Discuss constraints, including phasing, work stages, and milestones.
  4. Review delivery dates for CPS Energy-furnished products.
  5. Review schedule for work of CPS Energy's separate contracts.
  6. Review time required for review of Submittals and resubmittals.
  7. Review requirements for tests and inspections by independent testing and inspecting agencies.
  8. Review time required for completion and startup procedures.
  9. Review and finalize list of construction activities to be included in schedule.
  10. Review Submittal requirements and procedures.
  11. Review procedures for updating schedule.

1.06 COORDINATION:

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate construction progress schedule with the schedule of values, list of subcontracts, schedule of Submittals, Material and Equipment procurement, progress reports, payment requests, and other required schedules and reports.
    1. Secure time commitments for performing critical elements of the Work from parties involved.
    2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 SCHEDULE OF SUBMITTALS:

A. Preparation: Submit a schedule of Submittals, arranged in chronological order by dates required by construction progress schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates as required in SECTION 013300 - SUBMITTALS.
    1. Coordinate Submittals schedule with list of subcontracts, the schedule of values, and "Baseline" construction progress schedule.
    2. Initial Submittal: Submit concurrently with preliminary schedule. Include Submittals required during the first (60) sixty days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
    3. Final Submittal: Submit concurrently with the first complete submittal of construction progress schedule.

2.02 COMPANY'S CONSTRUCTION PROGRESS SCHEDULE, GENERAL:

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established in the Notice of Award-to date of Final Completion.
    1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each building floor or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
    1. Activity Duration: Define activities so no activity is longer than (30) thirty calendar days, unless specifically allowed by CPS Energy.
    2. Procurement Activities: Include procurement process activities for long lead items and major items, as separate activities in schedule. Procurement cycle activities include, but are not limited to, Submittals, approvals, purchasing, fabrication, and delivery.
    3. Submittal Review Time: Include review and resubmittal times indicated in SECTION 013300 - SUBMITTALS in schedule. Coordinate Submittal review times in Company's construction progress schedule with schedule of Submittals.
    4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for CPS Energy's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
    1. Phasing: Arrange list of activities on schedule by phase.
    2. Work under More Than One Contract: Include a separate activity for each contract.
    3. Work by CPS Energy: Include a separate activity for each portion of the Work performed by CPS Energy.

4. Products Ordered in Advance: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.
5. Work Restrictions: Show the effect of the following items on the schedule:
    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.
6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation, tests, and inspections.
    i. Curing.
    j. Startup and initial operation.
    k. Performance, guarantee, and acceptance testing.
    l. Placement into final use and operation.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion of Fly Ash Landfill Area 2, Phase 1.

F. Contract Modifications: For each proposed Contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall schedule.

G. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules and is acceptable to CPS Energy:
1. Primavera Project Planner (P3).
2. Primavera 3e.
3. Primavera 5.0.
4. SureTrak.
5. CPS Energy-approved equal.

2.03 PRELIMINARY CONSTRUCTION PROGRESS SCHEDULE:

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule with Bid and again within seven (7) calendar days of date in the Notice to Proceed.
1. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities throughout construction.

B. Preliminary Schedule of Values:
1. Initiate a preliminary value assigned to each significant construction activity.
2. Values shall give an indication of cash requirement prediction, with total equal to Contract Price.
3. Submit within ten days of Effective Date of Contract to CPS Energy for review.

2.04 CONSTRUCTION PROGRESS SCHEDULE (GANTT CHART):

A. Gantt-Chart Schedule: After submittal of preliminary construction progress schedule as stated above, submit a detailed construction progress schedule within (20) twenty days after the Notice of Award. Base the schedule on the preliminary construction progress schedule and incorporate review comments and other feedback.

B. The schedule shall show the Work in a horizontal bar chart or other graphic format suitable for displaying scheduled and actual progress.

   1. The schedule shall indicate phases of the Work, starting date, interim milestones, and dates of Substantial Completion and Final Completion.
   2. Breakdown Work phases into separate time bar for each significant construction activity entry, with dates Work is expected to begin and be completed. Within each time bar, indicate estimated completion percentage in 5% increments.
   3. Scale and spacing shall allow room for notation and revisions.
   4. Sheet Size: Minimum 11 x 17 inches.

C. Provide sub-schedules to define in more detail critical portions of schedules, including inspections and tests.

D. Coordinate construction progress schedule with schedule of values, schedule of Submittals schedule, procurement schedule, progress reports, and payment requests.

E. CPS Energy will review and comment on construction progress schedule and, upon agreement between CPS Energy and Company on necessary changes:

   1. Company shall distribute copies as specified of the accepted "baseline" schedule to CPS Energy. Company shall provide additional copies to Subcontractors and other parties required to comply with scheduled dates, one copy to each party.

F. Revise the construction progress schedule after each meeting, event, or activity where revisions have been recognized and accepted to reflect impacts of new developments on the schedule.

G. Update and submit electronically to CPS Energy the revised schedule at least once each month to show actual progress compared to the originally accepted "baseline" schedule and any proposed changes in the schedule of remaining Work. Include with construction progress report.

2.05 SCHEDULE OF VALUES:

A. Based on the preliminary draft schedule of values, reviewed by CPS Energy, submit finalized schedule of values acceptable to CPS Energy as to form and basic details. Submit final within (30) thirty days after Notice to Proceed.

B. Coordinate preparation of schedule of values with preparation and content of construction progress schedule.

C. Content:

   1. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
   2. Follow the construction progress schedule breakdown of Work activities as format for listing component items and assigning values.
   3. Follow the table of contents of this Project Manual as the format for listing component items.
      a. Identify each line item, with the number and title of the respective major Division or Section of the Specifications.
   4. For each major line item, list subvalues of major products or operations under the item.
      a. Each item shall include a directly proportional amount of the Company's overhead and profit.
      b. For items on which progress payments will be requested for stored materials received, but not installed, break down the value into:

(1) The cost of the materials, delivered and unloaded, including taxes paid unless taxes are exempted.
(2) The total installed value.
c. The sum of all values listed in the schedule shall equal the total Contract Price.

2.06 REPORTS:

A. Construction Progress Reports:
1. Submit a report on actual construction progress on a monthly basis. More frequent reports may be required should the Work fall behind the accepted schedule.
   a. Submit a weekly report and three-week look-ahead schedule to coordinate with and supplement the monthly construction progress report and which details Work scheduled for the following one-week interval, including:
      (1) Work activities which will occur.
      (2) Number and size of crews.
      (3) Construction equipment on Site.
      (4) Major items of Equipment and Material to be installed.
   b. Format shall be on 8-1/2 x 11-inch paper, submitted to CPS Energy electronically.
2. Construction progress reports shall consist of the revised construction progress schedule and a narrative report which shall include but not be limited to the following:
   a. Comparison of actual progress to planned progress shown on originally accepted schedule.
   b. Summary of activities completed since the previous construction progress report.
   c. Summary of activities planned for next reporting period.
   d. Planned, earned, and spent earned value analysis for the month.
   e. Identification of problem areas.
   f. A description of current and anticipated delaying factors, if any.
   g. Impact of possible delaying factors.
   h. Proposed corrective actions.
3. Submit a construction progress report to CPS Energy with each application for partial payment. Work reported complete but not readily apparent to CPS Energy must be substantiated with supporting data when requested by CPS Energy.
4. If a schedule update reveals that, through no fault of CPS Energy, the Work is likely to be completed later than the Contract completion date, Company shall:
   a. Establish a plan for making up lost time, to include, but not limited to:
      (1) Increase number of workers, or
      (2) Increase amount or kinds of tools, or
      (3) Work overtime or additional shifts, or
      (4) A combination of 2 or more of the above 3 actions.
   b. Submit plan to CPS Energy before implementing the plan.
   c. Take actions as necessary to get the Work back on schedule at no additional cost to CPS Energy.

B. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project Site:
1. List of Subcontractors at Project Site.
2. Approximate count of personnel at Project Site, and breakdown by craft.
3. Equipment at Project Site.
4. Material deliveries.
5. High and low temperatures and general weather conditions.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (refer to special reports).

9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Emergency procedures.

C. Special Reports:
   1. General: Submit special reports directly to CPS Energy within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
   2. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project Site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Company's personnel, evaluation of results or effects, and similar pertinent information. Advise CPS Energy in advance when these events are known or predictable.

PART 3 - EXECUTION

3.01 CONSTRUCTION PROGRESS SCHEDULE:

A. Construction Progress Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled construction progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate actual completion percentage for each activity.

B. Distribution: Distribute copies of accepted schedule to CPS Energy, CPS Energy’s third-party CQA personnel, separate contractors, testing and inspecting agencies, and other parties identified by Company with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes definitions, descriptions, transmittal, and review of Submittals.

B. Related Work Specified Elsewhere:
   1. SECTION 013100 - Construction Progress Schedules and Reports.
   2. SECTION 017800 - Contract Closeout.

1.02 GENERAL INFORMATION:

A. Definitions:
   1. Shop Drawings, product data, and Samples are technical Submittals prepared by Company, Subcontractor, manufacturer, or Supplier and submitted by Company to Engineer as a basis for approval of the use of Equipment and Materials proposed for incorporation in the Work or needed to describe installation, operation, maintenance, or technical properties, as specified in each Division of the Specifications.
      a. Shop Drawings include custom-prepared data of all types including drawings, diagrams, performance curves, material schedules, templates, instructions, and similar information not in standard printed form applicable to other projects.
      b. Product data includes standard printed information on materials, products, and systems; not custom-prepared for this Project, other than the designation of selections from available choices.
      c. Samples include both fabricated and unfabricated physical examples of materials, products, and Work; both as complete units and as smaller portions of units of Work; either for limited visual inspection or (where indicated) for more detailed testing and analysis. Mock-ups are a special form of Samples which are too large to be handled in the specified manner for transmittal of Sample Submittals.
   2. Informational Submittals are those technical reports, administrative Submittals, certificates, and guarantees not defined as Shop Drawings, product data, or Samples.
      a. Technical reports include laboratory reports, tests, technical procedures, technical records, and Company's design analysis.
      b. Administrative Submittals are those nontechnical Submittals required by the Contract Documents or deemed necessary for administrative records. These Submittals include maintenance agreements, Bonds, Project photographs, physical work records, statements of applicability, copies of industry standards, Project record data, schedules, security/protection/safety data, and similar type Submittals.
      c. Certificates and guarantees are those Submittals on Equipment and Materials where a written certificate or guarantee from the manufacturer or Supplier is called for in the Specifications.
   3. Refer to ARTICLES 1.03 and 1.04 of this Part for detailed lists of Submittals and specific requirements.

B. Quality Requirements:
   1. Submittals such as Shop Drawings and product data shall be of suitable quality for legibility and reproduction purposes. Every line, character, and letter shall be clearly legible. Drawings such as reproducibles shall be useable for further reproduction to yield legible hard copy.
   2. Documents submitted to Engineer that do not conform to specified requirements shall be subject to rejection by Engineer, and upon request by Engineer, Company shall resubmit conforming documents. If conforming Submittals cannot be obtained, such documents shall be retraced, redrawn, or photographically restored as may be necessary to meet such

requirements. Company's or its Subcontractor's failure to initially satisfy the legibility quality requirements will not relieve Company or its Subcontractors from meeting the required schedule for Submittals.

C. Language and Dimensions:
  1. All words and dimensional units shall be in the English language.
  2. Metric dimensional unit equivalents may be stated in addition to the English units. However, English units of measurement shall prevail.

D. Submittal Completeness:
  1. Submittals shall be complete with respect to dimensions, design criteria, materials of construction, and other information specified to enable Engineer to review the information effectively.
  2. Where standard drawings are furnished which cover a number of variations of the general class of Equipment, each drawing shall be annotated to indicate exactly which parts of the drawing apply to the Equipment being furnished. Use hatch marks or X-outs to indicate variations that do not apply to the Submittal. The use of "highlighting markers" will not be an acceptable means of annotating Submittals. Such annotation shall also include proper identification of the Submittal permanently attached to the drawing.
  3. Reproductions or copies of Contract Drawings or portions thereof will not be accepted as complete fabrication or erection drawings, but will be acceptable when used by Company as a drawing upon which to indicate information on erection or to identify detail drawing references. Whenever the Drawings are revised to show this additional Company information, Engineer's title block shall be replaced with Company's title block, and Engineer's professional seal shall be removed from the drawing. Company shall revise these erection drawings for subsequent Engineer revisions to the Contract Drawings.

E. Form of Submittals:
  1. Submittals and other Project documents shall be transmitted in electronic format as specified.
    a. Selected Submittals may be provided in paper ("hardcopy") copies with advance approval of Engineer, and using procedures specified herein.
  2. Electronic Format using Engineer's Document Management System:
    a. Scanned Submittals and documents are not acceptable. Transmit Submittal and Project documents in:
      (1) Adobe *PDF files created directly from native electronic format, or
      (2) Engineer-approved equal.
      (3) Electronic Submittals in .tif format are permitted only with specific Engineer approval.
    b. Each drawing shall be submitted with an electronic filename that is equivalent to the drawing number, and any resubmitted drawing shall use the same filename as the original file name each time.
    c. Company Submittals shall be accompanied with a completed transmittal letter. Submittals that are not accompanied with an approved transmittal letter will not be accepted and will be returned to Company.
    d. All Company transmittal letters submitted to Engineer shall be in the form supplied and shall contain as a minimum the following information:
      (1) Company's Name.
      (2) Engineer's Project number.
      (3) Engineer's Contract number.
      (4) Filename.
      (5) Description of the information contained in the specific Submittal.

        (6) Revision number.
        (7) Submittal type (IFR, IFC, IFI, CCR).
        (8) Date of Submittal.
    e. Nonconforming Submittals are subject to rejection by Engineer.
    f. Provide "as-constructed" Submittals, record documents, and other documents on CD-ROM in Adobe *PDF format except as follows:
        (1) All Equipment General Arrangement drawings, Piping and Instrumentation Diagrams, and One-line Diagrams shall be submitted on CD-ROM in AutoCAD format.
    g. CD-ROM shall include Project name, station name, station unit number, drawing numbers, and revision numbers identified on the disk labels. Provide four copies of the "as-constructed"/record document CD-ROM.
    h. All Submittals transmitted electronically shall include and electronic transmittal letter meeting the Engineer's requirements.
3. Engineer's review comments will be provided electronically in Adobe *PDF format.
4. Digital delivery media for transmittal of electronic documents and Submittals shall be through Engineer's Document Management (DM) Project website in accordance with the procedures specified herein, as addressed below. More information will be provided in the pre-construction conference for this Contract.
    a. DM guidelines and procedures:
        (1) Company shall complete the DM transmittal letter spreadsheet (provided by Engineer after award), package Submittals in one ZIP file, and upload transmittal to the DM website.
        (2) Company shall collect and download reviewed Submittals after notification from Engineer that the reviewed Submittals have been posted to the DM website.
        (3) Submittals shall be in Adobe PDF format converted from the native file type. The Submittals, including the transmittal letter, shall be packaged in one ZIP file.
        (4) A confirmation email is automatically distributed to Company after a successful upload to the DM website. If a confirmation email is not received by Company, a potential error has occurred; and Company shall contact Engineer.
        (5) Additional guidelines and procedures may be refined after Contract Award and during the course of the Work.
    b. Refer to Appendix E for summary of DM System.

1.03 TECHNICAL SUBMITTALS:

A. Items shall include, but not be limited to, the following:
1. Manufacturer's specifications.
2. Catalogs, or parts thereof, of manufactured Equipment.
3. Shop fabrication and erection drawings.
4. General outline drawings of Equipment showing overall dimensions, location of major components, weights, and location of required building openings and floor plates.
5. Detailed Equipment installation drawings, showing foundation details, anchor bolt sizes and locations, baseplate sizes, location of CPS Energy's connections; and all clearances required for erection, operation, and disassembly for maintenance.
6. Bills of materials.
7. Material lists or schedules.

8. Performance tests on Equipment by manufacturers.
9. Concrete mix design information.
10. Samples and color charts.
11. All drawings, catalogs or parts thereof, manufacturer's specifications and data, Samples, instructions, and other information specified or necessary:
    a. For Engineer to determine that Equipment and Materials conform to the design concept and comply with intent of the Contract Documents.
    b. For proper erection, installation, operation, and maintenance of Equipment and Materials which Engineer will review for general content but not for basic details.
    c. For Engineer to determine what supports, anchorages, structural details, connections, and services are required for Equipment and Materials, and effects on contiguous or related structures and Equipment and Materials.

1.04 INFORMATIONAL SUBMITTALS:

A. Informational Submittals are comprised of technical reports, administrative Submittals, and guarantees which relate to the Work, but do not require Engineer approval prior to proceeding with the Work. Informational Submittals include:
   1. Welder qualification tests.
   2. Welding procedure qualification tests.
   3. X-ray and radiographic reports.
   4. Hydrostatic testing of pipes.
   5. Field test reports.
   6. Certification of Materials: Concrete tests.
   7. Soil test reports.
   8. Piping stress analysis.
   9. Shipping or packing lists.
   10. Job progress schedules.
   11. Equipment and Material delivery schedules.
   12. Progress photographs.
   13. Warranties and guarantees.

B. Test Reports:
   1. Responsibilities of Company, CPS Energy, and Engineer regarding tests and inspections of Equipment and Materials and completed Work are set forth elsewhere in these Contract Documents.
   2. The party specified responsible for testing or inspection shall in each case, unless otherwise specified, arrange for the testing laboratory or reporting agency to distribute one electronic copy of the test reports to CPS Energy, Engineer, Company, and Manufacturer or Supplier.

1.05 LISTS:

A. Lists shall be in Microsoft Excel ® format and Supplier shall not modify the format or sequence without Engineer approval. Lists shall be submitted for initial review and resubmitted as a final list. The electronic template files to be used will be provided by Engineer to the Supplier after Contract Award. Prepare and submit the following lists for review:
   1. Equipment List
   2. Manual Valve List
   3. Actuated / Control Valve List
   4. Line List

5. Electric Motor List
6. Instrument List
7. Terminal Point/Connection List

1.06 SCHEDULE OF SUBMITTALS:

A. Prepare for Engineer's concurrence, a schedule for submission of all Submittals specified or necessary for Engineer's approval of the use of Equipment and Materials proposed for incorporation in the Work or needed for proper installation, operation, or maintenance. Submit the schedule with the procurement schedule and construction progress schedule. Schedule submission of all Submittals to permit review, fabrication, and delivery in time so as to not cause a delay in the Work of Company or his Subcontractors or any other contractors as described in the Contract Documents.

B. In establishing schedule for Submittals, allow 20 calendar days in Engineer's office for reviewing original Submittals and 15 calendar days in Engineer's office for reviewing resubmittals.

C. Submittals requiring revision shall be resubmitted within 5 days after receipt of Engineer's review notations.

D. The schedule shall indicate the anticipated dates of original submission for each item and Engineer's approval thereof, and shall be based upon at least one resubmission of each item.

E. Schedule all Submittals (Shop Drawings, product data, and Samples) required prior to fabrication or manufacture for submission within 30 calendar days of the Notice to Proceed. Schedule Submittals pertaining to storage, installation, and operation at the Site for Engineer's approval prior to delivery of the Equipment and Materials.

F. Resubmit Submittals the number of times required for Engineer's "Submittal Approved." However, any need for resubmittals in excess of the number set forth in the accepted schedule, or any other delay in obtaining approval of Submittals, will not be grounds for extension of the Contract Times, provided Engineer completes his reviews within the times specified.

G. Where a Submittal is required by the Contract Documents or the accepted schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertaining Submittal will be at the sole expense and responsibility of Company.

1.07 TRANSMITTAL OF SUBMITTALS:

A. All Submittals (Shop Drawings, product data, and Samples) for Equipment and Materials furnished by Company, Subcontractors, manufacturers, and Suppliers shall be submitted to Engineer by Company.

B. Transmit all Submittals to Engineer for approval as follows:

1. Submittal Information Block:
    a. Electronic files of Submittal Information Blocks will be provided to Company for use on electronic Submittals.
    b. An example of the Submittal Information Block is included in Appendix D.
2. Mark each Submittal by Project name and number, Contract title and number, and applicable Specification Section and Article number. Include in the letter of transmittal the Drawing number and title, sheet number (if applicable), revision number, and electronic filename (if applicable). Unidentifiable Submittals will be returned for proper identification.
3. Check and approve Submittals of Subcontractors, Suppliers, and manufacturers prior to transmitting them to Engineer. Company's submission shall constitute a representation to CPS Energy and Engineer that Company approves Submittals and has determined and

verified all information and that it is in compliance with Laws and Regulations, and Company assumes full responsibility for doing so.

4. At the time of each submission, call to the attention of Engineer in the letter of transmittal any deviations from requirements of the Contract Documents.
5. Make all modifications noted or indicated by Engineer and return the required number of revised Submittals until approved. Direct specific attention in writing, or on revised Submittals, to changes other than the modifications called for by Engineer on previous Submittals. Previously approved Submittals transmitted for final distribution will not be further reviewed and are not to be revised. If errors are discovered during manufacture or fabrication, correct the Submittal and resubmit for review.
6. Following completion of the Work and prior to final payment, furnish record documents and approved Samples and Shop Drawings necessary to indicate "as constructed" conditions, including field modifications, in the number of copies specified. All such copies shall be clearly marked "PROJECT RECORD."
    a. Submit a final record copy of the Master Field Drawing list which shall indicate the final revision status of each drawing on the list.
7. Keep a copy or sample of each Submittal in good order at the Site.

C. Quantity Requirements:
1. Except as otherwise specified, transmit all Shop Drawings in the following quantities:
    a. Initial Submittal: Per Appendix A, this SECTION.
    b. Resubmittals: Per Appendix A, this SECTION.
    c. Submittal for final distribution: Electronic - One copy to CPS Energy and Engineer.
    d. As-constructed documents: Electronic - One copy to Engineer.
2. Transmit Submittals of Material Samples, color charts, and similar items as follows:
    a. Initial Submittal – One copy to Engineer. One copy to CPS Energy.
    b. Resubmittal – One copy to Engineer. One copy to CPS Energy.
    c. Upon approval, no Sample(s) will be returned to Company.
3. When all Submittals have been updated to "as-constructed" conditions, transmit to Engineer and to CPS Energy in electronic format.
4. CPS Energy may copy and use for internal operations and staff training purposes any and all document Submittals required by this Contract and approved for final distribution, whether or not such documents are copyrighted, at no additional cost to CPS Energy. If permission to copy any such Submittal for the purposes stated is unreasonably withheld from CPS Energy by Company or any Subcontractor, manufacturer, or Supplier, Company shall provide to Engineer 50 copies plus the number of copies required by Company at each final distribution issue.
5. Equipment erection drawings and other Submittals required for installation of Equipment furnished by others under separate contract for installation under this Contract will be transmitted to Company by Engineer in the final distribution of such Submittals.
6. Information to Manufacturer's District Office: Company shall arrange for manufacturers and Suppliers of Equipment and Materials to furnish copies of all agreements, drawings, specifications, operating instructions, correspondence, and other matters associated with this Contract to the manufacturer's district office servicing CPS Energy. Insofar as practicable, all business matters relative to Equipment and Materials included in this Contract shall be conducted through such local district offices.

1.08 ENGINEER'S REVIEW:

A. Engineer will review and take appropriate action on Submittals in accordance with the accepted schedule of Submittals. Engineer's review and approval will be only to determine if the items of Equipment and Materials covered by the Submittals will, after installation or incorporation in the Work, conform to information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

B. Engineer's review and approval will not extend to design data reflected in Submittals which is peculiarly within the special expertise of Company or Company's Subcontractors or Suppliers. Review and approval of a component item as such will not indicate approval of the assembly in which the item functions.

C. Engineer's review and approval of Shop Drawings, product data, or Samples will not relieve Company of responsibility for any deviation from requirements of the Contract Documents unless Company has in writing called Engineer's attention to such deviation at the time of submission, and Engineer has given written concurrence in and approval of the specific deviation. Approval by Engineer shall not relieve Company from responsibility for errors or omissions in Submittals.

D. Submittal Action Stamp:

1. Engineer's review action stamp, appropriately completed, will appear on all Submittals of Company when returned by Engineer. Review status designations listed on Engineer's action stamp are defined as follows:

A - SUBMITTAL APPROVED: Signifies Equipment or Material represented by the Submittal conforms with the design concept and complies with the intent of the Contract Documents and is approved for incorporation in the Work. Company is to proceed with fabrication or procurement of the items and with related Work. Copies of the Submittal are to be transmitted to Engineer for final distribution.

B - SUBMITTAL APPROVED AS NOTED (RESUBMIT): Signifies Equipment and Material represented by the Submittal conforms with the design concept and complies with the intent of the Contract Documents and is approved for incorporation in the Work in accordance with Engineer's notations. Company is to proceed with fabrication or procurement of the items and with related Work in accordance with Engineer's notations and is to submit a revised Submittal responsive to notations marked on the returned Submittal or written in the letter of transmittal.

C - SUBMITTAL RETURNED FOR REVISION (RESUBMIT): Signifies Equipment and Material represented by the Submittal appears to conform with the design concept and comply with the intent of the Contract Documents but information is either insufficient in detail or contains discrepancies which prevent Engineer from completing his review. Company is to resubmit revised information responsive to Engineer's annotations on the returned Submittal or written in the letter of transmittal. Fabrication or procurement of items represented by the Submittal and related Work is not to proceed until the Submittal is approved.

D - SUBMITTAL NOT APPROVED (SUBMIT ANEW): Signifies Equipment and Material represented by the Submittal does not conform with the design concept or comply with the intent of the Contract Documents and is disapproved for use in the Work. Company is to provide Submittals responsive to the Contract Documents.

E - PRELIMINARY SUBMITTAL: Signifies Submittals of such preliminary nature that a determination of conformance with the design concept or compliance with the intent of the Contract Documents must be deferred until additional information is furnished. Company is to submit such additional information to permit layout and related activities to proceed.

F - FOR REFERENCE, NO APPROVAL REQUIRED: Signifies Submittals which are for supplementary information only; pamphlets, general information sheets, catalog cuts, standard sheets, bulletins and similar data, all of which are useful to Engineer or CPS Energy in design, operation, or maintenance, but which by their nature do not constitute a basis for determining that items represented thereby conform with the design concept or comply with the intent of the Contract Documents. Engineer reviews such Submittals for general content but not for basic details.

G - DISTRIBUTION COPY (PREVIOUSLY APPROVED): Signifies Submittals which have been previously approved and are being distributed to Company, CPS Energy, Resident Project Representative, and others for coordination and construction purposes.

1.09 SAMPLES:

A. Office Samples shall be of sufficient size and quantity to clearly illustrate the following:
   1. Functional characteristics of the product, with integrally related parts and attachment devices.
   2. Full range of color, texture, and pattern.
   3. Material, manufacturer, pertinent catalog number, and intended use.

1.10 INFORMATIONAL SUBMITTALS:

A. Informational Submittals are comprised of technical reports, administrative Submittals, and guarantees which relate to the Work, but do not require Engineer approval prior to proceeding with the Work. Informational Submittals include:
   1. Hydrostatic testing of pipes.
   2. Field test reports.
   3. Concrete cylinder test reports.
   4. Certification on Materials:
   5. Soil test reports.
   6. Temperature records.
   7. Shipping or packing lists.
   8. Job progress schedules.
   9. Equipment and Material delivery schedules.
   10. Progress photographs.
   11. Warranties and guarantees.

B. Transmittal of Informational Submittals:
  1. All informational Submittals furnished by Subcontractors, manufacturers, and Suppliers shall be submitted to Engineer by Company unless otherwise specified.
    a. Identify each informational Submittal by Project name and number, Contract title and number, and Specification Section and Article number marked thereon or in letter of transmittal. Unidentifiable Submittals will be returned for proper identification.
    b. At the time of each submission, call to the attention of Engineer in the letter of transmittal any deviations from requirements of the Contract Documents.
  2. Quantity Requirements:
    a. Technical reports and administrative Submittals except as otherwise specified:
      (1) Paper: One copy to Engineer. One copy to CPS Energy. Only Engineer's comments will be returned to Company.
      (2) Electronic: One copy to Engineer. One copy to CPS Energy.
    b. Written Certificates and Guarantees:
      (1) Paper: One copy to Engineer. One copy to CPS Energy. Only Engineer's comments will be returned to Company.
  3. Test Reports:
    a. Responsibilities of Company, CPS Energy, and Engineer regarding tests and inspections of Equipment and Materials and completed Work are set forth elsewhere in these Contract Documents.
    b. The party specified responsible for testing or inspection shall in each case, unless otherwise specified, arrange for the testing laboratory or reporting agency to distribute one electronic copy of the test reports to CPS Energy, Engineer, Company, and Manufacturer or Supplier.

C. Engineer's Review:
  1. Engineer will review informational Submittals for indications of Work or Material deficiencies.
  2. Engineer will respond to Company on those informational Submittals which indicate Work or Material deficiency.

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION – Not Applicable.

END OF SECTION 013300

SECTION 014000 – COMPANY QA/QC

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Company of responsibility for compliance with the Contract Document requirements.

  1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  2. Specified tests, inspections, and related actions do not limit Company's other quality assurance and quality control procedures that facilitate compliance with the Contract Document requirements.
  3. Requirements for Company to provide quality assurance and quality control services required by Engineer, CPS Energy, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

  1. For developing a schedule of required tests and inspections: SECTION 013200 - Construction Progress Schedules and Reports.
  2. For specific test and inspection requirements: DIVISIONS 2 through 48 sections.

1.02 REFERENCES:

A. ASTM International (ASTM):

  1. E548 - Guide for General Criteria Used for Evaluating Laboratory Competence.

B. Code of Federal Regulations (CFR):

  1. 29 CFR 1910, Subpart A, Section 1910.7 - Definition and Requirements for a Nationally Recognized Testing Laboratory (NRTL).

1.03 DEFINITIONS:

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual Equipment and Materials incorporated into the Work and completed construction comply with requirements. Services do not include Contract enforcement activities performed by Others.

C. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before Equipment and Materials are incorporated into the Work to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

E. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality Control Testing: Tests and inspections that are performed on Site for installation of the Work and for completed Work, i.e., soil compaction, concrete strength, and weld radiographs.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Company or another entity engaged by Company as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

I. Experienced: When used with an entity, "experienced" means having successfully completed specified number of previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 SUBMITTALS:

A. Qualification Data: For testing agencies to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality control service.

C. Reports: Arrange for testing agency/laboratory to prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For CPS Energy's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.05 QUALITY ASSURANCE:

A. General: Qualifications paragraphs in this Section establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing Equipment or systems or Material similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing Equipment and Material similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, Equipment, or Material that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

   1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP).

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's Equipment, Material, or systems that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

   1. Company responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Provide sizes and configurations of test assemblies to adequately demonstrate capability of products to comply with performance requirements.
      d. Build Site-assembled test assemblies using installers who will perform same tasks for Project.
      e. When testing is complete, remove test specimens and assemblies; do not reuse products on Project.
   2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to CPS Energy. Interpret tests and

inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.06 QUALITY CONTROL:

A. CPS Energy Responsibilities: Where quality control services are indicated as CPS Energy's responsibility, CPS Energy will engage a qualified testing agency to perform these services.
   1. CPS Energy will furnish Company with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Payment for these services will be made directly by CPS Energy.
   3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Company, and the Contract Price will be adjusted by Change Order.

B. Tests and inspections not explicitly assigned to CPS Energy are Company's responsibility. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Company by authorities having jurisdiction, whether specified or not.
   1. Where services are indicated as Company's responsibility, engage a qualified testing agency to perform these quality control services. Testing agency shall be acceptable to CPS Energy.
      a. Company shall not employ same entity engaged by CPS Energy, unless agreed to in writing by CPS Energy.
   2. Notify testing agencies at least 24hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality control services are indicated as Company's responsibility, submit a certified written report, electronically, of each quality control service.
   4. Testing and inspecting requested by Company and not required by the Contract Documents are Company's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services:
   1. Where indicated or specified in respective Equipment specifications, provide services of an experienced, competent, factory-authorized representative of the manufacturer of each item of Equipment.
   2. Arrange for Field Services representative to visit the Site of the Work and inspect, check, adjust as necessary, and approve the Equipment installation, including service connections. Field Services representative shall be present when Equipment is started up and placed into operation and shall revisit the Site as often as necessary until problems are corrected, and Equipment installation and operation are acceptable to CPS Energy.
   3. Submit to CPS Energy the Field Services representative's completed record forms as required and written report certifying that the Equipment has been properly installed and lubricated; is in accurate alignment; is free from undue stress imposed by connecting piping or anchor bolts; and has been successfully operated under expected full load conditions.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Company's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with CPS Energy and Company in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify CPS Energy and Company promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Company.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Company.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project Site.

G. Coordination: Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION

3.01 ACCEPTABLE TESTING AGENCIES:

A. Company to submit with Bid their proposed testing agency for Company required testing.

3.02 TEST AND INSPECTION LOG:

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to CPS Energy.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project Site. Post changes and modifications as they occur. Provide access to test and inspection log for CPS Energy's reference during normal working hours.

3.03 REPAIR AND PROTECTION:

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Company's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.01 SUMMARY:

A. Definitions:
   1. Basic contract definitions used in the Contract Documents are defined in the CPS ENERGY TERMS AND CONDITIONS. Definitions and explanations are not necessarily either complete or exclusive, but are general for the Work.
   2. General Requirements are the provisions or requirements of DIVISION 1 Sections and which apply to the entire Work of the Contract.

B. Related Information Specified Elsewhere: Specification standards and associations applicable to the Work are specified in each Section.

1.02 SPECIFICATION FORMAT AND CONTENT EXPLANATIONS:

A. Specification Format: The Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's (CSI) Section Format and MasterFormat numbering system. Some portions may not fully comply and no particular significance will be attached to such compliance or noncompliance.
   1. Divisions and Sections: For convenience, a basic unit of Specification text is a "Section," each unit of which is numbered and named. These are organized with related Sections, into "Divisions," which are recognized as the present industry consensus on uniform organization and sequencing of Specifications. The Section title is not intended to limit meaning or content of Section, nor is it to be fully descriptive of requirements specified therein, nor to be an integral part of text.
   2. Section Numbering: Used for identification and to facilitate cross-references in Contract Documents. Sections are placed in numeric sequence; however, numbering sequence is not complete, and listing of Sections in Table of Contents at beginning of the Project Manual must be consulted to determine numbers and names of Specification Sections in these Contract Documents.
   3. Page Numbering: Numbered independently for each Section. Section number is shown with page number at bottom of each page, to facilitate location of text.
   4. Parts: Each Section of Specifications generally has been subdivided into three basic "parts" for uniformity and convenience (PART 1 - GENERAL, PART 2 - PRODUCTS, and PART 3 - EXECUTION). These "Parts" do not limit the meaning of text within. Some Sections may not contain all three "Parts" when some are not applicable, or may contain more than three "Parts" to add clarity to organization of Section.
   5. Underscoring of Titles: Used strictly to assist reader of Specification in scanning text for key words in content. No emphasis on or relative importance is intended except where underscoring may be used in body of text to emphasize a duty, critical requirement, or similar situation.
   6. Project Identification: Project file number and identification are recorded at the bottom of each page of Specifications to minimize possible misuse of Specifications, or confusion with other Project Specifications.

B. Specification Content:
   1. These Specifications apply certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
      a. Imperative and Streamlined Language: These Specifications are written in imperative and abbreviated form. This imperative language of the technical Sections is directed at the Company, unless specifically noted

otherwise. Incomplete sentences shall be completed by inserting "shall," "the Company shall," and "shall be," and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, fulfill (perform) all indicated requirements whether stated imperatively or otherwise.

b. Specifying Methods: The techniques or methods of specifying requirements varies throughout text, and may include "prescriptive," "compliance with standards," "performance," "proprietary," or a combination of these. The method used for specifying one unit of Work has no bearing on requirements for another unit of Work.

c. Overlapping and Conflicting Requirements:
    1) Refer to the WESTAR TERMS AND CONDITIONS for the order of interpretation regarding conflicting provisions in the Contract.
    2) Where compliance with two or more industry standards or sets of requirements is specified and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, notify the CPS Energy in writing for a decision, which CPS Energy will render in writing within a reasonable time.

d. Abbreviations: Throughout the Contract Documents are abbreviations implying words and meanings which shall be appropriately interpreted. Specific abbreviations have been established, principally for lengthy technical terminology and in conjunction with coordination of Specification requirements with notations on Drawings and in schedules. These are normally defined at first instance of use. Organizational and association names and titles of general standards are also abbreviated.

C. Assignment of Specialists: In certain instances, Specification text requires that specific Work be assigned to specialists in the operations to be performed. These specialists shall be engaged for performance of those units of Work, and assignments are requirements over which Company has no choice or option. These assignments shall not be confused with, and are not intended to interfere with, enforcement of building codes and similar regulations governing the Work, local trade and union jurisdictions, and similar conventions. Nevertheless, final responsibility for fulfillment of Contract requirements remains with Company.

D. Trades: Except as otherwise specified or indicated, the use of titles such as "carpentry" in Specification text, implies neither that the Work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

1.03 DRAWING SYMBOLS:

A. Except as otherwise indicated, graphic symbols used on Drawings are those symbols recognized in the construction industry for purposes indicated. Refer instances of uncertainty to CPS Energy for clarification.

1.04 INDUSTRY STANDARDS:

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference and are stated in each Section.

1. Referenced standards, referenced directly in Contract Documents or by governing regulations, have precedence over nonreferenced standards which are recognized in industry for applicability to the Work.
2. Where compliance with an industry standard is required, the latest standard in effect at the time of Contract Award unless specifically defined otherwise in the Contract Documents.
3. Where an applicable code or standard has been revised and reissued after the effective date of the Contract and before performance of Work affected by the revision, CPS Energy will decide whether to issue a Change Order to proceed with the revised standard.
4. In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances of uncertainty to the CPS Energy for a decision before proceeding.
5. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
    a. Where copies of standards are needed for performance of a required construction activity, Company shall obtain copies directly from the publication source.

B. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision.

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable

END OF SECTION 014200

SECTION 015100 - TEMPORARY UTILITIES AND FACILITIES

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes requirements of a temporary nature not normally incorporated into final Work. It includes the following:
   1. Utility services.
   2. Construction and support facilities.
   3. Construction aids.
   4. Safety and health.
   5. Fire protection.

B. Related Work Specified Elsewhere:
   1. Temporary Barriers and Controls: SECTION 015700.
   2. Field Offices and Sheds: SECTION 015200.

1.02 REFERENCES:

A. American National Standards Association (ANSI):
   1. A10 Series - Safety Requirements for Construction and Demolition.

B. National Electrical Contractors Association (NECA):
   1. Electrical Design Library - Temporary Electrical Facilities.

C. National Fire Protection Association (NFPA):
   1. 10 - Portable Fire Extinguishers.
   2. 70 - National Electrical Code.
   3. 241 - Safeguarding Construction, Alterations, and Demolition Operations.

D. National Electrical Manufacturers Association (NEMA).

E. Underwriters Laboratories (UL).

1.03 QUALITY ASSURANCE:

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
   1. Building Code requirements.
   2. Health and safety regulations.
   3. Utility company regulations.
   4. Police, Fire Department, and rescue squad rules.
   5. Environmental protection regulations.
   6. Project permit requirements

B. Standards:
   1. Comply with NFPA 10 and 241, and ANSI A10 Series standards "Temporary Electrical Facilities."
   2. Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.04 FURNISHED BY COMPANY:

A. Except as expressly set forth in Article 1.05, Company shall supply, install, properly maintain, and remove all temporary facilities and utilities necessary for performance of the Work, including but not limited to:
   1. All temporary buildings. Refer to SECTION 015200.
   2. Fuels and lubricants.

3. Transportation facilities on and off Site.
4. Communication facilities.
5. Compressed gases.
6. Maintenance cleanliness of Company's work areas.
7. Rigging, scaffolding, and all equipment required for erection.
8. Electric panel and distribution wiring. Connection to and disconnection from the CPS Energy's power source shall be by CPS Energy after 24-hour notice. All electrical conductors from the load centers to the Company's equipment shall be provided by the Company.
9. All cranes and other necessary equipment for lifting and moving equipment.
10. All small tools.
11. Temporary lighting.
12. Temporary heat.
13. All standard expendable or consumable construction items and supplies.
14. Containers, ice, and drinking cups for potable water.
15. Cost of unloading, loading, and storing all Materials, Equipment, and supplies.
16. Dumpsters and waste disposal related to the Work.
17. All sanitary facilities at grade, including janitorial services.

1.05 FURNISHED BY CPS ENERGY:

A. CPS Energy shall supply to the Company the following:
   1. First-aid facilities.
   2. Storage space adjacent to the construction Site for performance of Work. However, the Company shall be responsible for security of materials stored in these areas. The location of all storage areas must be approved by CPS Energy in advance.
   3. Electrical power at construction power load centers. Connection to CPS Energy's load centers shall be performed by CPS Energy after reasonable notice by the Company. All electrical conductors from the load centers to the Company's equipment shall be provided by the Company.
   4. Space for the location of office trailer(s), change trailer(s), material trailer(s), and tool trailer(s), will be in the area designated by CPS Energy.
   5. Parking for Company Employees. All Company's employees shall park in the designated parking lot. Company will be allowed to bring onto the job Site only vehicles marked with the Company's name on the outside of the vehicle.
   6. Maintenance of the Site roads.

1.06 PROJECT CONDITIONS:

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities or permit them to interfere with progress. Do not allow hazardous, dangerous, unsanitary conditions, or public nuisances to develop or persist on the Site.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT:

A. Provide new materials and equipment. If acceptable to CPS Energy, undamaged previously used materials and equipment in serviceable condition may be used. Provide materials and equipment suitable for the use intended, of capacity for required usage, and meeting applicable codes and standards. Comply with requirements of DIVISIONS 2 through 48.

B. Water: Provide potable water approved by local health authorities.

C. Water Hoses: Provide 3/4-inch, heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

D. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

E. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio. If compliance with 2.01.D is not possible, provide GFCI protection with each extension cord.

F. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

G. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

H. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.01 TEMPORARY UTILITIES:

A. General:

1. Engage the appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
2. Provide adequate utility capacity at each stage of construction. Prior to availability of temporary utilities at the Site, provide trucked-in services as required for start-up of construction operations.
3. Obtain and pay for temporary easements required to bring temporary utilities to the Project Site, where CPS Energy's permanent easement cannot be used for that purpose.
4. Furnish, install, and maintain temporary utilities required for adequate construction, safety, and security. Modify, relocate, and extend systems as Work progresses. Repair damage caused by installation or use of temporary facilities. Grade the areas of Site affected by temporary installations to required elevations and grades and clean the area. Remove on completion of Work or until service or facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
5. The types of temporary construction utilities and facilities required include, but not by way of limitation, water distribution, drainage, dewatering equipment, enclosure of Work, heat, ventilation, electrical power distribution, lighting, hoisting facilities, stairs, ladders, and roads.

6. Inspect and test each service before placing temporary utilities in use. Arrange for required inspections and tests by governing authorities, and obtain required certifications and permits for use.
7. Materials used for temporary service shall not be used in the permanent system unless so specified or acceptable to CPS Energy.

B. Because of operational requirements, CPS Energy may restrict or curtail Company's use of electric power, and water. If these utilities are critical to Company's operations and completion of the Contract on the agreed schedule, Company shall consider furnishing alternate sources for its own use. Restriction or curtailment of these utilities shall not be a basis for a claim against CPS Energy or an extension of the agreed schedule.

3.02 TEMPORARY ELECTRICITY AND LIGHTING:

A. Use of Existing System:
   1. CPS Energy's existing system shall not be used for temporary electricity except as specified for office facilities.

B. Construction Power Locations: As designated by CPS Energy.

C. Costs of Installation and Operation:
   1. Pay fees and charges for permits, applications, and inspections.
   2. Pay costs of installation, operation, maintenance, removal of temporary services, and restoration of any permanent facilities used.
   3. Company shall pay cost of power.

3.03 TEMPORARY WATER:

A. Company shall provide approved containers for distributing potable water and provide personnel to fill and distribute water to areas needed.

B. Construction water will be available for Company’s use from CPS Energy-approved location as indicated. Additionally, Construction water may be pulled from Tower Hill Lake. Company to provide necessary personnel, equipment, and materials.

3.04 TEMPORARY TELEPHONE SERVICE:

A. General:
   1. Arrange with local telephone service company and provide direct line telephone service at the construction Site for the use of construction personnel and employees.
   2. Company shall arrange for cellular/mobile telephone service company for use by Company as required.

B. Costs of Installation and Operation:
   1. Pay all costs for telephone service including, but not limited to, long distance and toll charges.

3.05 TEMPORARY SANITARY FACILITIES:

A. Company-Furnished Facilities:
   1. Company shall furnish, install, and maintain temporary sanitary facilities for use through construction period. Remove on completion of Work.
   2. Provide for all construction workers under this Contract and representatives at the Site.
   3. Toilet facilities shall be of the chemical, aerated recirculation, or combustion type, properly vented, and fully enclosed with a glass- fiber-reinforced polyester shell or similar nonabsorbent material.
   4. Wash Facilities: Company shall provide potable water-supplied wash facilities at locations convenient to construction personnel involved in the handling of compounds

and materials where wash-up is necessary to maintain a safe, healthy and sanitary condition. Where recommended or required by governing authorities and regulations or recognized standards provide emergency safety showers, emergency eye-wash fountains, showers, and similar facilities. Dispose of drainage properly. Supply soap and other cleaning compounds appropriate for each condition.

5. Drinking Water Fixtures: Provide containerized tap-dispenser type drinking water units.
6. Supply and maintain toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each facility. Provide appropriate covered waste containers for used material.

B. Use of Existing Facilities:
   1. Existing restrooms facilities shall not be used.

3.06 SEWERS AND DRAINAGE:

A. General: Existing sewers or drainage facilities are not available for discharge of effluent. Provide containers to remove and dispose of effluent off the Site in a lawful manner.

3.07 TEMPORARY CONSTRUCTION AIDS:

A. General:
   1. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work; scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, and other such facilities and equipment.
   2. CPS Energy will not furnish or loan any equipment or tools to the Company.
   3. Materials may be new or used, must be suitable for the intended purpose, and meet the requirements of applicable codes, regulations, and standards.
   4. All equipment shall be located to maintain utility CPS Energy required clearances from overhead power lines at all times.

3.08 TEMPORARY ENCLOSURES:

A. New Construction:
   1. Provide temporary enclosure as Work progresses, to provide acceptable working conditions, weather protection for materials, allow for effective temporary heating, and to prevent entry of unauthorized persons.

3.09 TEMPORARY SAFETY AND HEALTH:

A. General: Company shall be solely responsible for initiating, maintaining, and supervising all safety and health precautions and programs in connection with the Work. Company shall take all necessary precautions for the safety of, and shall provide necessary protections to prevent injury or loss to, all employees on the Work and other persons and organizations who may be affected thereby.

3.10 TEMPORARY FIRE PROTECTION:

A. General:
   1. Company shall be responsible for development of a fire prevention and protection program for all Work under this Contract.
   2. The program shall comply with the applicable provisions for safety and protection specified in the Contract Documents and with applicable parts of the NFPA 10 and 241.
   3. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near such usable stairwell.
   4. Store combustible materials in containers in fire-safe locations.

5. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
6. Provide supervision of welding operations and similar sources of fire ignition.
7. Post warning and instructions at each extinguisher location, and instruct construction personnel on proper use of extinguishers and other available facilities at Project Site. Post local fire department telephone number on or near each telephone instrument at Project Site.

3.11 INSTALLATION AND REMOVAL:

A. Relocation: Relocate construction aids as required by progress of construction, storage limitations, or Work requirements and to accommodate requirements of CPS Energy and other contractors at the Site.

B. Removal: Remove temporary materials, equipment, and services when construction needs can be met and allowed by use of permanent construction, or at completion of the Project.

C. Repair: Clean and repair damage caused by installation or by use of temporary facilities.
   1. Remove foundations and underground installations for construction aids.
   2. Grade the areas of the Site affected by temporary installations to required elevations and clean the area.

END OF SECTION 015100

SECTION 015200 - FIELD OFFICES AND SHEDS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes requirements for temporary field offices and other structures required for office and storage space required by Company.

B. Related Work Specified Elsewhere:

1. Temporary Utilities and Facilities: SECTION 015100.

C. Use of Existing Facilities:

a. Existing facilities at the Site, including offices, sanitary facilities, lunch/break rooms, permanent parking and areas so designated by the CPS Energy shall not be used by Company's personnel.

PART 2 - PRODUCTS

2.01 FIELD OFFICES:

A. General:

1. Provide trailers, mobile buildings, or buildings constructed with floors raised aboveground, with steps, landings, and railings at entrance doors.
2. Buildings shall be structurally sound, secure, and weathertight.
3. Provide appropriate type fire extinguishers at each office and storage area.
4. Maintain offices during progress of the Work.
5. Install office spaces ready for occupancy to support the start of construction.

B. Company's Office:

1. Provide a field office for Company's personnel on the Site and large enough to hold weekly construction meetings.
2. Company's office trailer shall be provided functionally complete of size required for general use, with lights, heat, furnishings, sewage holding tank, telephone service, and other necessary facilities and utilities required by Company's operations.
3. Company shall supply all necessary computers, copiers, fax machines, filing cabinets, and other office supplies necessary to support Company's Work.

2.02 STORAGE SHEDS AND TRAILERS:

A. On Site:

1. CPS Energy may provide warehouse space needed for storage of Equipment and Materials that require indoor storage installed under this Contract. Company shall indicate in its Proposal the amount of space and duration required.

B. Off Site:

1. Advise CPS Energy of any arrangements made for storage of Equipment and Materials in a place other than CPS Energy's Site. Furnish evidence of insurance coverage with Application for Payment

PART 3 - EXECUTION

3.01 LOCATION, INSTALLATION AND MAINTENANCE:

A. General:

1. Place temporary buildings, trailers, and stored materials in locations acceptable to CPS Energy.
2. Install field offices and sheds to resist winds and elements of the locality where installed.
3. Remove when no longer needed at the Site or when Work is completed.

4. Keep approach walks free of leaves, mud, water, ice, or snow.
5. At completion of Work, remove temporary buildings and trailers, foundations (if any), utility services, and debris.
6. Prepare ground or paved areas as specified in applicable Sections.

END OF SECTION 015200

SECTION 015700 - TEMPORARY BARRIERS AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes General Requirements for:
   1. Safety and protection of Work.
   2. Safety and protection of existing property.
   3. Barriers.
   4. Security.
   5. Environmental controls.
   6. Access roads and parking areas.
   7. Traffic control and use of roadways.

B. Related Work Specified Elsewhere:
   1. Temporary Utilities and Facilities: SECTION 015100.
   2. Contract Closeout: SECTION 017800

PART 2 - PRODUCTS – Not Applicable.

PART 3 - EXECUTION

3.01 SAFETY AND PROTECTION OF WORK AND PROPERTY:

A. General:
   1. Provide for the safety and protection of the Work and of Materials and Equipment to be incorporated therein, whether in storage on or off the Site. Provide protection at all times against rain, wind, storms, frost, freezing, condensation, or heat so as to maintain all Work and Equipment and Materials free from injury or damage. At the end of each day, all new Work likely to be damaged shall be appropriately protected.
   2. Notify CPS Energy immediately at any time operations are stopped due to conditions which make it impossible to continue operations safely or to obtain proper results.
   3. Construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavations, floors, pits, trenches, manholes, and ducts free of water.

B. Property Other than CPS Energy's:
   1. Provide for the safety and protection of property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction. Report immediately to the owners thereof and promptly repair damage to existing facilities resulting from construction operations.
   2. Representatives of agencies and utilities having jurisdiction over streets and utilities in the Work area shall be contacted a minimum of 48 hours prior to performing Work, closing streets and other traffic areas, or excavating near underground utilities or pole lines.
   3. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.
   4. Where fences are to be breached on private property, the owners thereof shall be contacted and arrangements made to ensure proper protection of any livestock or other property thus exposed.
   5. The applicable requirements specified for protection of the Work shall also apply to the protection of existing property of others.
   6. Before acceptance of the Work by CPS Energy, restore all property affected by Company's operations to the original or better condition.

3.02 BARRIERS:

A. General:
  1. Furnish, install, and maintain suitable barriers as required to prevent public entry, to protect the public, and to protect the Work, existing facilities, trees, and plants from construction operations. Remove when no longer needed or at completion of Work.
  2. Materials may be new or used, suitable for the intended purpose, but shall not violate requirements of applicable codes and standards or regulatory agencies.
  3. Barriers shall be of a neat and reasonable uniform appearance, structurally adequate for the required purposes.
  4. Maintain barriers in good repair and clean condition for adequate visibility. Relocate barriers as required by progress of Work.
  5. Repair damage caused by installation and restore area to original or better condition. Clean the area.

B. Tree and Plant Protection:
  1. Preserve and protect existing trees and plants at the Site which are designated to remain and those adjacent to the Site.
  2. Provide temporary barriers around each, or around each group of trees and plants. Construct to a height of six feet around trees, and to a diameter at the drip line or five feet from trunk, whichever is greater, to adequately protect plants.
  3. Consult with CPS Energy and remove agreed-on roots and branches which will interfere with construction. Employ qualified tree surgeon to remove and to treat cuts.
  4. Protect root zones of trees and plants as follows:
     a. Do not allow vehicular traffic or parking.
     b. Do not store materials or products.
     c. Prevent dumping of refuse or chemically injurious materials or liquids.
     d. Prevent puddling or continuous running water.
  5. Carefully supervise excavating, grading and filling, and subsequent construction operations to prevent damage.
  6. Remove and replace, or suitably repair, trees and plants which are damaged or destroyed due to construction operations, and which were designated to remain.

3.03 ENVIRONMENTAL CONTROLS:

A. Dust Control:
  1. Provide positive methods and apply dust control materials to minimize raising dust from construction operations; and to prevent airborne dust from dispersing into the atmosphere.

B. Water and Erosion Control:
  1. Provide methods to control surface water to prevent damage to the Project, the Site, or adjoining properties.
  2. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
     a. Hold the areas of bare soil exposed at one time to a minimum.
     b. Provide temporary control measures such as berms, dikes, and drains.
  3. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.
  4. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and groundwater.

5. Treat and dispose of surface runoff water in a manner to prevent flooding, erosion, sedimentation, or other damage to any portion of the Site or to adjoining areas, and in a manner acceptable to authorities having jurisdiction.
6. Provide temporary drainage until completion of the permanent drainage piping system.

C. Rodent Control:
  1. Provide rodent control as necessary to prevent infestation of construction or storage areas.
    a. Employ methods and use materials which will not adversely affect conditions at the Site or adjoining properties.
    b. Should the use of rodenticides be considered necessary, submit an informational copy of the proposed program to CPS Energy. Clearly indicate:
      (1) The area or areas to be treated.
      (2) The rodenticides to be used, with a copy of the manufacturer's printed instructions.
      (3) The pollution preventive measures to be employed.
  2. The use of any rodenticide shall be in accordance with the manufacturer's printed instructions and regulatory agencies.

D. Debris Control and Clean-Up:
  1. Keep the premises free at all times from accumulations of debris, waste materials, and rubbish caused by construction operations and employees. Responsibilities shall include:
    a. Adequate trash receptacles about the Site, emptied promptly when filled.
    b. Periodic cleanup to avoid hazards or interference with operations at the Site and to maintain the Site in a reasonably neat condition.
    c. The keeping of construction materials such as forms and scaffolding neatly stacked.
    d. Immediate cleanup to protect the Work by removing splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from walls, floors, and metal surfaces before surfaces are marred.
  2. Prohibit overloading of trucks to prevent spillages on access and haul routes. Provide periodic inspection of traffic areas to enforce requirements.
  3. Final cleanup is specified in SECTION 017800 - Contract Closeout.

E. Pollution Control:
  1. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by the discharge of hazardous or toxic substances from construction operations.
  2. Provide equipment and personnel, perform emergency measures required to contain any spillages, and remove contaminated soils or liquids. Excavate and dispose of any contaminated earth off-Site in approved locations, and replace with suitable compacted fill and topsoil.
  3. Take special measures to prevent harmful substances from entering public waters, sanitary, or storm sewers.

3.04 ACCESS ROADS AND PARKING AREAS:

A. New Temporary On-Site Roads and Parking Areas:
  1. Locate roads, drives, walks, and parking facilities to provide access to construction offices, mobilization, Work, storage areas, and other areas required for execution of the Contract.
    a. Consult with CPS Energy regarding any desired deviation therefrom.

b. Size of parking facilities shall be adequate to provide for needs of Company's personnel, CPS Energy’s third-party CQA personnel, and visits to Site by CPS Energy and Engineer.

2. Provide access for emergency vehicles. Maintain driveways a minimum of 15 feet wide between and around combustible materials in storage and mobilization areas.
3. Maintain traffic areas free of excavated materials, construction equipment, snow, ice, and debris.
4. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.
5. Keep fire hydrants and water control valves free from obstruction and accessible for use.
6. Construction:
    a. Clear areas required.
    b. Fill, compact, and grade areas as necessary to provide suitable support for vehicular traffic under anticipated loadings. Materials and construction shall be as specified in DIVISIONS 31 and 32.
    c. Provide for surface drainage of facilities and surrounding areas.
    d. Maintain roads, walks, and parking areas in a sound, clean condition. Repair or replace portions damaged during progress of Work.
7. Removal:
    a. Completely remove temporary materials and construction when construction needs can be met by use of permanent installation, unless construction is to be integrated into permanent construction. Remove and dispose of compacted materials to depths required by various conditions to be met in completed Work.
    b. Restore areas to original, better, or specified condition at completion of Work.

B. Existing On-Site Roads and Parking Areas:

1. Designated existing on-Site streets and parking facilities may be used for construction traffic.
    a. Provide temporary additional roads as needed for required construction access.
    b. Maintain existing construction, and restore to original, better, or specified condition at completion of Work.
    c. Do not allow heavy vehicles or construction equipment in parking areas.

3.05 TRAFFIC CONTROL AND USE OF ROADWAYS:

A. Traffic Control:

1. Provide, operate, and maintain equipment, services, and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at Site entrances, on-Site access roads, and parking areas. This includes traffic signals and signs, flagmen, flares, lights, barricades, and other devices or personnel as necessary to adequately protect the public.
2. Remove temporary equipment and facilities when no longer required. Restore grounds to original, better, or specified condition when no longer required.
3. Provide and maintain suitable detours or other temporary expedients if necessary.
4. Bridge over open trenches where necessary to maintain traffic.
5. Consult with governing authorities to establish public thoroughfares which will be used as haul routes and Site access. All operations shall meet the approval of owners or agencies having jurisdiction.

B. Maintenance of Roadways:
   1. Repair roads, walkways, and other traffic areas damaged by operations. Keep traffic areas as free as possible of excavated materials and maintain in a manner to eliminate dust, mud, and hazardous conditions.
   2. All operations and repairs shall meet the approval of owners or agencies having jurisdiction.

3.06 RAILROAD SERVICE:

A. Maintenance:
   1. Schedule operations and exercise care to avoid any interruption to continuous service over the railroads within or adjacent to the Work area.
   2. Before transporting Equipment and Materials across railroad tracks or performing Work within any railroad right-of-way, obtain permission or any necessary permits from the railroads.
   3. The Work shall be subject to all supervision, inspection, and other conditions required by the affected railroads.

END OF SECTION 015700

SECTION 017800 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes administrative and procedural requirements for Contract closeout including, but not limited to, the following:
   1. Inspection procedures.
   2. Project record document submittal.
   3. Submittal of warranties.
   4. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections of the Specifications.

C. Related Work Specified Elsewhere:
   1. Submittals: SECTION 013300.
   2. Manufacturer's Field Services: SECTION 017500.

1.02 SUBSTANTIAL COMPLETION:

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
   1. Satisfy all requirements for Substantial Completion.
   2. Advise CPS Energy of pending insurance changeover requirements. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   3. Submit specific warranties, workmanship Bonds, maintenance agreements, final certifications, and similar documents.
   4. Obtain and submit releases enabling CPS Energy unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Submit record drawings, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
   6. Make final changeover of permanent locks and transmit keys to CPS Energy. Advise CPS Energy's personnel of changeover in security provisions.
   7. Complete start-up testing of systems and instruction of CPS Energy's operation and maintenance personnel. Discontinue and remove temporary facilities from the Site, along with mockups, construction tools, and similar elements.
   8. Complete final cleanup requirements, including touchup painting.

B. Inspection Procedures: On receipt of a request for inspection, CPS Energy will either proceed with inspection or advise Company of unfilled requirements. CPS Energy will prepare the Certificate of Substantial Completion following inspection or advise Company of construction that must be completed or corrected before the certificate will be issued.
   1. CPS Energy will repeat inspection when requested and assured by Company that the Work is Substantially Complete.
   2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.03 FINAL ACCEPTANCE:

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
   1. Satisfy all requirements for Final Completion.
   2. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.

3. Submit an updated final statement, accounting for final additional changes to the Contract Price.
4. Submit a certified copy of CPS Energy's final inspection list of items to be completed or corrected, endorsed and dated by CPS Energy. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by CPS Energy.
5. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the Date of Substantial Completion or when CPS Energy took possession of and assumed responsibility for corresponding elements of the Work.
6. Submit consent of surety to final payment.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Re-inspection Procedure: CPS Energy will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to CPS Energy.
   1. Submit a certified copy of CPS Energy's final inspection list of items to be completed or corrected, endorsed and dated by CPS Energy. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by CPS Energy.
   2. Upon completion of re-inspection, CPS Energy will prepare a certificate of final acceptance. If the Work is incomplete, CPS Energy will advise Company of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
   3. If necessary, re-inspection will be repeated.

1.04 RECORD DOCUMENT SUBMITTALS:

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for CPS Energy and Engineer's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   1. Record information concurrently with construction progress.
   2. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "PROJECT RECORD" in neat, large, printed letters.
   3. Mark new information that is important to CPS Energy but was not shown on Contract Drawings or Shop Drawings.
   4. Note related Change Order numbers where applicable.
   5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
   6. Upon completion of the Work, submit record drawings to CPS Energy for their records.
   7. Include the following:
      a. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

    b. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of construction.
    c. Where Submittals are used for mark-up, record a cross-reference at corresponding location on Drawings.
    d. Field changes of dimension and detail.
    e. Changes made by Change Order or other Modifications.
    f. Details not on original Contract Drawings.

C. Record Specifications: Maintain one complete copy of the Project Manual including Addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and Modifications issued in printed form during construction.
  1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
  2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
  3. Note related record drawing information and product data.
  4. Upon completion of the Work, submit record Specifications to CPS Energy for CPS Energy's records.
  5. Include the following:
    a. Manufacturer, trade name, catalog number, and Supplier of each product and item of Equipment actually installed, particularly optional and substitute items.
    b. Changes made by Addendum, Change Order, or other Modifications.
    c. Related Submittals.

D. Record Product Data: Maintain one copy of each product data Submittal. Note related Change Orders and markup of record drawings and specifications.
  1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Site and from the manufacturer's installation instructions and recommendations.
  2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
  3. Upon completion of markup, submit complete set of record product data to CPS Energy for CPS Energy's records.

E. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Final Completion, complete miscellaneous records, and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to CPS Energy for CPS Energy's records.

F. Electronic Documentation:
  1. In addition to paper copies, provide electronic versions of record documents showing "as-constructed" conditions, "as-constructed" construction progress schedule, and master field drawing list showing final revisions on CD-ROM in AutoCAD.

G. Warranties and Bonds: Specified in WESTAR TERMS AND CONDITIONS and in DIVISIONS 2 through 48.

PART 2 - PRODUCTS – Not Applicable.

PART 3 - EXECUTION

3.01 FINAL CLEANING:

- A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
  - 1. Complete the following cleaning operations before requesting inspection for Final Completion.
    - a. Remove labels that are not permanent labels.
    - c. Clean exposed exterior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Clean concrete floors to a "broom clean" condition. Vacuum carpeted surfaces.
    - d. Clean the Site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.
  - 2. Remove temporary structures, tools, equipment, supplies, and surplus materials.
  - 3. Remove temporary protection devices and facilities which were installed to protect previously completed Work.
  - 4. Special Cleaning: Cleaning for specific units of Work is specified in applicable Sections of Specifications.
- B. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
- C. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the CPS Energy's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Site and dispose of lawfully.
  - 1. Extra materials of value remaining after completion of associated Work become CPS Energy's property. Dispose of these materials as directed by CPS Energy.
- D. Repairs:
  - 1. Repair damaged protective coated surfaces.
  - 2. Repair roads, walks, fences, and other items damaged or deteriorated because of construction operations.
  - 3. Restore all ground areas affected by construction operations.

END OF SECTION 017800

DIVISION 2 - EXISTING CONDITIONS

SECTION 02 41 00 – DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the removal of existing construction as indicated and specified herein and indicated on the Contract Documents. Demolition includes the complete or partial removal and disposal of the following:
  1. Existing Fencing.
  2. Power Pole and cable.
  3. Other items as indicated on drawing CD000.
- B. Related Work Specified Elsewhere:
  1. SECTION 01 11 00 – Summary of work.
  2. SECTION 31 20 50 – Site Preparation and Earthwork

1.02 SUBMITTALS:

- A. Schedule of Demolition:
  1. Submit as specified in DIVISION 1.
  2. Submit proposed methods and operations of demolition for review prior to the start of Work. Include in the schedule the coordination for shutoff, capping, and continuation of utility services as required, together with details for dust, noise, and erosion control protection.
  3. Provide a detailed sequence of demolition, removal, and relocation Work to ensure the uninterrupted progress of CPS Energy's operations.

1.03 JOB CONDITIONS:

- A. CPS Energy will continuously occupy areas of the site immediately adjacent to areas of demolition. Conduct demolition work in a manner that will minimize need for disruption of CPS Energy’s normal operation. Provide CPS Energy a minimum of 72 hours’ advance notice of demolition activities which will severely impact CPS Energys’ normal operations.
- B. Condition of Structures to be Demolished:
  1. CPS Energy assumes no responsibility for actual condition of structures to be demolished.
  2. Conditions existing at time of inspection for bidding purposes will be maintained by CPS Energy insofar as practicable.
- C. Protections:
  1. Ensure the safe passage of persons around the area of demolition or relocation. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons. Erect temporary covered passageways as required by authorities having jurisdiction.
  2. Provide shoring, bracing, or support to prevent movement, settlement, or collapse of structures to be demolished and adjacent facilities to remain.
  3. Protect from damage existing finished facilities that are to remain in place and become exposed during demolition or relocation operations.

4. Construct temporary, insulated, solid, dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.
5. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
6. Remove protections at completion of Work.

D. Explosives: The use of explosives will not be permitted.

E. Traffic:
  1. Conduct demolition operations and the removal of debris to ensure minimum interference with roads and other adjacent occupied or used facilities.
  2. Do not close, block, or otherwise obstruct roads, walks or adjacent facilities without permission from CPS Energy. Provide alternate routes around closed or obstructed traffic ways if required by CPS Energy.

F. Promptly repair damages caused to adjacent facilities or existing utilities (including electrical) by demolition operations at no cost to CPS Energy.

G. Existing Utilities:
  1. Maintain existing utilities indicated to remain; keep in service and protect against damage during demolition operations.
  2. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by CPS Energy. Provide temporary services during interruptions to existing utilities.
  3. CPS Energy will shut off utilities serving each area. Disconnecting and sealing indicated utilities before starting demolition operations shall be done by Company.
  4. Company to verify location and elevation of all existing utilites prior to underground installation where interference or conflict with other utlities or structures could affect alignment and elevation of pipe. Existing utility locations shown on the drawings are an estimate only and may not contain all utilities in place. Company shall locate underground utilities utilizing a method in accordance with specification Section 31 20 50.

PART 2 - PRODUCTS – NOT APPLICABLE.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Prior to commencement of demolition Work, inspect areas in which demolition will be performed. Photograph existing conditions of structures, surfaces, Equipment, or surrounding properties which could be misconstrued as damage resulting from demolition or relocation operations. File with CPS Energy prior to starting Work.

3.02 PREPARATION:

A. Locate all underground utilities to be demolished by use of a water or air jet/vacuum-extraction system and/or hand digging.

B. Provide interior and exterior shoring, bracing or support as necessary to prevent movement, settlement, or collapse of structures near demolition area:
  1. Cease operations and notify CPS Energy and Engineer immediately if safety of nearby structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

  2. Erect and maintain dustproof partitions and closures as required to prevent spread of dust or fumes to occupied portions of building or Site.
- C. Coordinate with CPS Energy about the lock out tag out procedure.
  1. Locate, identify, stub off, and disconnect utility services that are indicated to be demolished, relocated, or are to remain.
  2. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building or Site. Provide minimum of 72 hours' advance notice to CPS Energy if shutdown of service is necessary during changeover.
  3. Fire protection and detection devices shall not be modified until specifically approved by CPS Energy and associated remedies in place prior to the Work.

3.03 DEMOLITION:

- A. Perform demolition in a systematic manner. Use such methods as required to complete demolition indicated on Drawings in accordance with demolition schedule and governing regulations:
  1. Demolish concrete in small sections. Cut concrete at junctures with construction to remain using power-driven masonry saw, hand tools or power-driven impact tools. Use high pressure water blasting for demolition of existing concrete surfaces where indicated. Provide additional equipment and materials to contain the water and protect nearby equipment from damage.
  2. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
  3. Completely fill below-grade areas and voids resulting from demolition. Provide fill consisting of granular material in areas to receive new pavement, and suitable materials in other areas, or as directed by Engineer (see SECTION 31 20 50.)
  4. Demolish concrete walls completely. Demolish and remove below-grade concrete, wood or metal construction.
  5. Demolition of electrical components will need to be done according to the guidelines specified in the National Electrical Code.
     - a. Cables either partially or completely routed in cable tray and slated for demolition shall be abandoned in place. Such cables shall be disconnected at both ends, pulled back to tray, and marked with green tape indicating cable is de-energized and abandoned in place. Exposed conductors shall be fully insulated with insulating tape.
     - b. Cables routed entirely in conduit shall be demolished and disposed of in accordance with requirements of this section along with conduit, conduit supports, and fittings.
     - c. Control panels and associated mounting hardware shall be demolished and disposed of in accordance with requirements of this section.
     - d. Care shall be taken when removing motors and instrumentation from service so as to avoid damage to equipment. Motors and instruments shall be presented to Owner and may be claimed by Owner at Owner’s discression.
  6. Fences: Remove fence construction including fabric, posts, other components, and any below-grade construction such as concrete.
     - a. Company shall protect and restore as necessary existing fence grounding grid during demolition of existing fencing and installation of new fencing.
- B. If unanticipated mechanical, electrical, or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to CPS Energy and Engineer in written, accurate detail. Pending

receipt of directive from CPS Energy, rearrange demolition schedule as necessary to continue overall job progress without delay.

C. Pollution Controls:
   1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.
   2. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
   3. Clean adjacent structures and area of dust, dirt, and debris caused by demolition operations.

3.04 SALVAGE MATERIALS:

A. Items to be removed may be claimed by the CPS Energy. These items shall be placed at CPS Energy approved location. All other materials removed shall become property of the Company. Items sent to landfill shall be placed at an CPS Energy approved landfill.

3.05 DISPOSAL OF DEMOLITION MATERIALS:

A. Remove debris, rubbish, and other materials resulting from demolition operations.

B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

C. Burning of removed materials from demolished structures will not be permitted on the Site.

D. Transport materials removed from demolished structures and dispose of off the Site at CPS Energy-approved landfills.

3.06 CONNECTIONS TO EXISTING CONSTRUCTION:

A. Cut and remove portions of existing construction as required to allow for proper installation of new construction.

B. Shore and brace existing structures until permanent supports are completed, and to maintain structures in a safe condition.

C. Repair all damage as a result of installation of shoring and bracing.

D. Seal the ends of all pipe and conduit remaining after demolition with a minimum of 12 inches of non-shrink grout.

3.07 CLEANUP AND REPAIR:

A. Upon completion of demolition Work, remove tools, equipment, and demolished materials from site.

B. Repair demolition performed in excess of that required. Repair adjacent construction or surfaces soiled or damaged by demolition Work.

END OF SECTION 02 41 00

SECTION 026613 - GEOTEXTILE

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes geotextile to be used at the following locations:
   1. Bedding material for riprap.
   2. Silt fence.

B. Related Work Specified Elsewhere:
   1. Geomembrane Liner: SECTION 026617.
   2. Site Preparation and Earthwork: SECTION 312000.

1.02 REFERENCES:

A. Applicable Standards:
   1. American Society for Testing and Materials (ASTM):
      a. D3776 – Test Methods for Mass per Unit Area (Weight) of Woven Fabric.
      b. D4355 – Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Are Type Apparatus).
      c. D4491 – Test Method for Water Permeability of Geotextiles by Permittivity.
      d. D4533 – Test Method for Trapezoid Tearing Strength of Geotextiles.
      e. D4632 – Test Method for Grab Breaking Load and Elongation of Geotextiles.
      f. D4751 - Test Method for Determining the Apparent Opening Size of a Geotextile.
      g. D4833 – Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
      h. D5261 – Test Method for Measuring Mass per Unit Area of Geotextiles.

1.03 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Includes, but not limited to, the following:
   1. Product Data: Specifications, installation instructions, and general recommendations from materials manufacturer of geotextile filter fabric. Specification sheets shall give full details of minimum physical properties and test methods used.
   2. Three fabric samples (6-inch x 6-inch minimum size).
   3. List of three similar projects completed in which the manufactured material has been successfully used. Include name and phone number of owner associated with each project.
   4. Chemical resistance data.
   5. Verification that manufacturer's quality control includes inspection for broken needles where appropriate before material leaves manufacturer's plant.
   6. Geotextile manufacturer’s quality control certificates for each roll of geotextile delivered to the Project Site. The quality control certificates shall be submitted prior to installation and include material components listed in Article 2.01.D, this Section.
   7. The geotextile installer's Quality Control manual describing method of documenting placement, seaming, laps, and related items.

1.04 QUALITY ASSURANCE:

A. CPS Energy will engage and pay for the services of (1) CQA Monitor, and (2) CQA Laboratory for monitoring the quality and installation of the geotextile, unless otherwise specified.
  1. CPS Energy shall not be charged any time or material expense by Company or manufacturer, related to plant visits during manufacturing by representatives of CPS Energy, Engineer, or CQA Monitor.
  2. Company shall provide personnel and equipment necessary to move, cut, and protect geotextile rolls.

B. Quality assurance conformance testing of geotextile shall be performed by an independent laboratory and paid for by the Company. Conformance sampling shall be completed at a minimum frequency of one sample every 50,000 square feet of geotextile delivered.
  1. Conformance testing of geotextile shall include those properties listed in Article 2.01.D, this Section.
  2. Engineer may revise the test methods used for determination of conformance properties to allow for use of improved methods.

C. All geotextile conformance test data as well as geotextile manufacturer quality control testing shall meet or exceed requirements of Article 2.01.D of this Section. Any materials that do not conform to these requirements shall be retested or rejected at the direction of the CPS Energy.
  1. Geotextile that is rejected shall be removed from the Project Site and replaced at Company's expense. Sampling and conformance testing of geotextile supplied as required for rejected material shall be performed by CPS Energy-approved independent laboratory at Company's expense.

1.05 OPERATING CONDITIONS:

A. The geotextile shall be manufactured for use under the following conditions:
  1. Wind velocity of 0 to 70 miles per hour can occur.
  2. Ambient air temperatures at Site location to range from –l0°F to 110°F.
  3. Ice formation may occur.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Do not leave geotextile material exposed to direct sunlight and ultraviolet rays.

B. Receive, store, and handle geotextile materials as recommended by manufacturer. Completely cover all materials while being stored on-Site prior to use.

C. Damaged material on rolls shall be cut out and removed from the Site.

PART 2 - PRODUCTS

2.01 FABRIC:

A. Provide geotextile of generic type specified and tested to show compliance with specified performances. Mass per unit area (ASTM D5261) shall be:
  1. 16 oz/sy material shall be used under riprap and for cushioning for the leachate pond inflow pipe.
  2. Silt fence material shall be as indicated on Contract Drawings.

B. Geotextile shall be manufactured of new, first quality products designed and manufactured specifically for the purpose of filtering out soil fines while maintaining good drainage characteristics.

C. Geotextile shall be so produced as to be free of tears, punctures, or any sign of contamination by foreign matter. Any such defect shall be repaired in accordance with the manufacturer's recommendations. Geotextile must be uniform in thickness with a maximum 10% deviation from the nominal thickness. Edges shall be straight and free of nicks and cuts.

D. Geotextile Properties (minimum) - refer to Paragraph 2.01.A for specific uses of each material:
  1. Nonwoven needle punched polypropylene or polyester fabric meeting the following specifications (minimum average roll values unless otherwise noted):
    a. Material: Nonwoven needle punched polypropylene or polyester.
    b. Mass/Unit Area: ASTM D3776, 14 oz/sy, 16 oz/sy.
    c. Grab Tensile Strength: ASTM D4632, min 330 pounds (14 oz/sy), min 390 lbs (16 oz/sy).
    d. Elongation at Failure: ASTM D4632, 50%.
    e. Coefficient of Permittivity-k: ASTM D4491 0.9 sec^{-1} (14 oz/sy), 0.60 sec^{-1} (16 oz/sy).
    f. Apparent Opening Size: ASTM D4751, less than or equal to No. 70 sieve.
    g. Puncture Strength: ASTM D4833, min 160 lbs (14 oz/sy), min 240 lbs (16 oz/sy).
    h. Trapezoid Tear Strength: ASTM D4533, min 125 lbs (8 oz/sy), min 125 lbs (16 oz/sy).
    i. Sewn Seam Strength: ASTM D4632, 140 pounds.
    j. Ultraviolet Light Resistance: ASTM D4355, 70%.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that all surfaces to be lined are smooth, free of all foreign material, sharp objects, or debris of any kind.
B. Verify that all surfaces to be lined provide a firm foundation with no sharp changes or abrupt breaks in grade.
C. Verify that there is no standing water or excessive moisture on prepared subgrade.
D. Certify in writing that the surface on which the geotextile is to be installed is acceptable before commencing work.

3.02 PREPARATION:

A. Surfaces to be lined shall be smooth and free of all rocks, stones, sticks, roots, sharp objects, or debris of any kind.
B. The surface should provide a firm foundation for the geotextile with no sudden, sharp, or abrupt changes or breaks in grade.
C. Standing water or excessive moisture shall not be allowed.

3.03 INSTALLATION:

A. Install geotextile and all accessories in accordance with these Specifications and as indicated.
B. Install geotextile on prepared surface or within trench using careful procedures with minimum handling. Unroll panels as close to their final position as possible.
C. Seaming of Geotextile:
  1. Geotextile panels shall be overlapped a minimum of 12 inches.
  2. Geotextile may be heat seamed (with no open flame). Engineer approval required prior to use of heat seaming.
D. Adhere to the following stipulations while working on or near geotextile:
  1. No smoking shall be allowed.
  2. No glass or metal containers or other sharp objects shall be used.
  3. No construction installation equipment shall pass over any exposed fabric surface.

4. Remove snow and water from the ground surface prior to fabric installation.
5. Cover the geotextile within 20 days after placement.
6. Placement of the cover material over the geotextile shall be as indicated in SECTION 312000.

END OF SECTION 026613

DIVISION 31 - EARTHWORK

SECTION 312000 - SITE PREPARATION AND EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes Site preparation activities and certain items of earthwork common to other related work as necessary to complete the Work including all clearing and grubbing, stripping, subgrade preparation, excavating, trenching, borrowing, embankment construction, backfilling, compacting, grading, placing of protective cover material, riprapping, topsoiling, and all related items necessary to complete the Work indicated or specified.

B. Related Work Specified Elsewhere:
   1. Geotextile: SECTION 026613.
   2. Crushed Rock Surface Course: SECTION 321100.
   3. Seeding: SECTION 329200.

1.02 REFERENCES:

A. Applicable Standards:
   1. American Society for Testing and Materials (ASTM) (Equivalent AASHTO standards may be substituted as approved):
      a. C88 - Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
      b. C131 – Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
      c. C136 – Test Method for Sieve Analysis of Fine and Coarse Aggregates.
      d. D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).
      e. D1556 – Test Method for Density and Unit Weight of Soil In-place by the Sand Cone Method.
      f. D2167 - Test Method for Density and Unit Weight of Soil in-Place by the Rubber Balloon Method.
      g. D2216 – Test Methods for Laboratory Determination of Water (Moisture) Content for Soil and Rock by Mass.
      h. D2434 – Test Method for Permeability of Granular Soils (Constant Head).
      i. D2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).
      j. D4253 - Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
      k. D4254 - Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
      l. D4318 - Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
      m. D4546 - Test Methods for One-Dimensional Swell or Settlement Potential of Cohesive Soils.
      n. D5084 – Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
      o. D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
   2. Occupational Safety and Health Administration (OSHA):

    a. 29 CFR Part 1926 - Safety and Health Regulations for Construction.
3. Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, State of Texas.

1.03 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Includes, but not limited to, the following:
    1. Test results from laboratory testing of proposed borrow material (general fill and protective cover material) from on or off site.
    2. Test results from laboratory testing of granular material.
    3. Erosion control plan.
    4. Sheeting and Shoring Excavation Plan.
    5. Where selecting an option for excavation, trenching, and shoring in compliance with local, state, or federal safety regulations such as OSHA 29 CFR Part 1926 or successor regulations, which require design by a registered professional engineer, submit (for information only and not for CPS Energy approval) the following:
        a. Copies of design calculations and notes for sloping, benching, support systems, shield systems, and other protective systems prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located.
        b. Documents provided with evidence of registered professional engineer's seal, signature, and date in accordance with appropriate state licensing requirements.

1.04 QUALITY ASSURANCE:

A. Sampling and Testing:
    1. Tests to determine conformance with all requirements of this Specification for quality and properties of all Company-secured materials, including borrow materials (both on or off Site) proposed for use, shall be performed by an independent, commercial laboratory retained and compensated by Company, and approved by CPS Energy.
    2. When incorporating materials into the Work, quality control testing will be performed during construction by a testing laboratory retained and compensated by CPS Energy.

1.05 PROJECT CONDITIONS:

A. Lines and grades shall be as indicated.

B. CPS Energy will furnish benchmarks, base lines, and reference points as necessary to permit Company to lay out and construct the Work properly.

C. Carefully maintain all benchmarks, monuments, and other reference points and replace as directed by CPS Energy if disturbed or destroyed.

D. Temporary Erosion and Sediment Controls: Furnish, install, construct, and maintain temporary measures to control erosion and minimize the siltation of intermittent streams. Temporary erosion and sediment control measures shall be constructed in substantial compliance with local, state, federal, and jurisdictional agency's regulations and the Stormwater Pollution Prevention Plan (SWPPP) and Contract Drawings. Temporary erosion and sediment control measures shall be maintained until completion of the Contract.

E. Disposition of Utilities: The project area does not contain any existing known utilities. However, if existing utilities are encountered, they shall be addressed in the following manner:
    1. Report active, inactive, and abandoned utilities encountered in excavating and grading operations. Remove, plug, or cap as directed by CPS Energy.
    2. Provide as-constructed drawings of Underground Facilities found.

F. Survey work, to accurately determine locations, elevations, and quantities of Contract pay items, shall be performed during the course of construction by an independent Professional Land Surveyor registered in the state of Texas. Surveyor shall be retained and compensated by Company. Company shall notify CPS Energy prior to commencing survey work.

PART 2 - PRODUCTS

2.01 MATERIALS ENCOUNTERED:

A. Suitable Materials: Materials suitable for use in embankment and fill include material that is free of debris, roots, organic matter, frozen matter, and which is free of stone having any dimension greater than 2 inches in areas requiring a high degree of compaction, or 4 inches in other embankment and fill areas:
  1. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands generally exclusive of clayey and silty material with the following properties:
    a. Are free-draining.
    b. Impact compaction will not produce a well-defined moisture-density relationship curve.
    c. Maximum density by impact methods will generally be less than by vibratory methods.
    d. Generally less than 15% by dry weight of soil particles pass a No. 200 square-mesh sieve.
  2. Cohesive materials include materials made up predominately of silts and clays generally exclusive of sands and gravel with the following properties:
    a. Impact compaction will produce a well-defined, moisture-density relationship curve.
    b. Are not free draining.

B. Unsuitable Materials: Materials unsuitable for use in embankment and fill include all material that contains debris, roots, organic matter, frozen matter, shale particles, or material containing gravel or stone with any dimension greater than 2 inches in areas requiring a high degree of compaction or 4 inches in other embankment and fill areas, or other materials that are determined by CPS Energy as too wet or otherwise unsuitable for providing a stable subgrade or stable foundation for structures.

C. Material used for embankment or fill:
  1. For soils used in dikes or embankments or below structural elements, such as footings, slabs, pavements, and mats, that portion of material passing the No. 40 square-mesh sieve shall have a liquid limit not exceeding 40 and a plasticity index not exceeding 25 when tested in accordance with ASTM D4318.

D. All Materials encountered, regardless of type, character composition and condition thereof, shall be considered “unclassified” for the purpose of payment. Determine quantity of various materials to be excavated prior to submitting Bid. Rock encountered shall be handled at no extra cost to CPS Energy.

E. Waste Materials:
  1. Waste materials, as described for purposes of this Section, consist of unsuitable materials, excess suitable material, rock, demolition debris, and other materials considered unacceptable for use as fill, and which are not environmentally contaminated. Waste materials shall not include environmental pollutants, hazardous substances, contaminated products, by-products, samples, or waste materials of any kind that are regulated under environmental laws.

2. Dispose of waste materials in accordance with Paragraph 3.02.F, this Section.

2.02 BORROW MATERIALS:

A. Suitable fill materials, granular materials, and topsoil obtained from locations arranged for by Company on or off the Site. Required to the extent sufficient suitable materials are not obtained from excavation and trenching.

B. Obtain, excavate, haul, handle, place, and compact borrow materials.

C. Borrow materials shall not exhibit characteristics of high shrink-swell potential as determined from Atterberg limit tests (ASTM D4318) and/or swell tests (ASTM D4546) unless otherwise specified herein.

D. All borrow materials shall be subject to the approval of CPS Energy.

2.03 GRANULAR MATERIAL:

A. Pipe bedding or granular drainage material for leachate collection pipes, and granular material for fill around the leachate pond riser discharge structure, shall be crushed limestone, dolomite, or crushed (natural) gravel, free from lumps or balls of clay, dirt, silt, vegetable matter, or other objectionable matter and reasonably free from thin and elongated pieces of aggregate. Aggregate shall be durable, sound, and reasonably uniform in density and quality.

1. Percentage of loss shall not exceed 45% when tested in accordance with ASTM C131. The magnesium sulfate soundness loss shall not exceed 18% after 5 cycles when tested in accordance with ASTM C88.

B. Gradation shall not vary from low limit on one sieve to high limit on adjacent sieve or vice versa. Test by ASTM C136, and conform to the following or Engineer-approved equal:

Standard Square Mesh Sieve U.S. Size or No.	Pipe Bedding/Granular Drainage Material ASTM C33 No. 6 Stone Percent Passing	Leachate Pond Riser Fill ASTM C33 No. 2 Stone Percent Passing
3 inch	-	100
2-1/2 inch	-	90 to 100
2 inch	-	35 to 70
1-1/2 inch	-	0 to 15
1 inch	100	-
3/4 inch	90 to 100	0 to 5
1/2 inch	20 to 55	-
3/8 inch	0 to 15	-
No. 4	0 to 5	-

C. The hydraulic conductivity for the pipe bedding/granular drainage material shall be equal to or greater than 1×10^{-3} centimeters per second as determined by ASTM D2434 when compacted as specified.

2.04 EMBANKMENT AND FILL MATERIAL:

A. Material shall be free of roots or other organic matter, refuse, ashes, cinders, frozen earth, or other unsuitable material.

B. Use suitable material sufficiently friable for embankment to provide a dense mass free of voids and capable of satisfactory compaction.

C. Do not use material containing gravel, stones, or shale particles greater in dimension than one-half the depth of the layer or lift to be compacted.

D. Moisture content shall be that required to obtain specified compaction of the soil or as indicated.

E. Perform moisture curing by wetting or drying of the material as required to attain required compaction criteria.

2.05 RIPRAP:

A. Riprap Material:

1. Quarry-run stone with stones weighing 80 to 150 pounds each. At least 90% shall weigh more than 80 pounds each.
2. Stones shall be durable, free from cracks, seams, and other defects which would tend to increase deterioration from natural causes.
3. Dirt, sand, or clay shall not exceed 5% by weight.
4. Quantity of rock with an elongation greater than 3:1 shall not exceed 20% of the mass. No stone shall have an elongation greater than 4:1.
5. Not more than 10% of the stone shall show splitting, crumbling, or spalling when subjected to 5 cycles of the sodium soundness test as required by ASTM C88.
6. In lieu of conforming to above specified test requirements, material with a proven history of satisfactory performance may be approved for use in the Work provided certification of this history is acceptable to Engineer.

B. Geotextile Fabric:

1. Geotextile Fabric shall be as specified in SECTION 026613.

2.06 GENERAL FILL:

A. General fill shall be soil material free of gravel or rock particles greater than one inch in size in any dimension, roots or other organic matter, ice, snow, frozen earth, or other unsuitable material; and a maximum 50% of the material shall pass the No. 200 sieve (ASTM D1140).

2.07 PROTECTIVE COVER MATERIAL:

A. Material shall be general fill soil or bottom ash material, meeting the below specifications and obtained from areas indicated in the Contract Documents or by the CPS Energy.

1. CPS Energy to identify and make accessible bottom ash from existing Bottom Ash Pond at CPS Energy-indicated location. Material shall be screened to meet the requirements of this Section.
2. General fill soil shall be obtained from an on-site or off-site location for use as protective cover in all 8-foot wide flat bottom ditches and leachate pond side slopes.

B. A maximum 50% of the material shall pass the No. 200 sieve (ASTM D1140).

C. The hydraulic conductivity for protective cover material shall be equal to or more than 1×10^{-4} centimeters per second as determined by ASTM D5084 when remolded to a density representative of the measured density achieved during placement of the protective cover material.

D. Thickness and location of protective cover material layer shall be as indicated and shall be verified by a survey as indicated in Article 3.03.F.

E. Shall be free of gravel or rock particles greater than one inch in size in any dimension, roots or other organic matter, ice, snow, frozen earth, or other unsuitable material.

PART 3 - EXECUTION

3.01 SITE PREPARATION:

A. Erosion and sediment control measures shall be installed and maintained in accordance with the Stormwater Pollution Prevention Plan (SWPPP) and as indicated and specified.

B. Sediment (Silt) Fence:
  1. Install silt fence as indicated and as follows:
    a. On the downslope side(s) of all disturbed areas.
    b. On the downslope side(s) of all stockpile areas.
  2. Inspection:
    a. Daily in areas of active construction or equipment operation.
    b. Weekly in areas with no construction or equipment operation.
    c. Within 24 hours of each 0.5-inch or greater rainfall event.
    d. Complete inspection reports after each inspection and submit to CPS Energy within 2 working days.
  3. Maintenance:
    a. Remove sediment from behind silt fence when it reaches one-third the height of fence. Place removed sediment in topsoil stockpile areas.
    b. Any silt fence damaged so it cannot perform its intended function shall be replaced as indicated or as directed by CPS Energy.
    c. Remove silt fence after area has been surfaced or seeded and has been accepted by CPS Energy.

C. Construction Access:
  1. Immediately remove by shoveling and/or sweeping all sediment tracked from the construction area onto Site access roads. Place sediment in stockpile areas.

D. Clearing and Grubbing:
  1. Perform only in areas where earthwork or other construction operations are to be performed, including borrow areas.
  2. Protect tops, trunks, and roots of existing trees which are to remain on Site.
  3. Clear areas and dispose of other trees, brush, and vegetation before starting construction.
  4. Remove tree stumps and roots larger than 3 inches in diameter and backfill resulting excavations with compacted, suitable material.
  5. Dispose of debris from clearing and grubbing at a location off the Site, as arranged for by Company, at no additional cost to CPS Energy. Alternatively, onsite burning is allowable after April 30 with CPS Energy's approval.
  6. Clearing:
    a. Clearing includes felling and disposal of trees, brush, and all other vegetation or combustible material found on or above the existing ground surface inside the work limits, including borrow areas.
    b. Conduct work in a manner to prevent damage to property and to provide for the safety of employees and others.
  7. Grubbing
    a. Grubbing includes the removal and disposal of all tree stumps and roots where fill is to be placed and when the excavated material is to be used as fill. Removal and disposal of tree stumps and roots larger than 3 inches in diameter will be required at all other locations.
    b. Remove to a depth of at least 18 inches below existing grade elevation at all water containment areas. Remove to a depth of at least 12 inches below existing grade elevation at all other locations.
    c. Backfill all excavated depressions with approved material and grade to drain.

E. Stripping:

1. Remove topsoil from areas within limits of excavation, trenching and borrow, and areas designated to receive embankment and compacted fill as follows:
    a. Scrape areas clean of all brush, grass, weeds, roots, and other material.
    b. Strip to depth of approximately 6 inches or to a sufficient depth to remove excessive roots in heavy vegetation or brush areas and as required to segregate topsoil, or as directed by CPS Energy.
    c. Stockpile topsoil in areas where it will not interfere with construction operations or existing facilities. Stockpiled topsoil shall be reasonably free of subsoil, debris, and stones larger than 2 inches in diameter.
    d. Remove waste from the Site.

3.02 EXCAVATION AND TRENCHING:

A. Sheeting and Bracing:
1. Design, furnish, place, maintain, and subsequently remove, to extent required, a system of temporary supports for cut and cover, open cut, or trench excavations, including bracing and associated items to support sides and ends of excavations where excavation slopes might endanger in-place or proposed improvements, extend beyond construction right-of-ways, or as otherwise specified or indicated.
2. Provide all materials on Site prior to start of excavation in each section and make such adjustments as are required to meet unexpected conditions.
3. Space and arrange sheeting and bracing as required to exclude adjacent material and according to stability of excavation slopes.
4. Assess existing conditions including adjacent property and possible effects of proposed temporary works and construction methods; and select and design such support systems, methods, and details as will assure safety to the public, adjacent property, and the completed Work.
5. Perform sheeting, shoring, and bracing in accordance with safety and protection requirements of the Contract Documents.
6. Provide sheeting, shoring, and bracing for trench excavation in subgrade of excavation when required to prevent movement of the main excavation support system.
7. Provide shoring, sheeting, and bracing as indicated or as needed to meet the following requirements:
    a. Prevent undermining and damage to all structures, buildings, underground facilities, pavements, and slabs.
    b. Perform excavations with vertical banks where necessary for construction activities or as indicated, and also within all limits of excavation noted on Drawings.
    c. Design excavation support system and components to support lateral earth pressures, unrelieved hydrostatic pressures, utility loads, traffic and construction loads, and building and other surcharge loads to allow safe and expeditious construction of permanent structures without movement or settlement of the ground, and to prevent damage to or movement of adjacent buildings, structures, underground facilities, and other improvements. Design shall account for staged removal of bracing to suit the sequence of concrete placement for permanent structures and backfill.
    d. Except as otherwise specified herein, shoring and sheeting materials may be extracted and reused at Company's option; however, Company shall remove and replace any existing structure or underground facility damaged during shoring and sheeting. Remove sheeting and bracing as backfill progresses. Fill voids left after withdrawal with sand or other material approved by CPS Energy.

        e. Where shoring and sheeting materials must be left in-place in the completed Work to prevent settlements to or damage within adjacent structures or as directed by CPS Energy, backfill the excavation to 3 feet below finished grade and remove the remaining exposed portion of shoring before completing backfill. If soldier piles and wood lagging are used for shoring, remove wood lagging to within 3 feet of finished grade in incremental steps of approximately 6 inches as backfill is placed, or to Company's design if more stringent. Location of all shoring and sheeting left in-place shall be documented on Company-furnished construction record drawings and provided to Engineer and CPS Energy.
    8. Company shall be solely responsible for proper design, installation, operation, maintenance, and any failure of any component of the system. Review by Engineer of drawings and data submitted by Company shall not in any way be considered to relieve Company from full responsibility for errors therein or from the entire responsibility for complete and adequate design and performance of the sheeting and shoring system.
    9. Provision for Contingencies:
        a. Performance of components of the support system shall be monitored for both vertical and horizontal movement daily.
        b. Provide a contingency plan or alternative procedure for implementation, if system does not adequately perform.
        c. Keep materials and equipment necessary to implement the contingency plan readily available.

B. Explosives: Blasting will not be permitted.

C. Excavation for Structures:
    1. Excavate area adequate to permit efficient erection and removal of forms.
    2. Trim to neat lines where details call for concrete to be deposited against earth.
    3. Excavate by hand in areas where space and access will not permit use of machines.
    4. Notify CPS Energy immediately when excavation has reached the depth indicated.
    5. Over-excavate and replace any localized zones of excessively wet, unstable, organic, yielding, or low bearing capacity materials as directed by CPS Energy. Restore bottom of excavation to proper elevation with compacted fill in areas over-excavated. Correct at no additional cost to CPS Energy when over-excavated without authority or to stabilize bottom rendered unsuitable through negligence or improper dewatering or other operations.

D. Trenching for Underground Utilities:
    1. Side Walls:
        a. Make vertical or sloped within specified trench width limitations below a plane 12 inches above top of pipe.
        b. Make vertical or sloped (stepped) as required for stability, above a plane 12 inches above top of pipe.
        c. Excavate without undercutting sidewalls.
    2. Trench Depth:
        a. Excavate to depth sufficient to provide the minimum bedding requirements for the pipe being placed.
        b. Do not exceed that indicated where conditions of bottom are satisfactory.
        c. Increase depth as necessary to remove unsuitable supporting materials.
        d. Maintain a minimum of 3 feet of soil cover above top of pipe.
    3. Trench Bottom:
        a. Protect and maintain when suitable natural materials are encountered.

b. Remove rock fragments and materials disturbed during excavation or raveled from trench walls.
c. Restore to proper subgrade with trench stabilization material. Correct at no additional cost to CPS Energy when trench is over-excavated without authority or to stabilize bottom rendered unsuitable through negligence or improper dewatering or other operations.

4. Trench Width:
a. Excavate trench to a width which will permit satisfactory jointing of pipe and thorough tamping of bedding and backfill.
b. Do not exceed following trench widths:
(1) For single pipe installation, maintain trench widths below a plane 12 inches above top of pipe as follows:

	Trench Width	
Nominal Pipe Size	Minimum	Maximum
Less than 24"	Pipe od + 1'	Pipe od + 2'
24" to 60"	Pipe od + 2'	Pipe od + 4'

(2) For multiple pipe installations maintain trench widths below a plane 12 inches above the top of the largest pipe as follows:

	Trench Clearances	
Nominal Pipe Size of Outside Pipe	Minimum from Outside Pipe	Maximum from Outside Pipe
Less than 24"	6"	12" F
24" to 60"	12"	24"

(3) Above plane defined in (1) and (2), no maximum limit.
(4) Maximum trench width limitations shall apply in all areas more than 3 feet from manhole or structure walls.
(5) Maximum width shall be as near the minimum specified as can be controlled by construction equipment and methods used.

5. Fill and Embankment Areas: Perform trenching only after compacted fill or embankments have reached an elevation of not less than 1 foot above top of pipe.
6. Limit maximum length of open trench to 100 feet in advance and to 100 feet behind pipe installation.
7. Test Pits:
a. Excavate test pits sufficiently in advance of trenching to enable adequate planning of construction procedure.
b. Locate as follows:
(1) When unstable material is suspected that may require special protective measures.
(2) Where groundwater may require special handling methods.
(3) Where indicated or otherwise approved.
(4) Where interference or conflict with other utilities or structures could affect alignment of pipe.
c. To depth required to obtain information desired.

E. Anchor Trenching:
1. Equipment and Methods:

      a. Types of Equipment and methods may be at Company's option, where other facilities are not endangered.
      b. Length of open trench shall be minimized as much as possible to allow for installation of all geosynthetics.
   2. Side Walls:
      a. Make vertical or slope within specified trench-width limitations.
      b. Excavate without undercutting.
   3. Trench Depth
      a. Excavate trench to a depth which will permit geosynthetics anchoring as indicated on Contract Drawings.
      b. Do not exceed the indicated depth where conditions of bottom are satisfactory.
      c. Increase depth as necessary to remove unsuitable supporting materials.
   4. Trench Bottom:
      a. Protect and maintain when suitable natural materials are encountered.
      b. Remove rock fragments and materials disturbed during excavation or raveled from trench walls.
      c. Restore to proper subgrade with suitable material when over-excavated:
         (1) Payment shall be in accordance with the price agreed upon by Company and CPS Energy.
         (2) Correct, at no additional cost to CPS Energy, when trench is over-excavated without authority or to stabilize bottom rendered unsuitable through negligence or improper operations.
      d. Trench Width:
         (1) Excavate trench to a width which will permit geosynthetics anchoring as indicated on Contract Drawings.
         (2) Minimum Trench Width: As indicated on Contract Drawings.
         (3) Maximum Trench Width:
            (a) Maximum width shall be as near the minimum specified as can be controlled by construction equipment and methods used.
            (b) Correct when over-excavated at no additional cost to the CPS Energy.

F. Waste Materials:
   1. Remove unsuitable materials from Work area as excavated.
   2. Material shall become property of Company and shall be disposed of off Site at locations arranged for by Company unless onsite disposal is approved by CPS Energy.
   3. Segregate excess suitable materials and topsoil from unsuitable materials for possible use by others. Place excavated rock in interior of waste area fills as approved by CPS Energy so it will not be exposed to view.
   4. Grade waste areas and leave free-draining with an orderly, neat appearance. Side slopes shall not be steeper than 3 horizontal to 1 vertical. Topsoil, seed, and mulch waste areas.

3.03 EARTHWORK:

A. Subgrades:
   1. General:
      a. Excavate or backfill as required to construct subgrades to elevations and grades indicated.
      b. Remove all unsuitable material and replace with acceptable fill material and perform all wetting, drying, shaping, and compacting required to prepare subgrade.

    c. Proofrolling: Exposed area to receive fill, backfill, or embankment shall be proofrolled to detect localized zones of excessively wet, unstable, organic, or low bearing capacity materials as follows:
        (1) Proofroll as a single-pass operation with conventional compaction equipment during subgrade preparation and prior to placement of fill, and as a spot check process without the need for complete coverage per unit area of tire. Soft spots shall be over-excavated, backfilled, and compacted with suitable material.
        (2) Proofroll within limits of proposed construction of footings, slabs, mats, or pavement and to extent of 10 feet beyond proposed exterior walls and stated limits, or as otherwise noted. Proofroll with loaded dump truck, loaded pan scrapper, 15-ton light class pneumatic tired roller compactor, or equivalent. Ground contact pressure of 80 psi and average speed of 5 miles per hour shall be maintained and continue until extent of soft spots is determined with not less than one pass per unit area of tire. Soft spots shall be over-excavated, backfilled, and compacted with suitable material.
  2. Subgrade for Fills and Embankments: Roughen by discing or scarifying and wet or dry top 6 inches as required to bond with fill or embankment.
  3. Subgrade for Roadways:
    a. Extend subgrade the full width of pavement or base course, plus 1 foot in each direction.
    b. Cohesive Soil Subgrades: Compact the top 6 inches to a minimum of 95% of maximum dry density within the moisture content range from 4% below optimum to 2% above optimum. Optimum moisture and maximum dry density shall be determined by ASTM D698.
    c. Cohesionless Soil Subgrades: Compact the top 6 inches to not less than 80% of relative dry density as determined by ASTM Methods D4253 and D4254.
  4. Subgrades for Geomembrane Liner:
    a. All surfaces to be lined shall be smooth, free of all foreign, organic, or sharp objects; rock or gravel of any size; or debris of any kind.
    b. Standing water or excessive moisture will not be allowed. Subgrades deemed to be too wet shall be dried and recompacted as required to meet specifications for subgrades.
    c. If rock is encountered, it shall be covered with 3-inches of general fill prior to installing GCL material.
    d. Proof of Compaction:
        (1) Proofroll areas where cutting down to reach subgrade as specified herein. No rut greater than one inch will be accepted. Notify CPS Energy of any soft spots encountered to allow for monitoring of corrective action.
        (2) In areas that have received fill, compact the top 6 inches to a minimum of 95% of maximum dry density within the moisture content range from 4% below optimum to 0% above optimum. Optimum moisture and maximum dry density shall be determined by ASTM D698.Weak or compressible areas which cannot be satisfactorily compacted shall be removed and replaced with properly compacted soil liner material.
    e. Maintain prepared subgrade until GCL is installed. Scarify, moisture-condition, and recompact subgrade or soil liner if damaged or shrinkage cracking occurs.

B. Embankments and Fills:

1. Embankments and fills constructed as subgrade for the landfill, including but not limited to backfill of embankments and perimeter road berms, shall be constructed of suitable cohesive materials as indicated, as defined in Paragraph 2.01.A, this Section, and as approved by CPS Energy.
2. Construct embankments to contours and elevations indicated, using suitable approved material from excavations and borrow areas:
    a. Place fill material in maximum 8-inch loose lifts.
    b. Place embankment only on subgrades approved by CPS Energy.
    c. Do not place snow, ice, or frozen earth in fill; do not place fill on a frozen surface.
3. Obtain compaction by the controlled movement of compaction equipment approved by CPS Energy during placing and grading of layers and to minimum density specified for indicated locations.
4. Except as indicated or specified otherwise, compact cohesive soils to a minimum of 95% of maximum dry density within the moisture content range from 4% below optimum to 2% above optimum. Optimum moisture and maximum dry density shall be as determined by ASTM D698.
5. Except as indicated or specified otherwise, compact cohesionless soils to not less than 75% relative density as determined by ASTM Method D4253 and D4254.

C. Granular Material:
1. Place granular pipe bedding/ granular drainage material as follows:
    a. With level bottom layer at proper grade to receive and uniformly support pipe barrel throughout its length.
    b. Form shallow depression under each joint to facilitate jointing.
    c. Add second layer simultaneously to both sides of pipe with care to avoid displacement.
    d. Complete promptly after completion of jointing operations.
    e. Substitute for any part of earth backfill to within 2 feet of final grade at Company's option.
2. Compact all granular material as follows:
    a. In loose lifts not exceeding 12 inches in depth.
    b. Rod, spade, or use pneumatic or vibratory equipment:
        (1) As required to obtain not less than 70% relative density as determined by ASTM Method D4253 and D4254.
        (2) Throughout depth of embedment.
        (3) For perforated leachate collection pipe within landfill cell, entire length of granular material shall be compacted within pipe trench.
    c. Compaction using flooding or water spraying techniques will not be allowed.

D. Backfilling:
1. Backfill for trenches shall be as specified in "Embankments and Fills," this Section, with the following additional provisions:
    a. Complete promptly upon completion of pipe embedment and approval to proceed.
    b. Use hand methods to a plane 12 inches above top of pipe.
    c. Mechanical methods shall be acceptable where hand backfill is not required.
    d. Backfill in lifts of thickness within compacting ability of equipment used, but not greater than 8 inches.
    e. Until compacted depth over conduit exceeds 3 feet, do not drop fill material over 5 feet. Distance may then be increased 2 feet for each additional foot of cover.

E. Protective Cover Material:

1. Compactive effort shall be as necessary to achieve required hydraulic conductivity in accordance with Article 2.06, this Section.
2. Placement:
    a. Clear areas free of vegetation, rock, and other materials which would interfere with grading and tillage operations.
    b. Protective cover material layer shall be placed in 12-inch compacted thickness lifts.
    c. Grade protective cover material to bring areas to grades as indicated, to ensure that all surfaces are left in an even and properly compacted condition.
3. Placement of the protective cover material shall be by low pressure equipment (not more than 8 psi). Equipment placing protective cover shall operate only on previously placed cover material and shall not operate directly on geotextile. Place cover material in the direction of seam overlaps and in a manner that does not pull, separate, or puncture geotextile. Spreading and/or hauling equipment shall not be allowed to make sudden stops or sharp turns when spreading cover material.

F. Surveying:
1. Establish a uniform grid over the work area not to exceed 100 feet between grid points. In addition, grid points shall be established at the top, mid-point and base of all slopes and other locations of breaks in grade within the indicated area.
    a. Perform a survey and determine vertical elevations at each grid point upon completion of the subgrade surface, the top of leachate collection layer, and the top of the protective cover material layer.
    b. Provide CPS Energy with Excel spreadsheet of surveyed points and elevations.
2. Perform a survey to determine final horizontal and vertical termination limits of installed geomembrane liner. Points shall be established every 100 linear feet along edge of geomembrane.
3. Perform a survey to locate horizontally and vertically the future leachate collection tie-in locations.
4. Submit plan drawings indicating the location of each grid point and the vertical elevations upon completion of the top of subgrade surface. Additionally, submit similar plan drawings upon completion of the top of leachate collection layer and the top of the protective cover layer, verifying that the required protective cover thickness has been obtained. Submit plan drawings within two weeks of completion of the protective cover. Survey drawings shall be signed and sealed by a Professional Land Surveyor registered in the State of Texas.
5. Completed subgrade surface elevations shall be completed within 0.25 feet plus or minus of the indicated grade. The total placed protective cover thickness shall not be less than specified, and the surface elevation of the top of protective cover shall be within 0.25 feet plus or minus of the indicated grade. Minimum design slopes of shall be maintained.
6. Provide list and drawing of field survey data to CQA Monitor and CPS Energy after completion of each required survey, indicating the thickness of the completed layer at the locations noted above.

G. Site Grading:
1. Excavate, fill, compact fill, and rough grade to bring Project area to subgrades as follows:
    a. For surfaced areas, to underside of respective surfacing or base course.
    b. For areas to receive topsoil, to a minimum of 4 inches below finished grade.
2. Grading:
    a. Grade and compact all areas within Project area, including excavated and filled sections and adjacent transition areas, reasonably smooth, and free from irregular surface changes.

      - b. Degree of finish for rough grading shall be that ordinarily obtained from blade grader or scraper operations except as otherwise specified with due allowance for topsoil.
      - c. Finished grades shall generally be not more than 0.1 foot above or below those indicated.
      - d. Finish all ditches and swales to drain readily.
      - e. Provide roundings at top and bottom of banks and at other breaks in grade.

3.04 TOPSOILING:

- A. Topsoil Materials:
  - 1. Shall be material excavated from within the upper layer of on-Site excavations; and be obtained from Site areas having healthy plant growth prior to stripping.
  - 2. Company may furnish topsoil from off-Site borrow areas at his option and without additional charge to CPS Energy provided these materials are:
    - a. From that portion of the soil profile defined as the "A" horizon by the Soil Science Society of America.
    - b. Fertile, friable, and loamy soil of uniform quality without admixture of subsoil materials, gravel, hardpan, debris, or other similar impurities.
    - c. Demonstrate healthy plant growth prior to stripping.
    - d. From areas from which topsoil has not been previously removed by erosion or mechanical methods.
- B. Place topsoil on all areas indicated and on stockpile areas and borrow areas.
- C. Treatment of Subgrade Prior to Topsoil Placement:
  - 1. Clear Site of vegetation heavy enough to interfere with proper grading and tillage operations.
  - 2. Clear surfaces of all stones or other objects larger than 3 inches in thickness or diameter, all roots, brush, wire, grade stakes, or other objectionable material.
  - 3. Loosen subgrade by discing or scarifying to a depth of 2 inches wherever compacted by traffic or other causes to permit bonding of the topsoil to the subgrade.
- D. Placement:
  - 1. Distribute over required areas without compaction other than that obtained with spreading equipment.
  - 2. Place to extent material is available within following limits:
    - a. Not less than 4 inches in depth.
    - b. Do not exceed 6 inches in depth.
  - 3. Shape cuts and fills to drain as indicated.
  - 4. Grade to match contours of adjacent areas and permit good natural drainage.
  - 5. Provide gentle mound over trenches.
- E. After topsoil has been spread, clear surface of stones or other objects larger than 2 inches in thickness or diameter and all other objects that might interfere with planting and maintenance operations.
- F. Protect topsoiled areas from the elements until grass is established. Repair eroded areas as required.
- G. Keep paved areas clean. Promptly remove topsoil or other dirt dropped on surfacing.

3.05 RIPRAP:

- A. Foundation Preparation:

1. Uniformly trim and dress areas on which are placed, conforming to cross sections indicated within an allowable tolerance of plus or minus 1 inch from indicated slope lines and grades of subgrade.
2. Fill areas below tolerance limit with suitable material and compact.
3. Do not place riprap until the base has been accepted by CPS Energy.

B. Placement of Geotextile Fabric:
   1. Place on slopes within limits as indicated.
   2. Roll geotextile fabric on prepared base in a neat manner and anchor.
   3. Any damages to geotextile fabric during placement shall be repaired before proceeding with the Work.

C. Placement of Riprap:
   1. Trim and dress areas requiring riprap to conform with lines as indicated within an allowable tolerance of 3 inches from indicated slope lines and grades of geotextile fabric. When regrading is required, existing geotextile fabric shall be removed and then replaced when slope meets specified tolerance.
   2. Geotextile fabric shall be free of tears, holes, and sags prior to placement of riprap.
   3. Place stone to full course thickness in one operation and in a manner to avoid displacing underlying material or damaging geotextile fabric.
   4. Place stone on prepared base to produce a reasonably well-graded mass of stone in close contact and with a minimum of voids.
   5. Place within a tolerance of plus or minus 3 inches from the theoretical slope lines and grades.
   6. Finished riprap shall be free from pockets of small stones and clusters of larger stones. Hand-place if necessary to secure the desired results.
   7. Maintain riprap protection until accepted; replace any material displaced.

3.06 MAINTENANCE:

A. Protect newly graded and topsoiled areas from actions of the elements.

B. Fill and repair settling, or erosion occurring prior to acceptance of the Work and reestablish grades to required elevations and slopes.

C. Correction of Settlement:
   1. Under provisions of the guarantee, correct any settlement of embankment, fill, or backfill and damages created thereby within 1 year after acceptance of the Work.
   2. Make repairs within 10 days after notification by CPS Energy of settlement.
   3. Make own arrangements for access to the Site for purposes of repair.

3.07 FIELD QUALITY CONTROL:

A. CPS Energy will, through services of an independent laboratory, test all embankments, fills, and subgrades under this Contract to determine conformance with specified density relationships.

B. Testing frequencies shall be per the CQA Plan. If discrepancies exist between the below information and the CQA Plan, the CQA Plan shall govern.

C. Material Properties:
   1. Perform at least one classification test (ASTM D2487) and one moisture-density test (ASTM D698) on each soil type used in fill or backfill operations during construction.
      a. Each sample shall be taken from trenches or other excavations as directed by CPS Energy and should be generally representative of distinguishably differing materials encountered and used for backfill or fill.

        b. Perform one set of tests at the beginning of excavation and one additional set of tests when material properties vary (more or less plastic, different color, more or less granular, or other conditions) from the material initially tested.
        c. Additional tests shall be performed when directed by CPS Energy.
    2. Granular Material:
        a. Perform following tests at intervals specified during granular material construction from material source to ensure compliance with Specification.
            (1) Particle size test (ASTM C136): at least one test for every 3,000 cubic yards of granular pipe bedding material placed.
            (2) Relative density (ASTM D4253 and D4254): at least one per every 50 linear foot along pipeline.
            (3) Laboratory hydraulic conductivity tests (ASTM D2434): at least one test for every 9,000 cubic yards of granular pipe bedding material placed.
                (a) Laboratory test sample shall be compacted to meet requirements of Paragraph 3.03.C, this Section.
    3. Protective Cover Material:
        a. Perform at least one classification test (ASTM D2487) and one moisture-density test (ASTM D698) on each material type used for protective cover.
        b. Perform at least one laboratory hydraulic conductivity test (ASTM D5084) for every 10,000 cubic yards of protective cover material layer material placed.
            (1) Field moisture and density shall be measured in approximate location of each sample.
            (2) Laboratory test sample shall be compacted to density and moisture similar to that of field moisture and density measure in approximate sample locations.
        c. Soil samples for the protective cover material layer testing shall be coordinated with the CPS Energy.

D. Compaction:
    1. Method of test may be either of the following at CPS Energy's option:
        a. ASTM D1556/D2216
        b. ASTM D2167/D2216.
        c. ASTM D6938.
    2. The frequency of in-place compaction testing including density and moisture content will be as follows:
        a. At least one test for every 1,000 cubic yards of material placed in a mass fill.
        b. At least one test for every 3,000 cubic yards of material placed in trenches or around structure.
        c. At least one test for every 2,500 square yards of subgrade fill for GCL.
        d. At least one test for every 100 feet of roadway for road subgrades and crushed rock surface course.
        e. At least one test for every 500 square feet per lift in structural fill.
        f. At least one test for every shift of compaction operations on a mass fill.
    3. At least one test when CPS Energy suspects quality of moisture control or effectiveness of compaction. Remove or scarify fill failing to meet required densities and recompact as necessary to achieve specified results.
    4. Removal of in-place material and replacement with approved new material will be required if scarifying and re-compaction do not produce the required densities.

E. Subgrades:
    1. CPS Energy will inspect all subgrades to determine conformance with indicated lines and grades.

2. Subgrades for roadways shall have a maximum deviation of not more than 1/2 inch in any 10 feet when tested with a 10-foot straightedge applied parallel with and at right angles to centerlines of subgrade areas. Actual grade shall not be more than 0.1 foot from indicated grade.

END OF SECTION 312000

SECTION 334100 - STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes storm drainage pipe and appurtenances, manholes, and inlet and outlet structures.

B. Related Work Specified Elsewhere:

  1. Site Preparation and Earthwork: SECTION 312000.
  2. Concrete: DIVISION 3.

1.02 REFERENCES:

A. Applicable Standards:

  1. American Society for Testing and Materials (ASTM):
     a. C478 - Precast Reinforced Concrete Manhole Sections.
     b. M252 - Plastic and Polyethylene Corrugated Drainage Pipe or Tubing.
     c. M294 – Standard specification for Corrugate Polyethylene Corrugated Pipe, 12 to 60-in Diameter.

1.03 SUBMITTALS:

A. Tests to determine conformance with all requirements of this Specification for quality and properties of all Company-secured materials, shall be performed by an independent commercial laboratory retained and compensated by Company, and approved by Engineer.

B. When incorporating materials into the Work, quality control testing will be performed during construction by a testing laboratory retained and compensated by CPS Energy.

C. Copies of reports and certificates regarding tests and inspection of equipment, materials, and completed Work shall be distributed as specified in DIVISION 1. Furnish specific schedule for sampling to provide Engineer with the opportunity to observe sampling.

PART 2 - PRODUCTS

2.01 CORRUGATED POLYETHYLENE PIPE:

A. Pipe and fittings shall conform to AASHTO M252 for pipe 10" to 15" diameter and AASHTO M294 for pipe 12" to 24" diameter except as modified herein.

B. Pipe and fittings shall not be made from reprocessed material.

C. Coupling bands shall be as per the manufacturer's recommendation to produce a watertight joint.

2.02 STORM DRAINAGE STRUCTURES:

A. Reinforced Portland Cement Concrete: All reinforced portland cement concrete storm drainage structures shall have a paved invert and a smooth grade from pipe invert to pipe invert in structures having more than one pipe.
   1. Cast-In-Place: Conform to all applicable requirements of DIVISION 3.
   2. Precast:
      a. Structures shall be of precast construction where indicated or as approved by Engineer.
      b. Precast structures shall have cast-in-place reinforced concrete base conforming to DIVISION 3.
      c. Precast manholes: Conform to ASTM C478. Joints shall be of rubber conforming to ASTM C443, paragraph 7 and concrete. Rubber gaskets shall be of the O-ring type.

PART 3 - EXECUTION

3.01 GENERAL:

A. Lay all pipe carefully, true to lines and grades indicated. Any pipe which is not in true alignment or which shows undue settlement after laying shall be taken up and relaid at Company's expense.

B. Excavation and Filling for Storm Drainage Structures: Perform as specified in SECTION 312000.

C. Trenching and Filling: Perform as specified in SECTION 312000.

3.02 INSTALLATION - CORRUGATED POLYETHYLENE PIPE:

A. Install to conform to manufacturer's recommendations.

B. All cracked pipe shall be rejected.

END OF SECTION 334100

SECTION 334100 - STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes storm drainage pipe and appurtenances, manholes, and inlet and outlet structures.

B. Related Work Specified Elsewhere:

1. Site Preparation and Earthwork: SECTION 312000.
2. Concrete: DIVISION 3.

1.02 REFERENCES:

A. Applicable Standards:

1. American Society for Testing and Materials (ASTM):
    a. C478 - Precast Reinforced Concrete Manhole Sections.
    b. M252 - Plastic and Polyethylene Corrugated Drainage Pipe or Tubing.
    c. M294 – Standard specification for Corrugate Polyethylene Corrugated Pipe, 12 to 60-in Diameter.

1.03 SUBMITTALS:

A. Tests to determine conformance with all requirements of this Specification for quality and properties of all Company-secured materials, shall be performed by an independent commercial laboratory retained and compensated by Company, and approved by Engineer.

B. When incorporating materials into the Work, quality control testing will be performed during construction by a testing laboratory retained and compensated by CPS Energy.

C. Copies of reports and certificates regarding tests and inspection of equipment, materials, and completed Work shall be distributed as specified in DIVISION 1. Furnish specific schedule for sampling to provide Engineer with the opportunity to observe sampling.

PART 2 - PRODUCTS

2.01 CORRUGATED POLYETHYLENE PIPE:

A. Pipe and fittings shall conform to AASHTO M252 for pipe 10" to 15" diameter and AASHTO M294 for pipe 12" to 24" diameter except as modified herein.

B. Pipe and fittings shall not be made from reprocessed material.

C. Coupling bands shall be as per the manufacturer's recommendation to produce a watertight joint.

2.02 STORM DRAINAGE STRUCTURES:

A. Reinforced Portland Cement Concrete: All reinforced portland cement concrete storm drainage structures shall have a paved invert and a smooth grade from pipe invert to pipe invert in structures having more than one pipe.
   1. Cast-In-Place: Conform to all applicable requirements of DIVISION 3.
   2. Precast:
      a. Structures shall be of precast construction where indicated or as approved by Engineer.
      b. Precast structures shall have cast-in-place reinforced concrete base conforming to DIVISION 3.
      c. Precast manholes: Conform to ASTM C478. Joints shall be of rubber conforming to ASTM C443, paragraph 7 and concrete. Rubber gaskets shall be of the O-ring type.

PART 3 - EXECUTION

3.01 GENERAL:

A. Lay all pipe carefully, true to lines and grades indicated. Any pipe which is not in true alignment or which shows undue settlement after laying shall be taken up and relaid at Company's expense.

B. Excavation and Filling for Storm Drainage Structures: Perform as specified in SECTION 312000.

C. Trenching and Filling: Perform as specified in SECTION 312000.

3.02 INSTALLATION - CORRUGATED POLYETHYLENE PIPE:

A. Install to conform to manufacturer's recommendations.

B. All cracked pipe shall be rejected.

END OF SECTION 334100

BURNS & McDONNELL

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
Phone: 816-333-9400
Fax: 816-333-3690
www.burnsmcd.com

Burns & McDonnell: Making our clients successful for more than 100 years