Appendix E Geotechnical Report

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DRAFT GEOTECHNICAL REPORT

Recycle Water Conveyance Project
City of Soledad, California

Prepared by:

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July 26, 2024

Prepared for:

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& Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Sacramento
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July 26, 2024
Crawford File No. 24-1057.1

Jonathan Marshall, PE
Chief of Infrastructure Design / Vice President
Carollo Engineers Inc.
2795 Mitchell Drive
Walnut Creek, CA 94598

Subject: **DRAFT GEOTECHNICAL REPORT**
Recycled Water Conveyance Project
City of Soledad, California

Dear Mr. Marshall,

Attached is our draft Geotechnical Report for the Recycled Water Conveyance Project in Soledad, California. We prepared this report to provide geotechnical data, conclusions, and recommendations for use in the design. Crawford & Associates, Inc. (Crawford) completed this report in accordance with our Master Agreement and Task Order #1, dated November 4, 2019 and March 6, 2024, respectively.

This report provides geotechnical and geologic data for the new distribution pipeline and provides conclusions and recommendations to support the new pump station, wetwell, and hydropneumatics tanks. We will issue a final report after receiving your comments on this draft.

Please call if you have questions or require additional information.

Sincerely,

Crawford & Associates, Inc.,

Reviewed By,

Ellen Tiedemann, PE
Project Manager

Benjamin D. Crawford, PE, GE
Principal

Maria Ayala, EIT
Project Engineer II

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1 INTRODUCTION

1.1 PURPOSE

Crawford & Associates, Inc. (Crawford) prepared this draft Geotechnical Report for Phase III of the Soledad Water Recycling/Reclamation Project in Soledad, California. Based on our discussions with Carollo Engineers Inc. (Carollo), we prepared this report to provide geotechnical data, conclusions, and recommendations based on the current understanding of the proposed project elements.

This report provides geotechnical and geologic data for the new distribution pipeline and provides conclusions and recommendations to support the new pump station, wetwell, and hydropneumatics tanks. We will issue a final report after receiving your comments on this draft.

1.2 SCOPE OF SERVICES

To prepare this report, Crawford:

- Reviewed geologic, soils, and seismic maps pertaining to the site;
- Discussed the project with Mr. Jonathan Marshall and Ms. Susan Fox with Carollo;
- Reviewed As-built sheets for “Reclaimed Wastewater Transmission Pipeline Project” prepared by Harris & Associates dated September 30, 2016;
- Reviewed the “Geotechnical Engineering Report Soledad Water Reclamation Facility Wind Turbine” prepared by Earth Systems Pacific dated October 17, 2013;
- Reviewed Appendix B from “Soledad WWTP Upgrade and Expansion” by Black & Veatch dated October 2007;
- Reviewed the 30% design submittal plan sheets ‘Recycled Water Conveyance Project’ (PP-S00 to PP-S13) by Carollo dated June 2024;
- Drilled, logged, and sampled four exploratory borings along the proposed distributing piping system and two borings at the Water Reclamation Facility (WRF) between May 13th and 15th, 2024;
- Performed laboratory testing on soil samples recovered from the test borings; and
- Developed conclusions and recommendations based on the data and test results.

2 PROJECT AND SITE DESCRIPTION

The project is located in various areas of Soledad, CA. As part of Phase III of the Soledad Water Recycling/Reclamation Project, the City of Soledad (City) is planning to construct a new pump station, hydropneumatics tanks, and distribution piping system to provide recycled water to about 20 parks and schools within the City. The WRF site is located within a floodplain immediately north of the convergence of the Salinas River and Arroyo Seco River. The approximate site coordinates of the pump station are 36.4205°, -121.3402°.

The new pump station will be located at the Soledad WRF, south of the wind turbine at the abandoned aerated pond No.2. The pump station will have an at-grade skid pad (about 16 ft by 7 ft by 1 ft) above a 11ft outer diameter circular wetwell. The wetwell will be about 16 ft deep with the bottom invert around elevation 156.5 ft. Two, 5 ft diameter at-grade hydropneumatics tanks will be located about 3 ft west of the skid pad. The hydropneumatics and skid pad will be support by new fill; the wetwell will extend into native soils.

Based on conversations with Carollo, we understand the southeast corner of the pond berm (about 40 ft by 50 ft) will be raised to elev. 173 ft and require about 4 to 13 ft of fill. The south and east sections of the fill will grade at a 3:1 toward the access road (elev. 169 to 170 ft). The west section of the fill will grade to the pond at a 2:1 slope. New access ramps will be located at the north and south sections of the fill limits.

New distribution piping is planned from the WRF site to Front Street, and then to 20 parks and schools. The new distribution piping is generally within the City streets, extending north to Terraza Street, slightly east of Orchard Lane, and south to State St. The piping will include about 29,500 linear ft of 4 to 8-inch pipe, all located about 6 ft below ground surface. We understand the pipe will be installed in an open trench. A trenchless crossing may be required at the Union Pacific Railroad by Front Street. If required, the trenchless crossing would parallel an existing jack and bore trenchless crossing about 8 to 10 ft below ground surface. The project also includes replacing about 1,000 linear ft of sewer pipe via pipe bursting on Main Street.

Elevations are based on the project datum provided by Carollo. The project vicinity is shown in Figure 1 in Appendix I.

3 SITE GEOLOGY

The site is located within the Coastal Ranges geomorphic province of California, which is characterized by a series of discontinuous northwest-trending mountain ranges extending from the Klamath Mountains on the north coast of California to the Transverse Ranges to the south. The Coast Ranges are composed of thick Mesozoic and Cenozoic sedimentary strata with a complex structure due to intense folding and faulting. Our site is located in the Salinas Valley between the Klamath Mountains and the Transverse Ranges.

Regional geologic mapping shows the project site underlain by Holocene to Pleistocene aged, alluvium deposits. At the WRF, the site is underlain by Holocene aged young alluvium (Qya), consisting of unconsolidated gravel, silt, and sand deposited by active or recently active floodplains. The trenchless crossing is underlain by Holocene aged young alluvium (Qya1s), consisting of pebbly, medium to fine grained sand and silt deposited from standing to slow moving water in extreme flood events such as 1968 to 1969. The distribution pipeline is mapped within multiple alluvial deposits including Qya, Qya1s, older alluvial fan deposits (Qof4), and very old alluvial fan deposits (Qvof). Qof4 consists of Pleistocene aged, weakly consolidated moderately to poorly-graded gravel, sand, and silt alluvial fans deposits from the Salinas Valley and along Arroyo Seco. Qvof consists of moderately to poorly-graded gravel, sand, and silt from alluvial fans along the sides of the Salinas Valley north of the town of Greenfield.

The geologic map and legend are shown in Figures 3a and 3b in Appendix I.

4 FIELD EXPLORATION

Crawford completed six borings in May 2024. Additionally, Earth Systems Pacific performed one boring in October 2013, and Black & Veatch hired Fugro to perform five boring and eight cone penetration tests (CPTs) at the WRF. Details for each exploration program are provided below.

4.1 PREVOUS EXPLORATIONS

Black & Veatch hired Fugro to complete five borings and eight CPTs in the Soledad wastewater treatment facility in November 2006 for the planned facility expansion. Explorations B-3, B-4, and CPT-2 are located on the access road adjacent to the aeration pond and secondary pond, near the proposed pump station and hydropneumatics tanks. These borings were drilled using a truck-mounted drill rig equipped with rotary wash drill equipment. The CPT was advanced with a 20-ton truck-mounted rig with a 15 cm^2 tip.

Earth Systems Pacific completed one boring (Boring 1) to 61.5 ft below ground surface (bgs) in 2013 to address the wind turbine. The boring was drilled using a truck-mounted Mobile B-53 drill rig with an automatic hammer and 6-inch hollow stem auger. Boring 1 was completed at the bottom of the abandoned aerated pond No.2.

Table 1 provides a subsurface exploration summary of the previous relevant nearby explorations. The details of the borings are shown in Appendix III. Figure 2a shows the approximate boring locations of B-3, B-4, CPT-2, and Boring 1.

Table 1: Previous Boring Subsurface Exploration Summary

Boring Number	Completion Date	Approx. Ground Surface Elev. (ft)	Boring Depth (ft)
B-3	11/17/06	168.9	40.5
B-4	11/8/06	169.0	40.5
CPT-2	11/21/06	169.3	40.3
Boring 1	8/13/13	967[1]	61.5

1. Elevation noted on Boring 1 used a different datum than the 2006 and 2024 borings. The boring was completed at the bottom of the pond and the top of boring elevation is estimated as elev. 160 ft based on current topography.

4.2 CRAWFORD EXPLORATIONS

Crawford completed six explorations in May 2024. Crawford retained Geo-Ex Subsurface Exploration (GeoEx) to drill and sample the borings to a maximum depth of about 61.5 ft bgs. GeoEx used a D70 Track mounted drill rig to complete the borings with 4-inch solid-stem auger. Mud-rotary drilling equipment was utilized at borings A-24-001 and R-24-002. At the time of the 2024 explorations, GeoEx reported the last energy calibration performed on the hammer used in the field for this project has an average efficiency of 92.2%

Table 2 provides a subsurface exploration summary of the Crawford explorations.

Table 2: Crawford Subsurface Exploration Summary

Project Feature	Boring Number	Completion Date	Approx. Ground Surface Elev. (ft)	Boring Depth (ft)
WRF – Pump Station	A-24-001	5/13/24	167	36.5
	R-24-002	5/14/24	162	61.5
Trenchless Crossing	A-24-003	5/14/24	182	36.5
Distribution Pipeline	A-24-004	5/15/24	190	16.5
	A-24-005	5/14/24	258	16.5
	A-24-006	5/15/24	224	18

Soil samples were recovered by means of a 2.0-inch O.D. Standard Penetration Test (SPT) split-spoon sampler without liners and a 3.0-inch O.D. "Modified California" split-spoon sampler with liners. Both samplers were advanced with standard 350 ft-lb striking force using an auto-hammer. Sampler penetration resistance was recorded to provide a field measure of relative densities and can be correlated to a soil's strength and bearing characteristics. Consistency of cohesive soils were obtained in the field by means of pocket penetrometer. The boring logs attached in Appendix II show the field-recorded (uncorrected) blow counts.

Crawford's project engineer logged the test borings consistent with the Unified Soil Classification System (USCS) and the Caltrans Logging Manual[1]. Selected portions of recovered soil drive samples were retained in sealed containers for laboratory testing and reference. Bulk soil samples were retained in sealed bags for laboratory testing and reference. Groundwater observations were recorded during drilling operations when encountered. At completion, the test borings were backfilled with cement grout at the completion of the field study and capped with cement and dyed black in asphalt areas.

The boring locations were measured in the field with respect to existing site features. The boring elevations were estimated based on the 30% plans provided by Carollo. The boring locations are shown in Figures 2 through 2c in Appendix I. Boring details are shown on the boring logs in Appendix II.

5 SURFACE AND SUBSURFACE CONDITIONS

5.1 EXISTING PAVEMENT THICKNESSES

Crawford measured the pavement sections along the distribution pipeline alignment at three boring locations. We present existing pavement section thickness data in Table 3 below.

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[1] Caltrans, Soil and Rock Logging, Classification, and Presentation Manual, 2022 Edition

Table 3: Existing Pavement Section Thicknesses

Boring Number	Street Name	Asphalt Concrete Thickness (in)	Aggregate Base Thickness (in)
A-24-003	Front Street	4.0	6.0
A-24-004	Main Street	5.0	5.0
A-24-006	3rd Street	4.5	4.0

5.2 SOIL CONDITIONS

Soil descriptions for the trenchless crossing, distribution piping system, and new pump and tank are summarized below. Refer to the boring logs in Appendix II for more detailed soil conditions.

5.2.1 PUMP STATION, WETWELL, AND TANKS

Crawford borings A-24-001 and R-24-002 were drilled at the WRF. Based on our subsurface exploration, they are consistent with published geologic maps with near surface materials consisting of loose, alluvial fan deposits. In general, the soils at the WRF site consist of very loose to medium dense silty sand to poorly-graded sand to elev. 140 ft. The sand layer was underlain by 20 ft of stiff fat clay to about elev. 120 ft and then stiff lean clay and medium plastic silt to about elev. 108 ft. Below the clay and silt, we encountered dense to very dense silty to poorly-graded sand until boring termination (61.5 ft bgs; elev. 100.5 ft).

5.2.2 TRENCHLESS CROSSING BORING

Crawford borings A-24-003 was drilled along the potential trenchless crossing. Based on our subsurface explorations, the soils were generally more clayey than published geologic maps.
In general, the soils consist of hard, lean clay to about 11 ft bgs (elev. 171 ft), underlain by interchanging layers of dense to very dense silty sand, poorly-graded sand with silt, and poorly-graded sand to a depth of about 36.5 ft bgs (elev. 145.5 ft).

5.2.3 DISTRIBUTION PIPING SYSTEM BORINGS

Crawford borings A-24-004 through A-24-006 were drilled along the proposed distribution piping system. Based on our subsurface explorations, the soils were generally more clayey than published geologic maps. In these borings, the soils consist of very stiff to hard lean clay and loose to medium dense clayey sand in the upper 8 to 13 ft bgs. Below the lean clay to clayey sand layer, we encountered interchanging layers of medium dense to very dense poorly-graded sand, poorly-graded sand with silt, silty sand, and clayey sand to about 16.5 ft bgs. In boring A-24-006, we encountered stiff sandy clay to very stiff lean clay with sand until the terminal depth of 18 ft bgs.

5.3 GROUNDWATER

Groundwater was encountered in borings A-24-001, R-24-002, and A-24-003 at about 9.5 ft, 4.0 ft, and 27.0 ft bgs, respectively. The borings were backfilled before reliable “static” groundwater level measurements could be taken (24 hours or more is commonly needed to define “static” groundwater level).

Crawford also reviewed the Department of Water Resources Sustainable Groundwater Management Act Data Viewer[2] for nearby well groundwater levels. The recent groundwater levels encountered/recorded in the nearby well, previous boring, and our 2024 borings are shown in Table 4.

Table 4: Groundwater Data

Consultant/ Source	Boring/ Well Number	Date Measured	Groundwater Depth (ft)	Groundwater Elevation (ft)
Crawford	A-24-001	5/13/24	9.5	157.5
Crawford	R-24-002	5/13/24	4.0	158.0
Crawford	A-24-003	5/14/24	27.0	155.0
Earth System Pacific	Boring No.1	8/13/13	4.5	155.5[1]
DWR	364306N1213457W001	11/21/23	29.40	150.9

[1] Based on an estimated top of boring elevation of 160 ft.

DWR well 364306N1213457W001 is located about 0.75 mi northwest of the WRF site.
Groundwater levels can fluctuate due to changes in precipitation, river levels, seasonal variations, local irrigation, and possibly other factors.

6 LABORATORY TESTING

We completed the following laboratory tests on representative soil samples obtained from the exploratory borings:

- Atterberg Limits (ASTM D4318);
- Chloride Content (CTM 422);
- Consolidation Test (ASTM D2435);
- Hydrometer (ASTM D422);
- Moisture Content (ASTM D2216);
- No. 200 Sieve Wash (ASTM D1140);
- pH/Minimum Resistivity (CTM 643);
- Particle Size Analysis (ASTM D6913);
- Redox Potential (ASTM G200-m);
- Sulfate Content (CTM 417);
- Unit Weight (ASTM D7263).

Refer to Appendix IV for the laboratory results.

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[2] https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels (Date accessed June 18, 2024)

7 CORROSION EVALUATION

A soils corrosivity analysis is important for estimating and mitigating the deterioration of buried ferrous metals and concrete. Mapping from the United States Department of Agriculture (USDA) Web Soil Survey[3] indicates the project site is low to moderately corrosive to cementitious elements and low to highly corrosive to ferrous elements.

The results of corrosivity tests on a soil samples obtained from the borings completed for this project are summarized in Table 5.

Table 5: Soil Corrosivity Test Results

Boring / Sample No.	Depth (ft)	pH	Minimum Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)	Redox Potential (mv)	Sulfides Presence
R-24-002 / 7B	15.5-16.0	7.10	540	62.5	177.5	223	Negative
A-24-003 / 3B	4.5-5.0	8.12	600	131.0	196.7	261	Negative
A-24-005 / 3B	3.5-4.0	7.61	3,750	6.2	18.9	290	Negative
A-24-006 3B	4.5-5.0	7.02	910	22.5	80.3	28	Negative

Crawford used the 10-point system in C105/A21.5 (ANSI/AWWA1999) to evaluate the potential for external correction potential on ductile-iron pipe from the soil. Results with 10 points and greater indicate the soil is corrosive to ductile-iron pipe and protection is needed (AWWA 2005). *Based on the corrosivity test results and the 10-point system, our site is considered corrosive to ferrous metals.*

According ACI 318, a sulfate concentration less than 1,000 parts per million (ppm) is considered negligible. A chloride content of less than 600 ppm is non-corrosive to reinforced concrete. *Based on the corrosivity test results and ACI, the site is non-corrosive to concrete.*

The tests results are only an indicator of soil corrosivity and the designer should consult with a corrosion engineer if these values are considered significant.

8 SITE SEISMICITY

8.1 LIQUEFACTION POTENTIAL

Soil liquefaction can occur when saturated, relatively loose sand and specific soft, fine-grained saturated soils (typically within the upper 50 feet) are subject to ground shaking strong enough to create soil particle separation that results from increased pore pressure. This separation and subsequent pore pressure dissipation can lead to decreased soil shear strength and settlement. Liquefaction is known to occur in soils ranging from low-plasticity silts to gravels. However, soil most susceptible to liquefaction are clean sands to silty sands and non-plastic silts. Granular soils with SPT blow count $(N1)_{60} \geq 30$, rock, and most clay soil are not liquefiable. Liquefaction susceptibility of a soil deposit is a function of the soil grain size, relative density, percent fines, plasticity of fines, degree of saturation, age of deposit, and earthquake ground motion.

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[3] https://websoilsurvey.nrcs.usda.gov/app/, access June 6, 2024

To evaluate the potential for soil liquefaction to occur at the site, Crawford used the simplified procedure outlined by Youd et. al.[4] with exploration and lab data Borings A-24-001 and R-24-002, a design groundwater elevation 158 feet, a site-to-fault distance[5] of 9.76 miles, a Maximum Moment Magnitude of 7.6 and PGA_m of 0.83 from the site-specific hazard analysis.

Based on the analysis, potentially liquefiable granular soils are present at this site. Table 6 summarizes the potentially critical liquefiable soil zones (Factor of Safety < 1.0) based on the results of our analysis.

Table 6: Potentially Liquefiable Soil Zones/Layers

Boring ID	Potentially Liquefiable Soil Zones/Layers		Layer Thickness (ft)	Generalized Soil Description	Liquefaction Factor of Safety	Residual Soil Strength[1] (psf)	Liquefaction (Seismic) Settlement (in)
	Depth (ft)	Elevation (ft)					
A-24-001	9 to 19	158 to 148	10	Poorly-graded Sand	0.24 to 0.61	192 to 649	3
	23 to 27	144 to 140	4	Poorly-graded Sand	0.89	851	
R-24-002	4 to 13	158 to 149	9	Poorly-graded Sand	0.22 to 0.47	134 to 398	2.3

[1] Kramer, S. and Wang, C.H., (2015), *"Empirical Model for Estimation of the Residual Strength of Liquefied Soil,"* Journal of Geotechnical and Geoenvironmental Engineering, ASCE as cited in Caltrans (2017), Memo To Designers (MTD) 20-15, Lateral Spreading Analysis for New and Existing Bridges.

The potential for seismically induced settlement is identified at this site from the boring data generated for this study. The calculated settlements from the boring data indicate both variability across the site and in the magnitude of settlement.

During a seismic event, ground shaking can cause densification of granular soils that can result in settlement of the ground surface. For foundation design, we consider the potentially liquefiable soil layers identified in Table 6 to be subjected to reduction to residual shear strength values and seismically induced (vertical) settlement under conditions of strong ground shaking form a design earthquake event.

Based on our analysis, the magnitude of potential post-liquefaction ground settlement associated with the susceptible soil layers identified at this site is on the order of 2 to 3 inches (to lowest elev. 140).

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[4] Youd et.al. (2001), Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshop on Evaluation of Liquefaction Resistance of Soils.

[5] United States Geologic Survey, Unified Hazard Tool, Deaggregation, https://earthquake.usgs.gov/hazards/interactive/

The methods outlined by Idriss and Boulanger (2008)[6] were used to estimate post-liquefaction settlement. The method follows the approach developed by Ishihara and Yoshimine (1992) that relates volumetric strain, SPT $(N_1)_{60cs}$ [i.e., $(N_1)_{60}$ values corrected for fines content], and the factor of safety against liquefaction (FS_L) to estimate the post-liquefaction settlement of a liquefied layer.

8.2 SEISMIC DESIGN PARAMETERS

The encountered subsurface soils during Crawford's 2024 exploration indicate a Site Class D; however, the results of our liquefaction analysis show potentially liquefiable soils layers present at the project site. Liquefiable soils are considered Site Class F per Section 20.3.1 of ASCE 7-16 and a site-specific site response is required, unless the structures have fundamental periods of vibration equal or less than 0.5s. *We assume the proposed pump station will have a fundamental period of 0.5 seconds or less.* According to the Exception in Section 20.3.1 of ASCE 7-16, "a site class is permitted to be determined in accordance with Section 20.3 and the corresponding values of Fa and Fv are determined from Table 11.4-1 and 11.4-2."; therefore, the soils are considered Site Class D for the site-specific ground motion hazard analysis.

The following site-specific seismic design parameters provided in Table 7 should be used for seismic design of the project. If the structure periods are larger than 0.5s, then the site-specific analysis will need to be revised.

Table 7: Site-Specific Seismic Design Parameters

Design Parameter	Value (g)
Design Spectral Acceleration for Short Period (S_{DS})	1.24
Design Spectral Acceleration for 1 sec Period (S_{D1})	1.67
MCE Spectral Response Acceleration for short Period (S_{MS})	1.86
MCE Spectral Response Acceleration Parameter for 1 sec Period	2.50

See Appendix V for the detailed site-specific ground motion hazard analysis.

9 CONCLUSIONS AND RECOMMENDATIONS

We conclude that the site conditions are suitable for construction of the proposed pipeline, pump station, and tanks provided the recommendations presented below are included in design and construction documents. However, the improvements at the WRF site will experience gross static and seismic settlement. Key geotechnical considerations associated with design and construction of this project include:

- the presence of a clay layer about 30 ft thick that is susceptible to consolidation settlement;
- the presence of liquefiable, loose sandy soils above and below the pump station foundation that are susceptible to seismic settlement;
- the presence of saturated, loose sandy soils at the pump station that will be unstable during excavation/construction;

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[6] Idriss, I. M. and Boulanger, R. W., 2008, *"Soil Liquefaction During Earthquakes,"* Earthquake Engineering Research Institute, pages 140-142 and 152-158.

- the presence of loose to medium dense sandy soils above the planned pipe zone within the alignment which will cave during excavation (near borings A-24-005 to about 13 ft and A-24-006 to about 16 ft);
- differential settlement between the pump station and piping; and
- high groundwater at the WRF site.

We recommend the WRF improvements (pipeline connections, pump station, tanks, and wetwell excavation) be constructed after the fill is placed to reduce static settlement of the structure and pipeline.

We understand shallow/mat foundations will be utilized for the structures. If structures cannot tolerate the estimated static and seismic settlements, we recommend supporting the structures on deep foundations such as drilled piers.

9.1 WETWELL

The 11 ft outer diameter (10 ft inner diameter) wetwell will be about 16 ft deep with the bottom invert around elevation 156.5 ft. The wetwell foundation will be located within saturated, loose to medium dense poorly graded sand that is susceptible to liquefaction, therefore we have provided an overexcavation recommendation in Section 9.6.7 to both improve the foundation material and improved the constructability of the wetwell.

For a minimum 18-inches thick mat foundation founded at elev. 156 ft constructed following Section 9.6.8, provided the mat foundation is designed to evenly distribute the load across the foundation without deflection, an allowable gross bearing capacity of 1,200 psf can be used for design. The bearing capacity can be increased by 1/3 for transient loads such as wind or seismic. For the above bearing capacity, we estimated the total and differential settlement as 2.5-inches and 1-inch, respectively. Of that settlement, we estimated 0.75-inches will be immediate and will occur during construction and 1.75-inches will occur as primary consolidation settlement (occur over 2 to 3 years). An additional 1-inch of secondary settlement is estimated to occur beyond 3 years.

In addition, during a seismic event, we anticipate up to an additional 3-inches of liquefaction settlement could occur.

We recommend the use of flexible connections between the piping and wetwell to mitigate the differential settlement at the site. We estimated about 2.5-inches of settlement will occur near the pipe connection to the wetwell. Of the 2.5-inches of settlement, we estimated 1.5-inches is immediate and will occur during construction and 1-inch is primary consolidation settlement. An additional 1-inch of secondary settlement is estimated to occur at the connection to the wetwell. We anticipate minimal static settlement (< 0.25 inches) will occur at the pipe section within the existing access road.

Resistance to lateral loads (including those due to wind or seismic forces) may be determined using a coefficient of friction of 0.43 between the bottom of the precast foundation and native soils. Lateral resistance for foundations is also available from passive soil pressure acting against the vertical face of the footing, use the static passive pressure of 240 psf/ft. These two modes of resistance can be combined; however, since horizontal movements is required to mobilize passive resistance, decrease the passive pressure by ½ if both friction and passive pressures are used. During a seismic event, reduce the passive pressure to 194 psf/ft.

9.2 SKID PAD AND TANKS

The 16 ft x 7 ft x 1 ft skid pad and 5 ft diameter hydropneumatics tanks will be founded within the new fill. For a mat foundation or a 12-inches wide square footing founded a minimum 12-inches deep into bearing material, use an allowable gross bearing capacity of 500 psf. The bearing capacity can be increased by 1/3 for transient loads such as wind or seismic. For the above bearing capacity, we estimated the total and differential settlement as 3-inches and 1-inch at the skid pad, and 2.5-inches and <0.25-inches at the tanks, respectively. Of the total static settlement, we estimated 2-inches is immediate and will occur during construction. An additional 1-inch of secondary settlement is estimated to occur. During a seismic event, we anticipate an additional 3-inches of liquefaction settlement.

Resistance to lateral loads (including those due to wind or seismic forces) may be determined using a coefficient of friction of 0.43 between the bottom of the precast foundation and native soils. Lateral resistance for foundations is also available from passive soil pressure acting against the vertical face of the footing, use the static passive pressure of 264 pcf. These two modes of resistance can be combined; however, since horizontal movements is required to mobilize passive resistance, decrease the passive pressure by ½ if both friction and passive pressures are used. During a seismic event, reduce the passive pressure to 207 pcf.

9.3 BUOYANCY FORCES

We expect buoyancy uplift to be a design consideration at the wetwell. Buoyancy forces can be counterbalanced using thickened slabs, base extensions, and skin friction. If base extensions are used, uplift resistance is provided by the effective unit weight of the soil column directly above the base extension and wedge of soil extending outward and upward at a rate of 1H:2V from the edge of the base extension. Assume an effective unit weight of 50 pcf for base extension uplift resistance below groundwater.

9.4 TRENCHLESS CROSSING

The contractor is responsible for selecting appropriate trenchless installation methods that do not cause detrimental settlement, surface heave, damage to existing facilities, and that maintain the designed horizontal and vertical pipe alignments and tolerances. Issues that may affect operations include the depth of soil cover, existing surface facilities, existing underground utilities, and dissimilar types of earth materials along the pipe alignment.

Generally, the upper 11 ft at the trenchless crossing location consisted of hard clay and was underlain by dense sands. The soil conditions at the other receiving pit are unknown but will likely consist of clays and sands.

The soil conditions encountered at the trenchless crossings appear capable of supporting various trenchless installation methods such as jack and bore, mirotunneling, and horizontal directional drilling.

A passive pressure of 240 pcf is appropriate for the walls of the trenchless shafts (includes a safety factor of 1.5). Once the trenchless portion of the pipe is installed, the launching and receiving shafts should be backfilled per Section 9.6.

9.5 LATERAL EARTH PRESSURES AT WRF SITE

Design the structures using the equivalent fluid weights (EFWs) shown on Tables 8 and 9.

Table 8: Static Equivalent Fluid Weights

	Above Groundwater (pcf)	Below Groundwater (pcf)	Below Groundwater Buoyant + Hydrostatic (pcf)
At-Rest	54	28	91
Active	35	19	82
Passive	264	96	159

Table 9: Additional Seismic Equivalent Fluid Weights

	Above Groundwater (pcf)	Below Groundwater (pcf)
At-Rest	61	28
Active	34	16

The passive fluid weight is only applicable if the retained earth is allowed to strain at least 0.02H.

For *static design*, apply the resultant of the static earth pressure at a depth of 0.33H from the base of the wall where H equals the wall height. Include full hydrostatic pressure (i.e., buoyant + hydrostatic) for walls designed to be in service below the water table. At-rest and active earth pressures do not include a factor of safety; the passive earth pressures have been reduced by a factor of safety of 1.5.

For *seismic design,* the incremental active and at-rest seismic pressure was estimated using guidance from the University of California at Berkeley[7,8] and the site PGA of 0.83g. For either case, a triangular pressure distribution should be used, and the magnitude of the controlling resultant should be applied at H/3 from the base of the wall. Add the resultant of the seismic earth pressure to the resultant of the static active or “at-rest” earth pressure.

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[7] Mikola, R.G. & Sitar,N., Seismic Earth Pressures on Retaining Structures in Cohesionless Soils, March 30, 2013

[8] Agusti, G.C. & Sitar, N., Seismic Earth Pressures on Retaining Structures with Cohesive Backfills, August 14, 2013

For permanent surcharge loads, apply a uniform load to the wall equal to 0.45-times the surcharge load. Apply an additional 200 psf to accommodate transient and construction surcharge loading. Surcharge loading applies to the upper 20 ft of the retaining structure or shoring system.

9.6 GRADING

Where reference, use ASTM D1557 test methods to determine relative compaction and optimum moisture. Compacted soil should not be considered suitable (even if it meets relative compaction requirements) if it is unstable and pumps or flexes excessively under construction equipment loads, as determined by Crawford.

9.6.1 CLEARING

Prior to grading, clear to the site to remove structures, fences, vegetation, roots, debris, abandoned utilities, soft or unstable areas, and other deleterious materials. At the pond bottom, clearing should extend a minimum of 1.5 ft bgs (elev. 158.5 ft). The site clearing should extend laterally a minimum of 3 ft beyond the fill limits.

9.6.2 SCARIFICATION AND COMPACTION

Process and compact the exposed subgrade in fill areas as follows:

- Scarify the subgrade to a depth of approximately 10-inches
- Moisture condition the subgrade soil to within 2% of optimum moisture content and compact it to a minimum 90% relative compaction.

9.6.3 IMPORT MATERIAL

Import fill shall be granular soil, free of organic material and debris, have an Expansion Index (per ASTM D4829) or less than 25, and confirm to the following gradation:

Sieve Size	Percentage Passing
2-inch	100
No. 4	35-100
No. 30	20-100
No. 200	10-45

Import fill must be observed and tested prior to its approval.

9.6.4 FILL PLACEMENT

Where new fill is placed against an existing slope, bench the fill into the slope at regular vertical intervals of 2 to 3 ft to lock the materials together and reduce failure planes. The bench width should be a minimum of 3 ft wide.

Place the fill in maximum 8-inch lifts, moisture condition to within 2% of optimum moisture content and compact to a minimum of 90% relative compaction. Increase to 95% relative compaction within 18 inches of pavement, access roads, or structure foundations.

Trench backfill should meet 95% relative compaction following the City's Design Standards & Standard Specifications (2007).

9.6.5 SLOPE GEOMETRY AND STABILITY

We expect that new embankment constructed as above, and with exterior side slopes at 2:1 (horizontal:vertical), or flatter, will be stable.

9.6.6 WAITING PERIOD

The settlement of newly constructed fill is expected to occur due to compression of the underlying soils and compression of the fill itself. We anticipate about 90% of the primary consolidation settlement would occur after 18 months. An 18-month waiting period is likely not an economical alternative for this project. If the design would like to decrease the amount of primary consolidation settlement at the improvements, a 60 day waiting period would allow for about 30% of the consolidation settlement to occur (about 0.5-inches at the wetwell). The waiting period would start at the end of the fill placement prior to construction of the improvements.

If the potential consolidation settlement is determined to be excessive, then mitigation measures may be needed. Potential options for mitigating excessive long-term primary consolidation settlement may include the following:

- Establish a waiting period with or without prefabricated vertical wick drains
- Apply a surcharge fill to the site
- Utilize lightweight fill

If desired, Crawford can provide additional details on various lengths of waiting periods and expected settlement that will occur.

9.6.7 OVER-OPTIMUM SOIL MOISTURE

Excessively over-optimum (wet) soil conditions can make proper compaction difficult or impossible. In general, wet soil can be mitigated by:

- Discing the soil during prolonged periods of dry weather,
- Over-excavating and replacing with drier material,
- Stabilization using aggregate and stabilization fabric or grid.

Due to the groundwater level, wet soil conditions may be encountered during excavation within the pond.

9.6.8 OVER EXVACATION AND SUBGRADE STABILIZATION AT WETWELL

The exposed native soils at the wetwell foundation elevation consist of saturated, very loose to loose poorly graded sand. Therefore, the soils encountered at the bottom of this excavation will likely be unable to provide uniform and unyielding support for the wetwell and during construction. We recommended overexcavating 3 feet (below bottom of foundation) and backfilling with crushed rock (wrapped in fabric). Scarification and compaction will likely not improve the exposed soil condition and will be ineffective.

Controlled low-strength material (CLSM) can be placed below the wetwell foundation as an alternative to aggregate base.

9.7 CONSTRUCTION CONSIDERATIONS

9.7.1 TRENCH STABILITY AND TEMPORARY CONSTRUCTION SLOPES

Due to the presence of loose sands within the planned excavation limits of the planned project improvements, trench walls and temporary construction slopes will experience caving during construction. For preliminary design, use OSHA slopping requirements for Type A soils at the trenchless crossing (upper 11 ft) and Type C soils at the remaining locations. The contractor is responsible for the safety of all temporary excavations and must provide sloping and shoring in accordance with current Cal OSHA requirements.

9.7.2 SHORING

The shoring design should consider the chances of boiling or bottom heave during construction. Our borings encountered plastic, fine-grained soils at about elev. 140 ft that may help reduce seepage pressure and corresponding pressures on the bottom of the excavations.

Ultimately the contractor is responsible for designing the shoring and dewatering system to work in concert to allow for a stable excavation bottom.

9.7.3 SOIL EXCAVATABILITY

Based on the conditions observed in our subsurface explorations and our experience, the on-site soil should be excavatable with typical grading equipment such as scrapers, dozers, backhoes and excavators.

9.7.4 DEWATERING

In order for the excavations and foundations to be installed in the dry at the WRF site, the contractor must lower the groundwater to a minimum of 3 ft below bottom of excavation to reduce the chances of pumping-soils and unstable foundation support during construction. A well point dewatering system outside the excavations to draw down water as the excavations progress should be considered. The contractor should balance the groundwater head pressure within the excavation and outside of the shoring. A “rat slab” or seal course could be constructed at the bottom of the excavation, which may provide the contractor the ability to adjust the dewatering system. The contractor is responsible for designing the dewatering system.

Groundwater was not encountered in the pipeline borings and was encountered at a depth of 27 ft bgs at the trenchless crossing; dewatering is likely not required along the distribution pipeline.

10 RISK MANAGEMENT

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services. For this project, Crawford should be retained to:

- Review and provide written comments on the (civil) plans and specifications prior to construction.

- Monitor construction to check and document our report assumptions. At a minimum, Crawford should monitor trench bedding/backfill operations for the pipeline, fill placement, and underground excavations.
- Update this report if design changes occur, 2 years lapse between this report and construction, or site conditions change.

If Crawford is not retained to perform the above applicable services, we are not responsible for any other parties' interpretation of our report, and subsequent addendums, letters, and discussions.

11 LIMITATIONS

Crawford performed services in accordance with generally accepted geotechnical engineering principles and practices currently used in this area. This report is intended to assist Carollo for the Recycled Water Conveyance Project in Soledad, CA. Do not use this report for different locations and/or projects without the written consent of Crawford. Where referenced, we used ASTM and Caltrans as a general (not strict) *guideline* only.

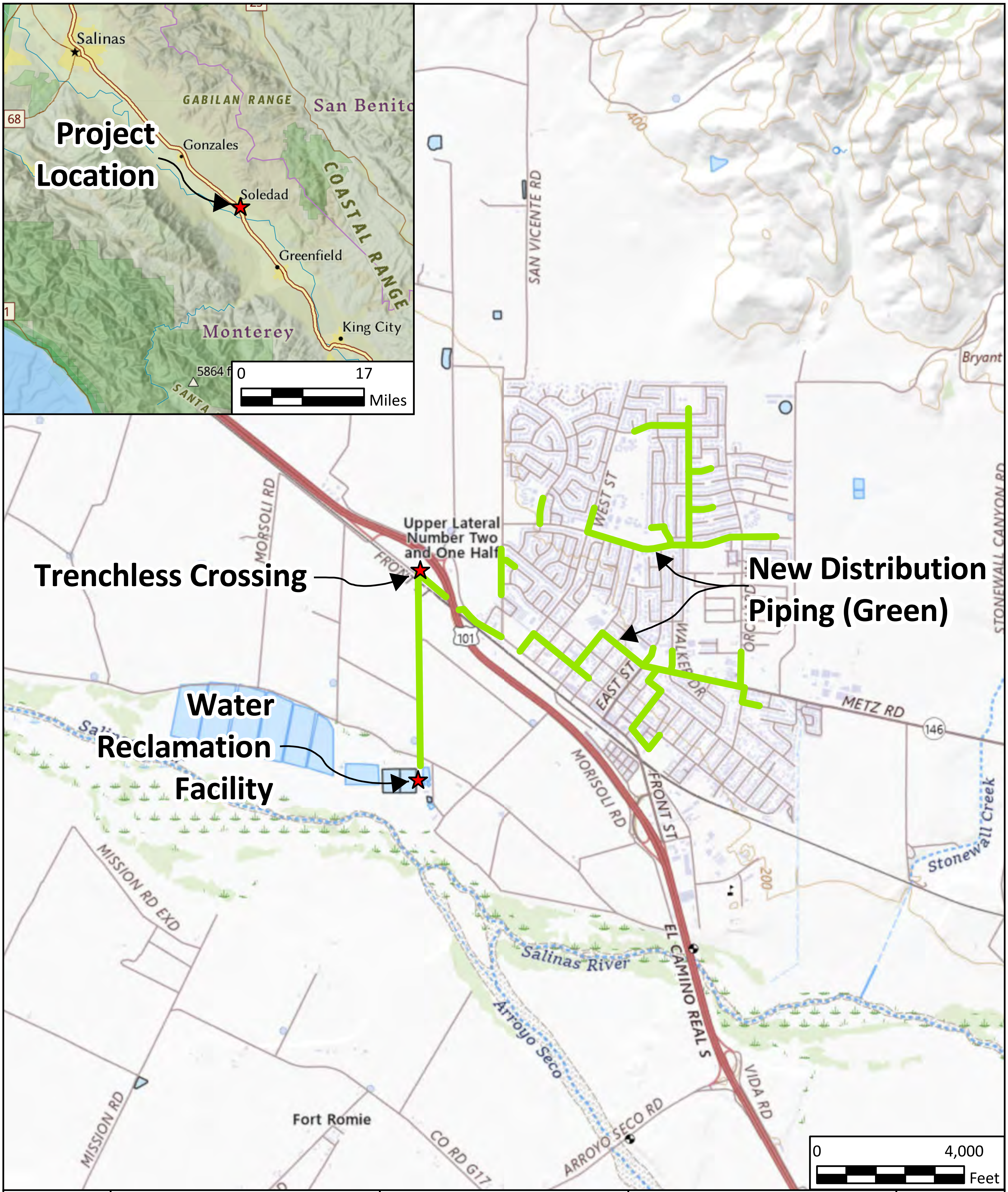
Crawford based this report on the current site conditions. We assume the soil and groundwater conditions are representative of the subsurface conditions on the site. Actual conditions between explorations will vary along the project alignment segments.

Our scope did not include evaluation of on-site hazardous materials.

Logs of our explorations are found in Appendix II. The lines designating the interface between soil types are approximate. The transition between soil types may be abrupt or gradual. Our recommendations are based on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geological conditions.

Modern design and construction are complex, with many regulatory sources/restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delays.

APPENDIX I



NORTH

References

1. Base Map: USGS Topographic Map Layer, ArcGIS Pro, ESRI

2. Insert Base Map: National Geographic Style, ArcGIS Pro, ESRI

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Soledad Recycled Water Conveyance

Soledad, CA

Figure 1
Vicinity Map

Prj. No: 24-1057.1
Date: 06/24/2024

Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps

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Soledad, CA

Figure 2
Exploration Map-
Overall Site

Prj. No: 24-1057.1
Date: 06/24/2024

Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps

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Soledad, CA

Figure 2a
Exploration Map-
Sheet 1 of 3

Prj. No: 24-1057.1
Date: 06/24/2024

Legend

⌖ APPROX. BORING LOCATION

Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps

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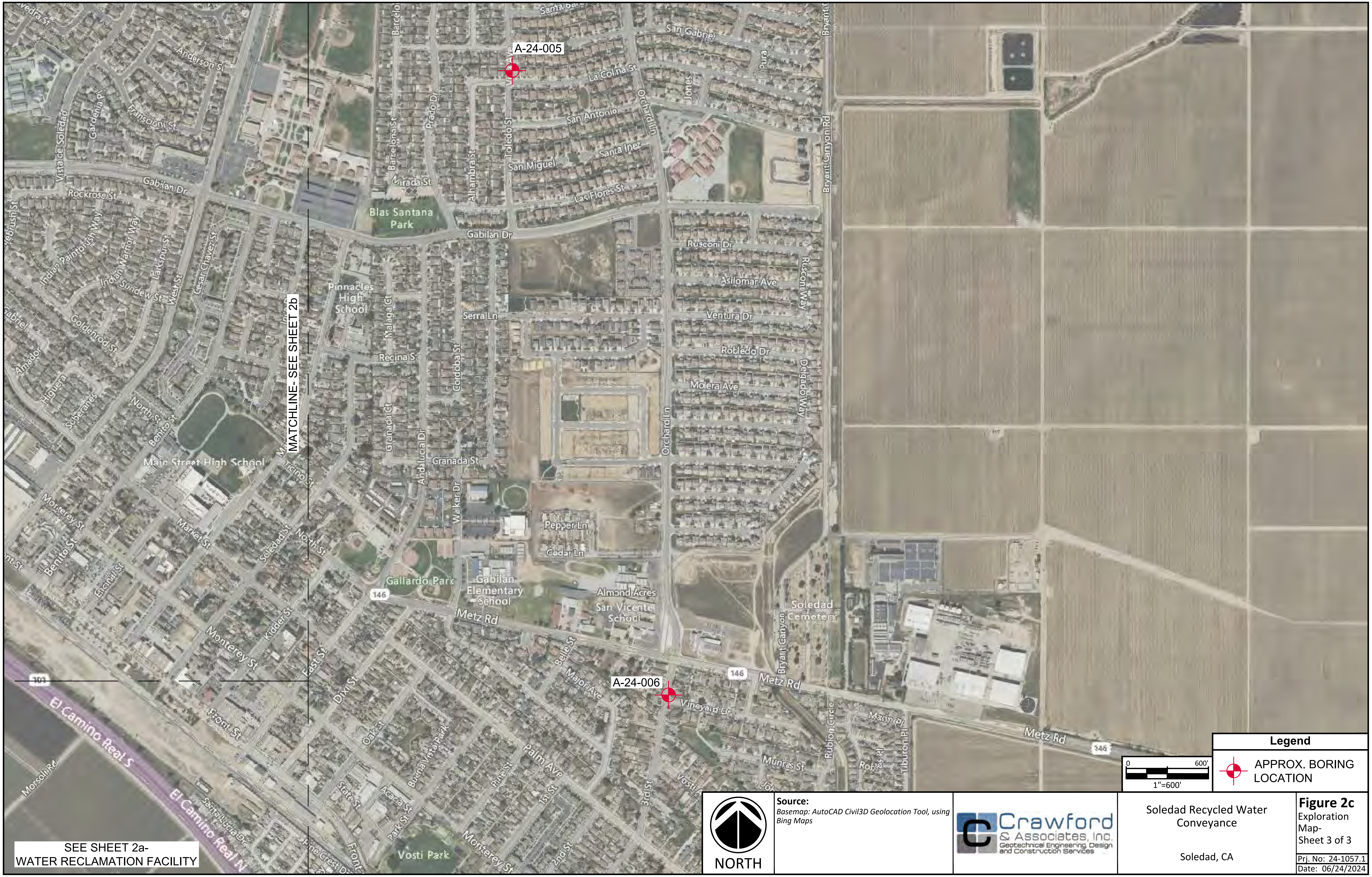
Soledad, CA

Figure 2b
Exploration Map-
Sheet 2 of 3

Prj. No: 24-1057.1
Date: 06/24/2024



Source:
Basemap: AutoCAD Civil3D Geolocation Tool, using Bing Maps

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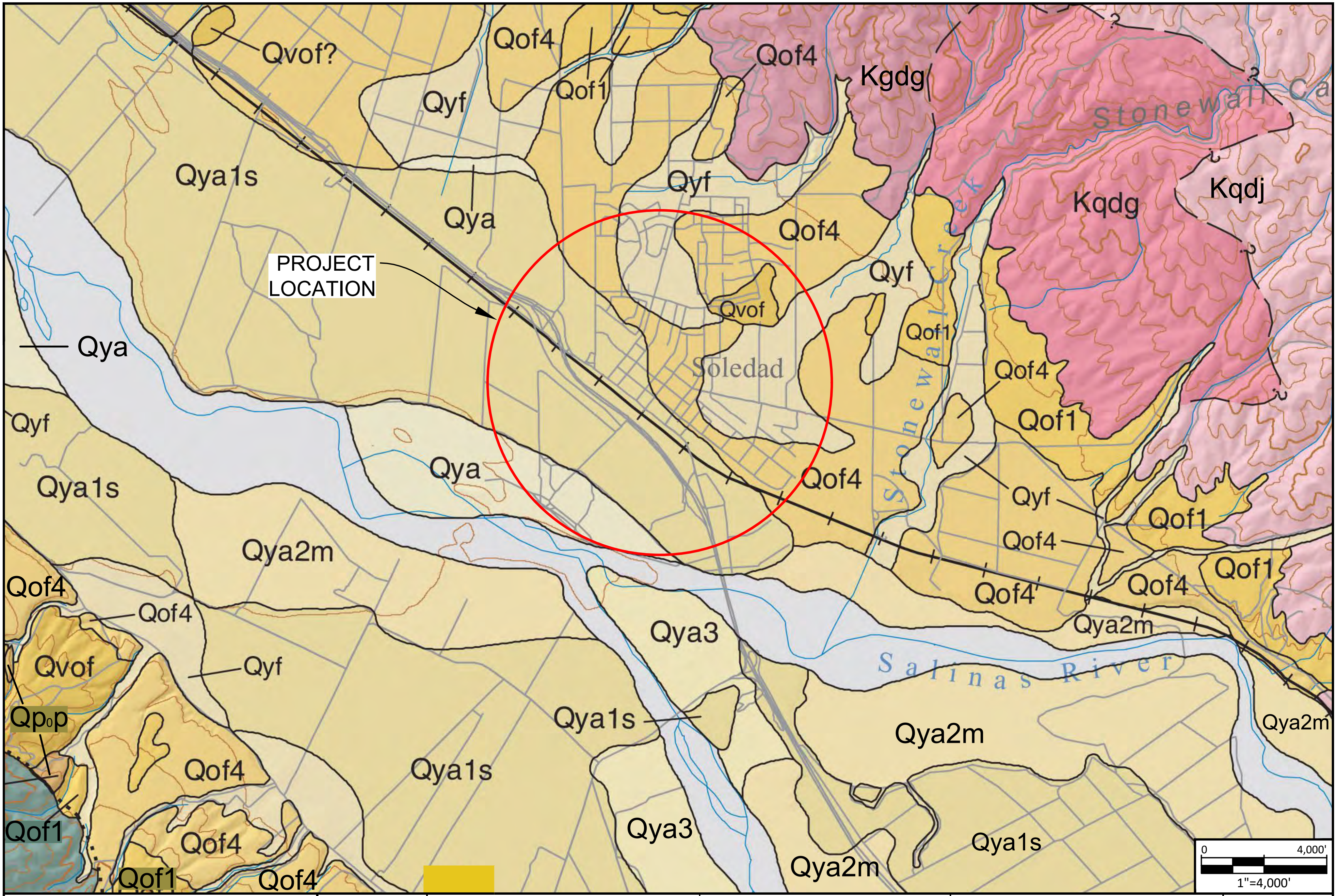
Soledad, CA

Figure 2c
Exploration Map-
Sheet 3 of 3

Prj. No: 24-1057.1
Date: 06/24/2024



See Geologic Map Legend Sheet 3b for Identifying Layers

NORTH

Source:

Rosenberg, L.I., Wills, C.J.; 2016, California Geological Survey, Preliminary Geologic Map of the Point Sur 30' x 60' Quadrangle, California; Version 1.0; scale 1:100,000.

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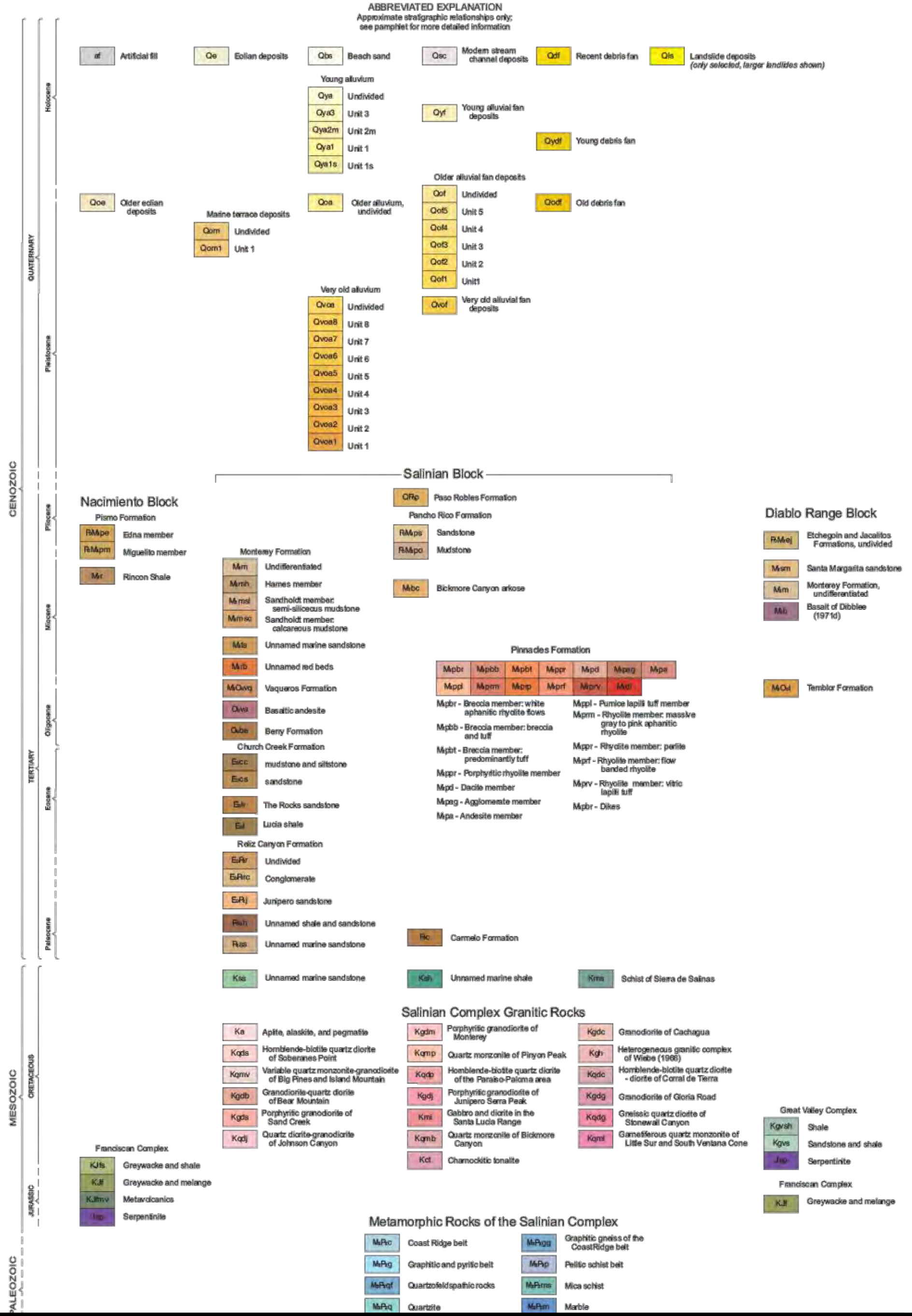
Soledad, CA

Figure 3a
Geologic Map

Prj. No: 24-1057.1
Date: 06/24/2024



NORTH

Source:
Rosenberg, L.I., Wills, C.J.; 2016, California Geological Survey, Preliminary Geologic Map of the Point Sur 30' x 60' Quadrangle, California; Version 1.0; scale 1:100,000.

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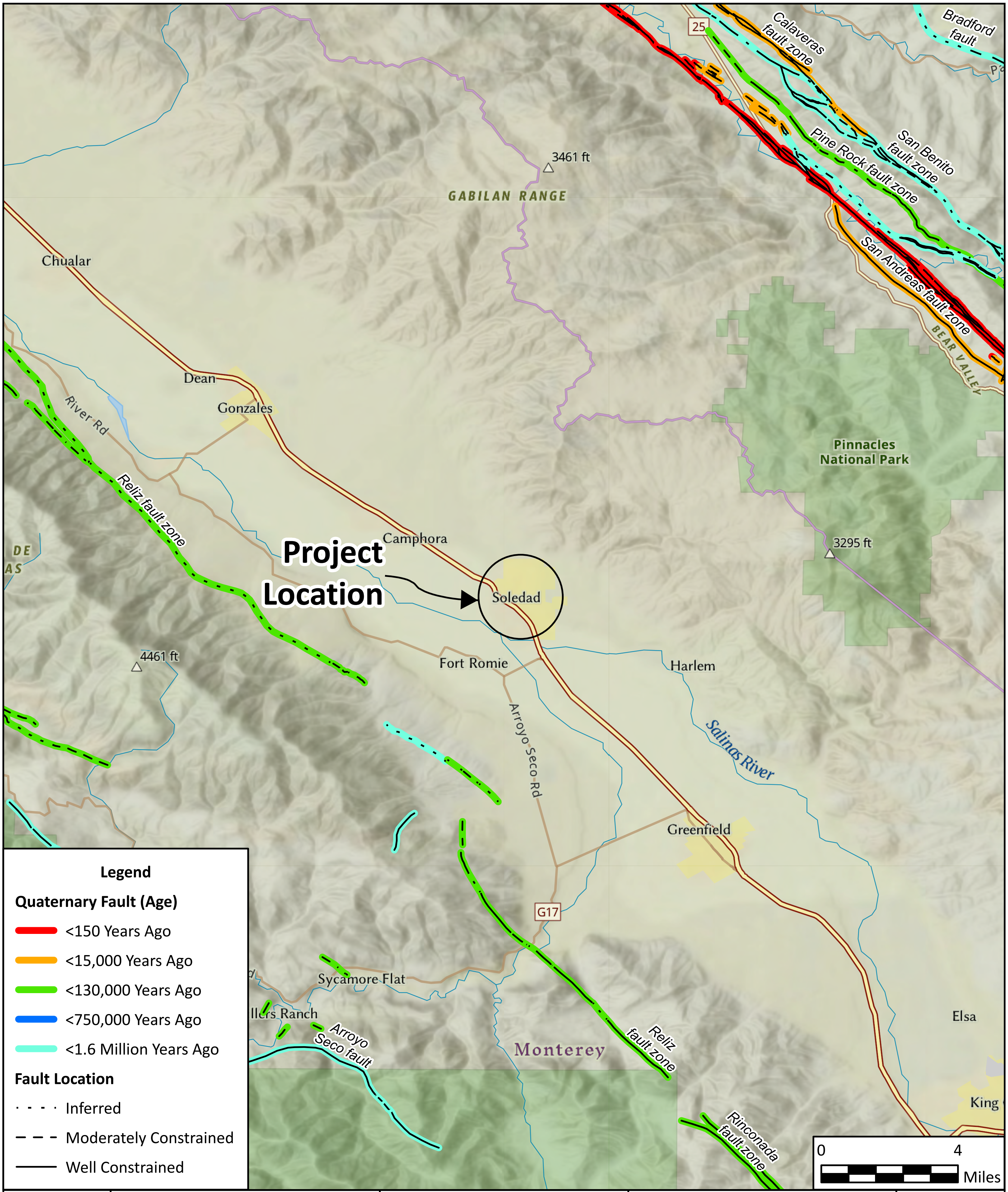
Soledad, CA

Figure 3b
Geologic Map Legend

Prj. No: 24-1057.1
Date: 06/24/2024



NORTH

References

1. Fault Data: USGS GIS Data

2. Base Map: National Geographic Style, ArcGIS Pro, ESRI

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Soledad
Recycled Water Conveyance

Soledad, CA

Figure 4
Fault Map

Prj. No: 24-1057.1
Date: 06-24-2024

APPENDIX II

Boring Log Legend

2022 Crawford Boring Logs

UNIFIED SOIL CLASSIFICATION (ASTM D 2487)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GRAPHIC SYMBOL	GROUP SYMBOL	SOIL GROUP NAMES
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	**GRAVELS** >50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS <5% FINES	$Cu \geq 4$ AND $1 \leq Cc \leq 3$	▨	**GW**	WELL-GRADED GRAVEL
			$Cu < 4$ AND/OR $1 > Cc > 3$	▨	**GP**	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR MH	▨	**GM**	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	▨	**GC**	CLAYEY GRAVEL
	SANDS <50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN SANDS <5% FINES	$Cu \geq 6$ AND $1 \leq Cc \leq 3$	▨	**SW**	WELL-GRADED SAND
			$Cu < 6$ AND/OR $1 > Cc > 3$	▨	**SP**	POORLY-GRADED SAND
		SANDS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR MH	▨	**SM**	SILTY SAND
			FINES CLASSIFY AS CL OR CH	▨	**SC**	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSING NO. 200 SIEVE	**SILTS AND CLAYS** LIQUID LIMIT <50	INORGANIC	PI>7 AND PLOTS ON OR ABOVE "A" LINE	▨	**CL**	LEAN CLAY
			PI>4 AND PLOTS BELOW "A" LINE	▨	**ML**	SILT
		ORGANIC	LL (oven dried)<0.75/LL (not dried)	▨	**OL**	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT >50	INORGANIC	PI PLOTS ON OR ABOVE "A" LINE	▨	**CH**	FAT CLAY
			PI PLOTS BELOW "A" LINE	▨	**MH**	ELASTIC SILT
		ORGANIC	LL (oven dried)<0.75/LL (not dried)	▨	**OH**	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK COLOR, ORGANIC ODOR		▨	**PT**	PEAT

NOTE: $Cu = D_{60}/D_{10}$

$Cc = (D_{30})^2 / D_{10} \times D_{60}$

BLOW COUNT

The number of blows of a 140-lb. hammer falling 30-inches required to drive the sampler the last 12-inches of an 18-inch drive. The notation 50/4 indicates 4-inches of penetration achieved in 50 blows.

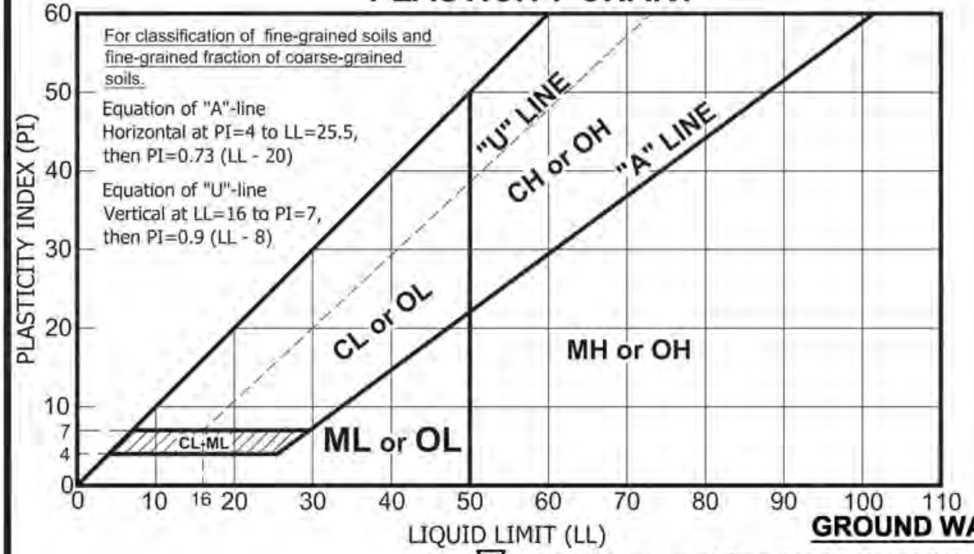
SAMPLE TYPES

- ▌ Auger or backhoe cuttings
- ▌ Shelby tube
- ☒ Standard Penetration (SPT)
- ▩ Bulk Sample
- ⧓ Modified California 2.5"
- ⧗ California Standard 2"
- ▐ Rock core

ADDITIONAL TESTS

C	- Consolidation
CP	- Compaction Curve
CR	- Corrosivity Testing
CU	- Consolidated Undrained Triaxial
DS	- Direct Shear
EI	- Expansion Index
P	- Permeability
PA	- Partical Size Analysis
PI	- Plasticity Index
PP	- Pocket Penetrometer
R	- R-Value
SE	- Sand Equivalent
SG	- Specific Gravity
SL	- Shrinkage Limit
SW	- Swell Potential
TV	- Pocket Torvane Shear Test
UC	- Unconfined Compression
UU	- Unconsolidated Undrained Triaxial

PLASTICITY CHART



For classification of fine-grained soils and fine-grained fraction of coarse-grained soils.

Equation of "A"-line
Horizontal at PI=4 to LL=25.5,
then PI=0.73 (LL - 20)

Equation of "U"-line
Vertical at LL=16 to PI=7,
then PI=0.9 (LL - 8)

GROUND WATER LEVELS

- ▽ First Water Level Reading (during drilling)
- ▼ Static Water Level Reading (short-term)
- ▼ Static Water Level Reading (long-term)

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BORING LOG / TEST PIT LEGEND AND SOIL DESCRIPTIONS

LOG OF BORING A-24-001

PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
LOCATION: Soledad, CA
COUNTY: Monterey
CLIENT: Carollo
LOGGED BY: EAH
DEPTH OF BORING: 36.5 (ft)

BEGIN DATE: 05/13/2024
COMPLETION DATE: 05/13/2024
SURFACE ELEVATION: 167.0 (ft)
SURFACE CONDITION: Soil
WATER DEPTH: 9.5 ft
READING TAKEN: 05/13/24
HAMMER EFFICIENCY: 92.2 (%)

DRILLING CONTRACTOR: Geo-Ex
DRILLING METHOD: 4" SS and 4" Rotary
DRILL RIG: D 70 Track
HAMMER TYPE: Automatic; 140 (lbs); 30 (in) drop
SAMPLER TYPE & SIZE: SPT (1.4" ID), MCAL (2.4" ID)
BOREHOLE DIAMETER: 4.0 (in)
BACKFILL METHOD: Neat Cement Grout

FIELD								DESCRIPTION			LABORATORY								REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG		RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	
166	1		1	7 7 6	13				SILTY SAND (SM); medium dense; brown; moist; mostly fine to medium SAND; some non-plastic fines.	83									
165	2		2	5 8 9	17				Poorly-Graded SAND with SILT (SP-SM); medium dense; brown; moist; mostly fine to medium SAND; few non-plastic fines. Medium dense.	78									
164 163	3 4		3	7 10 11	21				Poorly-Graded SAND (SP); medium dense; brown; moist; mostly fine to medium SAND; trace fines. Poorly-Graded SAND with SILT (SP-SM); medium dense; brown; moist; mostly fine to medium SAND; few non-plastic fines.	100				7.7	102.7				
162	5		4	5 7 9	16				Poorly-Graded SAND (SP); medium dense; brown; moist; mostly fine to medium SAND; trace fines.	78									
161 160	6 7								SILTY SAND (SM); medium dense; brown; moist; mostly fine to medium SAND; little non to low plastic fines.										
159	8		5	5 7 8	15									13.6	102.7				
158 157	9 10								Poorly-Graded SAND (SP); medium dense; brown; wet; mostly fine to medium SAND; 4% non-plastic fines.										
156	11		6	4 5 5	10									20.6		4			
155 154 153 152	12 13 14 15																		
151	16		7	2 2 2	4				loose					23.2		4			

		FIELD										LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
150	17								Poorly-Graded SAND (SP); medium dense; brown; wet; mostly fine to medium SAND; 4% non-plastic fines.										
149	18																		
148	19																		
147	20		8	4															
				12	29														
146	21			17					6" lense of CLAYEY GRAVEL with SAND (GC)					26.3	102.0				
145	22								Medium dense										
144	23																		
143	24																		
142	25		9	4															
				6	11														
141	26			5					Fat CLAY (CH); (stiff); tan; moist; mostly medium to high plastic fines; trace fine SAND.										
140	27																		
139	28								SANDY Fat CLAY (CH); (very stiff); tan; moist; mostly medium to high plastic fines; some fine SAND.										
138	29																		
137	30		10	6															
				11	24				Fat CLAY (CH); stiff to very stiff; tan; moist; mostly medium to high plastic fines; trace fine to medium SAND.										
136	31			13		2.75	0.88		Dry to moist; few fine SAND.					39.2	82.4				UC Strength: 1,742psf Strain at Failure: 6.2%
135	32																		
134	33																		
133	34																		
132	35		11	5															
				7	15														
131	36			8								65	101						
									Bottom of borehole at 36.5 ft bgs										

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Geotechnical Engineering, Design and Construction Services

Crawford & Associates, Inc.
4701 Freeport Blvd
Sacramento, CA 95822
(916) 455-4225

PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: A-24-001
ENTRY BY: EAH
CHECKED BY: ETT

LOG OF BORING R-24-002

PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
LOCATION: Soledad, CA
COUNTY: Monterey
CLIENT: Carollo
LOGGED BY: EAH
DEPTH OF BORING: 61.5 (ft)

BEGIN DATE: 05/13/2024
COMPLETION DATE: 05/14/2024
SURFACE ELEVATION: 162.0 (ft)
SURFACE CONDITION: Grass
WATER DEPTH: 4.0 ft
READING TAKEN: 05/13/24
HAMMER EFFICIENCY: 92.2 (%)

DRILLING CONTRACTOR: Geo-Ex
DRILLING METHOD: 4" SS and 4" Rotary
DRILL RIG: D 70 Track
HAMMER TYPE: Automatic; 140 (lbs); 30 (in) drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID), ST, SPT (1.4" ID)
BOREHOLE DIAMETER: 4.0 (in)
BACKFILL METHOD: Neat Cement Grout

FIELD												LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
			1	6					SILTY SAND (SM); dense; brown; dry; mostly fine to medium SAND; little non-pastic fines.	67									
161	1			11	33														Organics present from 0 to 1 ft
				22										10.6	110.1				
			2	10					Poorly-Graded SAND with SILT (SP); dense; brown; dry; mostly fine to medium SAND; few non-plastic fines.	83									
160	2			14	45														
				31					Very dense.										
									Poorly-Graded SAND (SP); very dense; brown; dry; mostly fine to medium SAND; trace fines.										
159	3		3	8						78									
									Poorly-Graded SAND with SILT and GRAVEL (SP-SM); medium dense; tan; moist; mostly fine to medium SAND; little fine to medium GRAVEL, 6% fines. 6" lense of Silty Sand (SM)										
158	4			14	29														
				15										23.6	87.4	6			
157	5		4	4						100									
				3	7														
156	6			4															
155	7								Poorly-Graded SAND (SP); loose; tan; wet; 92% coarse to fine SAND; 5% fine GRAVEL; 3% fines..										
154	8		5	2						61									
				1	3				Very loose; tan; wet.										
153	9			2										22.9		2			
152	10		6	2					Medium Dense	72									
151	11			3	7														
				4										20.0		3			
150	12																		
149	13								Fat CLAY (CH); stiff; tan; moist to wet; mostly high plastic fines; few fine to medium SAND.										
148	14																		
147	15		7	4						100									pH: 7.100, Min Resistivity: .54ohm-cm, Chloride: 62.5ppm, Sulfate: 177.5ppm, Redox Potential: 223mv UC Strength: 2,390psf Strain at Failure: 6.7%
146	16			3	7														
				4		1.00	0.50					48	80	52.5	70.9				

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4701 Freeport Blvd
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PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: R-24-002
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CHECKED BY: ETT

FIELD												LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
145	17								Fat CLAY (CH); stiff; tan; moist to wet; mostly high plastic fines; few fine to medium SAND.										
144	18																		
143	19																		
142	20		S 7																Shelby hydraulic push: 500 PSI
141	21																		
						2.75			Very Stiff										
140	22																		
139	23																		
138	24																		
137	25		8	7															
				9	22				Fat CLAY with SAND (CH); very stiff to stiff; tan; moist to wet; mostly high plastic Fines; little fine to medium SAND.										
136	26			13		3.50	0.68					77	113	41.4	78.9				
135	27																		
134	28								Fat CLAY (CH); very stiff; tan; moist; mostly high plastic fines; few fine SAND.										
133	29																		
132	30		9	8															UC Strength: 4,046psi Strain at Failure: 5%
				10	26														
131	31			16			1.25					55	88	40.8	79.2				
130	32																		
129	33																		
128	34																		
127	35		10	9															
				13	31														
126	36			18			0.88		Grayish brown.										

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PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: R-24-002
ENTRY BY: EAH
CHECKED BY: ETT
SHEET # 2 of 4

FIELD												LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
125	37								Fat CLAY (CH); very stiff; tan; moist; mostly high plastic fines; few fine SAND.										
124	38																		
123	39																		
122	40		S 11																Shelby hydraulic push: 100 PSI
121	41					2.50													consolidation test
120	42								Medium plastic fines.; trace fine SAND										
119	43																		
118	44								Lean CLAY with SAND (CL); stiff; tan; moist; mostly medium plastic fines; little fine to medium SAND.										
117	45		12	7 9 12	21														
116	46								SILT (ML); medium dense; gray; moist; mostly medium plastic fines; few fine SAND. Gray; moist; trace fine SAND.			14	42	32.7 35.1	89.5 84.9				
115	47																		
114	48																		
113	49																		
112	50		13	7 9 16	25														
111	51					1.75	0.35							39.7	80.0				UC Strength: 2,578psf Strain at Failure: 6.6%
110	52																		
109	53								SILTY SAND (SM); (dense); brown; wet; mostly fine to medium SAND; little non-plastic fines.										
108	54																		
107	55		S 14																Shelby hydraulic push: 1000 PSI
106	56																		

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PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: R-24-002
ENTRY BY: EAH
CHECKED BY: ETT

SHEET # 3 of 4

FIELD												LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
									SILTY SAND (SM); (dense); brown; wet; mostly fine to medium SAND; little non-plastic fines.										
104	58								Poorly-Graded SAND (SP); very dense; tan; wet; mostly fine to medium SAND; trace non-plastic fines.										
103	59																		
102	60	☒	15	25 38 38	76									17.8		5			
101	61																		
									Bottom of borehole at 61.5 ft bgs										
100	62																		
99	63																		
98	64																		
97	65																		
96	66																		
95	67																		
94	68																		
93	69																		
92	70																		
91	71																		
90	72																		
89	73																		
88	74																		
87	75																		
86	76																		

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PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: R-24-002
ENTRY BY: EAH
CHECKED BY: ETT

LOG OF BORING A-24-003

PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
LOCATION: Soledad, CA
COUNTY: Monterey
CLIENT: Carollo
LOGGED BY: EAH
DEPTH OF BORING: 36.5 (ft)

BEGIN DATE: 05/14/2024
COMPLETION DATE: 05/14/2024
SURFACE ELEVATION: 182.0 (ft)
SURFACE CONDITION: Asphalt
WATER DEPTH: 27.0 ft
READING TAKEN: 05/14/24
HAMMER EFFICIENCY: 92.2 (%)

DRILLING CONTRACTOR: Geo-Ex
DRILLING METHOD: 4" SS and 4" Rotary
DRILL RIG: D 70 Track
HAMMER TYPE: Automatic; 140 (lbs); 30 (in) drop
SAMPLER TYPE & SIZE: SPT (1.4" ID), MCAL (2.4" ID), Bulk
BOREHOLE DIAMETER: 4.0 (in)
BACKFILL METHOD: Neat Cement Grout

FIELD												LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
									ASPHALT CONCRETE(4")										
									AGGREGATE BASE(6")										
181	1	Bulk	1	8					CLAYEY SAND (SC); medium dense; brown; moist; mostly fine to coarse SAND; little medium plastic fines.	100									
				11	23				Lean CLAY with SAND (CL); hard; dark brown; moist; mostly medium plastic fines; little fine to medium SAND.										
180	2			12		+4.5													
			2	4					Lean CLAY (CL); (hard); dark brown; moist; mostly medium plastic fines; few fine to medium GRVEL; trace fine SAND.	67									
179	3			4	10														
				6															
178	4		3	7					Lean CLAY with SAND (CL); hard; tan; dry; 82% fines; little fine to medium SAND.	67									
				21	50														
177	5			29		+4.5								22.6	101.8	82			
			4	7						78									
176	6			8	15				SANDY lean CLAY (CL); (stiff); tan; dry; 53% low to medium plastic fines; some fine to medium SAND.							53			
				7															
175	7																		
174	8																		
173	9																		
172	10		5	13					very stiff; brown; moist; 60% fines.										
171	11			14	31	2.00													
				17					Poorly-Graded SAND (SP); dense; tan; moist; mostly fine to medium SAND; trace fines.					18.9	107.5	60			
170	12																		
169	13								SILTY SAND (SM); dense; tan; dry; mostly fine to coarse SAND; little non-plastic fines.										
168	14																		
167	15		6	13															
166	16			14	28				Poorly-Graded SAND (SP); dense; tan; dry to moist; most fine to coarse SAND; trace fines.										
				14										2.8		3			

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PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: A-24-003
ENTRY BY: EAH
CHECKED BY: ETT

FIELD												LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
165	17								Poorly-Graded SAND (SP); dense; tan; dry to moist; most fine to coarse SAND; trace fines.										
164	18								Poorly-Graded SAND with SILT (SP-SM); very dense; tan; moist; mostly fine to coarse SAND; few non-plastic fines.										
163	19																		
162	20	☒	7	15 19 28	47														
161	21								Poorly-Graded SAND (SP); very dense; tan; moist; mostly fine to coarse SAND; trace fines.										
160	22								Poorly-Graded SAND with GRAVEL (SP); very dense; tan; moist; mostly fine to coarse SAND; little fine to medium GRAVEL; trace non-plastic fines.										
159	23								SILTY SAND (SM); dense; tan; moist; mostly fine to coarse SAND; little non-plastic fines.										
158	24																		
157	25	☒	8	9 10 21	31														
156	26								SILTY SAND with GRAVEL (SM); dense; tan; moist; mostly fine to coarse; little non-plastic fines.										
155	27 ▼																		
154	28								SILTY SAND (SM); dense; tan; moist to wet; mostly fine to coarse SAND; little non-plastic fines; little fine to medium GRAVEL.										
153	29																		
152	30	☒	9	13 14 13	27									9.1					
151	31																		
150	32																		
149	33								Poorly-Graded SAND (SP); very dense; tan; wet; mostly fine to medium SAND; trace fines.										
148	34																		
147	35	☒	10	17 19 25	44														Could not continue sampling, auger hole was collapsing.
146	36								Poorly-Graded SAND with SILT (SP-SM); very dense; tan; wet; mostly fine to medium SAND; few non-plastic fines.										1" SILTY SAND pockets present.

Bottom of borehole at 36.5 ft bgs

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PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: A-24-003
ENTRY BY: EAH
CHECKED BY: ETT

LOG OF BORING A-24-004

PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
LOCATION: Soledad, CA
COUNTY: Monterey
CLIENT: Carollo
LOGGED BY: EAH
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 05/14/2024
COMPLETION DATE: 05/15/2024
SURFACE ELEVATION: 190.0 (ft)
SURFACE CONDITION: Asphalt
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 92.2 (%)

DRILLING CONTRACTOR: Geo-Ex
DRILLING METHOD: 4" SS
DRILL RIG: D 70 Track
HAMMER TYPE: Automatic; 140 (lbs); 30 (in) drop
SAMPLER TYPE & SIZE: MCAL (2.4" ID), SPT (1.4" ID), Bulk
BOREHOLE DIAMETER: 16.5 (in)
BACKFILL METHOD: Neat Cement Grout

FIELD												LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
									ASPHALT CONCRETE(5")										
									AGGREGATE BASE(5")										
189 188	1 2		Bulk 1	6 10 11	21	3.25 2.82			CLAYEY SAND (SC); Medium dense; brown; moist; mostly fine to coarse SAND; little low to medium plastic fines. Lean CLAY with SAND (CL); very stiff; brown; moist; mostly medium plastic fines; little fine to medium SAND.	100				20.9	105.6				
187	3		2	4 7 9	16				Lean CLAY (CL); very stiff; brown; moist; mostly medium plastic fines; trace fine to medium SAND. Few fine to medium SAND.	100									
186 185	4 5		3	9 7 22	29	+4.5 +4.5			Hard.	89									pH: 8.12, Min Resistivity: .6ohm-cm, Chloride: 131ppm, Sulfate: 196.7ppm, Redox Potential: 261mv
184 183	6 7		4	5 5 4	9				Lean CLAY with SAND (CL); (stiff); tan; dry; mostly low to medium plastic fines; little fine to medium SAND. <6" Lense of SILT (ML)	94									
182	8																		
181	9								Poorly-Graded SAND (SP); medium dense; tan; moist; mostly medium to coarse SAND; 3% fines.										
180 179	10 11		5	5 7 8	15									2.1		3			Finished drilling for the day 5-14-24, continued on 5-15-24.
178	12																		
177 176	13 14								Poorly-Graded SAND with SILT and GRAVEL (SP-SM); dense; tan; dry; mostly fine to medium SAND; little fine to medium GRAVEL; few non-plastic fines.										
175	15		6	10 12 18	30														
174	16								Poorly-Graded SAND (SP); dense; tan; dry; mostly fine to medium SAND; trace fines.										

Bottom of borehole at 16.5 ft bgs

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PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: A-24-004
ENTRY BY: EAH
CHECKED BY: ETT

LOG OF BORING A-24-005

PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
LOCATION: Soledad, CA
COUNTY: Monterey
CLIENT: Carollo
LOGGED BY: EAH
DEPTH OF BORING: 16.5 (ft)

BEGIN DATE: 05/14/2024
COMPLETION DATE: 05/14/2024
SURFACE ELEVATION: 258.0 (ft)
SURFACE CONDITION: Soil
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 92.2 (%)

DRILLING CONTRACTOR: Geo-EX
DRILLING METHOD: 4" SS
DRILL RIG: D 70 Track
HAMMER TYPE: Automatic; 140 (lbs); 30 (in) drop
SAMPLER TYPE & SIZE: SPT (1.4" ID), Bulk, MCAL (2.4" ID)
BOREHOLE DIAMETER: 4.0 (in)
BACKFILL METHOD: Neat Cement Grout

FIELD												LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
257	1		Bulk 1	20 16 20	36				SILTY SAND (SM); dense; brown; dry; mostly fine to coarse SAND; little non-plastic fines.	100 67				6.3	135.1				
256	2		2	14 9 4	13				CLAYEY SAND (SC); medium dense; dark brown; dry; mostly fine to coarse SAND; 29% low to medium plastic fines.	78				5.2		29			
255	3																		
254	4		3	5 12 10	22	4.00 +4.5			SANDY lean CLAY (CL); (hard); dark brown; dry; mostly medium plastic fines; some fine to coarse SAND.					8.0	127.3				pH: 7.61, Min Resistivity: 3.75ohm-cm, Chloride: 6.2ppm, Sulfate: 18.9ppm, Redox Potential: 290mv
253	5		4	4 5 5	10				CLAYEY SAND (SC); medium dense; brown; moist; mostly fine to coarse SAND; 43% medium to low plastic fines.					8.4		43			
252	6																		
251	7																		
250	8																		
249	9																		
248	10		5	11 8 5	13					83				8.4					
247	11																		
246	12																		
245	13								SILTY SAND (SM); very dense; brown; moist; mostly fine to coarse SAND; little non to low plastic fines.										
244	14																		
243	15		6	20 31 35	66					100									
242	16																		

Bottom of borehole at 16.5 ft bgs

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PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: A-24-005
ENTRY BY: EAH
CHECKED BY: ETT

SHEET # 1 of 1

LOG OF BORING A-24-006

PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
LOCATION: Soledad, CA
COUNTY: Monterey
CLIENT: Carollo
LOGGED BY: EAH
DEPTH OF BORING: 18.0 (ft)

BEGIN DATE: 05/15/2024
COMPLETION DATE: 05/14/2024
SURFACE ELEVATION: 224.0 (ft)
SURFACE CONDITION: Asphalt
WATER DEPTH: Not Encountered
READING TAKEN: N/A
HAMMER EFFICIENCY: 92.2 (%)

DRILLING CONTRACTOR: Geo-Ex
DRILLING METHOD: 4" SS
DRILL RIG: D70 Track
HAMMER TYPE: Automatic; 140 (lbs); 30 (in) drop
SAMPLER TYPE & SIZE: SPT (1.4" ID), MCAL (2.4" ID), Bulk
BOREHOLE DIAMETER: 4.0 (in)
BACKFILL METHOD: Neat Cement Grout

FIELD								GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY					DRILL METHOD	CASING DEPTH	REMARKS
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)					PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE			
									ASPHALT CONCRETE(4")										
									AGGREGATE BASE(4")										
			Bulk						CLAYEY SAND (SC); loose; dark brown; dry; mostly fine to medium SAND; 24% low to medium plastic fines.	100									
223	1		1	6						61									
				3	8														
222	2			5					Moist					8.3	119.2				
			2	4						89									
221	3			4	10				Medium Dense										
				6															
220	4		3	7						78									pH: 7.02, Min Resistivity: .91ohm-cm, Chloride: 22.5ppm, Sulfate: 80.3ppm, Redox Potential: 28mv
				8	19				Fine to coarse SAND.										
219	5			11										6.7		24			
			4	5						83									
218	6			5	10				Some low to medium plastic fines, few fine GRAVEL. No GRAVEL.										
				5															
217	7																		
216	8																		
									Poorly-Graded SAND with CLAY (SP-SC); medium dense; dark brown; moist; mostly fine to medium SAND; few low to medium plastic fines.										
215	9																		
214	10		5	6						78									
				5	10														
213	11			5										12.9					
									CLAYEY SAND (SC); medium dense; dark brown; moist; mostly fine to medium SAND; little low to medium plastic fines.										
212	12																		
211	13																		
210	14																		
209	15		6	4						89									
				6	13														
208	16			7					SANDY CLAY (CL); (stiff); brown; moist; mostly low to medium plastic fines; some fine to medium SAND.										
			7							100									

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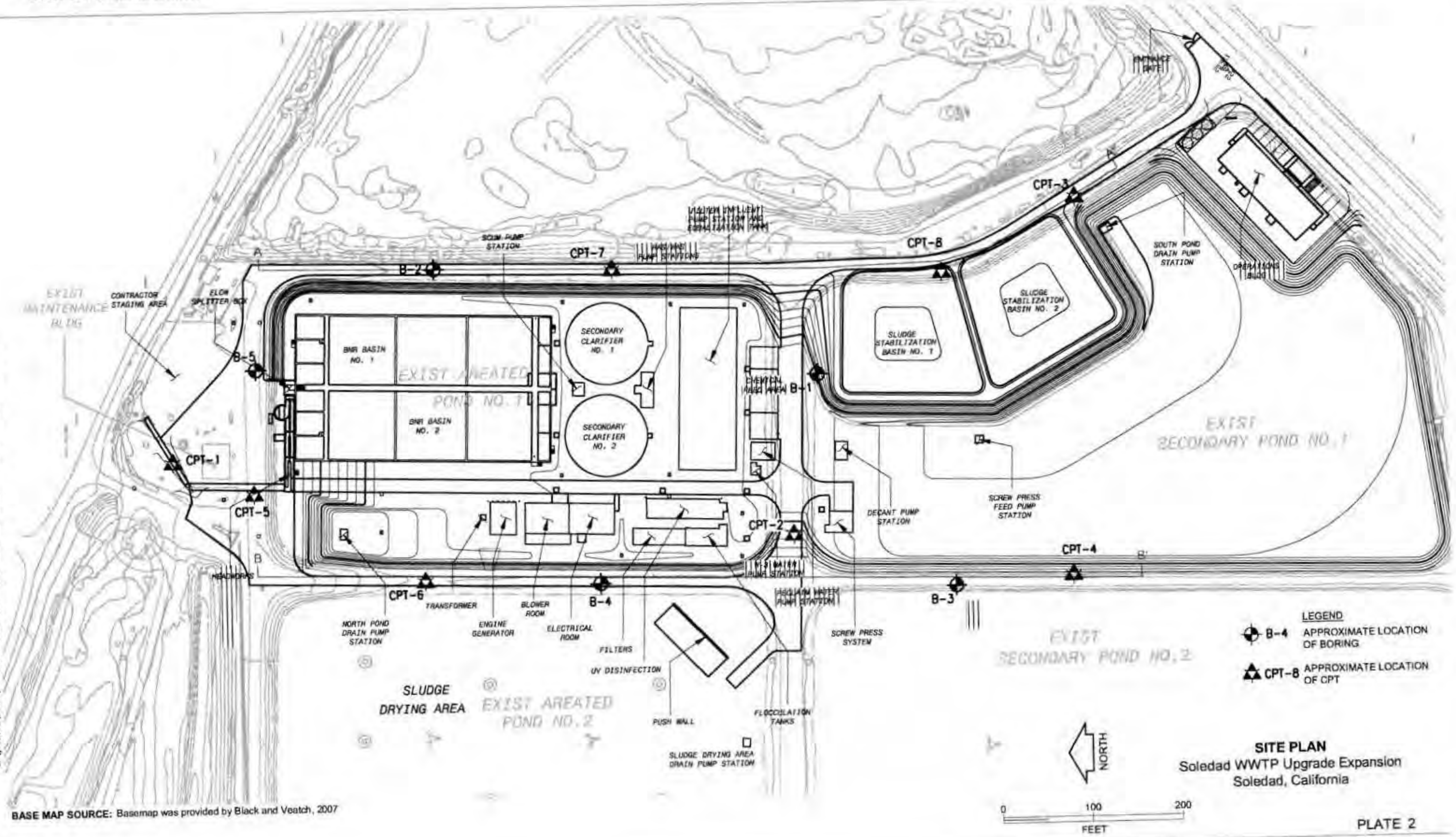
PROJECT NO: 24-1057.1
PROJECT: Soledad Recycled Water Conveyance
BORING: A-24-006
ENTRY BY: EAH
CHECKED BY: ETT

FIELD												LABORATORY							
ELEVATION (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 IN.	BLOWS PER FOOT	POCKET PEN. (TSF)	TORVANE (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	PLASTICITY INDEX	LIQUID LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
207	17			13 15 21	36	2.75	1.62		SANDY CLAY (CL); (stiff); brown; moist; mostly low to medium plastic fines; some fine to medium SAND. Lean CLAY wih SAND (CL); very stiff; brown; moist; mostly fine to medium SAND; little fine to coarse SAND.										
206	18								Bottom of borehole at 18.0 ft bgs										
205	19																		
204	20																		
203	21																		
202	22																		
201	23																		
200	24																		
199	25																		
198	26																		
197	27																		
196	28																		
195	29																		
194	30																		
193	31																		
192	32																		
191	33																		
190	34																		
189	35																		
188	36																		

APPENDIX III

Previous Boring Logs and Associated Lab



LEGEND

- B-4 APPROXIMATE LOCATION OF BORING
- CPT-8 APPROXIMATE LOCATION OF CPT

BASE MAP SOURCE: Basemap was provided by Black and Veatch, 2007

c:\jobdocs\3040\3040.009 Soledad\Drawings\B3040_009_05.dwg 10-25-07 01:36:33 PM vtong

SITE PLAN
Soledad WWTP Upgrade Expansion
Soledad, California

PLATE 2

MAJOR DIVISIONS				GROUP NAMES		
COARSE-GRAINED SOILS	More than 50% retained on the No. 200 sieve	GRAVELS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	Clean gravels less than 5% fines	GW	▨	Well-Graded Gravel
				GP	▨	Poorly Graded Gravel
			Gravels with more than 12% fines	GM	▨	Silty Gravel
				GC	▨	Clayey Gravel
		SANDS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	Clean sand less than 5% fines	SW	▨	Well-Graded Sand
				SP		Poorly Graded Sand
			Sands with more than 12% fines	SM	▨	Silty Sand
				SC	▨	Clayey Sand
FINE-GRAINED SOILS	50% or more passes the No. 200 sieve	SILTS AND CLAYS Liquid Limit Less than 50%		ML	▥	Silt
				CL	▨	Lean Clay
				OL	▨	Organic Silt
		SILTS AND CLAYS Liquid Limit Greater than 50%		MH	▥	Elastic Silt
				CH	▨	Fat Clay
				OH	▨	Organic Clay
HIGHLY ORGANIC SOILS				PT	▨	Peat or Highly Organic Soils
				FILL	▨	Debris or Mixed Fill
				AC	▨	Asphalt Concrete Pavement with Aggregate Base

GENERAL NOTES

Classification of Soils in general accordance with ASTM D2487 or D2488 (based on the Unified Soil Classification System)

Geologic Formation noted in bold font at the top of interpreted interval

Sloped line in break column indicates transitional boundary

Blow counts for modified California Liner Sampler shown in ( )

Length of sample symbol approximates recovery length

SAMPLER DRIVING RESISTANCE

Number of blows with 140 lb. hammer, falling 30-in. to drive sampler 1-ft. after seating sampler 6-in.; for example,

Blows/ft	Description
25	25 blows drove sampler 12" after initial 6" of seating
50/7"	50 blows drove sampler 7" after initial 6" of seating
Ref/3"	50 blows drove sampler 3" during initial 6" seating interval (Ref=Refusal)

STRENGTH TEST METHOD

U = Unconfined Compression
Q = Unconsolidated Undrained Triaxial
T = Torvane
P = Pocket Penetrometer
M = Miniature Vane
F = Field Vane

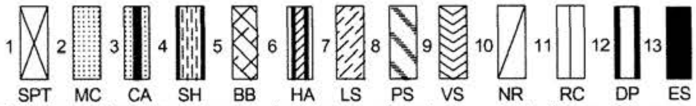
OTHER TESTS

k = Permeability
Consol = Consolidation
Gs = Specific Gravity
MA = Particle Size Analysis
EI = Expansion Index
OVM = Organic Vapor Meter

WATER LEVEL SYMBOLS

▽ Initial or perched water level
▼ Final ground water level
∿ Seepages encountered

SAMPLER TYPE AND RECOVERY



Samplers and sampler dimensions (unless otherwise noted in report text) are as follows:

1	SPT Sampler, driven 1 3/8" ID, 2" OD
2	MOD CA Liner Sampler 2 3/8" ID, 3" OD
3	CA Liner Sampler 1 7/8" ID, 2.5" OD
4	Thin-walled Tube, pushed 2 7/8" ID, 3" OD
5	Bulk Bag Sample (from cuttings)
6	Hand Auger Sample
7	Lexan Sample
8	Pitcher Sample
9	Vibracore Sample
10	No Sample Recovered
11	Rock Core
12	Direct Push
13	Enviromental Sample

Retained samples listed in sample No. column

SOIL STRUCTURE

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 types.

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.

CONSISTENCY (1)

Clays	Blows/Foot SPT	Undrained Shear Strength (ksf)
Very Soft	**0 - 2**	**0 - 0.25**
Soft	**2 - 4**	**0.25 - 0.5**
Firm	**4 - 8**	**0.5 - 1**
Stiff	**8 - 15**	**1 - 2**
Very Stiff	**15 - 30**	**2 - 4**
Hard	**Over 30**	**Over 4**

RELATIVE DENSITY (1)

Sands and Gravels	Blows/Foot SPT
Very Loose	**0 - 4**
Loose	**4 - 10**
Medium Dense	**10 - 30**
Dense	**30 - 50**
Very Dense	**Over 50**

INCREASING VISUAL MOISTURE CONTENT

↓
Dry
Moist
Wet

Information on each boring log is a compilation of subsurface conditions and soil or rock classifications obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and approximate in nature. Water level measurements refer only to those observed at the time and places indicated, and can vary with time, geologic condition, or construction activity.

(1) Terzaghi and Peck 1967

TERMS AND SYMBOLS USED ON BORING LOGS

Sheet 1 of 3

LOCATION: Soledad City Plant
N 2,044,503 E 5,873,492

SURFACE EL: 169.1 ft +/- 0.5 (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
			1a 1b		(47)	Fine to Medium SAND (SP): medium dense, brown, dry, trace fine gravel - layer of dark brown clay with organics, at 1'							
			2		28								
						Clayey Fine SAND (SC): medium dense, dark gray							
165	5		3a 3b		(49)								
						- black, with organics, below 6'							
			4		20				39				
160			5		18								
	10												
155			6		23								
	15												
			7		24	Fine to Coarse SAND (SW): medium dense, gray, with clay pockets, trace gravel							Corrosivity
150			8		11	Medium to Coarse SAND with Fine Gravel (SW): loose to medium dense, gray			3				
	20												
145			9		14	Fat CLAY (CH): stiff, light brown							

Continued

BORING DEPTH: 50.5 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 17, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-1

Soledad WWTP Upgrade and Expansion
Soledad, California

Sheet 2 of 3

LOCATION: Soledad City Plant
N 2,044,503 E 5,873,492

SURFACE EL: 169.1 ft +/- 0.5 (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
140			10a 10b		(31)			37		70	51	0.6 Q	
	30												
135			11		(78/9")								
	35					- mottled brown, below 35'							
130			12a 12b		(19)								
	40					- with coarse gravel and rock fragments, at 40'							
125			13		300 psi								
	45												
						- fine sand in tip of sampler, at 46'							
120			14		(24)								

Continued

BORING DEPTH: 50.5 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 17, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-1

Soledad WWTP Upgrade and Expansion
Soledad, California

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	LOCATION: Soledad City Plant N 2,044,503 E 5,873,492 SURFACE EL: 169.1 ft +/- 0.5 (rel. NAVD88 datum) MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
		▨		◸		- brownish gray, mottle brown, with sand pockets, at 50' - End of Boring at 50.5'							
115													
	55												
110													
	60												
105													
	65												
100													
	70												
95													

BORING DEPTH: 50.5 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 17, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-1

Soledad WWTP Upgrade and Expansion
Soledad, California

Sheet 1 of 2

LOCATION: Soledad City Plant
N 2,044,930 E 5,873,605

SURFACE EL: 171.9 ft +/- 0.5 (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
						Clayey SAND (SC): medium dense, brown, dry							
			1		23								
170													
						Clayey SAND (SC): medium dense, dark gray to black							
	5		2		19								
165													
			3		18	- with organics, at 9'			44				
	10												
160													
			4a 4b		(11)								
	15												
155													
						Silty Fine SAND (SM): medium dense, gray, trace mica							
			5a 5b		(19)								
	20												
150													
			6		12				18				

Continued

BORING DEPTH: 30.5 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 18, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-2
Soledad WWTP Upgrade and Expansion
Soledad, California

Sheet 2 of 2

LOCATION: Soledad City Plant
N 2,044,930 E 5,873,605

SURFACE EL: 171.9 ft +/- 0.5 (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
145													
			7a		(23)	Lean CLAY (CL): stiff, grayish brown, mottled brown	80	42					
	30		7b										
						- End of Boring at 30.5'							
140													
	35												
135													
	40												
130													
	45												
125													

BORING DEPTH: 30.5 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 18, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-2

Soledad WWTP Upgrade and Expansion
Soledad, California

Sheet 1 of 2

LOCATION: Soledad City Plant
N 2,044,352 E 5,873,250

SURFACE EL: 168.9 ft +/- 0.5 (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
						Fine SAND with silt (SP-SM): dense, brown, dry							
			1		43								
165													
	5		2		39	- light gray, moist, with gravel, below 5'							
160			3		25				7				
	10												
155			4		14	Fine to Coarse SAND with Gravel (SW): medium dense, brown			3				
	15												
150			5		30								
	20												
145					14								

Continued

BORING DEPTH: 40.5 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 17, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-3
Soledad WWTP Upgrade and Expansion
Soledad, California

Sheet 2 of 2

LOCATION: Soledad City Plant
N 2,044,352 E 5,873,250

SURFACE EL: 168.9 ft +/- 0.5 (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
			6		22								
140			7		12	Lean CLAY (CL): stiff to very stiff, grayish brown, mottled brown							
	30												
135			8a 8b		(17)	- with gravel, at 34'	86	38					
	35												
130			9		18								
	40												
						- End of Boring at 40.5'							
125													
	45												
120													

BORING DEPTH: 40.5 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 17, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-3

Soledad WWTP Upgrade and Expansion
Soledad, California

Sheet 1 of 2

LOCATION: Soledad City Plant
N 2,044,749 E 5,873,260

SURFACE EL: 169.0 ft +/- 0.5 (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	SAMPLE NO.	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
		1	83	Find SAND with Silt (SP-SM): very dense, brown, dry (high blowcount from cold cathead) - gray, moist, below 2'							
165	5	2	56								
160		3	8	Lean CLAY (CL): firm, gray, trace organics			90				
	10										
155		4a	(8)								
	15	4b		Fine SAND with Silt (SP-SM): loose, gray							Corrosivity
150		5	21	Fine to Coarse SAND with Gravel (SW): medium dense, gray			5				
	20										
145		6	50	- very dense, at 24'							

Continued

BORING DEPTH: 40.5 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 18, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-4
Soledad WWTP Upgrade and Expansion
Soledad, California

Sheet 2 of 2

LOCATION: Soledad City Plant
N 2,044,749 E 5,873,260

SURFACE EL: 169.0 ft +/- 0.5 (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	SAMPLE NO.	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
				Lean CLAY (CL): stiff, grayish brown, mottled brown							
140		7a	(42)		113	17					
	30	7b									
135		8	psi	- with sand, at 34'		39		48	32	1.8 Q	
	35										
130		9	16	- trace gravel, at 39'							
	40			- End of Boring at 40.5'							
125											
	45										
120											

BORING DEPTH: 40.5 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 18, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

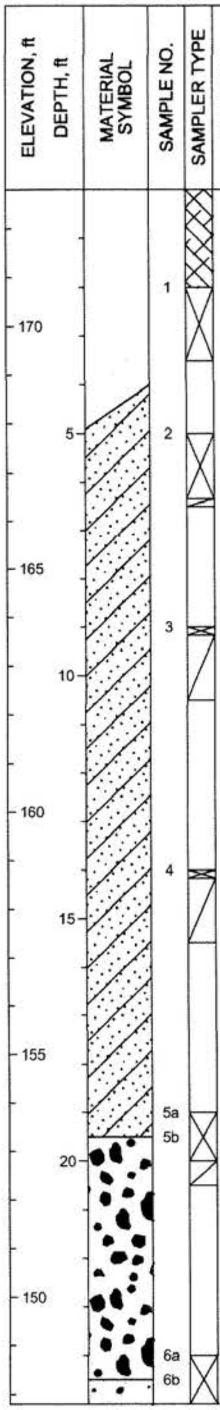
DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-4
Soledad WWTP Upgrade and Expansion
Soledad, California

Sheet 1 of 2

LOCATION: Soledad City Plant
N 2,045,173 E 5,873,505

SURFACE EL: 172.8 ft +/- 0.5 (rel. NAVD88 datum)



SAMPLE NO.	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
		Fine SAND (SP): very dense, light brown, dry, with clay pockets							
1	68								
		Clayey SAND with Fine Gravel (SC): dense, dark brown							
2	42								
3	12	- medium dense, brown, with clay pockets, below 9'							
4	13								Corrosivity
5a 5b	23								
		Fine to Coarse GRAVEL with Sand (GW): medium dense, subrounded							
6a 6b	35				11				
		Fine to Medium SAND with Gravel (SP): dense,							

Continued

BORING DEPTH: 35.0 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 17, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-5

Soledad WWTP Upgrade and Expansion
Soledad, California

Sheet 2 of 2

LOCATION: Soledad City Plant
N 2,045,173 E 5,873,505

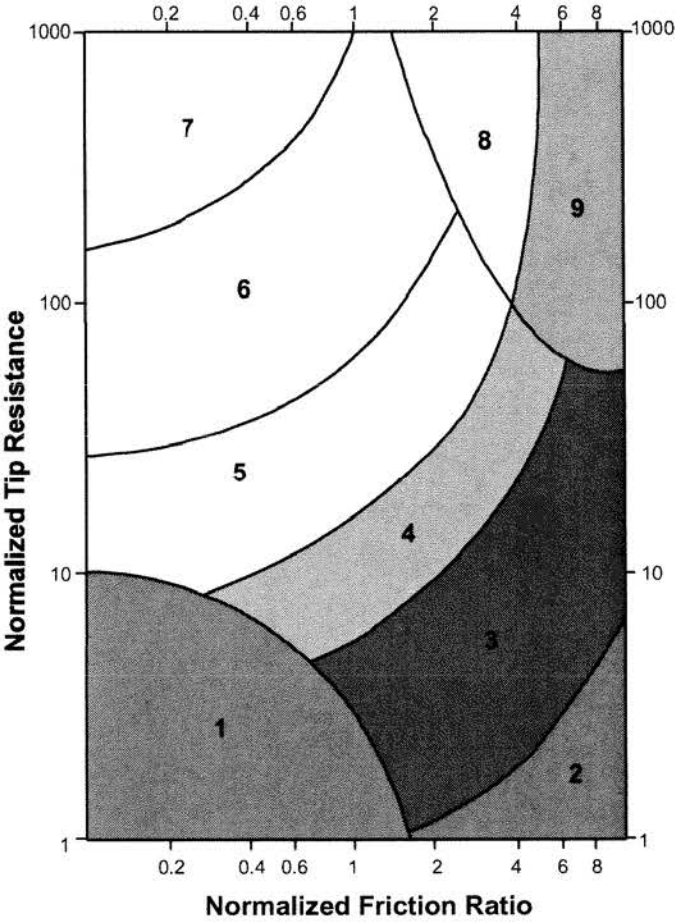
SURFACE EL: 172.8 ft +/- 0.5 (rel. NAVD88 datum)

ELEVATION, ft	DEPTH, ft	MATERIAL SYMBOL	SAMPLE NO.	SAMPLER TYPE	SAMPLER BLOW COUNT/ PRESSURE, psi	MATERIAL DESCRIPTION	DRY UNIT WEIGHT, pcf	WATER CONTENT, %	% PASSING #200 SIEVE	LIQUID LIMIT, %	PLASTICITY INDEX	UNDRAINED SHEAR STRENGTH, S_u, ksf	OTHER TESTS
						brown							
145													
			7		34								
	30												
140													
			8		32	Clayey SAND (SC): dense, brown, mottled red			42				
	35					- End of Boring at 35'							
135													
	40												
130													
	45												
125													

BORING DEPTH: 35.0 ft
DEPTH TO WATER: Not Measured
BACKFILL: Grout
COMPLETION DATE: November 17, 2006
NOTES: 1. Terms and symbols defined on Plate A-1.

DRILLING METHOD: 5-in. dia. Mud Rotary Wash
HAMMER TYPE: Safety Hammer - Rope and Cathead, 140 lb
DRILLED BY: Gregg Drilling
LOGGED BY: M. Paquette

LOG OF BORING NO. B-5
Soledad WWTP Upgrade and Expansion
Soledad, California



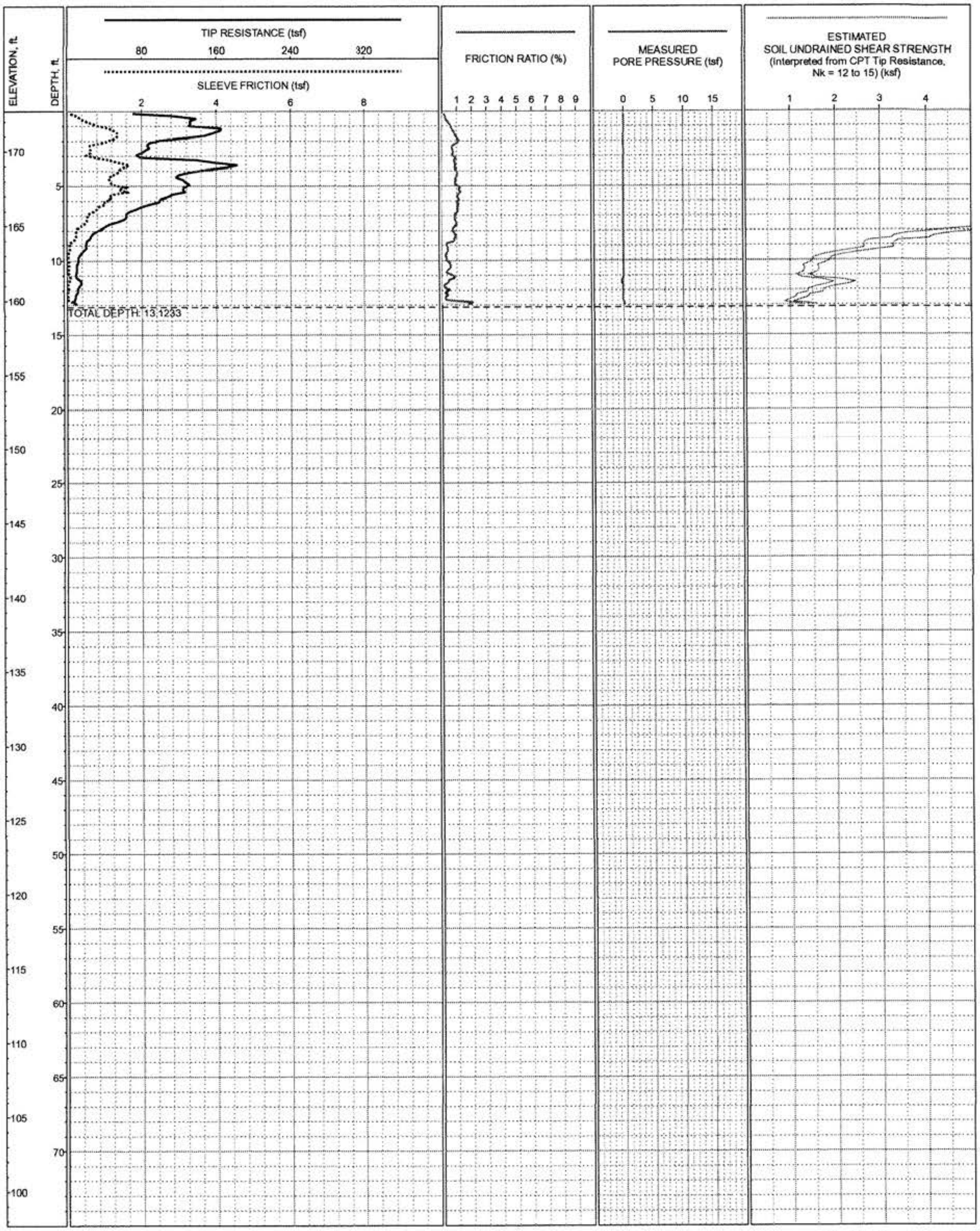
Zone	Soil Behavior Type
1	Sensitive Fine-grained
2	Organic Material
3	Clay to Silty Clay
4	Clayey Silt to Silty Clay
5	Silty Sand to Sandy Silt
6	Clean Sands to Silty Sands
7	Gravelly Sand to Sand
8	Very Stiff Sand to Clayey Sand
9	Very Stiff Fine-grained *

*overconsolidated or cemented

CPT CORRELATION CHART
(Modified from Robertson, 1990)

KEY TO CPT LOGS
Soledad WWTP Upgrade and Expansion
Soledad, California

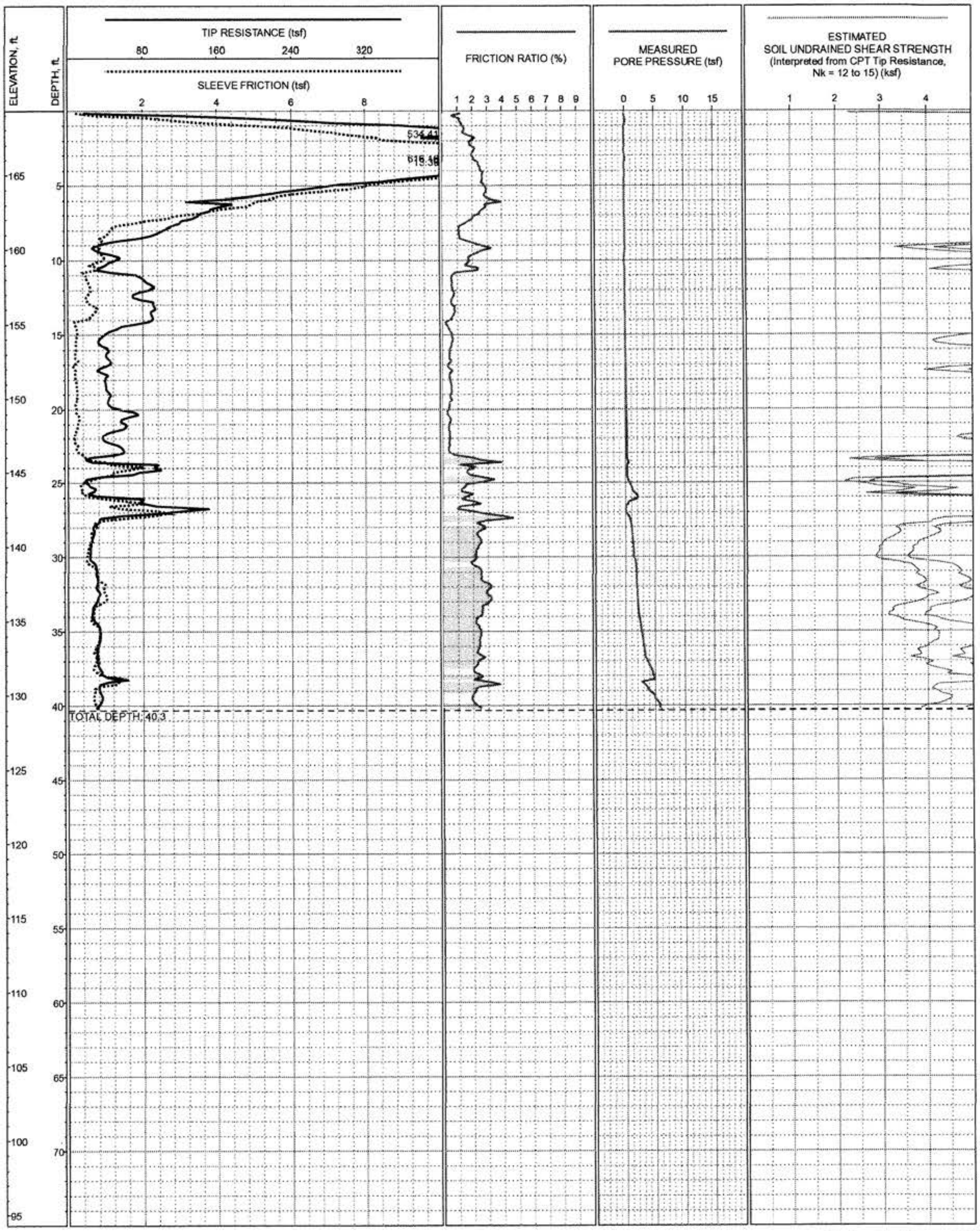
G:\jobdocs\3040\3040.009 Soledad\GIS\MXD\Key_CPT_Logs.mxd, 06/04/07, mboone



LOCATION: E5873404 N2045226 (State Plane, NAD83, California Zone 4)
SURFACE EL: 172.7ft (NAVD88)
COMPLETION DEPTH: 13.1233ft
TEST DATE: 11/21/2006

Exploration Type: CPT
PERFORMED BY: Gregg In Situ
OPERATOR: Gregg In Situ
REVIEWED BY: M. Paquette

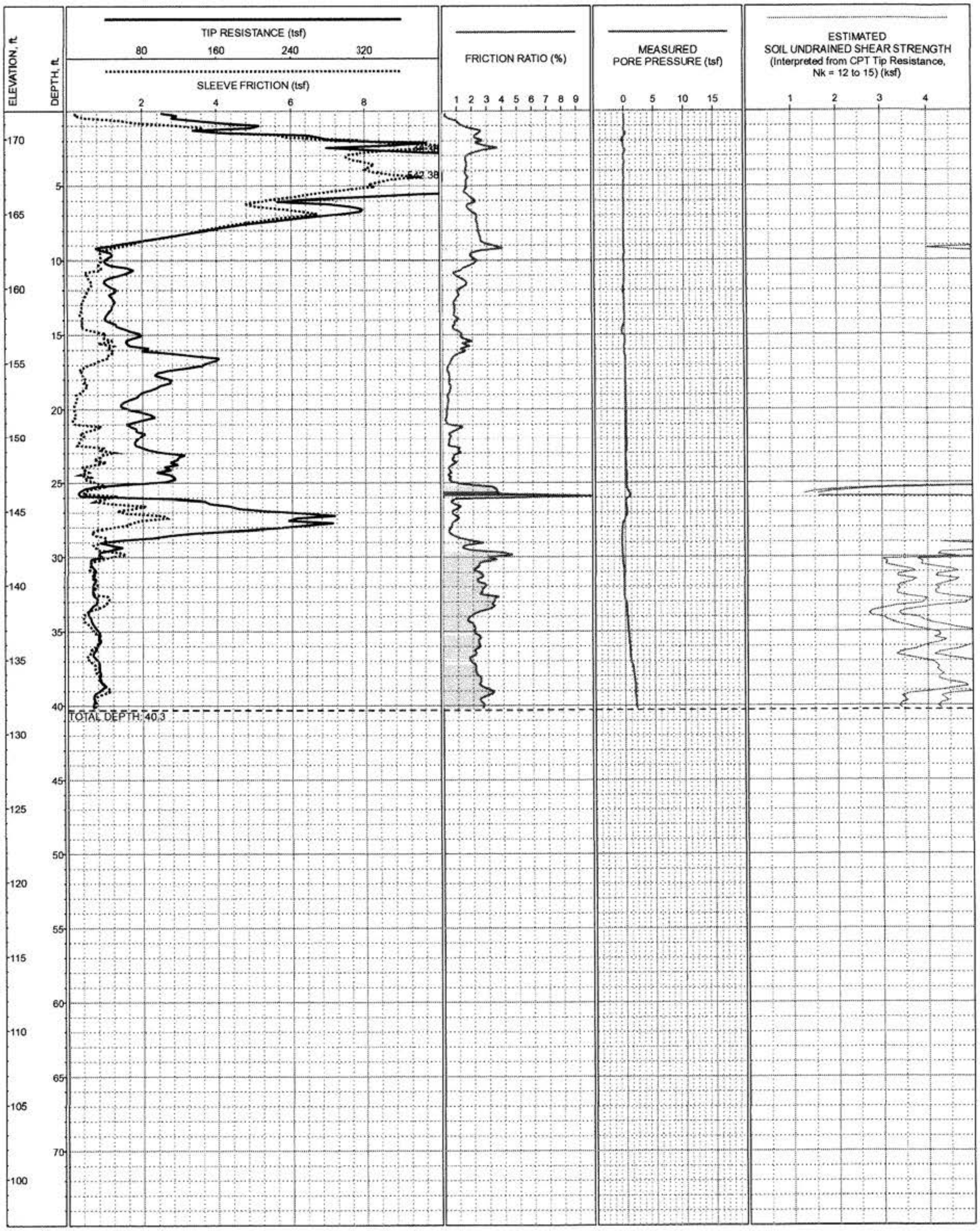
LOG OF CPT-1
Soledad WWTP Upgrade and Expansion
Soledad, California



LOCATION: E5873310 N2044533 (State Plane, NAD83, California Zone 4)
SURFACE EL: 169.3ft (NAVD88)
COMPLETION DEPTH: 40.3ft
TEST DATE: 11/21/2006

Exploration Type: CPT
PERFORMED BY: Gregg In Situ
OPERATOR: Gregg In Situ
REVIEWED BY: M. Paquette

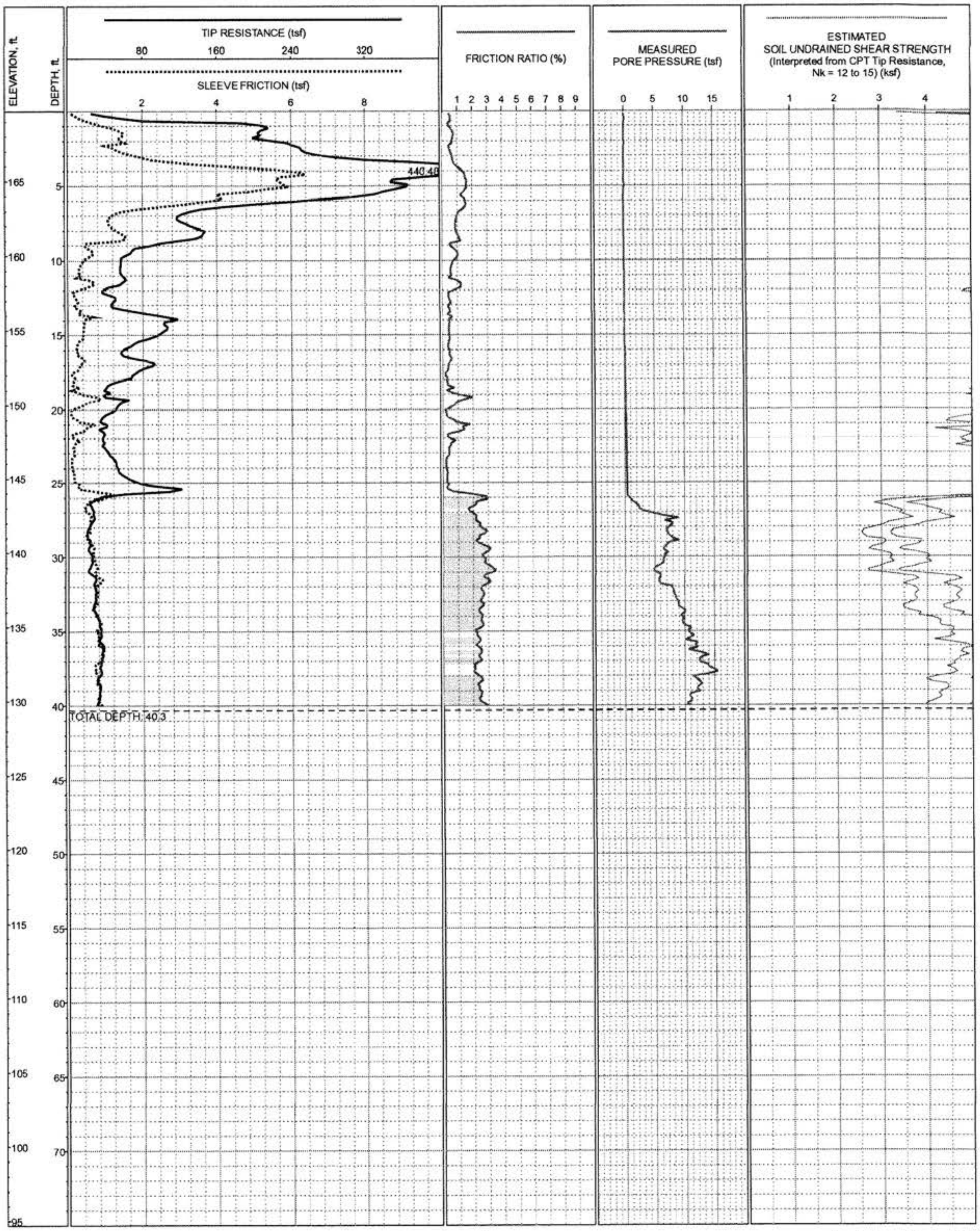
LOG OF CPT-2
Soledad WWTP Upgrade and Expansion
Soledad, California



LOCATION: E5873685 N2044211 (State Plane, NAD83, California Zone 4)
SURFACE EL: 171.9ft (NAVD88)
COMPLETION DEPTH: 40.3ft
TEST DATE: 11/22/2006

Exploration Type: CPT
PERFORMED BY: Gregg In Situ
OPERATOR: Gregg In Situ
REVIEWED BY: M. Paquette

LOG OF CPT-3
Soledad WWTP Upgrade and Expansion
Soledad, California

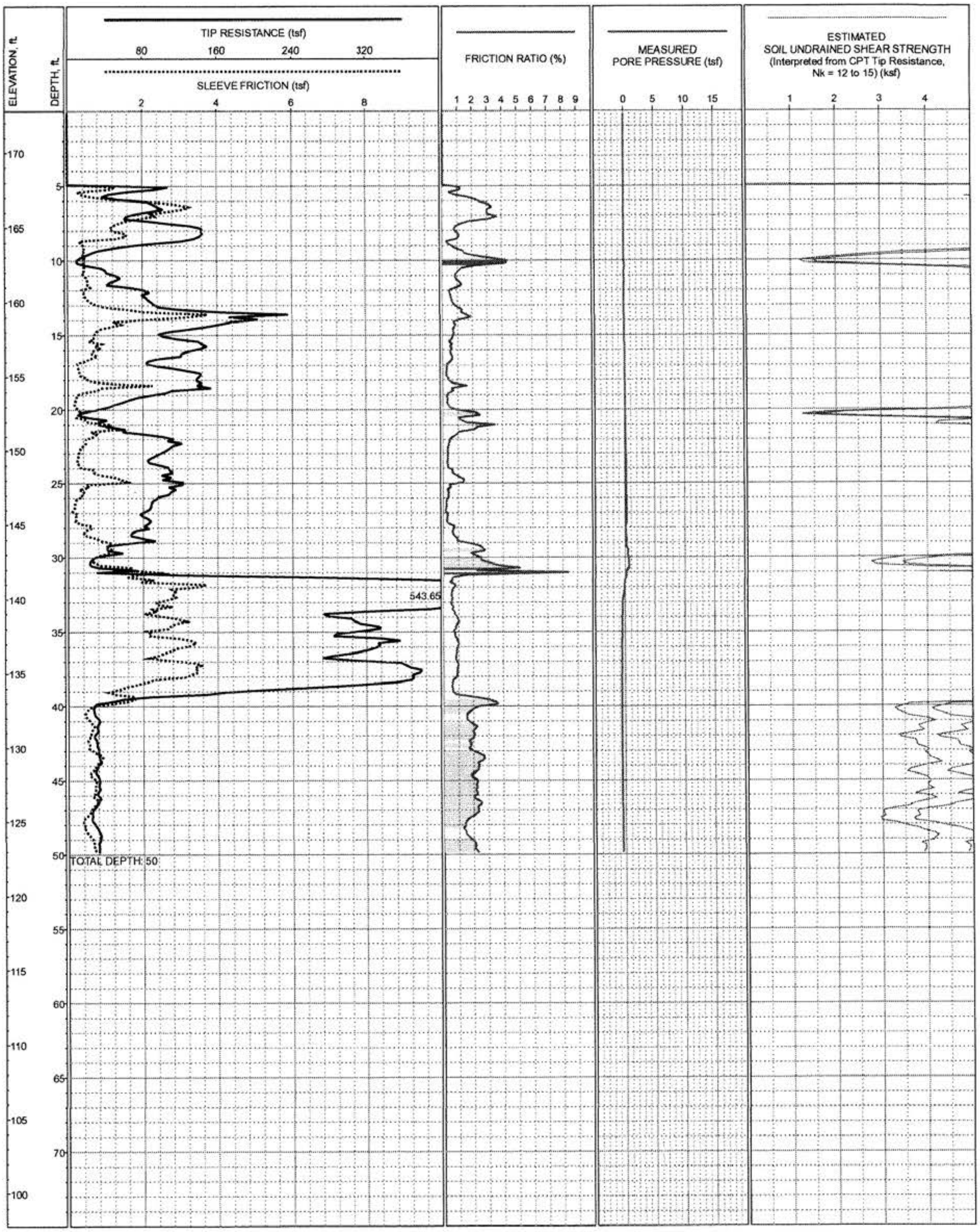


LOCATION: E5873258 N2044221 (State Plane, NAD83, California Zone 4)
SURFACE EL: 169.7ft (NAVD88)
COMPLETION DEPTH: 40.3ft
TEST DATE: 11/21/2006

Exploration Type: CPT
PERFORMED BY: Gregg In Situ
OPERATOR: Gregg In Situ
REVIEWED BY: M. Paquette

LOG OF CPT-4

Soledad WWTP Upgrade and Expansion
Soledad, California

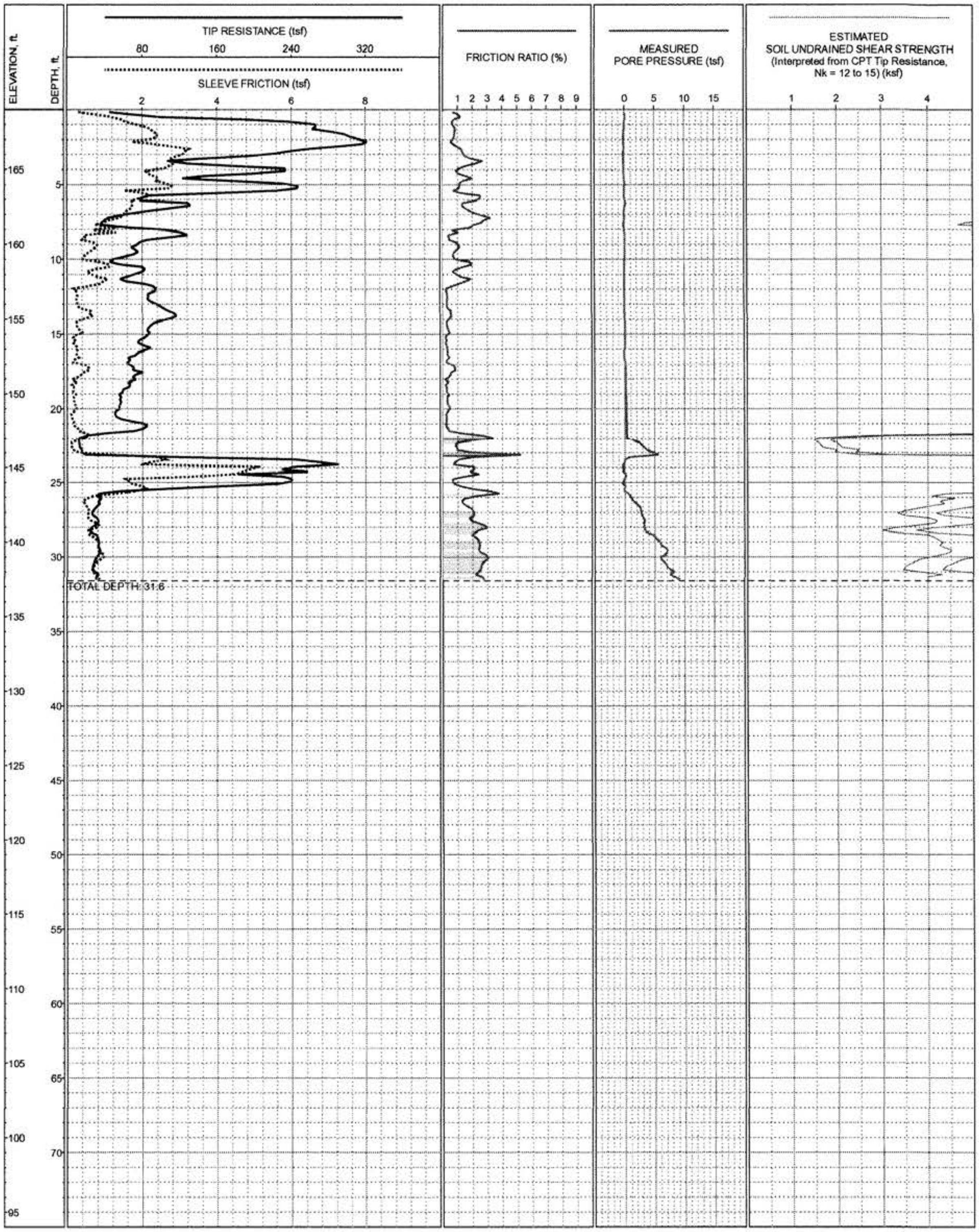


LOCATION: E5873366 N2045136 (State Plane, NAD83, California Zone 4)
SURFACE EL: 172.8ft (NAVD88)
COMPLETION DEPTH: 50ft
TEST DATE: 11/21/2006

Exploration Type: CPT
PERFORMED BY: Gregg In Situ
OPERATOR: Gregg In Situ
REVIEWED BY: M. Paquette

LOG OF CPT-5

Soledad WWTP Upgrade and Expansion
Soledad, California

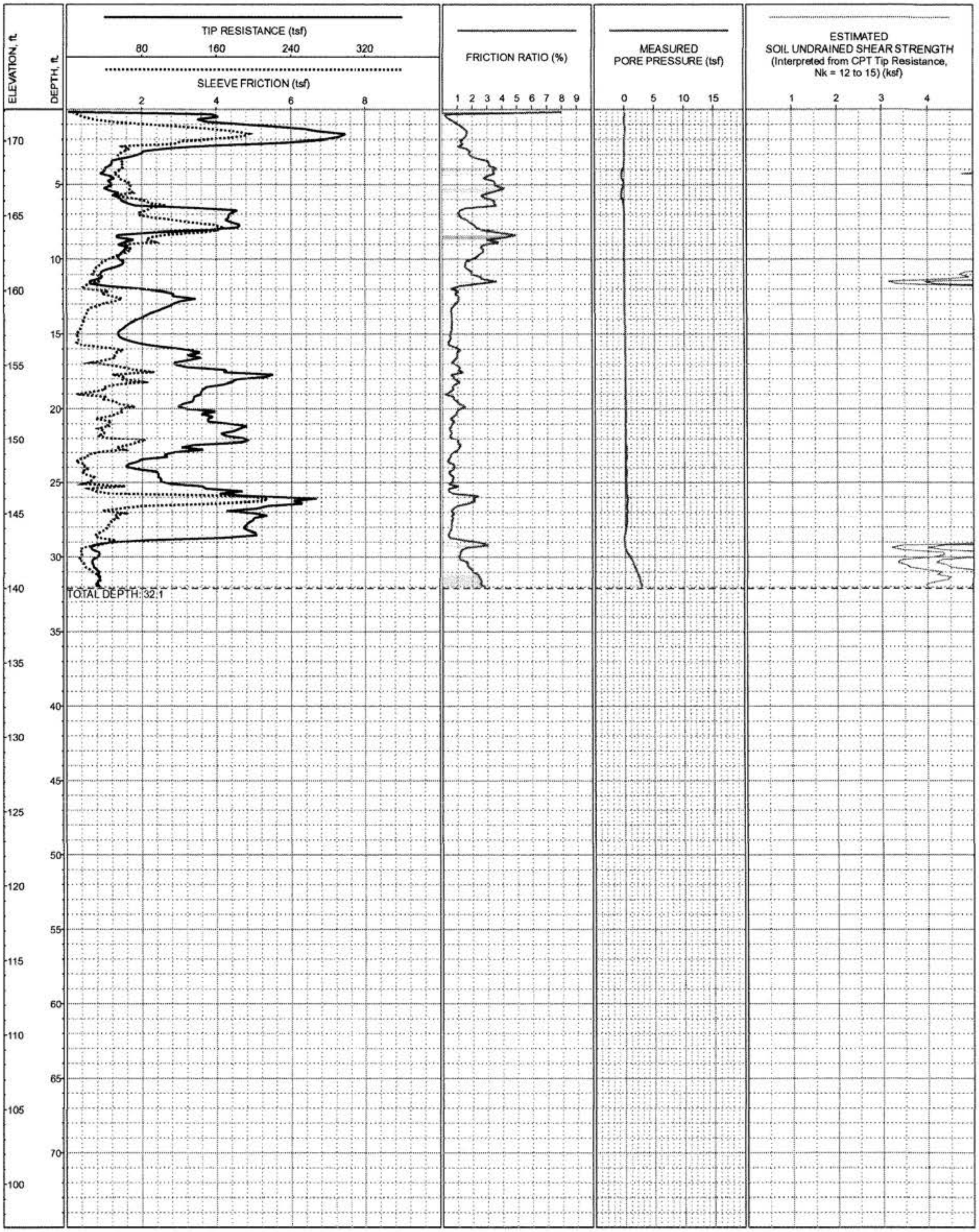


LOCATION: E5873264 N2044946 (State Plane, NAD83, California Zone 4)
SURFACE EL: 169ft (NAVD88)
COMPLETION DEPTH: 31.6ft
TEST DATE: 11/21/2006

Exploration Type: CPT
PERFORMED BY: Gregg In Situ
OPERATOR: Gregg In Situ
REVIEWED BY: M. Paquette

LOG OF CPT-6

Soledad WWTP Upgrade and Expansion
Soledad, California

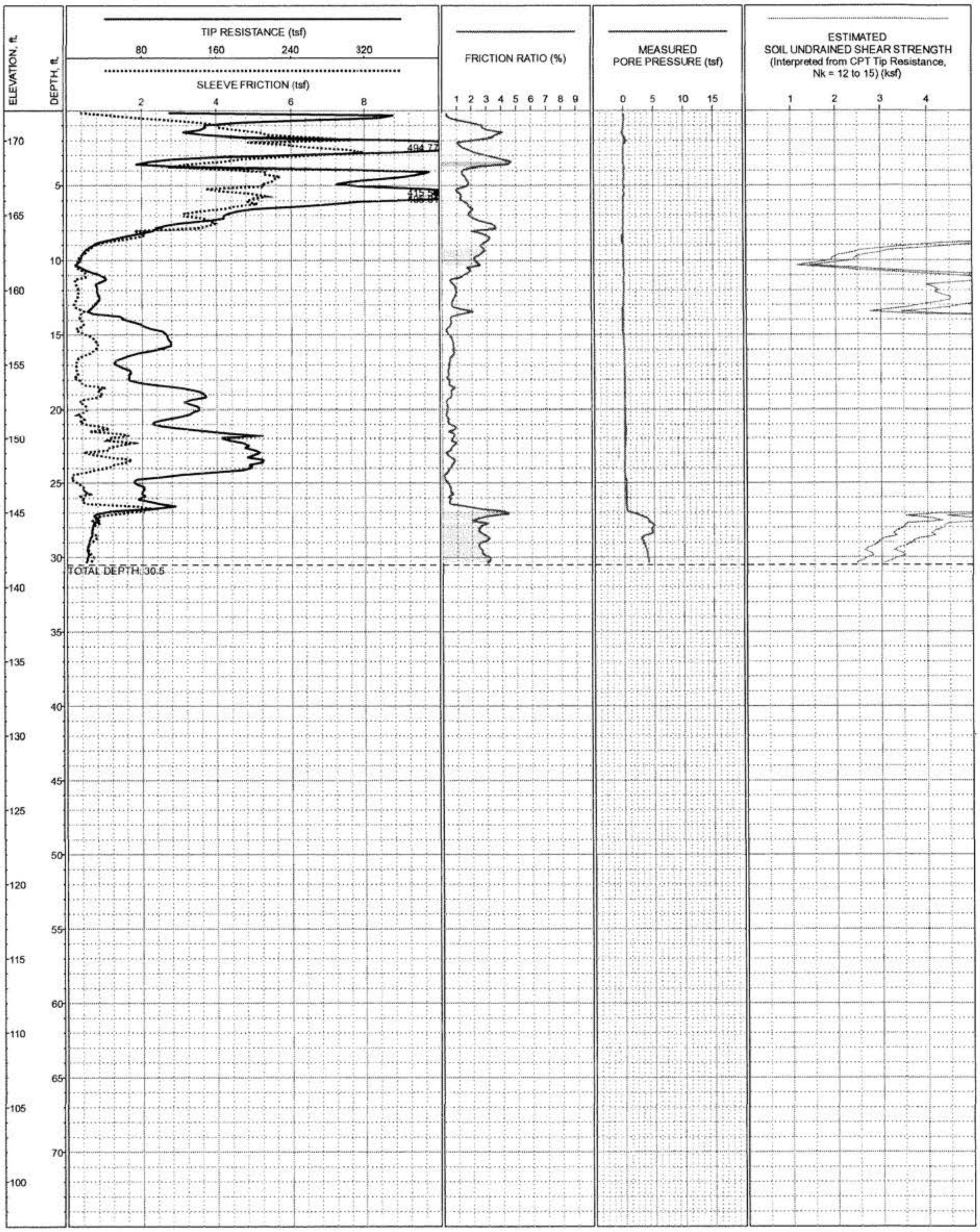


LOCATION: E5873606 N2044730 (State Plane, NAD83, California Zone 4)
SURFACE EL: 172.1ft (NAVD88)
COMPLETION DEPTH: 32.1ft
TEST DATE: 11/22/2006

Exploration Type: CPT
PERFORMED BY: Gregg In Situ
OPERATOR: Gregg In Situ
REVIEWED BY: M. Paquette

LOG OF CPT-7

Soledad WWTP Upgrade and Expansion
Soledad, California



LOCATION: E5873603 N2044362 (State Plane, NAD83, California Zone 4)
SURFACE EL: 172ft (NAVD88)
COMPLETION DEPTH: 30.5ft
TEST DATE: 11/22/2006

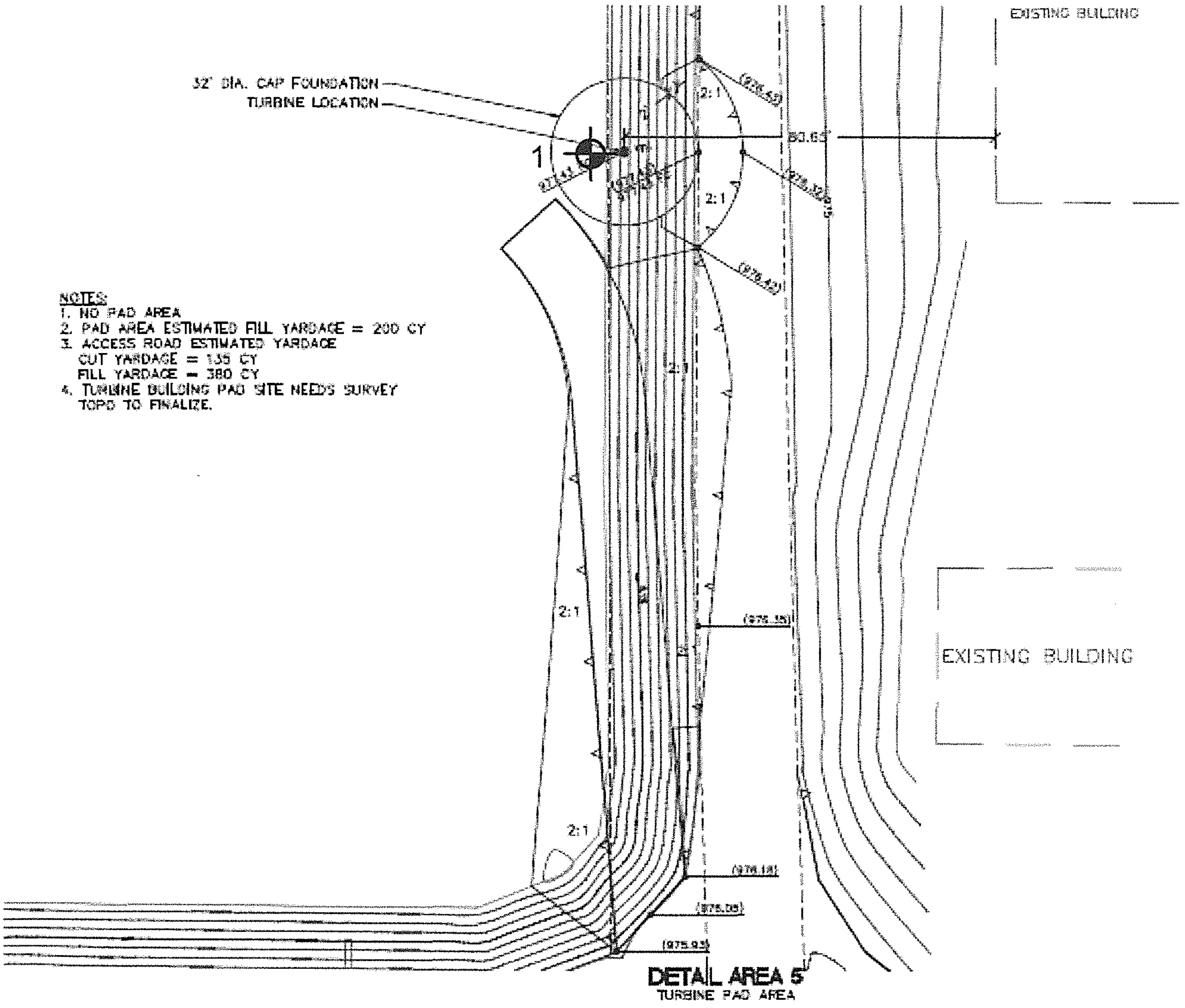
Exploration Type: CPT
PERFORMED BY: Gregg In Situ
OPERATOR: Gregg In Situ
REVIEWED BY: M. Paquette

LOG OF CPT-8
Soledad WWTP Upgrade and Expansion
Soledad, California

BORING LOCATION MAP

SOLEDAD WATER RECLAMATION FACILITY
WIND TURBINE

34520 Morsoli Road
Soledad, California



NOTES:
1. NO PAD AREA
2. PAD AREA ESTIMATED FILL YARDAGE = 200 CY
3. ACCESS ROAD ESTIMATED YARDAGE
   CUT YARDAGE = 135 CY
   FILL YARDAGE = 380 CY
4. TURBINE BUILDING PAD SITE NEEDS SURVEY
   TOPO TO FINALIZE.

Base Map Provided by Patrick and Henderson, Inc., September 25, 2013

LEGEND

1 ⊕ Boring Location (Approx.)

NOT TO SCALE

Earth Systems Pacific

4378 Old Santa Fe Road
San Luis Obispo, CA 93401-8116
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E-mail: esp@earthsys.com

October 3, 2013 QF SL-17099-SA

SOLEDAD WATER RECLAMATION FACILITY WIND TURBINE–100313Borings

Earth Systems Pacific

BORING LOG LEGEND

SAMPLE / SUBSURFACE WATER SYMBOLS

SAMPLE / SUBSURFACE WATER SYMBOLS	GRAPH. SYMBOL
CALIFORNIA MODIFIED	▬
STANDARD PENETRATION TEST (SPT)	●
SHELBY TUBE	▭
BULK	○
SUBSURFACE WATER DURING DRILLING	▼
SUBSURFACE WATER AFTER DRILLING	▽

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTIONS	GRAPH. SYMBOL
COARSE GRAINED SOILS	MORE THAN HALF OF MATERIAL IS TESTED OR JUDGED TO BE LARGER THAN #200 SIEVE SIZE	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	▨
		GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	▨
		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES	▨
		GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES	▨
		SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	▨
		SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	▨
		SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES	▨
		SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES	▨
FINE GRAINED SOILS	HALF OR MORE OF MATERIAL IS TESTED OR JUDGED TO BE SMALLER THAN #200 SIEVE SIZE	ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY, CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY	▥
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	▧
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	▤
		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY, SILTY SOILS, ELASTIC SILTS	▥
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	▧
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	▤
		PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	▽ ▽ ▽

OBSERVED MOISTURE CONDITION

DRY	SLIGHTLY MOIST	MOIST	VERY MOIST	WET
LITTLE/NO MOISTURE	JUDGED BELOW OPTIMUM	JUDGED ABOUT OPTIMUM	JUDGED OVER OPTIMUM	SATURATED

TYPICAL CONSISTENCY

COARSE GRAINED SOILS

BLOWS/FOOT		DESCRIPTIVE TERM
SPT	CA SAMPLER	
0-10	0-16	LOOSE
11-30	17-50	MEDIUM DENSE
31-50	51-83	DENSE
OVER 50	OVER 83	VERY DENSE

FINE GRAINED SOILS

BLOWS/FOOT		DESCRIPTIVE TERM
SPT	CA SAMPLER	
0-2	0-3	VERY SOFT
3-4	4-7	SOFT
5-8	8-13	MEDIUM STIFF
9-15	14-25	STIFF
16-30	26-50	VERY STIFF
OVER 30	OVER 50	HARD

GRAIN SIZES

U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENING		
# 200	# 40	# 10	# 4	3/4"	3"	12"

SILT & CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

TYPICAL ROCK HARDNESS

MAJOR DIVISIONS	TYPICAL DESCRIPTIONS
EXTREMELY HARD	CORE, FRAGMENT, OR EXPOSURE CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CAN ONLY BE CHIPPED WITH REPEATED HEAVY HAMMER BLOWS
VERY HARD	CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CORE OR FRAGMENT BREAKS WITH REPEATED HEAVY HAMMER BLOWS
HARD	CAN BE SCRATCHED WITH KNIFE OR SHARP PICK WITH DIFFICULTY (HEAVY PRESSURE); HEAVY HAMMER BLOW REQUIRED TO BREAK SPECIMEN
MODERATELY HARD	CAN BE GROOVED 1/16 INCH DEEP BY KNIFE OR SHARP PICK WITH MODERATE OR HEAVY PRESSURE; CORE OR FRAGMENT BREAKS WITH LIGHT HAMMER BLOW OR HEAVY MANUAL PRESSURE
SOFT	CAN BE GROOVED OR GOUGED EASILY BY KNIFE OR SHARP PICK WITH LIGHT PRESSURE, CAN BE SCRATCHED WITH FINGERNAIL; BREAKS WITH LIGHT TO MODERATE MANUAL PRESSURE
VERY SOFT	CAN BE READILY INDENTED, GROOVED OR GOUGED WITH FINGERNAIL, OR CARVED WITH KNIFE; BREAKS WITH LIGHT MANUAL PRESSURE

TYPICAL ROCK WEATHERING

MAJOR DIVISIONS	TYPICAL DESCRIPTIONS
FRESH	NO DISCOLORATION, NOT OXIDIZED
SLIGHTLY WEATHERED	DISCOLORATION OR OXIDATION IS LIMITED TO SURFACE OF, OR SHORT DISTANCE FROM; SOME FRACTURES PRESENT; FELDSPAR CRYSTALS ARE DULL
MODERATELY WEATHERED	DISCOLORATION OR OXIDATION EXTENDS FROM FRACTURES, USUALLY THROUGHOUT; Fe-Mg MINERALS ARE "RUSTY"; FELDSPAR CRYSTALS ARE "CLOUDY"
INTENSELY WEATHERED	DISCOLORATION OR OXIDATION THROUGHOUT; FELDSPAR AND Fe-Mg MINERALS ARE ALTERED TO CLAY TO SOME EXTENT OR CHEMICAL ALTERATION PRODUCES IN SITU DISAGGREGATION
DECOMPOSED	DISCOLORATION OR OXIDATION THROUGHOUT, BUT RESISTANT MINERALS SUCH AS QUARTZ MAY BE UNALTERED; FELDSPAR AND Fe-Mg MINERALS ARE COMPLETELY ALTERED TO CLAY

drafting/masters/Boring Log Legend091608.dwg

Earth Systems Pacific

Boring No. 1

PAGE 1 OF 3

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Auto Hammer
AUGER TYPE: 6" Hollow Stem Auger
Surface Elevation: 967 ft +/-
JOB NO.: SL-17099-SA
DATE: 08/13/13

SOLEDAD WATER RECLAMATION FACILITY
WIND TURBINE
34520 Morsoli Road
Soledad, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	N_{60} BLOWS PER FOOT
0	SM		SILTY SAND: olive brown, loose, slightly moist (Alluvium)						
1									
2			gray						
3			olive	0.0 - 4.0	○				
4			▼						
5	SP		POORLY GRADED SAND: gray, loose, wet, fine grained to very fine grained	5.0 - 6.5	▬	86.0	40.7	2 3 3	4
6									
7									
8									
9									
10			interbedded with thin lenses of SANDY SILT	10.0 - 11.5	▬	90.6	30.7	1 4 6	7
11									
12									
13									
14			medium dense, trace fine to coarse gravel						
15				15.0 - 16.5	▬	96.6	23.9	4 9 13	17
16									
17									
18									
19									
20	CH		FAT CLAY WITH SAND: light olive gray, stiff, very moist, very fine grained sand	20.0 - 21.5	▬	82.4	38.7	4 10 10	17
21									
22									
23									
24									
25				25.0 - 26.5	▬	84.6	38.3	6 10 11	18
26									

LEGEND: ▬ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Boring No. 1

PAGE 2 OF 3

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WIND TURBINE
34520 Morsoli Road
Soledad, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	N_{60} BLOWS PER FOOT
27	CH	▨	FAT CLAY WITH SAND: as above						
28									
29									
30				30.0 - 31.5	■	82.5	37.7	4 7 9	14
31									
32									
33									
34									
35				35.0 - 36.5	■	80.2	41.5	4 5 8	11
36			medium stiff						
37									
38									
39									
40	CL	▨	LEAN CLAY: gray, stiff, very moist, trace fine sand	40.0 - 41.5	●			3 4 6	14
41									
42									
43									
44									
45				45.0 - 46.5	●			2 4 5	13
46									
47									
48									
49									
50			medium stiff	50.0 - 51.5	●			2 4 4	11
51									
52									
53									

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Boring No. 1

PAGE 3 OF 3

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WIND TURBINE
34520 Morsoli Road
Soledad, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	N_{60} BLOWS PER FOOT
54	CL		LEAN CLAY: as above						
55	SP		POORLY GRADED SAND: brown, loose, wet, fine grained ▼	55.0 - 56.5	●			0 0 4	6
59	SW		WELL GRADED SAND: light brown, medium dense, wet						
61			End of Boring @ 61.5' Subsurface water encountered between 4.5' and 19.5' and @ 55.5'	60.0 - 61.5	●			4 7 11	25
62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80									

LEGEND: ▬ Ring Sample ○ Grab Sample ☐ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

BULK DENSITY TEST RESULTS

ASTM D 2937-10 (modified for ring liners)

September 8, 2013

BORING NO.	DEPTH feet	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
1	6.0 - 6.5	40.7	121.0	86.0
1	11.0 - 11.5	30.7	118.4	90.6
1	16.0 - 16.5	23.9	119.7	96.6
1	21.0 - 21.5	38.7	114.3	82.4
1	26.0 - 26.5	38.3	117.0	84.6
1	31.0 - 31.5	37.7	113.6	82.5
1	36.0 - 36.5	41.5	113.5	80.2

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12

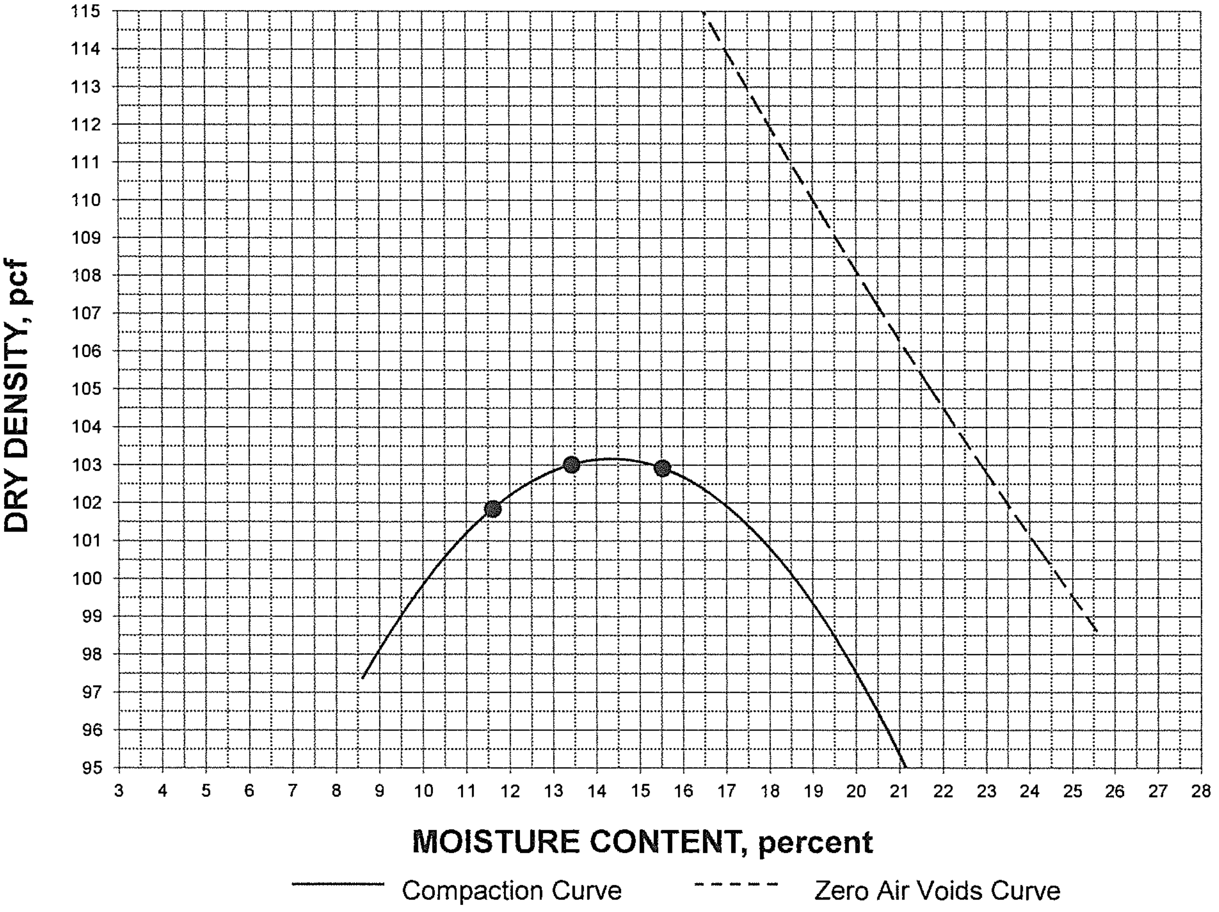
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.65 (assumed)

September 8, 2013
Boring #1 @ 0.0 - 4.0'
Olive Brown Silty Sand (SM)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	0

MAXIMUM DRY DENSITY: 103.2 pcf
OPTIMUM MOISTURE: 14.3%



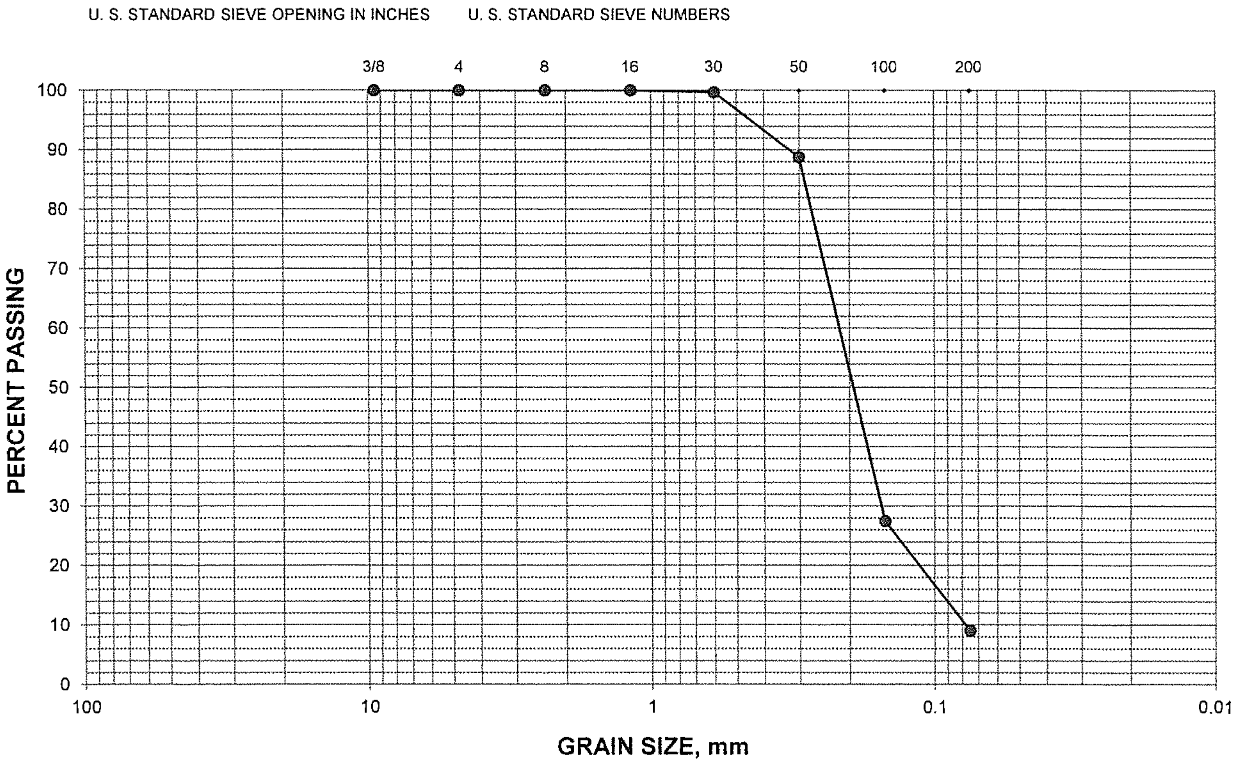
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07; D 1140-00/06

Boring #1 @ 6.0 - 6.5'
Poorly Graded Sand (SP)
Cu = 2.8; Cc = 1.4

September 8, 2013

Sieve size	% Retained	% Passing
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	0	100
#16 (1.18-mm)	0	100
#30 (600-µm)	0	100
#50 (300-µm)	11	89
#100 (150-µm)	73	27
#200 (75-µm)	91	9



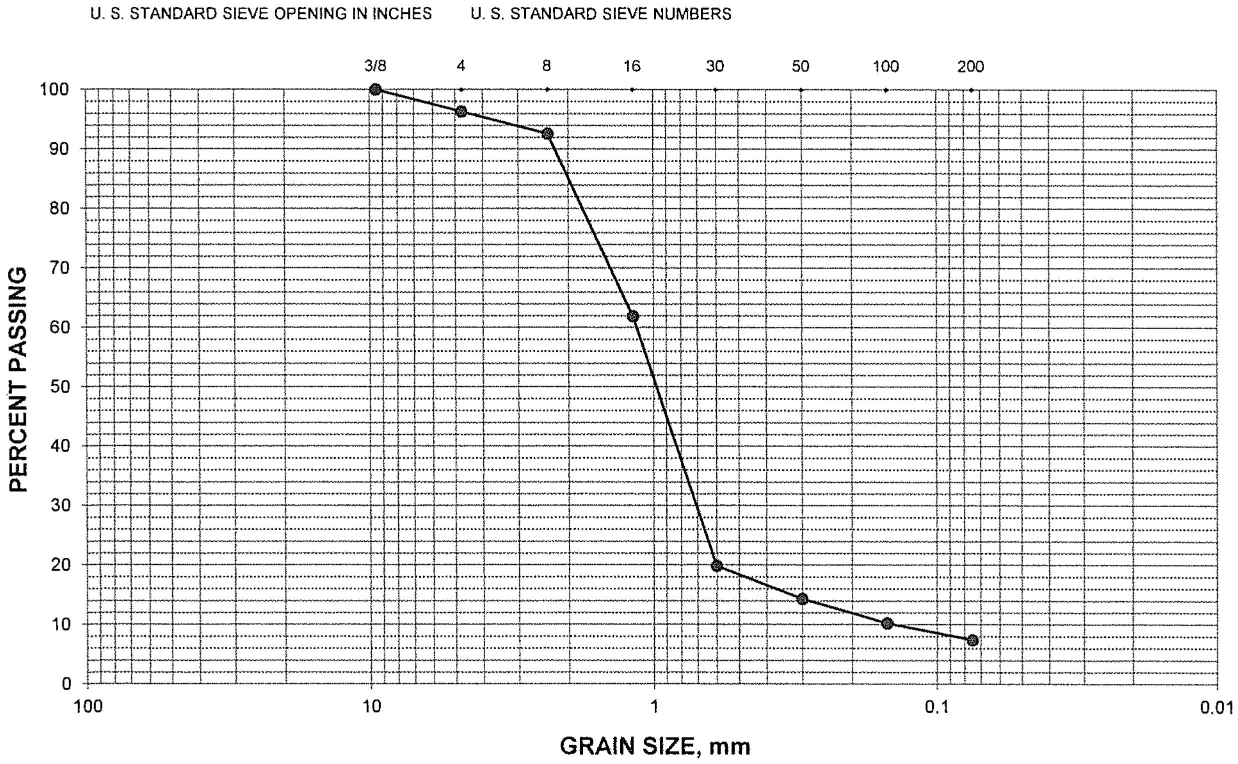
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07; D 1140-00/06

Boring #1 @ 16.0 - 16.5'
Poorly Graded Sand (SP)
Cu = 8.1; Cc = 3.1

September 8, 2013

Sieve size	% Retained	% Passing
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	4	96
#8 (2.36-mm)	7	93
#16 (1.18-mm)	38	62
#30 (600-µm)	80	20
#50 (300-µm)	86	14
#100 (150-µm)	90	10
#200 (75-µm)	93	7



PARTICLE SIZE ANALYSIS

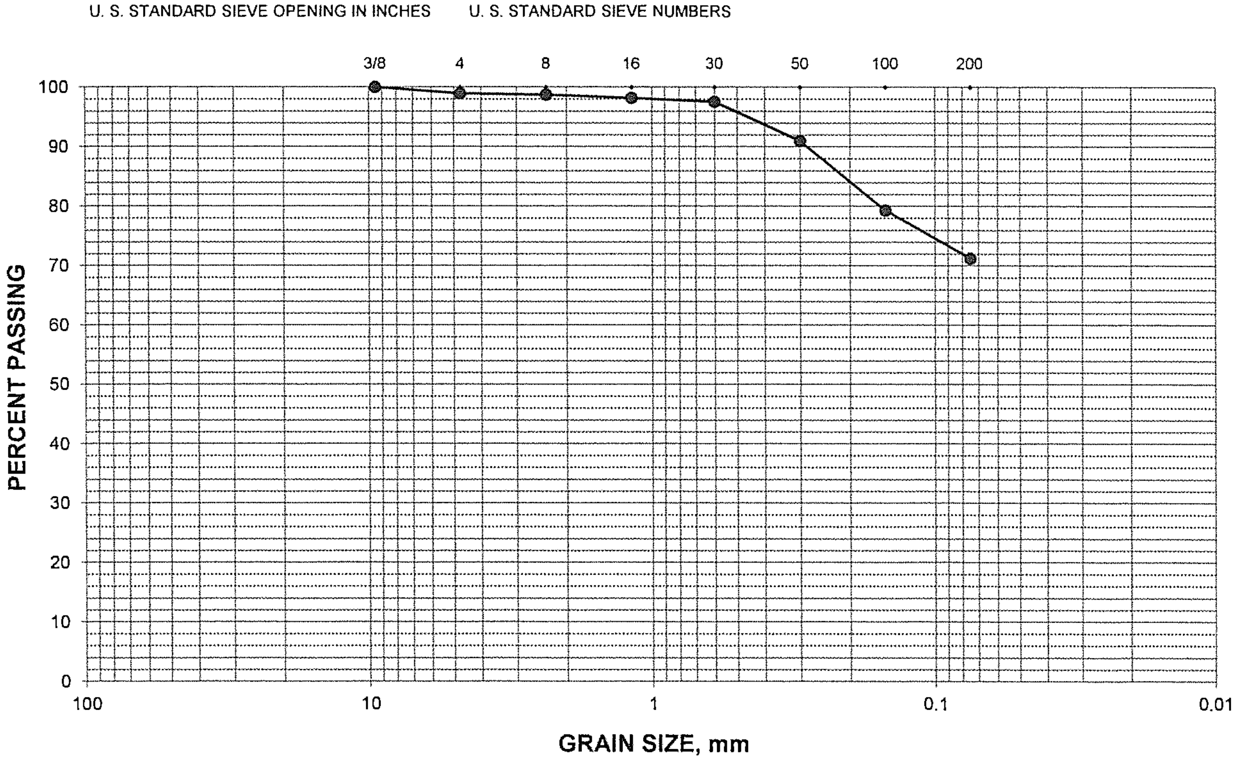
ASTM D 422-63/07; D 1140-00/06

Boring #1 @ 26.0 - 26.5'
Fat Clay with Sand (CH)

September 8, 2013

LL = 51; PL = 13; PI = 38

Sieve size	% Retained	% Passing
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	1	99
#16 (1.18-mm)	2	98
#30 (600-µm)	2	98
#50 (300-µm)	9	91
#100 (150-µm)	21	79
#200 (75-µm)	29	71



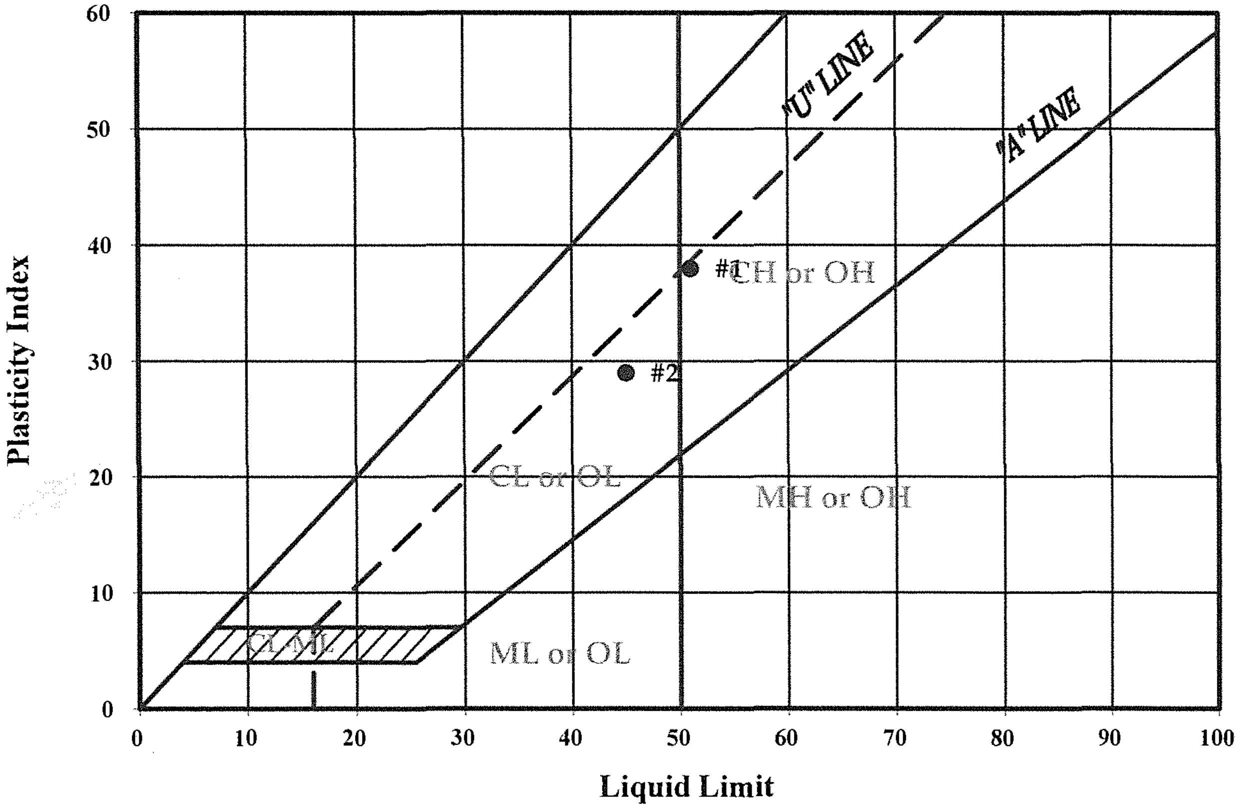
PLASTICITY INDEX

ASTM D 4318-10

September 8, 2013

Test No.:	1	2	3	4	5
Boring No.:	1	1			
Sample Depth:	26.0 - 26.5'	45.0 - 46.5'			
Liquid Limit:	51	45			
Plastic Limit:	13	16			
Plasticity Index:	38	29			

Plasticity Chart



DIRECT SHEAR

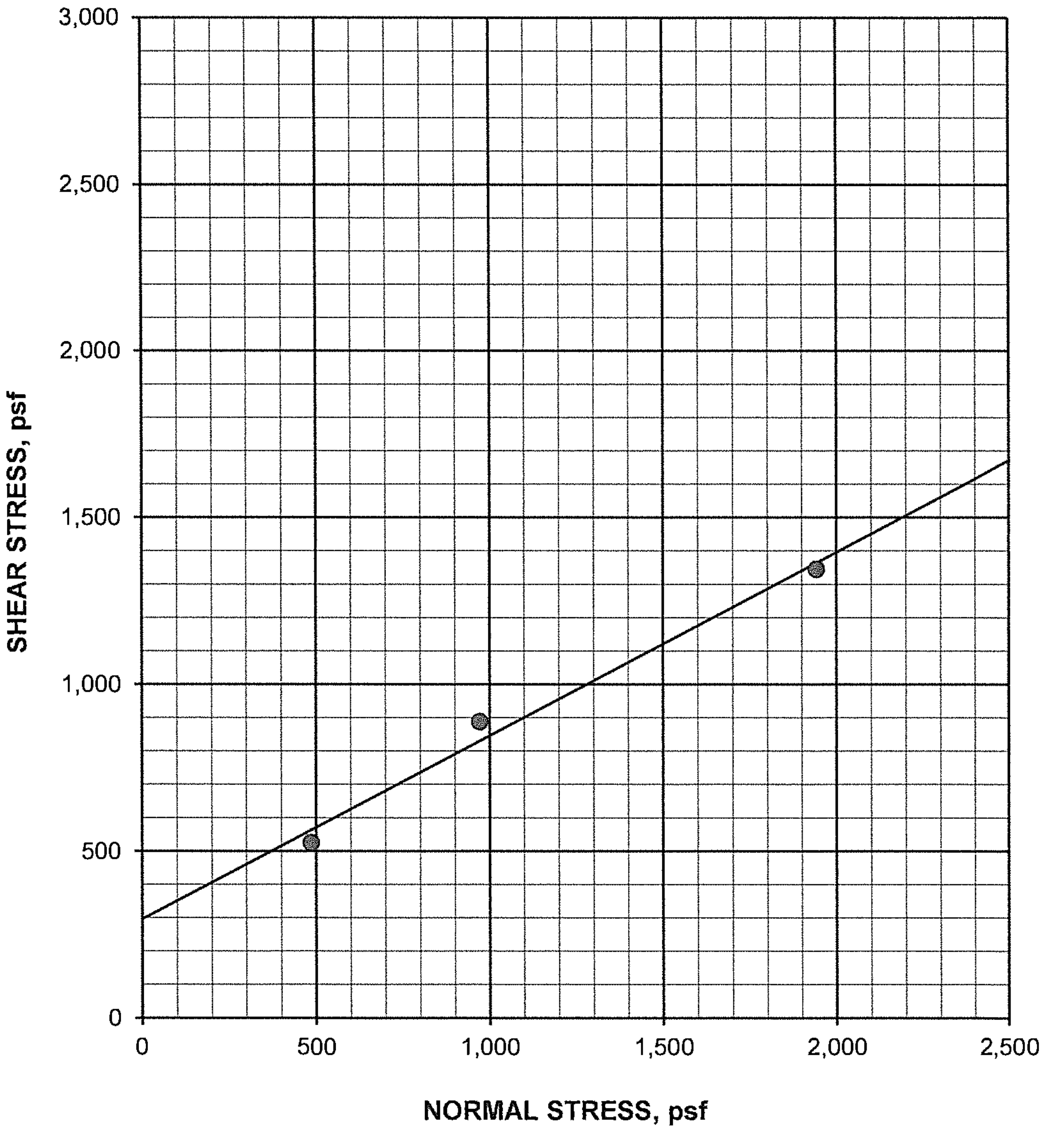
ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

September 8, 2013

Boring #1 @ 11.0 -11.5'
Poorly Graded Sand (SP)
Ring sample, saturated

INITIAL DRY DENSITY: 90.4 pcf
INITIAL MOISTURE CONTENT: 30.7 %
PEAK SHEAR ANGLE (Ø): 29°
COHESION (C): 296 psf

SHEAR vs. NORMAL STRESS



DIRECT SHEAR continued

ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

Boring #1 @ 11.0 -11.5'

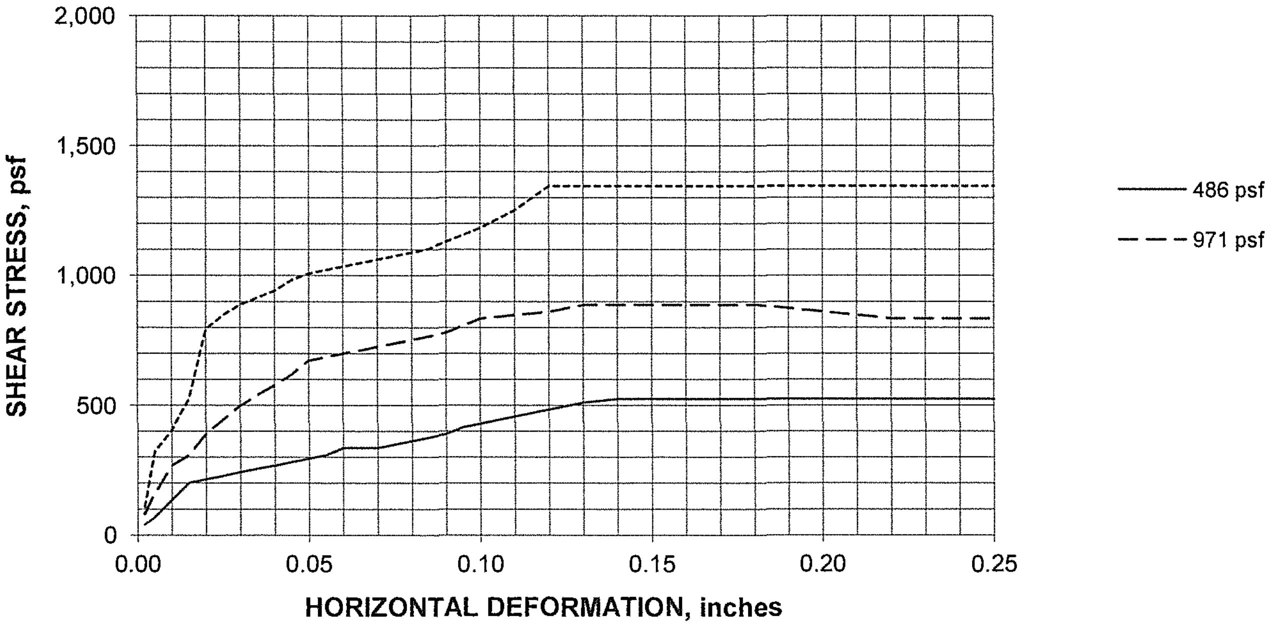
September 8, 2013

Poorly Graded Sand (SP)

Ring sample, saturated

SPECIFIC GRAVITY: 2.65 (assumed)

SAMPLE NO.:	1	2	3	AVERAGE
INITIAL				
WATER CONTENT, %	30.7	30.7	30.7	30.7
DRY DENSITY, pcf	89.3	91.1	91.0	90.4
SATURATION, %	95.4	99.7	99.5	98.2
VOID RATIO	0.853	0.816	0.817	0.829
DIAMETER, inches	2.410	2.410	2.410	
HEIGHT, inches	1.00	1.00	1.00	
AT TEST				
WATER CONTENT, %	35.3	36.1	37.8	
DRY DENSITY, pcf	89.9	92.8	96.5	
SATURATION, %	100.0	100.0	100.0	
VOID RATIO	0.840	0.782	0.714	
HEIGHT, inches	0.99	0.98	0.94	



DIRECT SHEAR

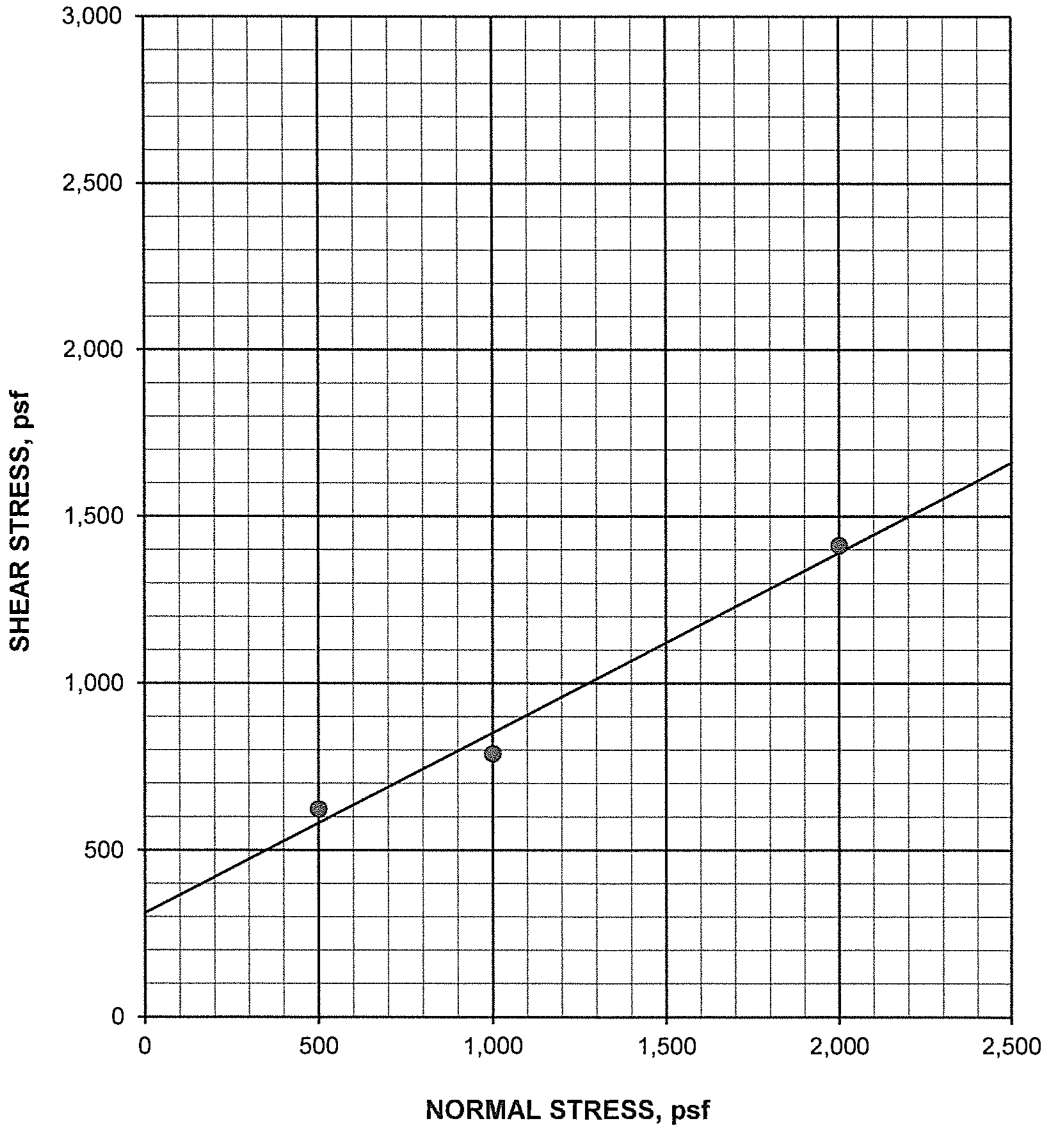
ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

September 8, 2013

Boring #1 @ 16.0 - 16.5'
Poorly Graded Sand (SP)
Ring sample, saturated

INITIAL DRY DENSITY: 110.0 pcf
INITIAL MOISTURE CONTENT: 13.5 %
PEAK SHEAR ANGLE (Ø): 28°
COHESION (C): 312 psf

SHEAR vs. NORMAL STRESS



DIRECT SHEAR continued

ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

Boring #1 @ 16.0 - 16.5'

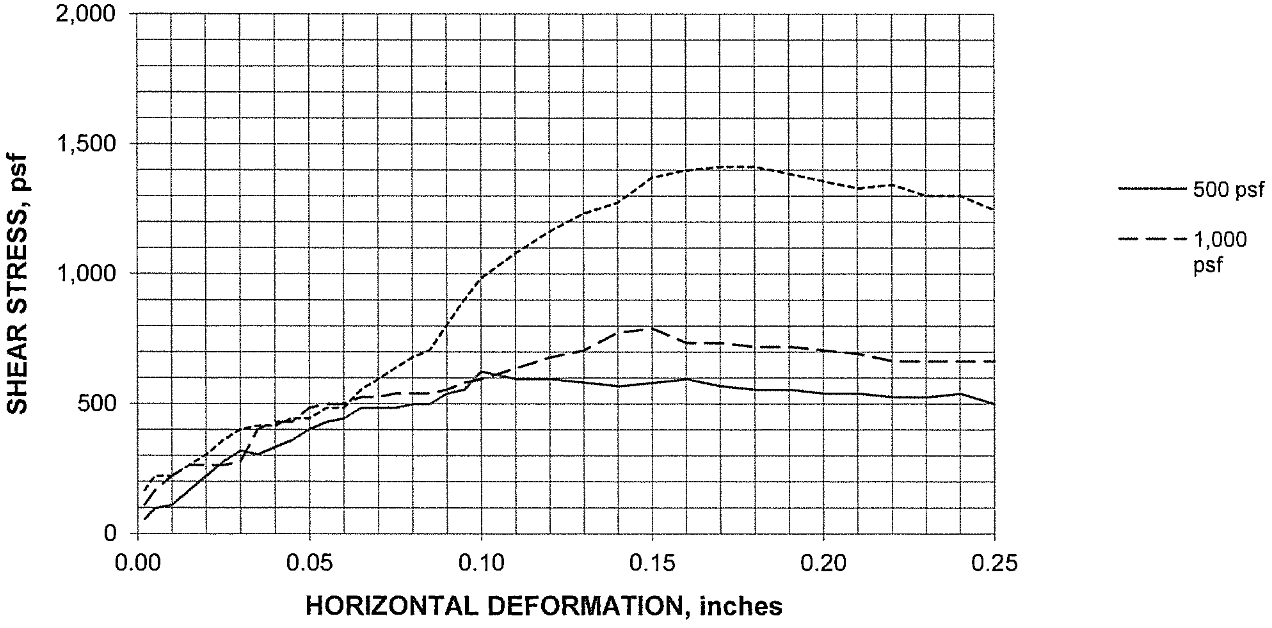
Poorly Graded Sand (SP)

Ring sample, saturated

September 8, 2013

SPECIFIC GRAVITY: 2.65 (assumed)

SAMPLE NO.:	1	2	3	AVERAGE
INITIAL				
WATER CONTENT, %	13.5	13.5	13.5	13.5
DRY DENSITY, pcf	110.5	111.0	108.6	110.0
SATURATION, %	72.0	73.0	68.5	71.2
VOID RATIO	0.497	0.490	0.522	0.503
DIAMETER, inches	2.375	2.375	2.375	
HEIGHT, inches	1.00	1.00	1.00	
AT TEST				
WATER CONTENT, %	18.6	17.9	17.8	
DRY DENSITY, pcf	110.8	112.3	112.6	
SATURATION, %	100.0	100.0	100.0	
VOID RATIO	0.492	0.472	0.469	
HEIGHT, inches	1.00	0.99	0.97	



UNCONFINED COMPRESSION ON COHESIVE SOIL

ASTM D 2166-06

September 8, 2013

Boring #1 @ 21.0 - 21.5'
Fat Clay with Sand (CH)
Ring Sample
COMPRESSIVE STRENGTH: 27 psi (3,940 psf)

Dry Density: 82.4 pcf
Moisture Content: 38.7%
Degree Saturation: 100%
Specific Gravity: 2.70 (assumed)
H/D Ratio: 1.68

TIME (MINUTES)	DEFORM, in (X 1000)	AXIAL STRAIN	AREA (SQ. IN.)	APPLIED LOAD (LBS)	STRENGTH (PSI)	STRENGTH (PSF)
0.5	31	0.0078	4.46	36	8	1,161
1.0	69	0.0173	4.51	78	17	2,492
1.5	106	0.0265	4.55	105	23	3,323
2.0	141	0.0353	4.59	118	26	3,700
2.5	177	0.0443	4.64	126	27	3,914
3.0	212	0.0530	4.68	128	27	3,940
3.5	248	0.0620	4.72	124	26	3,781
4.0	281	0.0703	4.76	111	23	3,355
4.5	315	0.0788	4.81	88	18	2,635
5.0	351	0.0878	4.86	68	14	2,016
5.5	390	0.0975	4.91	50	10	1,467
6.0	424	0.1060	4.96	31	6	901
6.5	460	0.1150	5.01	20	4	575
7.0	495	0.1238	5.06	13	3	370
7.5	531	0.1328	5.11	10	2	282
8.0	600	0.1500	5.21	5	1	138

UNCONFINED COMPRESSION ON COHESIVE SOIL

ASTM D 2166-06

September 8, 2013

Boring #1 @ 36.0 - 36.5'
Fat Clay with Sand (CH)
Ring Sample
COMPRESSIVE STRENGTH: 24 psi (3,454 psf)

Dry Density: 80.2 pcf
Moisture Content: 41.5%
Degree Saturation: 100%
Specific Gravity: 2.70 (assumed)
H/D Ratio: 1.68

TIME (MINUTES)	DEFORM, in (X 1000)	AXIAL STRAIN	AREA (SQ. IN.)	APPLIED LOAD (LBS)	STRENGTH (PSI)	STRENGTH (PSF)
0.5	31	0.0078	4.46	28	6	903
1.0	61	0.0153	4.50	46	10	1,472
1.5	93	0.0233	4.54	56	12	1,778
2.0	123	0.0308	4.57	65	14	2,048
2.5	154	0.0385	4.61	71	15	2,219
3.0	185	0.0463	4.64	78	17	2,418
3.5	215	0.0538	4.68	83	18	2,553
4.0	245	0.0613	4.72	90	19	2,746
4.5	277	0.0693	4.76	96	20	2,904
5.0	307	0.0768	4.80	100	21	3,001
5.5	338	0.0845	4.84	105	22	3,125
6.0	368	0.0920	4.88	110	23	3,247
6.5	399	0.0998	4.92	115	23	3,365
7.0	429	0.1073	4.96	118	24	3,424
7.5	458	0.1145	5.00	120	24	3,454
8.0	488	0.1220	5.05	118	23	3,368
8.5	518	0.1295	5.09	115	23	3,254
9.0	548	0.1370	5.13	106	21	2,973
9.5	578	0.1445	5.18	98	19	2,725
10.0	610	0.1525	5.23	86	16	2,369
10.5	641	0.1603	5.28	73	14	1,993

CONSOLIDATION TEST

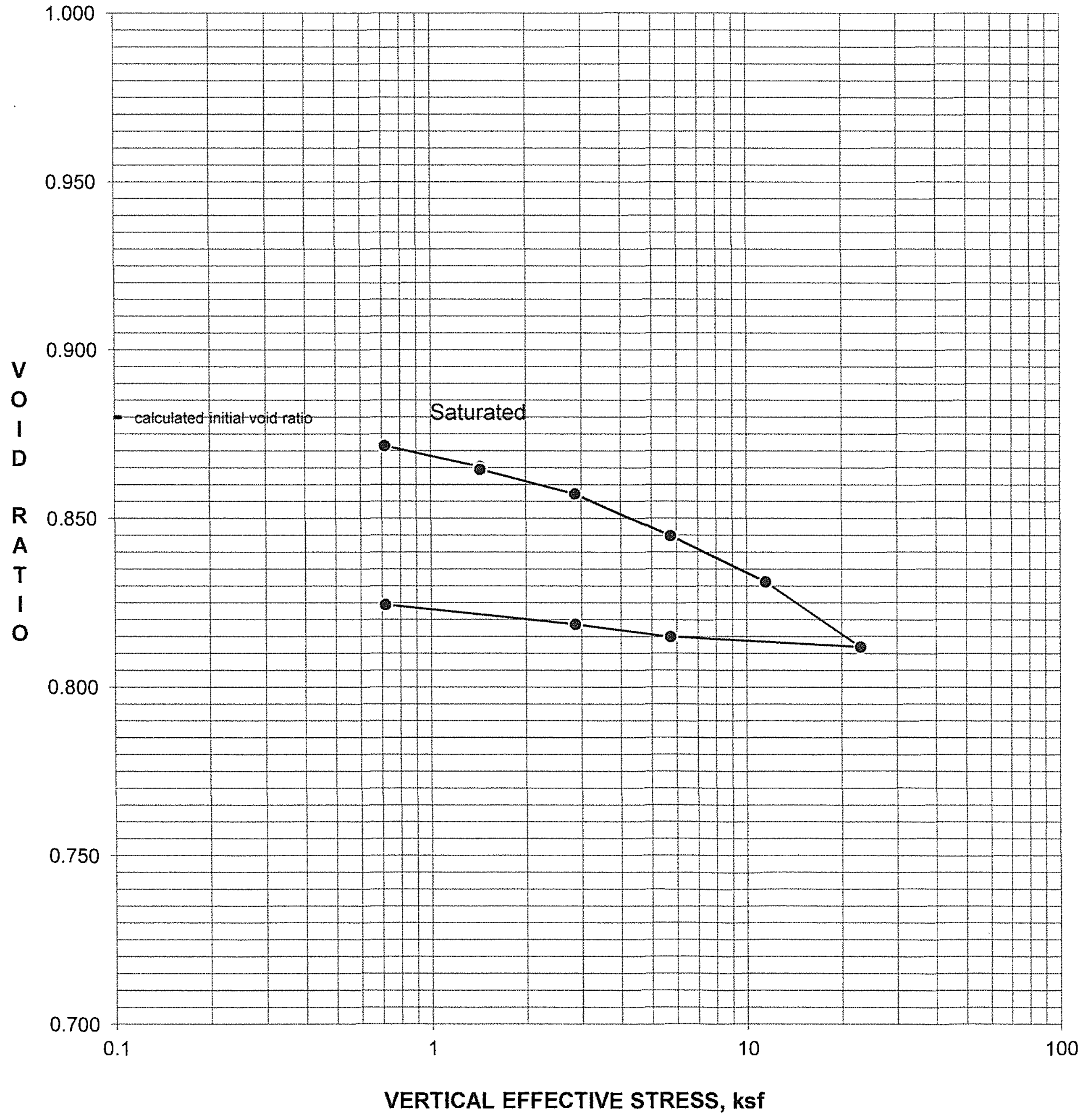
ASTM D 2435/D2435M-11

September 8, 2013

Boring #1 @ 6.0 - 6.5'
Poorly Graded Sand (SP)
Ring Sample

DRY DENSITY: 88.0 pcf
MOISTURE CONTENT: 40.7%
SPECIFIC GRAVITY: 2.65 (assumed)
INITIAL VOID RATIO: 0.880

VOID RATIO vs. NORMAL PRESSURE DIAGRAM



CONSOLIDATION TEST

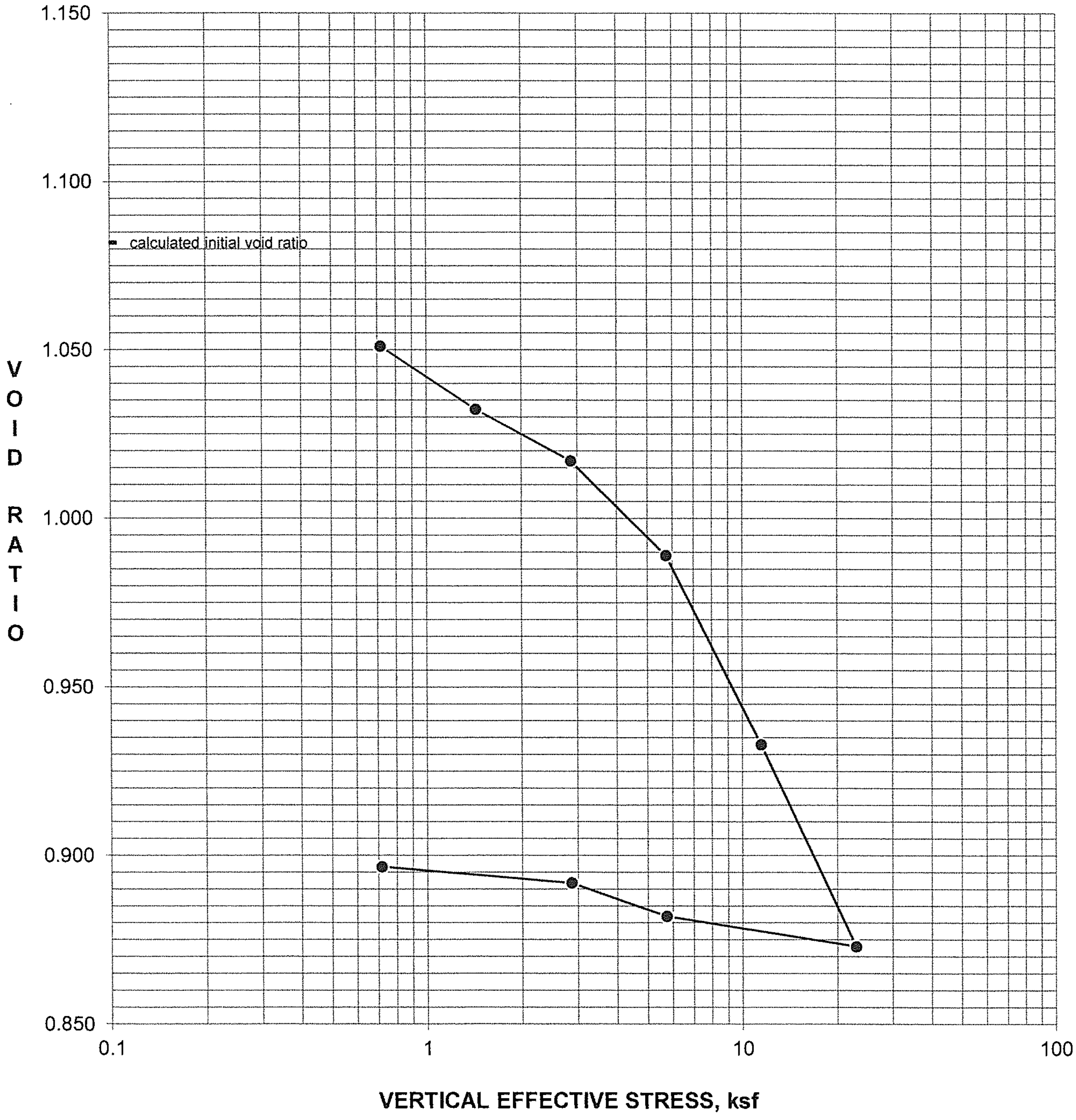
ASTM D 2435/D2435M-11

September 8, 2013

Boring #1 @ 21.0 - 21.5'
Fat Clay with Sand (CH)
Ring Sample

DRY DENSITY: 81.0 pcf
MOISTURE CONTENT: 38.7%
SPECIFIC GRAVITY: 2.70 (assumed)
INITIAL VOID RATIO: 1.082

VOID RATIO vs. NORMAL PRESSURE DIAGRAM



CONSOLIDATION TEST

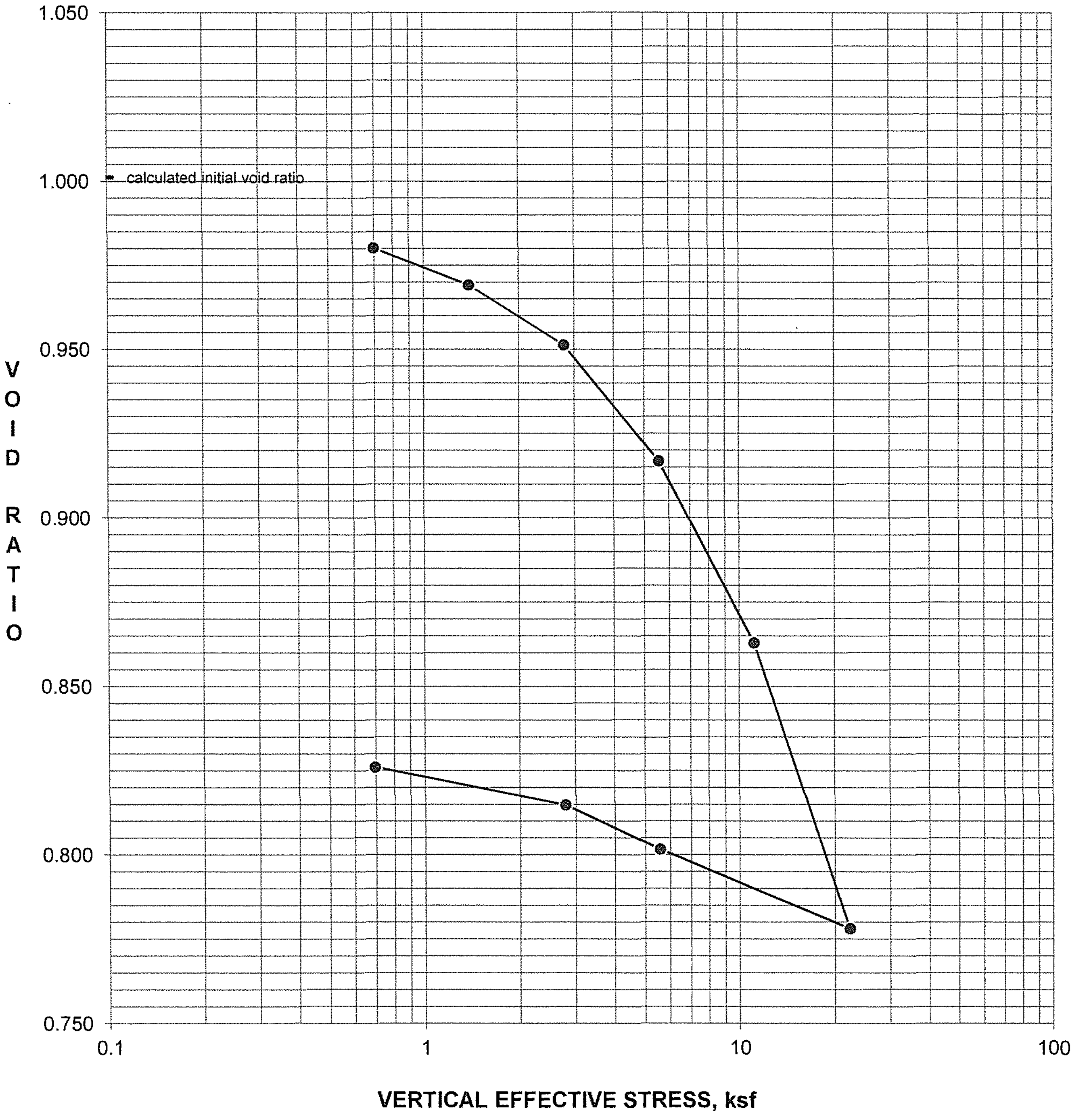
ASTM D 2435/D2435M-11

September 8, 2013

Boring #1 @ 26.0 - 26.5'
Fat Clay with Sand (CH)
Ring Sample

DRY DENSITY: 84.2 pcf
MOISTURE CONTENT: 38.3%
SPECIFIC GRAVITY: 2.70 (assumed)
INITIAL VOID RATIO: 1.001

VOID RATIO vs. NORMAL PRESSURE DIAGRAM



CONSOLIDATION TEST

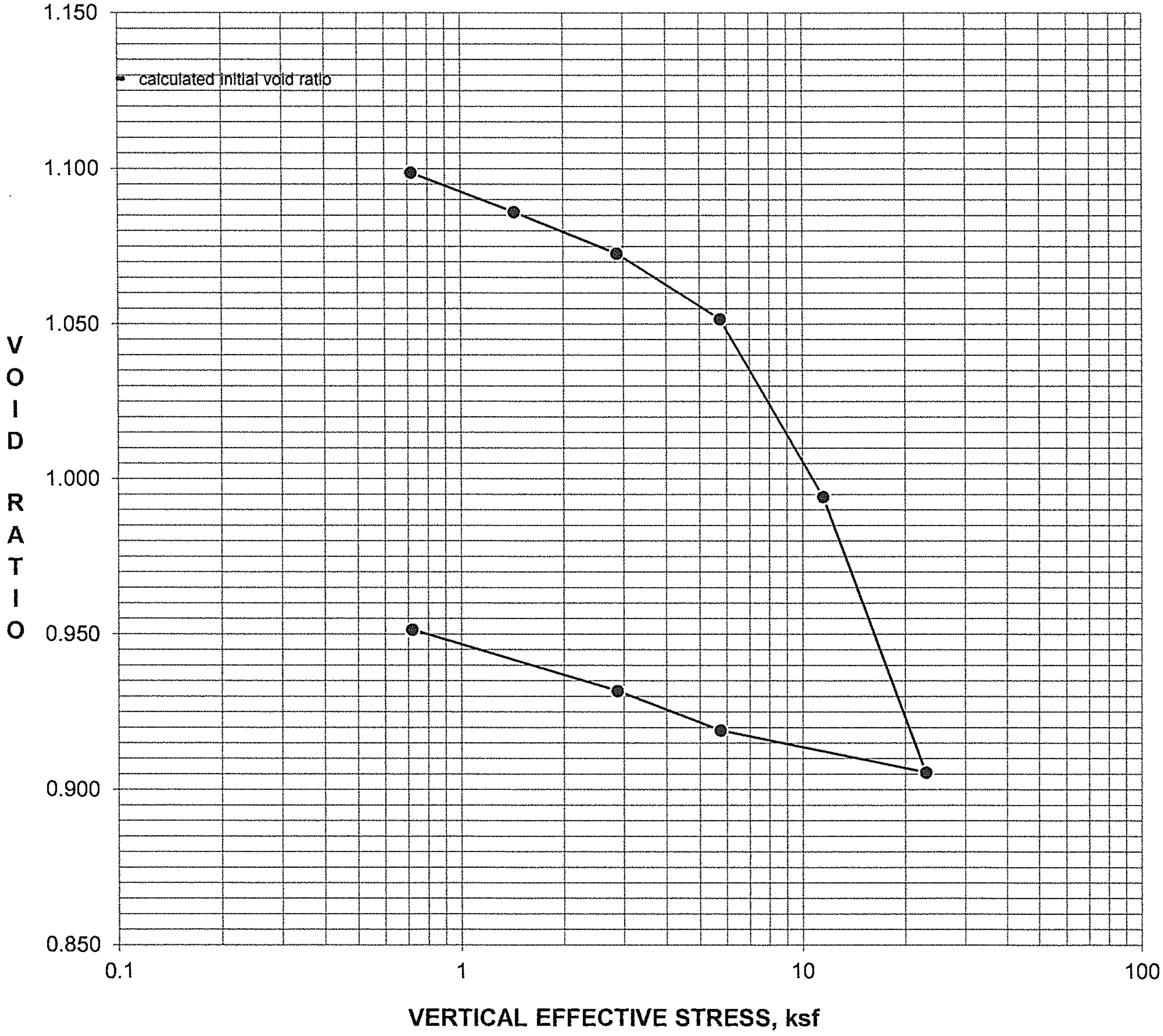
ASTM D 2435/D2435M-11

September 8, 2013

Boring #1 @ 36.0 - 36.5'
Fat Clay with Sand (CH)
Ring Sample

DRY DENSITY: 79.2 pcf
MOISTURE CONTENT: 41.5%
SPECIFIC GRAVITY: 2.70 (assumed)
INITIAL VOID RATIO: 1.129

VOID RATIO vs. NORMAL PRESSURE DIAGRAM



California State Certified Laboratory No. 2153

CERCO
analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

12 September, 2013

Job No.1309000
Cust. No.11974

Mr. Judd King
Earth Systems Pacific
4378 Santa Fe Road
San Luis Obispo, CA 93401

Subject: Project No.: SL-17099-SA
Project Name: Soledad WRF Wind Turbine
Corrosivity Analysis – ASTM Test Methods

Dear Mr. King:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on September 03, 2013. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, both samples are classified as "corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations ranged from none detected to 50 mg/kg. Because the chloride ion concentrations are less than 300 mg/kg, they are determined to be insufficient to attack steel embedded in a concrete mortar coating.

The sulfate ion concentrations ranged from 69 to 1,000 mg/kg and are determined to be sufficient to damage reinforced concrete structures and cement mortar-coated steel at these locations. Therefore, concrete that comes into contact with this soil should use sulfate resistant cement such as Type II, in accordance with the California Building Code requirements with a maximum water-to-cement ratio of 0.55.

The pH of the soils range from 6.74 to 8.87 which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potentials range from 310 to 470-mV. Sample No.001 is indicative of aerobic soil conditions. Sample No.002 is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

California State Certified Laboratory No. 2153

CERCO
analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: EarthSystems Pacific
Client's Project No.: SL-17099-SA
Client's Project Name: Soledad WRF Wind Turbine
Date Sampled: 13-Aug-13
Date Received: 3-Sep-13
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 12-Sep-2013

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1309000-001	B1 @ 0'-5.0'	470	6.74	-	510	-	50	1,000
1309000-002	B1 @ 50.5'-51.5'	310	8.87	-	970	-	N.D.	69

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Detection Limit:	-	-	10	-	50	15	15
Date Analyzed:	10-Sep-2013	10-Sep-2013	-	11-Sep-2013	-	11-Sep-2013	11-Sep-2013

Cheryl McMillen

Cheryl McMillen
Laboratory Director

* Results Reported on "As Received" Basis

N.D. - None Detected

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

APPENDIX IV

2024 Laboratory Test Results

Crawford
& Associates, Inc.
Geotechnical Engineering, Design
and Construction Services

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/24/24
Technician: SPV

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-24-001-3A	A-24-001-5A	A-24-001-8A	A-24-001-10A	R-24-002-1A
USCS Symbol	SP	SP	SP	CH	SP-SM
Depth (ft.)	4	8.5	21	31	1
Sample Length (in.)	5.946	5.948	5.369	4.880	5.944
Diameter (in.)	2.395	2.361	2.399	2.383	2.354
Sample Volume (ft^3)	0.01550	0.01507	0.01404	0.01260	0.01497
Total Mass Soil+Tube (g)	1050.3	1082.2	1101.3	928.6	1106.9
Mass of Tube (g)	272.8	284.9	280.3	272.6	279.2
Tare No.	122	124	105	D4	152
Tare (g)	14.7	14.3	14.0	13.7	14.2
Wet Soil + Tare (g)	77.0	88.8	88.8	81.3	93.0
Dry Soil + Tare (g)	72.6	79.9	73.2	62.2	85.4
Dry Soil (g)	57.8	65.6	59.2	48.5	71.3
Water (g)	4.5	8.9	15.6	19.0	7.6
Moisture (%)	**7.7**	**13.6**	**26.3**	**39.2**	**10.6**
Dry Density (pcf)	**102.7**	**102.7**	**102.0**	**82.4**	**110.1**

Notes:

Crawford
& Associates, Inc.
Geotechnical Engineering, Design
and Construction Services

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/24-5/30/2024
Technician: SPV

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	R-24-002-3A	R-24-002-7A	R-24-002-8A	R-24-002-9A	R-24-002-12B
USCS Symbol	SP-SM	CH	CH	CH	ML
Depth (ft.)	4	16	26	31	45.5
Sample Length (in.)	5.977	5.594	5.290	5.071	3.725
Diameter (in.)	2.344	2.379	2.396	2.401	2.390
Sample Volume (ft^3)	0.01492	0.01439	0.01380	0.01329	0.00967
Total Mass Soil+Tube (g)	1012.5	980.3	978.4	949.4	799.0
Mass of Tube (g)	280.8	275.0	279.5	277.1	278.2
Tare No.	9013	152.0	K18	G7	G23
Tare (g)	114.2	14.2	13.6	13.4	13.5
Wet Soil + Tare (g)	334.6	67.8	70.6	74.7	76.3
Dry Soil + Tare (g)	292.5	49.3	53.9	56.9	60.8
Dry Soil (g)	178.4	35.2	40.3	43.5	47.4
Water (g)	42.1	18.5	16.7	17.8	15.5
Moisture (%)	**23.6**	**52.5**	**41.4**	**40.8**	**32.7**
Dry Density (pcf)	**87.4**	**70.9**	**78.9**	**79.2**	**89.5**

Notes:

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/24-5/30/2024
Technician: SPV

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	R-24-002-12A	R-24-002-13A	A-24-003-1A	A-24-003-3A	A-24-003-5A
USCS Symbol	ML	ML	CL	CL	CL
Depth (ft.)	46	51	2	5	11
Sample Length (in.)	5.510	5.392	5.931	5.570	6.005
Diameter (in.)	2.388	2.394	2.380	2.385	2.363
Sample Volume (ft^3)	0.01428	0.01405	0.01527	0.01440	0.01524
Total Mass Soil+Tube (g)	1017.6	991.5	1167.3	1038.0	1155.3
Mass of Tube (g)	274.7	279.2	273.2	223.1	272.0
Tare No.	H22	A12	C19	2015	9018
Tare (g)	13.6	13.8	13.9	114.6	115.4
Wet Soil + Tare (g)	81.0	75.9	98.7	321.3	319.7
Dry Soil + Tare (g)	63.5	58.3	91.7	283.2	287.1
Dry Soil (g)	49.9	44.4	77.7	168.6	171.8
Water (g)	17.5	17.6	7.1	38.2	32.5
Moisture (%)	**35.1**	**39.7**	**9.1**	**22.6**	**18.9**
Dry Density (pcf)	**84.9**	**80.0**	**118.4**	**101.8**	**107.5**

Notes:

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/24/24
Technician: SPV

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-24-003-9A	A-24-004-1A	A-24-004-5A	A-24-005-1A	A-24-005-3A
USCS Symbol	SP	CL	SP	CL	SC
Depth (ft.)	31	2	11	1	4
Sample Length (in.)	-	5.736	-	5.822	5.962
Diameter (in.)	-	2.372	-	2.382	2.393
Sample Volume (ft^3)	-	0.01467	-	0.01501	0.01552
Total Mass Soil+Tube (g)	-	1090.4	-	1216.3	1253.0
Mass of Tube (g)	-	241.5	-	238.3	285.9
Tare No.	C19	B18	2005	2019	G7
Tare (g)	13.9	13.8	121.7	124.8	13.4
Wet Soil + Tare (g)	93.6	85.3	331.2	265.3	81.3
Dry Soil + Tare (g)	86.9	73.0	327.0	257.0	76.3
Dry Soil (g)	73.1	59.2	205.3	132.2	62.9
Water (g)	6.7	12.3	4.2	8.3	5.0
Moisture (%)	**9.1**	**20.9**	**2.1**	**6.3**	**8.0**
Dry Density (pcf)	**-**	**105.6**	**-**	**135.1**	**127.3**

Notes:

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/24/24
Technician: SPV

MOISTURE-DENSITY TESTS - D2216/D7263

	1	2	3	4	5
Sample No.	A-24-005-5A	A-24-006-1A	A-24-006-3A	A-24-006-5A	
USCS Symbol	SC	SC	SC	SC	
Depth (ft.)	11	2	5	11	
Sample Length (in.)	-	5.979	5.294	-	
Diameter (in.)	-	2.401	2.397	-	
Sample Volume (ft^3)	-	0.01567	0.01383	-	
Total Mass Soil+Tube (g)	-	1157.7	1106.2	-	
Mass of Tube (g)	-	240.4	239.2	-	
Tare No.	C4	122	B18	A9	
Tare (g)	13.6	14.2	13.7	13.9	
Wet Soil + Tare (g)	83.2	86.3	78.4	88.3	
Dry Soil + Tare (g)	77.8	80.8	74.0	79.8	
Dry Soil (g)	64.2	66.5	60.2	65.9	
Water (g)	5.4	5.5	4.4	8.5	
Moisture (%)	**8.4**	**8.3**	**7.3**	**12.9**	
Dry Density (pcf)	**-**	**119.2**	**128.8**	**-**	

Notes:

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/24/24
Technician: AOM

200 Wash - ASTM D1140

Method A

Max Particle	Standard Sieve	Recommended
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	A-24-001-6A	A-24-001-7A	R-24-002-3A	R-24-002-5A	R-24-002-15A
USCS Symbol	SP	SP	SP-SM	SP	SP
Depth (ft.)	11	16	4	7.5	61
Tare No.	9007	1009	9013	X26	X23
Tare (g)	114.6	126.69	114.17	116.47	117.14
Dry Soil + Tare (g)	283.33	292.71	292.52	280.34	289.22
Dry Mass before (g)	168.7	166.0	178.4	163.9	172.1
Dry Mass after (g)	162.0	159.8	167.6	159.8	164.3
Moisture (%)	20.6	23.2	23.6	22.9	17.8
Percent Fines (%)	4	4	6	2	5

Notes:

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/24/24
Technician: AOM

200 Wash - ASTM D1140

Method A

Max Particle	Standard Sieve	Recommended
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	A-24-003-3A	A-24-003-5A	A-24-003-6A	A-24-004-5A	A-24-005-2A
USCS Symbol	CL	CL	SP	SP	SC
Depth (ft.)	5	11	16	11	2.5
Tare No.	2015	9018	X11	2005	X19
Tare (g)	114.6	115.35	116.37	121.66	114.1
Dry Soil + Tare (g)	283.15	287.13	367.08	326.96	307.66
Dry Mass before (g)	168.6	171.8	250.7	205.3	193.6
Dry Mass after (g)	30.8	68.2	242.8	199.2	138.0
Moisture (%)	22.6	18.9	2.8	2.1	5.2
Percent Fines (%)	82	60	3	3	29

Notes:

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/24/24
Technician: AOM

200 Wash - ASTM D1140
Method A

Max Particle	Standard Sieve	Recommended
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

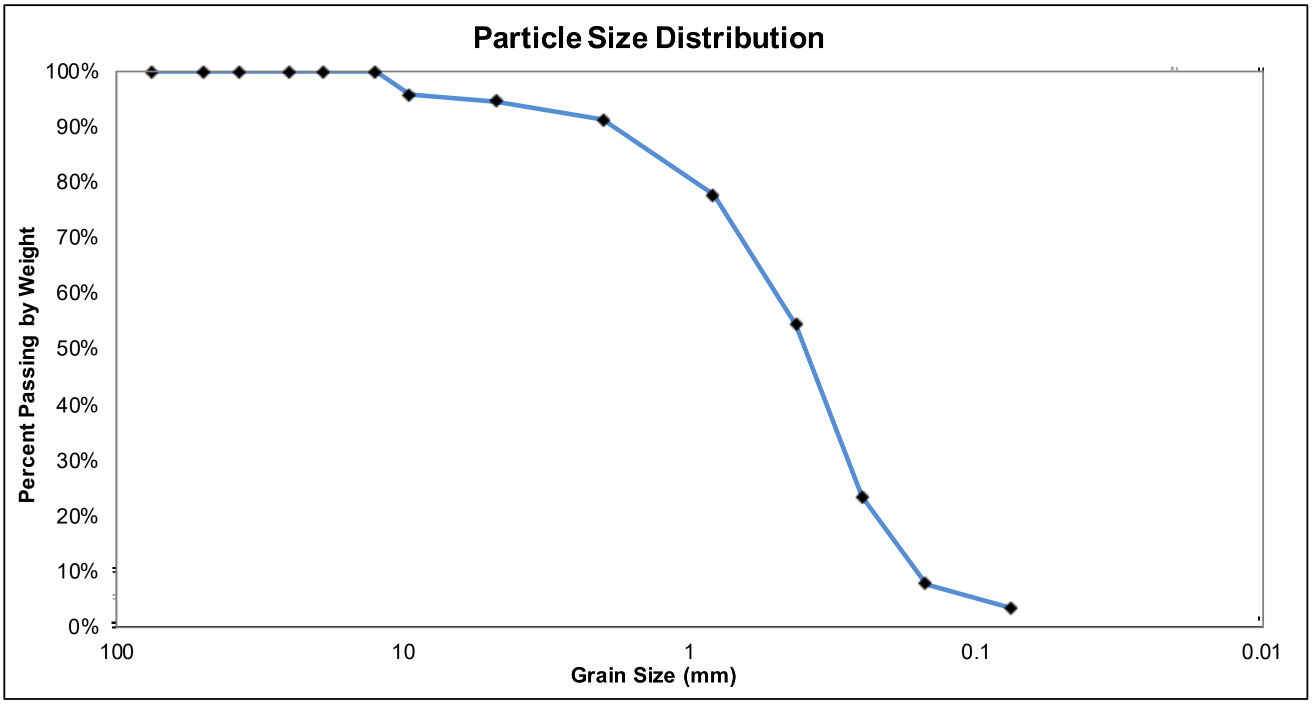
Table from 6.2 of ASTM D1140

Sample No.	A-24-005-4A	A-24-006-3A			
USCS Symbol	SC	SC			
Depth (ft.)	5.5	5			
Tare No.	X19	23213			
Tare (g)	115.77	129.16			
Dry Soil + Tare (g)	303.95	325.31			
Dry Mass before (g)	188.2	196.2			
Dry Mass after (g)	107.2	149.0			
Moisture (%)	8.4	6.7			
Percent Fines (%)	43	24			

Notes:

Project Name: Soledad Recycled Water Conveyance
CAInc File No: 24-1057.1
Date: 5/24/24
Technician: AOM
Sample ID: R-24-002-6A
Depth (ft): 11
USCS Classification: Poorly-graded Sand (SP)

ASTM 6913 - Method A



% Cobble	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt/Clay
	0	5	4	37	51	
0	**5**		**92**			**3**

		Sieve #	Opening mm	Cummulative Mass Retained (g)	% Passing %
Cobbles		**3"**	75	0.0	100%
Gravel	Coarse	**2"**	50	0.0	100%
		1-1/2"	37.5	0.0	100%
		1"	25.0	0.0	100%
		3/4"	19.0	0.0	100%
	Fine	**1/2"**	12.5	0.0	100%
		3/8"	9.50	7.3	96%
		#4	4.75	9.3	95%
Sand	Coarse	**#10**	2.00	15.0	91%
	Medium	**#20**	0.825	38.4	78%
		#40	0.425	78.4	54%
	Fine	**#60**	0.250	131.9	23%
		#100	0.150	158.9	8%
Silt/Clay		**#200**	0.075	166.4	3%

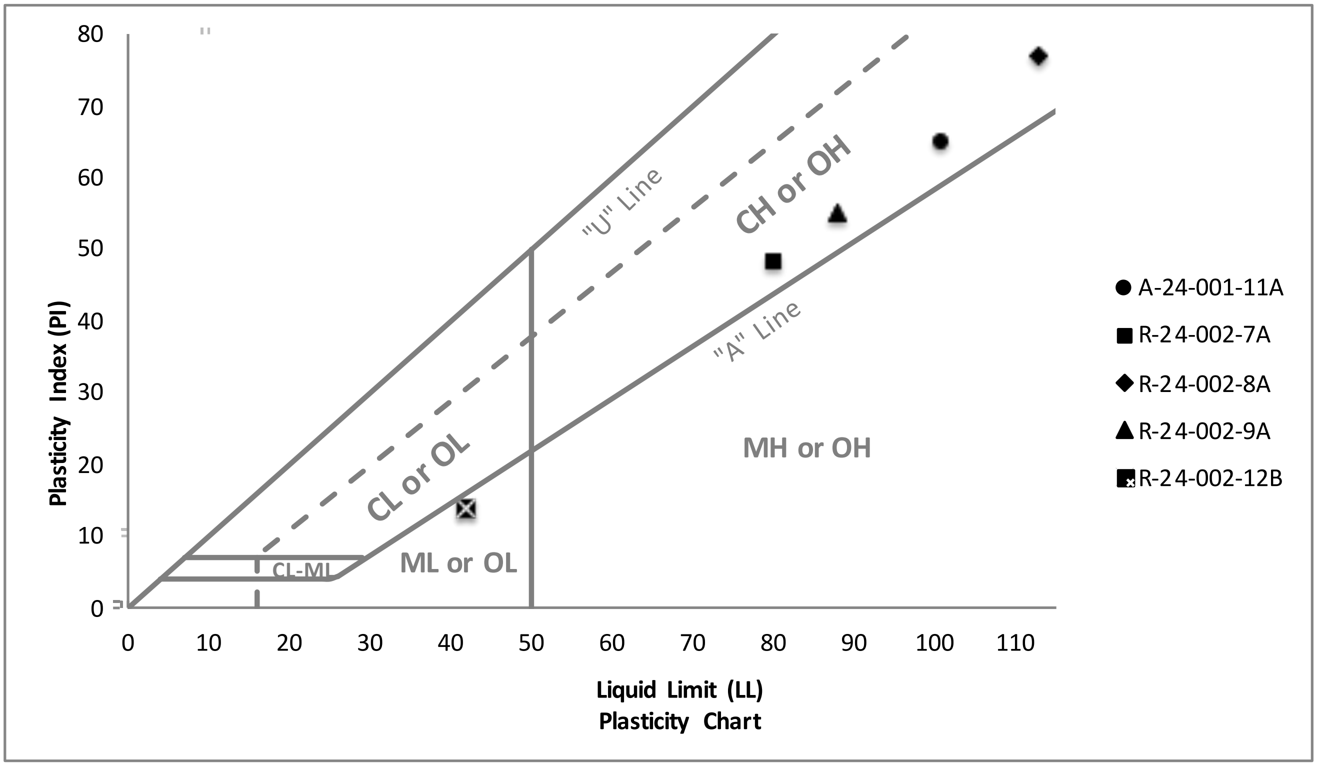
Coefficient of Uniformity	Coefficient of Curvature
Cu = 3.2	Cc = 1.0

Moisture (%)
20%

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/29-6/4/2024
Technician: AOM

Plasticity Index - ASTM D4318

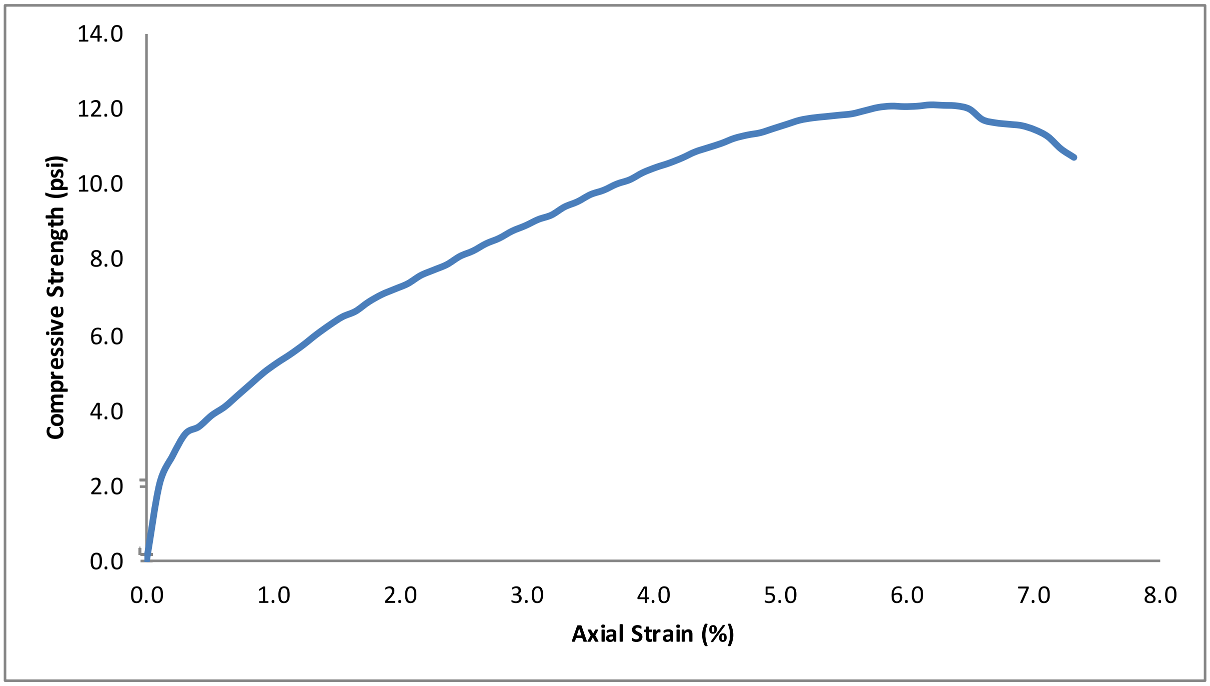
Sample ID	Depth (ft)	Liquid Limit	Plastic Limit	PI
A-24-001-11A	36	101	36	65
R-24-002-7A	16	80	32	48
R-24-002-8A	26	113	36	77
R-24-002-9A	31	88	33	55
R-24-002-12B	45.5	42	28	14



Plasticity Chart

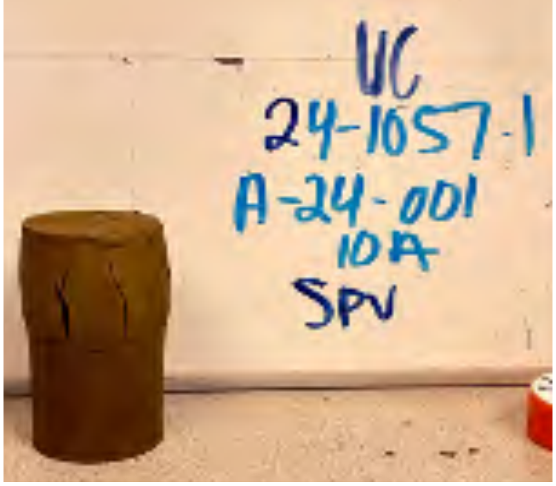
Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/24/24
Technician: SPV
Sample ID: A-24-001-10A Depth (ft): 31.0
USCS Classification: Fat Clay (CH)

UNCONFINED COMPRESSION TEST - D2166



Dry Density (pcf)	**82.4**
Water Content (%)	**39.2**
Unconfined Compressive Strength (psi)	**12.1**
Unconfined Compressive Strength (psf)	**1742**
Average Height (in)	4.880
Average Diameter (in)	2.383
Rate of strain (%)	0.5
Strain at Failure (%)	6.2

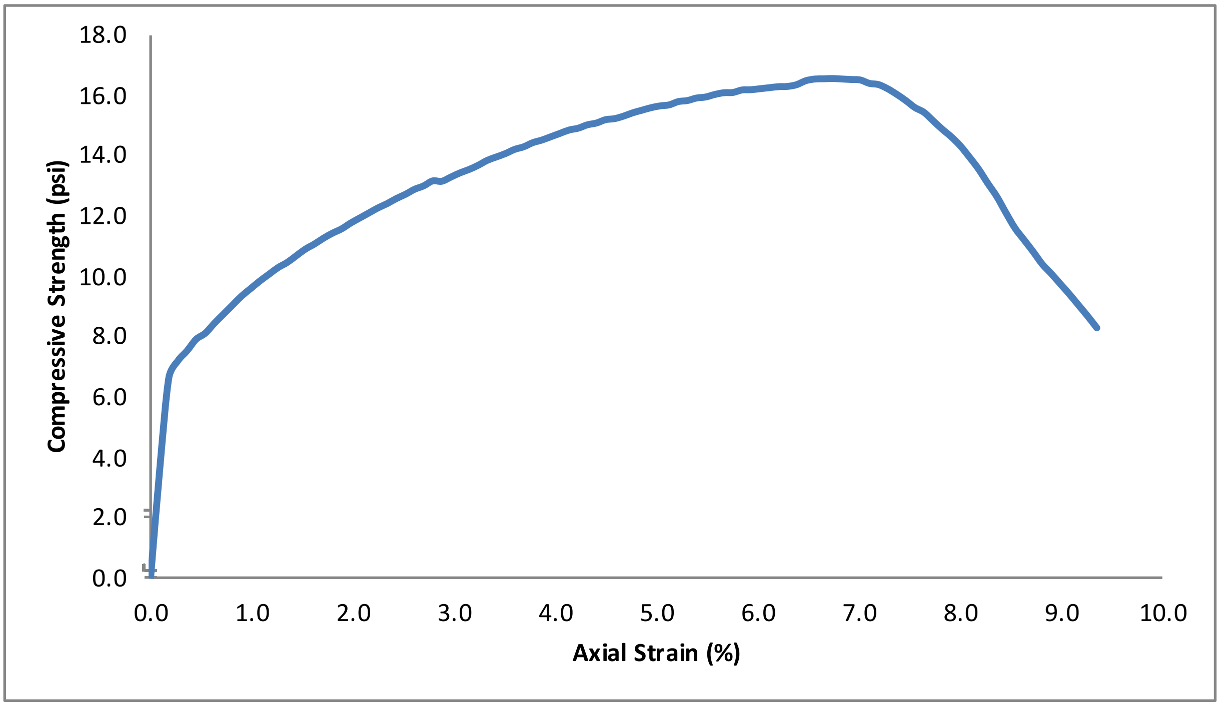
Notes:



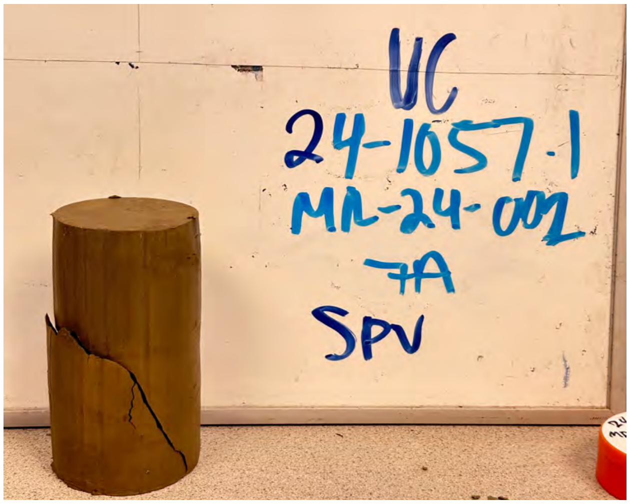
Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/30/24
Technician: SPV
Sample ID: R-24-002-7A Depth (ft): 16.0
USCS Classification: Fat Clay (CH)

UNCONFINED COMPRESSION TEST - D2166



Dry Density (pcf)	**70.9**
Water Content (%)	**52.5**
Unconfined Compressive Strength (psi)	**16.6**
Unconfined Compressive Strength (psf)	**2390**
Average Height (in)	5.594
Average Diameter (in)	2.379
Rate of strain (%)	0.5
Strain at Failure (%)	6.7

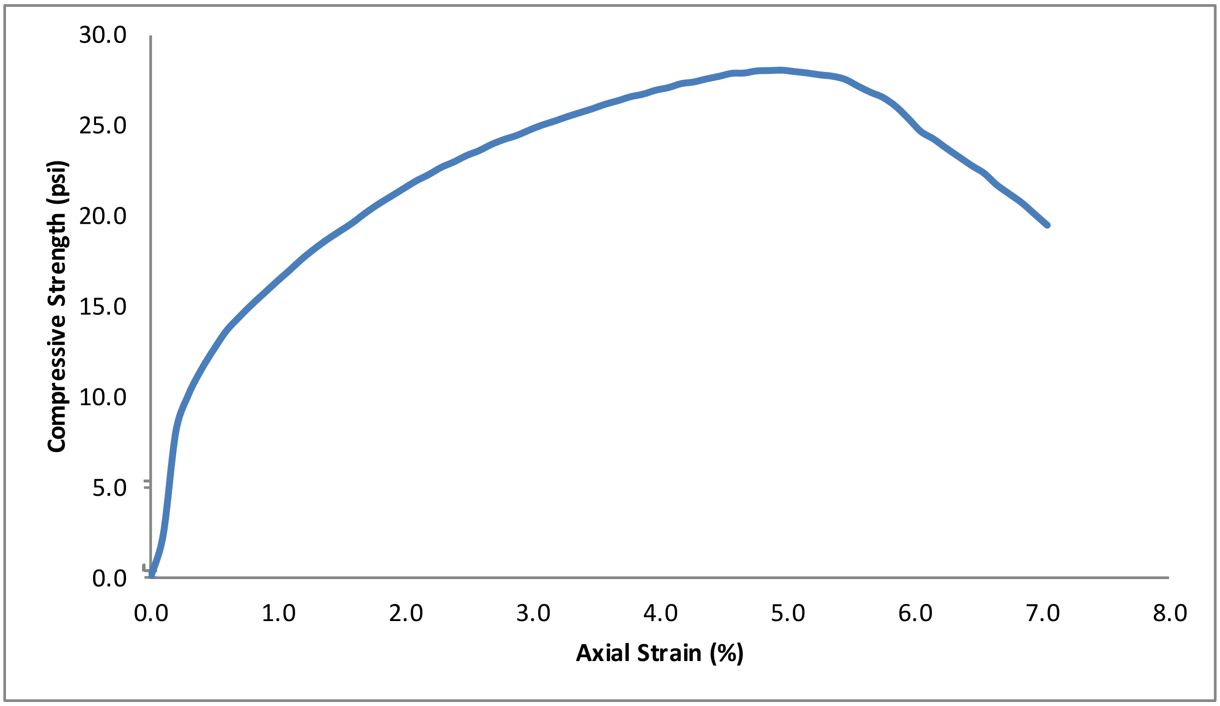


Notes:

Crawford
& Associates, Inc.
Geotechnical Engineering, Design
and Construction Services

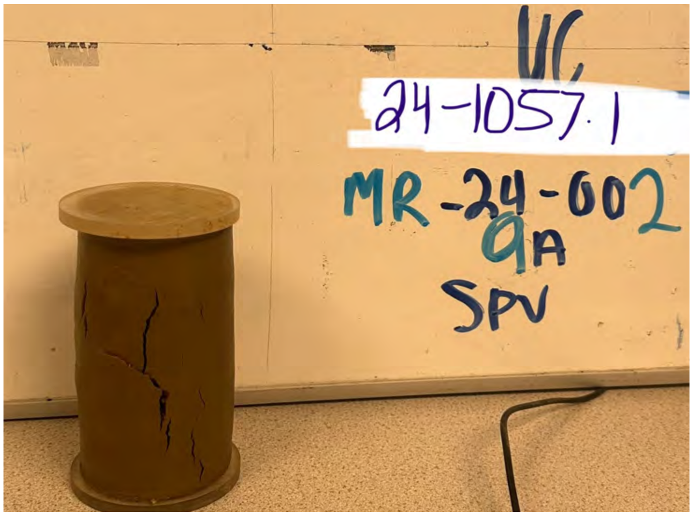
Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/29/24
Technician: SPV
Sample ID: R-24-002-9A Depth (ft): 31.0
USCS Classification: Fat Clay (CH)

UNCONFINED COMPRESSION TEST - D2166



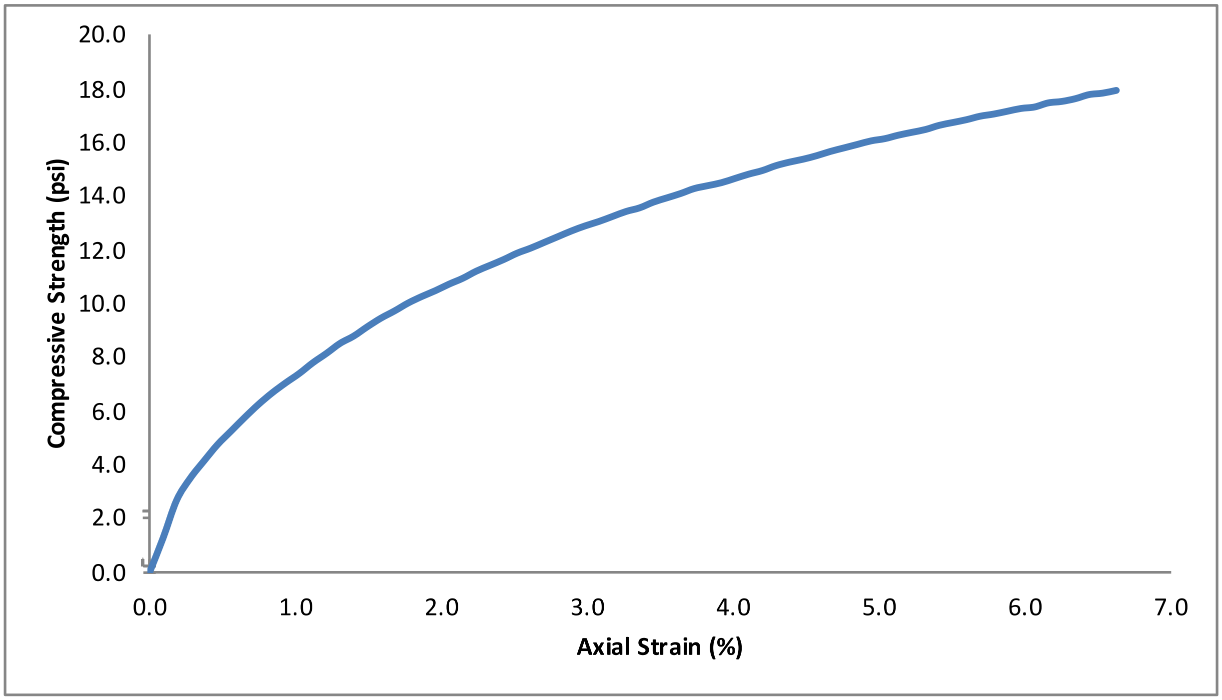
Dry Density (pcf)	**79.2**
Water Content (%)	**40.8**
Unconfined Compressive Strength (psi)	**28.1**
Unconfined Compressive Strength (psf)	**4046**
Average Height (in)	5.071
Average Diameter (in)	2.401
Rate of strain (%)	0.5
Strain at Failure (%)	5.0

Notes:



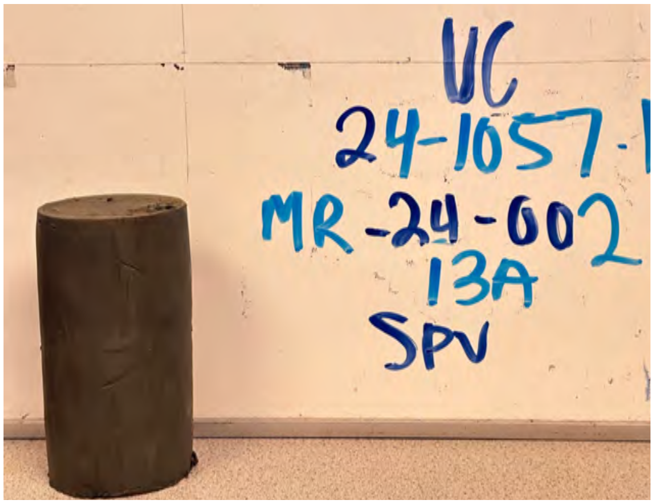
Project Name: Soledad Recycled Water Conveyance
Crawford File No: 24-1057.1
Date: 5/30/24
Technician: SPV
Sample ID: R-24-002 13A Depth (ft): 51.0
USCS Classification: Silt (ML)

UNCONFINED COMPRESSION TEST - D2166



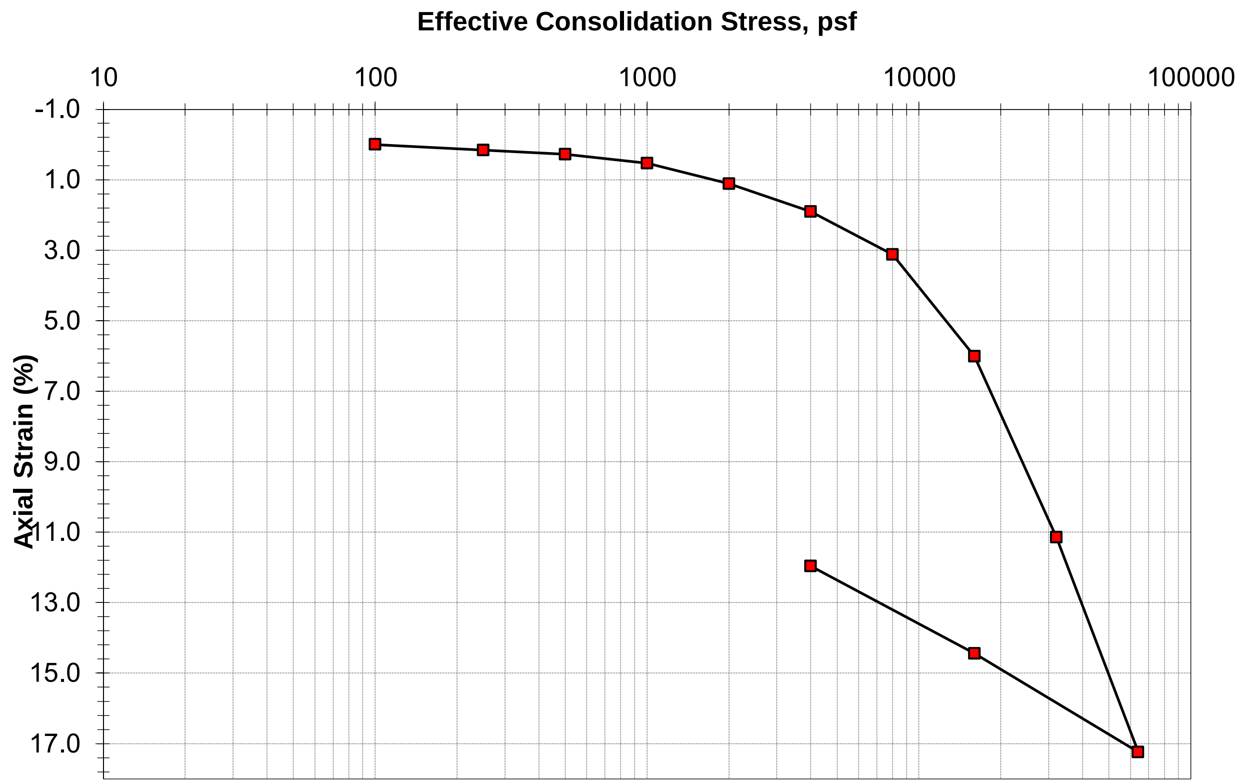
Dry Density (pcf)	**80.0**
Water Content (%)	**39.7**
Unconfined Compressive Strength (psi)	**17.9**
Unconfined Compressive Strength (psf)	**2578**
Average Height (in)	5.392
Average Diameter (in)	2.394
Rate of strain (%)	0.5
Strain at Failure (%)	6.6

Notes:



CONSOLIDATION TEST - ASTM D2435
STRESS VERSUS STRAIN

Project Name	Soledad Recycled Water
Geocon Project Number	S9763-05-285
Boring Number	MR-24-002
Sample Number	Shelby 11 (40-42')
Sample Description	Greenish Gray lean CLAY



Axial Load, psf	Void Ratio	Axial Strain, %
initial	1.215	0.00
100	1.215	0.00
250	1.211	0.16
500	1.209	0.28
1000	1.203	0.53
2000	1.190	1.11
4000	1.173	1.90
8000	1.146	3.12
16000	1.082	6.01
32000	0.968	11.15
64000	0.833	17.24
16000	0.895	14.44
4000	0.950	11.96

Measurement	Initial	Final
Height (in.)	0.750	0.654
Moisture Content (%)	40.4	33.8
Dry Density (pcf)	77.2	88.6
Saturation (%)	91	100

Note:
Gs = 2.74 (assumed)

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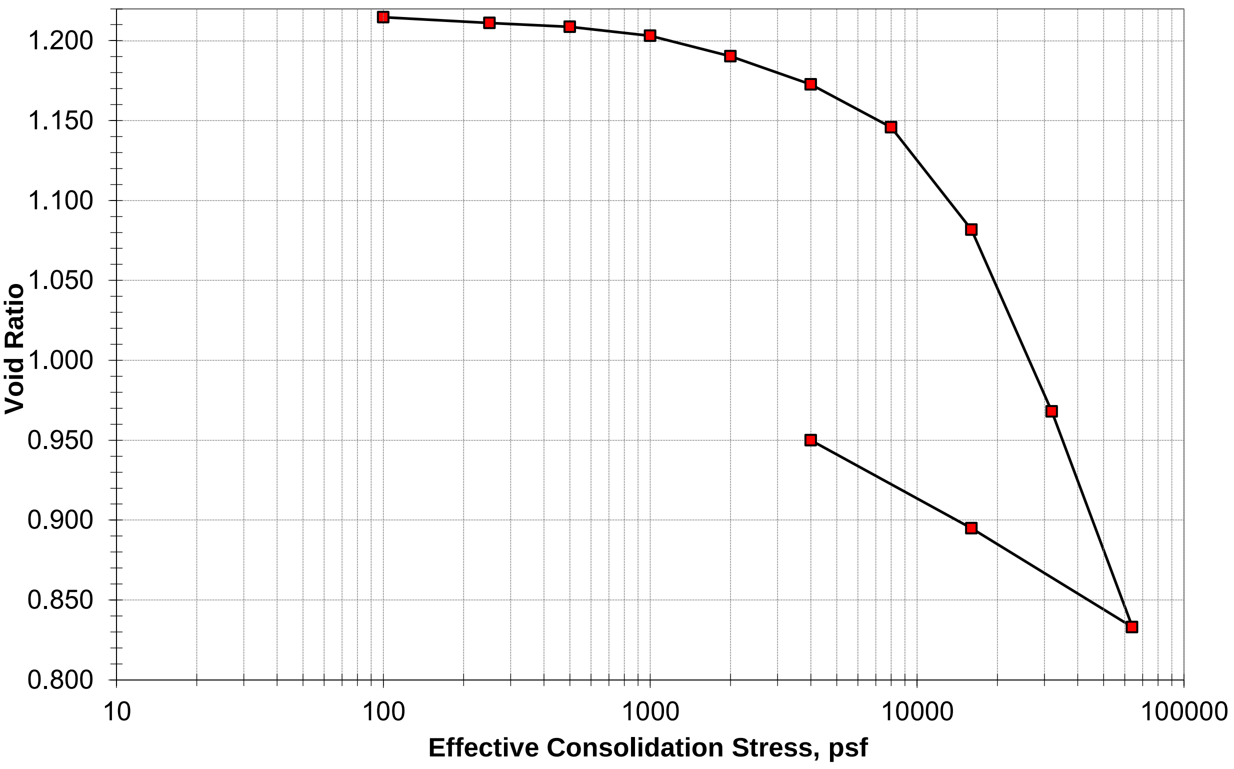
3160 Gold Valley Drive, Suite 800
Rancho Cordova, CA 95742
tel. 916.852-9118 fax. 916.852.9132

CONSOLIDATION TEST - ASTM D2435
STRESS VERSUS VOID RATIO

Project Name	Soledad Recycled Water
Geocon Project Number	S9763-05-285
Boring Number	MR-24-002
Sample Number	Shelby 11 (40-42')
Sample Description	Greenish Gray lean CLAY



Axial Load, psf	Void Ratio	Axial Strain, %
initial	1.215	0.00
100	1.215	0.00
250	1.211	0.16
500	1.209	0.28
1000	1.203	0.53
2000	1.190	1.11
4000	1.173	1.90
8000	1.146	3.12
16000	1.082	6.01
32000	0.968	11.15
64000	0.833	17.24
16000	0.895	14.44
4000	0.950	11.96

Measurement	Initial	Final
Height (in.)	0.750	0.654
Moisture Content (%)	40.4	33.8
Dry Density (pcf)	77.2	88.6
Saturation (%)	91	100

Note:
Gs = 2.74 (assumed)

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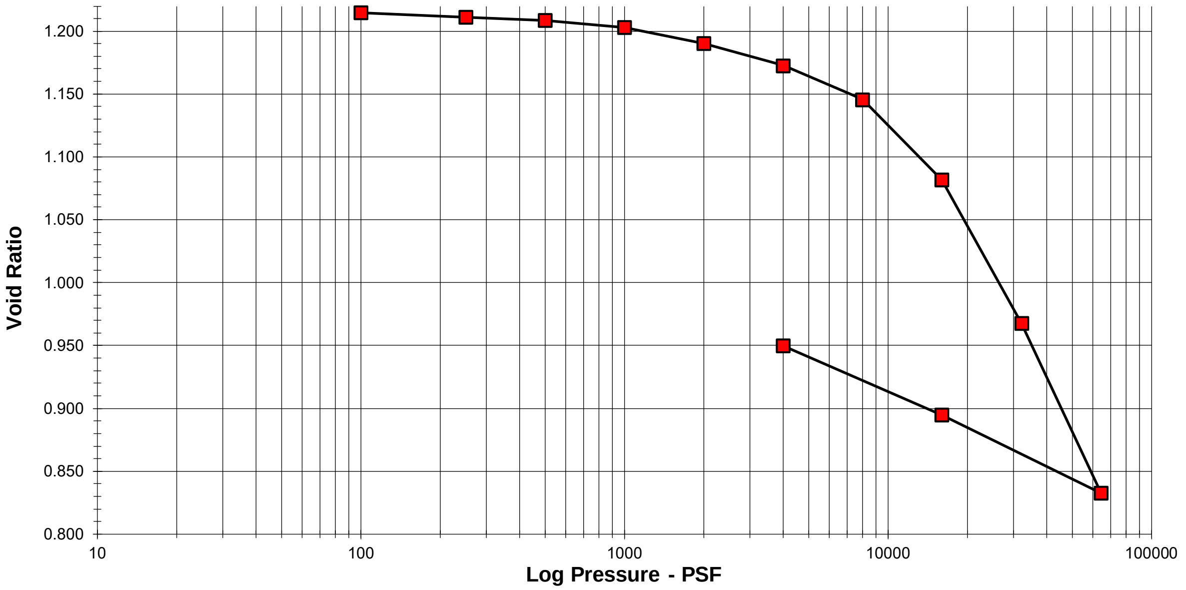
CONSOLIDATION TEST - ASTM D2435

Project Name:	Soledad Recycled Water		
Project Number:	S9763-05-285	Sample Number:	MR-24-002 Shelby 11 (40-42')

CONSOLIDATION TEST RESULTS

JOB S9763-05-285, BORING MR-24-002, Shelby 11 (40-42')



Axial Load (psf)	Void Ratio	Axial Strain (%)	m_V, coef of vol Compres (in^2/lb)	$c_{C,}$ Comp Index	50% Consolidation		90% Consolidation	
					t_{50}, Time to Consol (min)	C_V, Coeff of Consol (ft^2/yr)	t_{90}, Time to Consol (min)	C_V, Coeff of Consol (ft^2/yr)
initial	1.215	0.00						
100	1.215	0.00						
250	1.211	0.16	0.0016	0.009	0.02	4325.07	0.10	4350.05
500	1.209	0.28	0.0007	0.008	0.03	3521.38	0.12	3541.72
1000	1.203	0.53	0.0007	0.018	0.03	3035.15	0.14	3052.68
2000	1.190	1.11	0.0008	0.043	0.41	242.06	1.76	243.46
4000	1.173	1.90	0.0006	0.058	0.32	310.02	1.36	311.81
8000	1.146	3.12	0.0004	0.089	0.22	442.05	0.93	444.60
16000	1.082	6.01	0.0005	0.213	0.93	99.16	3.98	99.73
32000	0.968	11.15	0.0005	0.378	2.41	35.07	10.33	35.27
64000	0.833	17.24	0.0003	0.448	5.46	13.64	23.39	13.72
16000	0.895	14.44						
4000	0.950	11.96						

G_s = 2.74 (assumed)	COND AT START OF TEST	COND AT END OF TEST
HEIGHT (in.)	0.7500	0.6537
MOISTURE CONTENT (%)	40.4	33.8
DRY DENSITY (pcf):	77.2	88.6
SATURATION (%)	91.1	99.7

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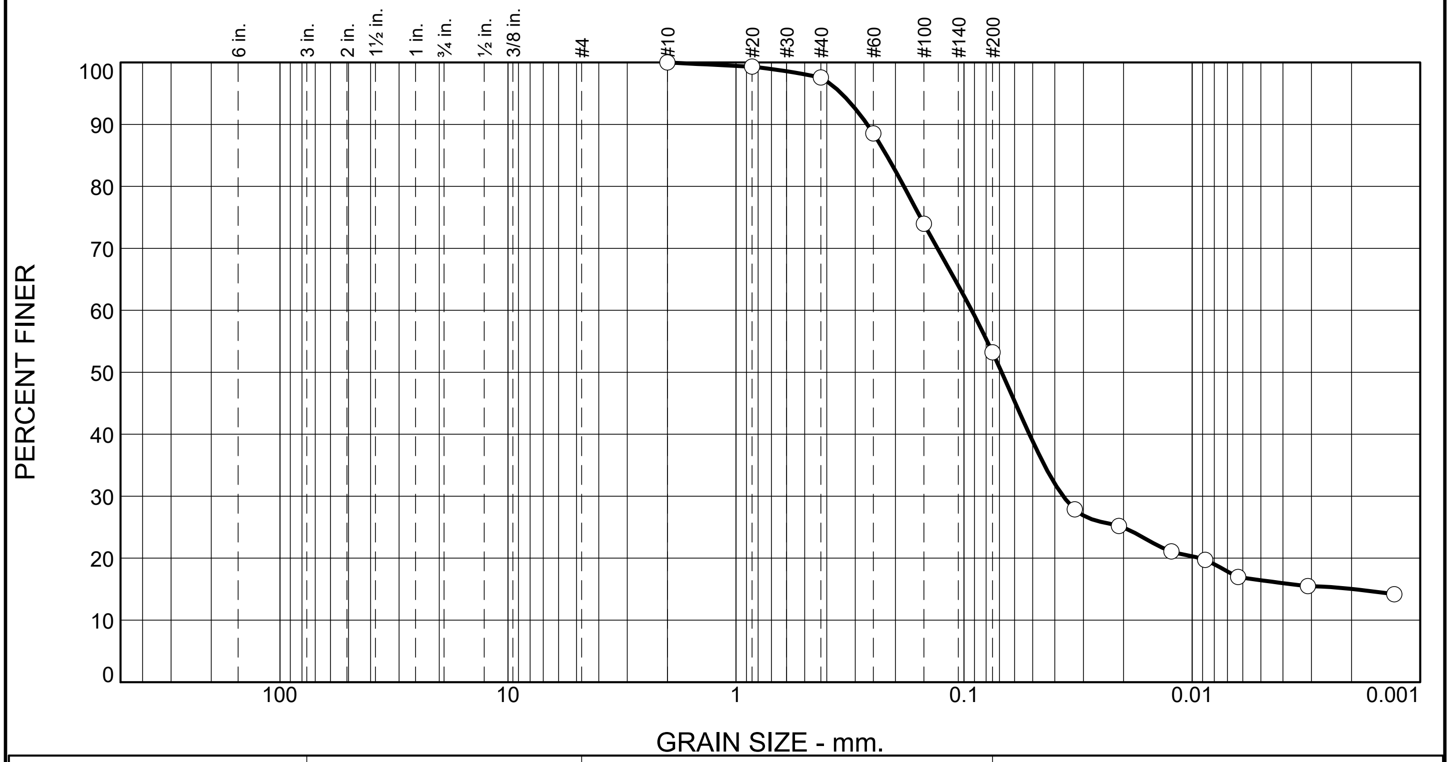
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.4	44.4	36.8	16.4

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.3		
#40	97.6		
#60	88.5		
#100	74.0		
#200	53.2		
0.0327 mm.	27.9		
0.0209 mm.	25.2		
0.0123 mm.	21.1		
0.0088 mm.	19.7		
0.0063 mm.	17.0		
0.0031 mm.	15.5		
0.0013 mm.	14.2		

* (no specification provided)

Material Description

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 0.2659	D_{85}= 0.2184	D_{60}= 0.0927
D_{50}= 0.0684	D_{30}= 0.0368	D_{15}= 0.0020
D_{10}=	C_u=	C_c=

Remarks

Date Received: **Date Tested:** 6/4/24

Tested By: JF

Checked By: MR

Title: Lab Manager

Sample Number: A-21-003-4A **Depth:** 6.5-7.0 **Date Sampled:**

GEOCON CONSULTANTS, INC.

Client: Crawford and Associates
Project: Soledad Recycled Water Conveyance

Project No: S9763-05-285 **Figure**

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 06/05/2024
Date Submitted 05/31/2024

To: Carmelo Pagan
Crawford & Associates, Inc.
4701 Freeport Blvd
Sacramento, CA 95822

From: Gene Oliphant, Ph.D. \ Randy Horney RH
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 24-1057.1 Site ID : A-24-005 3B.
Thank you for your business.

* For future reference to this analysis please use SUN # 92349-191324.

EVALUATION FOR SOIL CORROSION

Soil pH	7.61			
Moisture	6.8	%		
Minimum Resistivity	3.75	ohm-cm (x1000)		
Chloride	6.2	ppm	00.00062	%
Sulfate	18.9	ppm	00.00189	%
Redox Potential	(+) 290	mv		
Sulfides	Presence - NEGATIVE			

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m
Redox Potential ASTM G-200m, Sulfides AWWA C105/A25.5

Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 06/05/2024
Date Submitted 05/31/2024

To: Carmelo Pagan
Crawford & Associates, Inc.
4701 Freeport Blvd
Sacramento, CA 95822

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 24-1057.1 Site ID : A-24-004 3B.
Thank you for your business.

* For future reference to this analysis please use SUN # 92349-191325.

EVALUATION FOR SOIL CORROSION

Soil pH	8.12			
Moisture	10.4	%		
Minimum Resistivity	0.60	ohm-cm (x1000)		
Chloride	131.0	ppm	00.01310	%
Sulfate	196.7	ppm	00.01967	%
Redox Potential	(+) 261	mv		
Sulfides	Presence - NEGATIVE			

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m
Redox Potential ASTM G-200m, Sulfides AWWA C105/A25.5

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 06/05/2024
Date Submitted 05/31/2024

To: Carmelo Pagan
Crawford & Associates, Inc.
4701 Freeport Blvd
Sacramento, CA 95822

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 24-1057.1 Site ID : A-24-006 3B.
Thank you for your business.

* For future reference to this analysis please use SUN # 92349-191326.

EVALUATION FOR SOIL CORROSION

Soil pH	7.02		
Moisture	6.3 %		
Minimum Resistivity	0.91 ohm-cm (x1000)		
Chloride	22.5 ppm	00.00225	%
Sulfate	80.3 ppm	00.00803	%
Redox Potential	(+) 28 mv		
Sulfides	Presence - NEGATIVE		

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m
Redox Potential ASTM G-200m, Sulfides AWWA C105/A25.5

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 06/05/2024
Date Submitted 05/31/2024

To: Carmelo Pagan
Crawford & Associates, Inc.
4701 Freeport Blvd
Sacramento, CA 95822

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 24-1057.1 Site ID : MK-24-002 7B.
Thank you for your business.

* For future reference to this analysis please use SUN # 92349-191327.

EVALUATION FOR SOIL CORROSION

Soil pH	7.100	
Moisture	30.9 %	
Minimum Resistivity	0.54 ohm-cm (x1000)	
Chloride	62.5 ppm	00.00625 %
Sulfate	177.5 ppm	00.01775 %
Redox Potential	(+) 223 mv	
Sulfides	Presence - NEGATIVE	

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m
Redox Potential ASTM G-200m, Sulfides AWWA C105/A25.5

APPENDIX V

Site Specific Analysis

Appendix V

Site-Specific Ground Motion Hazard Memorandum
Recycled Water Conveyance
City of Soledad, California

SITE SPECIFIC ANALYSIS

The following sections describe the site-specific ground motion analysis performed in accordance with ASCE 7-16 (and supplements) and 2022 CBC.

INITIAL SEISMIC HAZARD ANALYSIS

SEISMIC DESIGN CRITERIA

Seismic design criteria are included in Section 11 of ASCE 7-16 (Sections referenced hereafter refer to ASCE 7-16), including mapped acceleration parameters. These mapped parameters are available online through the SEAOC/OSHPD[2] Seismic Design website, which interpolates values form the ASCE 7-16 maps using the site location.

SITE CLASS AND RISK CATEGORY

The encountered subsurface soils during Crawford's 2024 exploration indicate a Site Class D. However, the 2024 borings show potentially liquefiable soils present at the proposed pump station site. Liquefiable soils are considered Site Class F per Section 20.3.1 of ASCE 7-16 and a site-specific site response is required, unless the structures have fundamental periods of vibration equal or less than 0.5s. *We assume the proposed pump station will have a fundamental period of 0.5 seconds or less.* According to the Exception in Section 20.3.1 of ASCE 7-16, "a site class is permitted to be determined in accordance with Section 20.3 and the corresponding values of Fa and Fv are determined from Table 11.4-1 and 11.4-2."; therefore, the soils are considered Site Class D for the site-specific ground motion hazard analysis.

The average shear wave velocity of 195 meters per second (m/s) in the upper 30 meters or 100 feet (V_{S30}) used for the site was developed from 2024 boring data. Crawford used correlations[1] with SPT blow count N-values (Burmister[2]) corrected for hammer efficiency to determine V_S values. The Risk Category for the structure was assumed to be III.

MAPPED ACCELERATION PARAMETERS

Crawford accessed the SEAOC/OSHPD Seismic Design Map website[3] considering the site location latitude 36.4205°N and longitude -121.3402°, Site Class D, and Risk Category III to determine the Mapped Maximum Considered Earthquake (MCE) Spectral Response Short Period (S_S), Mapped MCE Spectral Response at 1 second period (S_1), Long Period (T_L), and mapped risked coefficients (C_{RS} and C_{R1}). The S_S, S_1, T_L, C_{RS}, and C_{R1} are coordinate specific and are

---

[1] Empirical Correlations for Estimating Shear Wave Velocity, Caltrans Geotechnical Manual, Design Acceleration Response Spectrum, Attachment 2, January 2021.

[2] AASHTO LRFD Bridge Design Specifications, Section 10.4.6.2.4, 8th Edition, 2018 and Burmister's Energy-Area Correction for Sampler Size Conversions to SPT N-value.

[3] https://www.seismicmaps.org/

taken from ASCE 7-16 figures independently of site class. The mapped acceleration parameters are based on an MCE which is roughly equivalent to an earthquake with a 2% chance of exceedance in 50 years (2,475-year return period). Table 1 summarizes the mapped acceleration parameters.

Table 1: Mapped Acceleration Parameters

Mapped Acceleration Parameter	Value	Source
Mapped MCE_R Spectral Response Short Period (S_S)	1.591	Figure 21-1
Mapped MCE_R Spectral Response at 1 Second Period (S_1)	0.566	Figure 21-2
Long Period (T_L)	12	Figure 21-14
Mapped Risk Coefficient at Short Period (C_{RS})	0.982	Figure 22-17
Mapped Risk Coefficient at 1 Second Period (C_{R1})	0.946	Figure 22-18

HORIZONTAL GROUND MOTION HAZARD ANALYSIS

A ground motion hazard analysis accounts for the regional tectonic setting, geology, and seismicity of a specific site as well as the expected recurrence of the maximum magnitudes of the earthquakes on known faults and source zones, considering ground motion attenuation and near source effects. The methodology included in ASCE 7-16 was used to determine the site-specific ground motions of the project site, generally consisting of the following steps:

- Determine the probabilistic MCE ground motions
- Determine the deterministic MCE ground motions
- Adjust probabilistic MCE ground motions to risk-targeted maximum considered earthquake ground motions (MCE_R)
- Compare and scale the site-specific deterministic MCE ground motion with minimum spectral responses to ASCE 7-16 Supplement 1 Section 21.2.2
- Compare the scaled deterministic ground motion to the probabilistic ground motion to determine the site-specific MCE_R ground motion (lower of the two at each period)
- Calculate design spectral response ground motion (2/3 of MCE_R)
- Compare the Section 21.2 design spectral response ground motion to the Section 11.4.6 design spectral response ground motion (cannot be lower than 80% Section 11.4.6 design spectral response ground motion)
- Determine the design spectral response spectrum and design acceleration parameters
- Calculate peak ground acceleration (PGA_M)

GROUND MOTION HAZARD ANALYSIS

Crawford performed a seismic hazard analyses and site response analyses using EZ-FRISK software Version 8.10. Crawford used the following next generation attenuation (NGA) relationships all equally weighted for the nearby strike-slip, normal, and reverse faults:

- Abrahamson-et al (2014)
- Boore-et al (2014)

- Campbell and Bozorgnia (2014)
- Chiou and Youngs (2014)

The following parameters were common to all analyses for each of the attenuation relationships:

- The V_{S30} of the site of 195 m/s
- Depth to soil with a V_S of 1,000 m/s was calculated to be 763 meters based on the methodology proposed by Abrahamson and Silva (2008)
- Depth to soil with a V_S of 2,500 m/s was calculated to be 3.26 kilometers based on the methodology proposed by Campbell and Bozorgnia (2008)

PROBABILISTIC MCER GROUND MOTION

Seismic sources within 300 kilometers were used to determine the site-specific ground motions. The NGA analyses considered the faults in Table 2: Summary of Seismic Sources (See page 7).

EZ-FRISK software was used to determine geometric mean spectral response acceleration predicted using attenuation relationships from a 5% damped response spectrum with a 2% in 50-year exceedance probability. Crawford included directivity factors following Huang, Whittaker, and Luco (2008) to apply the maximum rotated component.

RISK COEFFICIENTS

Method 1 of Section 21.2 was used to determine the probabilistic MCE_R ground motion

Mapped risk coefficients (C_{RS} and C_{R1}) were used to adjust the response accelerations to a 1% chance of collapse in 50 years per Section 21.2.1.1. The risk coefficients are summarized in Table 1, along with the source figure from ASCE 7-16.

C_{RS} was applied to accelerations at spectral periods less than or equal to 0.2 seconds. C_{R1} was applied accelerations at spectral periods greater than or equal to 1 second. For spectral periods between 0.2 and 1 seconds, the C_R value was linearly interpolated.

PROBABILISTIC MCE$_R$ GROUND MOTION

Figure 1 shows the maximum rotated spectral response for the 2% in 50-year event developed using EZ-FRISK for each of the attenuation relationships described above. Also shown is the risk-adjusted response spectrum adjusting the response to a 1% in 50-year probability of collapse, which is equivalent to the site-specific probabilistic ground motion MCE_R.

DETERMINISTIC MCE$_R$ GROUND MOTION

The deterministic spectral response acceleration is defined as the 84th-percentile 5% damped spectral response in the direction of maximum horizontal response for the characteristic earthquake on all known active faults within the region. EZ-FRISK was used to calculate the deterministic ground motion per Section 21.2.2. The deterministic spectral response was taken as the largest amplitude of ground motion considering all sources using the weighted mean of NGA attenuation relationships stated above. The controlling seismic source for the project site is the Great Valley 10 (Panoche) fault from spectral periods of 0 to 1 seconds and Reliz 2011 CFM for spectral periods greater than 1 seconds. Figure 2 shows the 84th-percentile 5% damped spectral response for the NGA attenuation relationships.

DETERMINISTIC MCE$_R$ GROUND MOTION SCALING

Per ASCE 7-16 Supplement 1 Section 21.2.2, the maximum deterministic spectral response was compared with the minimum peak acceleration of 1.5Fa with Fa = 1 for Site Class D. Our maximum spectral response was 2.26g, therefore, no scaling of the deterministic curve was required. Figure 2 shows our deterministic ground motions compared to the minimum peak spectral accelerations.

SITE-SPECIFIC SPECTRAL RESPONSE ACCELERATION MCE$_R$

The site-specific spectral response acceleration is defined as the lower of the probabilistic and deterministic ground motions in Section 21.2.3. For the project site, the probabilistic ground motion controls for at PGA and 0.3 to 10 seconds. The deterministic ground motion controls for periods between 0.05 to 0.2 seconds. The site-specific spectral response acceleration (MCE$_R$) is shown on Figure 3.

DESIGN RESPONSE SPECTRUM

The design response spectrum is defined in Section 21.3 as the higher of two values:

- Two-thirds of the site-specific design spectral response acceleration per Section 21.2
- 80% of the design spectral response acceleration per Section 11.4.6 where Fa is calculated in Table 11.4-1 and Fv = 2.5 for $S_1 > 0.2$ for Site Class D

Crawford first calculated the design spectral response acceleration by taking 2/3 of the site-specific response acceleration MCE$_R$ as shown in Figure 4.

Crawford then calculated the design response accelerations per Section 11.4.6 using F_a = 1.0 and F_v = 2.5 and reduced the spectral accelerations 80% to determine the design accelerations for a Site Class D. We then compared Section 11.4.6 design spectral accelerations for Site Class D with our site-specific design spectral response accelerations (Figure 5). The site-specific design spectral response acceleration per Section 21.2 controlled for all periods.

The design response spectrum is shown on Figure 5 and Table 3.

Table 3: Design Response Spectrum

Period, s	Sa, g
PGA	0.54
0.05	0.56
0.1	0.76
0.2	0.98
0.3	1.04
0.4	1.35
0.5	1.37
0.6	1.35

Period, s	Sa, g
0.7	1.26
0.8	1.17
0.9	1.10
1.0	1.04
2.0	1.03
3.0	0.98
4.0	0.70
5.0	0.53
6.0	0.42
7.0	0.32
8.0	0.25
9.0	0.20
10.0	0.17

DESIGN ACCELERATION PARAMETERS

Design acceleration parameters were calculated in accordance with Section 21.4. The S_{DS} value was taken as 90% the peak spectral acceleration value from periods 0.2 to 5 seconds. The S_{D1} value was taken as the maximum product of $T*S_a$ (period * spectral acceleration) from periods 1 to 5 seconds. Per Section 21.4, the S_{DS} and S_{D1} values cannot be less than 80% of the S_{DS} and S_{D1} calculated from Section 11.4.5. The S_{DS} and S_{D1} values in Section 11.4.5 was calculated from using $F_a = 1.0$ and $F_v = 4.0$ for a Site Class D as given in Section 21.3.

S_{MS} and S_{M1} were calculated as 1.5 times S_{DS} and S_{D1}, respectively. Per Section 21.4, the S_{MS} and S_{M1} values cannot be less than 80% of the S_{MS} and S_{M1} calculated from Section 11.4.3. The S_{MS} and S_{M1} values in Section 11.4.3 was calculated from using $F_a = 1.0$ and $F_v = 2.5$ for a Site Class D as given in Section 21.3

The design acceleration parameters are summarized in Table 4.

Table 4: Horizontal Site-Specific Spectral Accelerations

Design Acceleration Parameter	Value (g)
Design Spectral Acceleration for Short Period (S_{DS})	1.24
Design Spectral Acceleration for 1 Second Period (S_{D1})	1.67
MCE Spectral Response Acceleration for Short Period (S_{MS})	1.86
MCE Spectral Response Acceleration for 1 Second Period (S_{M1})	2.50

MAXIMUM CONSIDERED EARTHQUAKE MCE_G PEAK GROUND ACCELERATION (PGA)

PROBABILISTIC MCE_G PGA

Per Section 21.5.1 the probabilistic geometric mean PGA shall be taken as geometric mean peak ground acceleration with a 2% probability of exceedance within a 50-year period. The probabilistic MCE_G PGA is 0.83g.

DETERMINISTIC MCE_G PGA

Per Section 21.5.2, the deterministic geometric mean PGA shall be taken as the largest 84th-percentile geometric mean peak PGA but not lower than $0.5*F_{PGA}$ where F_{PGA} is determined using ASCE 7-16 Table 11.8-1 and PGA is taken as 0.5g. The deterministic MCE_G PGA was taken as 0.86g.

SITE-SPECIFIC MCE_G PGA

The site-specific MCE_G PGA (PGA_M) taken as the lesser of the probabilistic MCE_G PGA and deterministic MCE_G PGA but not less than 80% of the PGA_M determined from Equation 11.8-1 in ASCE 7-16. The site-specific PGA_M was taken as 0.83g.

TABLE 2

Table 2: Summary of Seismic Sources

Attenuation Relationship Type	Source	Closest Distance (km)	Maximum Magnitude	Mechanism	Dip Angle (degree)	Dips Direction	Site Lies
NGA	Carson Range fault [1285]	283.94	7.08	Normal	35-65	E	SW
	Carson Range-Kings Canyon fault [1285_1654]	283.94	7.23	Normal	35-65	E	SW
	Huntoon Valley fault system [1302]	291.98	6.9	Strike Slip	90	--	SW
	Smith Valley fault [1291abc]	288.35	7.4	Normal	35-65	E	SW
	Unnamed faults [1303]	296.33	6.9	Strike Slip	90	--	SW
	FM31-Antelope Valley 2011	281.69	7.0	Normal	50	E	SW
	FM31-Bennett Valley 2011 CFM	224.06	7.6	Strike Slip	90	--	SE
	FM31-Big Pine (Central)	264.83	8.0	SS|R	76	SE,S	NW
	FM31-Big Pine (East)	264.53	8.0	SS|R	73	NW,N	NW
	FM31-Big Pine (West)	237.19	7.4	Reverse	50	N	NW
	FM31-Breckenridge 2011	273.54	7.2	N|SS	60	E	NW
	FM31-Butano 2011 CFM	93.85	8.1	SS|R	70	N,NE	SE
	FM31-Calaveras (Central) 2011 CFM	72.56	7.8	Strike Slip	77	NE	S
	FM31-Calaveras (No) 2011 CFM	122.72	7.5	Strike Slip	80	SW,W	S
NGA	FM31-Calaveras (So) - Paicines extension 2011 CFM	25.09	7.9	Strike Slip	77	SW	S
	FM31-Calaveras (So) 2011 CFM	46.89	7.9	Strike Slip	85	NE,E	S
	FM31-Casmalia 2011 CFM	168.24	8.0	Reverse	75	S,SW	N
	FM31-Channel Islands Western Deep Ramp	272.37	7.8	SS|R	21	S,SW	NW
	FM31-Clayton	166.28	7.7	SS|R	90	--	S
	FM31-Collayami 2011 CFM	277.84	6.7	Strike Slip	90	--	SE
	FM31-Concord 2011 CFM	174.21	7.8	Strike Slip	90	--	S
	FM31-Contra Costa (Lafayette) 2011 CFM	172.44	7.3	Strike Slip	90	--	SE
	FM31-Contra Costa Shear Zone (connector) 2011 CFM	178.72	7.3	Strike Slip	81	SW,W	S
	FM31-East Huasna 2011 CFM	146.04	7.2	Strike Slip	90	--	NW
	FM31-Fish Slough 2011 CFM	273.92	7.3	N|SS	60	W	SW
	FM31-Franklin 2011 CFM	170.21	7.3	Strike Slip	90	--	S
	FM31-Garlock (West)	281.70	8.2	Strike Slip	90	--	NW

Attenuation Relationship Type	Source	Closest Distance (km)	Maximum Magnitude	Mechanism	Dip Angle (degree)	Dips Direction	Site Lies
	FM31-Great Valley 03 Mysterious Ridge	257.22	7.4	Reverse	16-20	SW,W	S
	FM31-Great Valley 03a Dunnigan Hills	250.16	6.5	Reverse	20	NE,E	S
	FM31-Great Valley 04a Trout Creek	237.93	7.4	Reverse	20	SW	SE
	FM31-Great Valley 04b Gordon Valley	212.18	7.5	Reverse	20	SW,W	S
	FM31-Great Valley 05 Pittsburg - Kirby Hills alt1	182.58	6.5	Strike Slip	55	E	S
	FM31-Great Valley 06 (Midland) 2011 CFM alt1	161.64	7.3	Reverse	47	SW,W	S
	FM31-Great Valley 07 (Orestimba)	79.16	6.9	Reverse	20	SW	S
	FM31-Great Valley 08 (Quinto)	63.15	6.8	SS|R	25	SW	S
	FM31-Great Valley 09 (Laguna Seca)	48.68	6.6	Reverse	25	SW	S
	FM31-Great Valley 10 (Panoche)	17.00	7.6	Reverse	15-24	SW	SW
	FM31-Great Valley 11	33.67	7.5	Reverse	15-16	SW	W
	FM31-Great Valley 12	36.87	7.4	Reverse	15-17	SW	W
	FM31-Great Valley 13 (Coalinga)	68.04	7.4	Reverse	15-19	SW	NW
	FM31-Great Valley 14 (Kettleman Hills)	107.41	7.0	Reverse	22	SW	NW
	FM31-Green Valley 2011 CFM	192.20	7.9	Strike Slip	84	W	S
	FM31-Greenville (No) 2011 CFM	122.20	7.8	SS|R	84	NE	S
	FM31-Greenville (So) 2011 CFM	93.39	7.8	Strike Slip	87	E	S
NGA	FM31-Hartley Springs 2011 CFM	249.04	7.4	Normal	50	NE,E	SW
	FM31-Hayward (No) 2011 CFM	168.60	7.7	Strike Slip	82	NE,E	SE
	FM31-Hayward (So) 2011 CFM	116.12	7.8	Strike Slip	76	NE	S
	FM31-Hayward (So) extension 2011 CFM	95.58	7.8	Strike Slip	48	NE,E	S
	FM31-Hilton Creek 2011 CFM	258.39	7.3	Normal	50	NE	SW
	FM31-Hosgri	45.46	8.0	SS|R	80	NE,E	N
	FM31-Hosgri (Extension)	182.11	6.5	Strike Slip	80	E	N
	FM31-Hunting Creek - Bartlett Springs connector 2011	266.97	7.9	Strike Slip	90	--	S
	FM31-Hunting Creek - Berryessa 2011 CFM	235.00	7.9	Strike Slip	90	--	S
	FM31-Independence rev 2011	272.22	7.8	N|SS	50	NE,E	W
	FM31-Kern Canyon (Lake Isabella) 2011	272.38	7.3	N|SS	60	E	W
	FM31-Kern Canyon (North Kern) 2011	262.30	7.7	Normal	60	E	W
	FM31-Kern Canyon (South Kern) 2011	262.72	7.7	Normal	60	E	W
	FM31-La Panza 2011	126.19	7.3	Strike Slip	51	NE	NW

Attenuation Relationship Type	Source	Closest Distance (km)	Maximum Magnitude	Mechanism	Dip Angle (degree)	Dips Direction	Site Lies
	FM31-Lake Isabella (Seismicity)	273.44	7.1	Strike Slip	90	--	W
	FM31-Las Positas	138.45	6.4	Strike Slip	90	--	S
	FM31-Lions Head 2011 CFM	175.76	7.8	Reverse	75	N,NE	NW
	FM31-Los Alamos 2011 CFM	207.38	8.1	SS|R	30	S,SW	NW
	FM31-Los Alamos extension	229.33	8.0	SS|R	30	S,SW	NW
	FM31-Los Medanos - Roe Island	181.68	7.8	SS|R	39	NE	S
	FM31-Los Osos 2011	122.48	7.8	Reverse	45	S,SW	N
	FM31-Lost Hills	137.05	6.8	Reverse	29	SW	NW
	FM31-Maacama 2011 CFM	258.26	7.6	Strike Slip	63	NE	SE
	FM31-Mission (connected) 2011 CFM	122.68	7.5	Strike Slip	90	--	SE
	FM31-Mission Ridge-Arroyo Parida-Santa Ana	257.13	8.1	SS|R	70	SE,S	NW
	FM31-Mono Lake 2011 CFM	261.29	6.6	Normal	50	NE,E	SW
	FM31-Monte Vista - Shannon 2011 CFM	88.25	8.1	SS|R	61	S,SW	SE
	FM31-Monterey Bay-Tularcitos	16.19	7.9	Strike Slip	90	--	NE
	FM31-Morales (East)	209.93	6.5	Reverse	32	N	NW
	FM31-Morales (West)	189.58	6.8	Reverse	32	NE	NW
	FM31-Mount Diablo Thrust North CFM	159.39	7.8	SS|R	40	NE	S
NGA	FM31-Mount Diablo Thrust South	151.69	7.8	SS|R	40	NE	S
	FM31-Oceanic - West Huasna	78.04	7.4	SS|R	58	NE,E	NW
	FM31-Ortigalita (North)	69.80	6.8	Strike Slip	90	--	S
	FM31-Ortigalita (South)	51.51	7.2	Strike Slip	90	--	S
	FM31-Owens Valley	282.71	7.8	N|SS	90	--	W
	FM31-Owens Valley Keough Hot Springs	278.81	7.8	N|SS	50-86	NE,E	W
	FM31-Ozena	225.85	7.6	Reverse	33	S,SW	NW
	FM31-Pilarcitos 2011 CFM	123.15	8.0	SS|R	81	NE	SE
	FM31-Pine Mtn	251.63	7.7	SS|R	45	N,NE,N	NW
	FM31-Pitas Point (Lower West)	124.61	8.1	Reverse	13	N	NW
	FM31-Pitas Point (Lower)-Montalvo	195.69	8.0	Reverse	16	N	NW
	FM31-Pleito	247.26	8.1	SS|R	46	SE,S,SW	NW
	FM31-Point Reyes 2011 CFM	213.16	7.0	Reverse	53	N,NE,E	SE
	FM31-Point Reyes 2011 connector	178.74	8.0	SS|R	53	NE	SE
	FM31-Quien Sabe 2011 CFM	38.92	7.6	Strike Slip	85	SW	S
	FM31-Red Mountain	227.41	8.0	Reverse	56	N	NW

Attenuation Relationship Type	Source	Closest Distance (km)	Maximum Magnitude	Mechanism	Dip Angle (degree)	Dips Direction	Site Lies
	FM31-Reliz 2011 CFM	6.33	8.1	Strike Slip	58	SW	SE
	FM31-Rinconada 2011 CFM	24.90	7.6	Strike Slip	82	SW,W	N
	FM31-Robinson Creek	267.59	6.5	Normal	50	SE	SW
	FM31-Rodgers Creek - Healdsburg 2011 CFM	217.10	7.6	Strike Slip	77	NE	SE
	FM31-Round Valley	259.19	7.2	Normal	50	NE,E	W
	FM31-San Andreas (Big Bend)	239.80	8.1	SS|R	90	--	NW
	FM31-San Andreas (Carrizo) rev	180.96	8.1	SS|R	90	--	NW
	FM31-San Andreas (Cholame) rev	119.36	8.2	Strike Slip	90	--	NW
	FM31-San Andreas (Creeping Section) 2011 CFM	22.97	8.4	Strike Slip	90	--	NW
	FM31-San Andreas (Mojave N)	284.82	8.0	Strike Slip	90	--	NW
	FM31-San Andreas (North Coast) 2011 CFM	201.69	7.9	Strike Slip	90	--	SE
	FM31-San Andreas (Parkfield)	83.90	8.2	Strike Slip	90	--	NW
	FM31-San Andreas (Peninsula) 2011 CFM	102.48	8.0	SS|R	90	--	SE
	FM31-San Andreas (Santa Cruz Mts) 2011 CFM	44.08	8.1	Strike Slip	79	SW	SE
	FM31-San Cayetano	283.03	8.1	SS|R	42	N	NW
	FM31-San Gabriel	292.70	7.7	Strike Slip	61	NE	NW
	FM31-San Gregorio (North) 2011 CFM	89.04	8.0	SS|R	90	--	SE
NGA	FM31-San Gregorio (South) 2011 CFM	41.69	8.2	Strike Slip	75	NE,E	NE
	FM31-San Juan	111.48	7.4	SS|R	90	--	NW
	FM31-San Luis Range - Oceano 2011 CFM	150.21	7.8	Reverse	45	NE	NW
	FM31-San Luis Range - Pecho 2011 CFM	142.45	6.6	Reverse	90	--	N
	FM31-San Luis Range 2011 CFM	136.28	7.8	SS|R	52	NE	NW
	FM31-Santa Cruz Island	288.11	8.0	SS|R	90	--	NW
	FM31-Santa Rosa Island	277.21	7.9	SS|R	90	--	NW
	FM31-Santa Ynez (East)	263.76	7.7	SS|R	70	S	NW
	FM31-Santa Ynez (West)	226.09	8.0	SS|R	70	S,SW	N
	FM31-Santa Ynez River	205.76	8.0	SS|R	70	S,SW	N
	FM31-Sargent 2011 CFM	50.44	8.1	SS|R	90	--	SE
	FM31-Shoreline	134.42	7.8	SS|R	90	--	N
	FM31-Sierra Nevada (No Extension)	291.47	7.7	N|SS	50	E	W
	FM31-Silver Creek 2011 CFM	87.86	7.8	Strike Slip	75	NE,E	S

Attenuation Relationship Type	Source	Closest Distance (km)	Maximum Magnitude	Mechanism	Dip Angle (degree)	Dips Direction	Site Lies
	FM31-Sisar	293.99	8.1	SS|R	29	S	NW
	FM31-South Cuyama	158.91	7.9	Reverse	33	S,SW	NW
	FM31-Swain Ravine - Spenceville	258.33	7.4	Normal	60	NE,E	S
	FM31-Ventura-Pitas Point	275.15	8.0	SS|R	64	N,NW, N	NW
	FM31-West Napa 2011 CFM	209.55	7.0	Strike Slip	75	SW,W	SE
	FM31-West Tahoe	284.73	7.3	Normal	50	E	SW
	FM31-White Mountains	288.92	7.4	Strike Slip	90	--	W
	FM31-White Wolf	261.67	7.5	Strike Slip	75	SE	NW
	FM31-White Wolf (Extension)	283.19	7.1	Strike Slip	75	SE	NW
	FM31-Zayante-Vergeles 2011 CFM	26.17	8.2	Strike Slip	30	S,SW	SE
	FM32-Antelope Valley 2011	281.69	7	Normal	50	E	SW
	FM32-Bennett Valley 2011 CFM	224.06	7.6	Strike Slip	90	--	SE
	FM32-Big Pine (Central)	264.83	8	SS|R	76	SE,S	NW
	FM32-Big Pine (East)	264.53	8	SS|R	73	NW,N	NW
	FM32-Big Pine (West)	237.19	7.4	Reverse	50	N	NW
	FM32-Breckenridge 2011	273.54	7.2	N|SS	60	E	NW
	FM32-Butano 2011 CFM	93.85	8.1	SS|R	70	N,NE	SE
	FM32-Calaveras (Central) 2011 CFM	72.54	7.9	Strike Slip	77	NE	S
	FM32-Calaveras (No) 2011 CFM	122.72	7.4	Strike Slip	80	SW,W	S
	FM32-Calaveras (So) - Paicines extension 2011 CFM	25.09	7.9	Strike Slip	77	SW	S
	FM32-Calaveras (So) 2011 CFM	46.89	7.9	Strike Slip	85	NE,E	S
	FM32-Casmalia 2011 CFM	168.25	7.8	SS|R	75	S,SW	N
	FM32-Channel Islands Western Deep Ramp	272.75	8.0	SS|R	21	S,SW	NW
	FM32-Clayton	166.28	7.7	SS|R	90	--	S
	FM32-Collayami 2011 CFM	277.84	6.7	Strike Slip	90	--	SE
	FM32-Concord 2011 CFM	174.21	7.8	Strike Slip	90	--	S
	FM32-Contra Costa (Briones) 2011 CFM	181.83	7.2	Strike Slip	90	--	SE
	FM32-Contra Costa (Dillon Point) 2011 CFM	191.69	7.1	Strike Slip	90	--	SE
	FM32-Contra Costa (Lafayette) 2011 CFM	172.44	7.3	Strike Slip	90	--	SE
	FM32-Contra Costa (Lake Chabot) 2011 CFM	203.58	7.0	Strike Slip	90	--	S

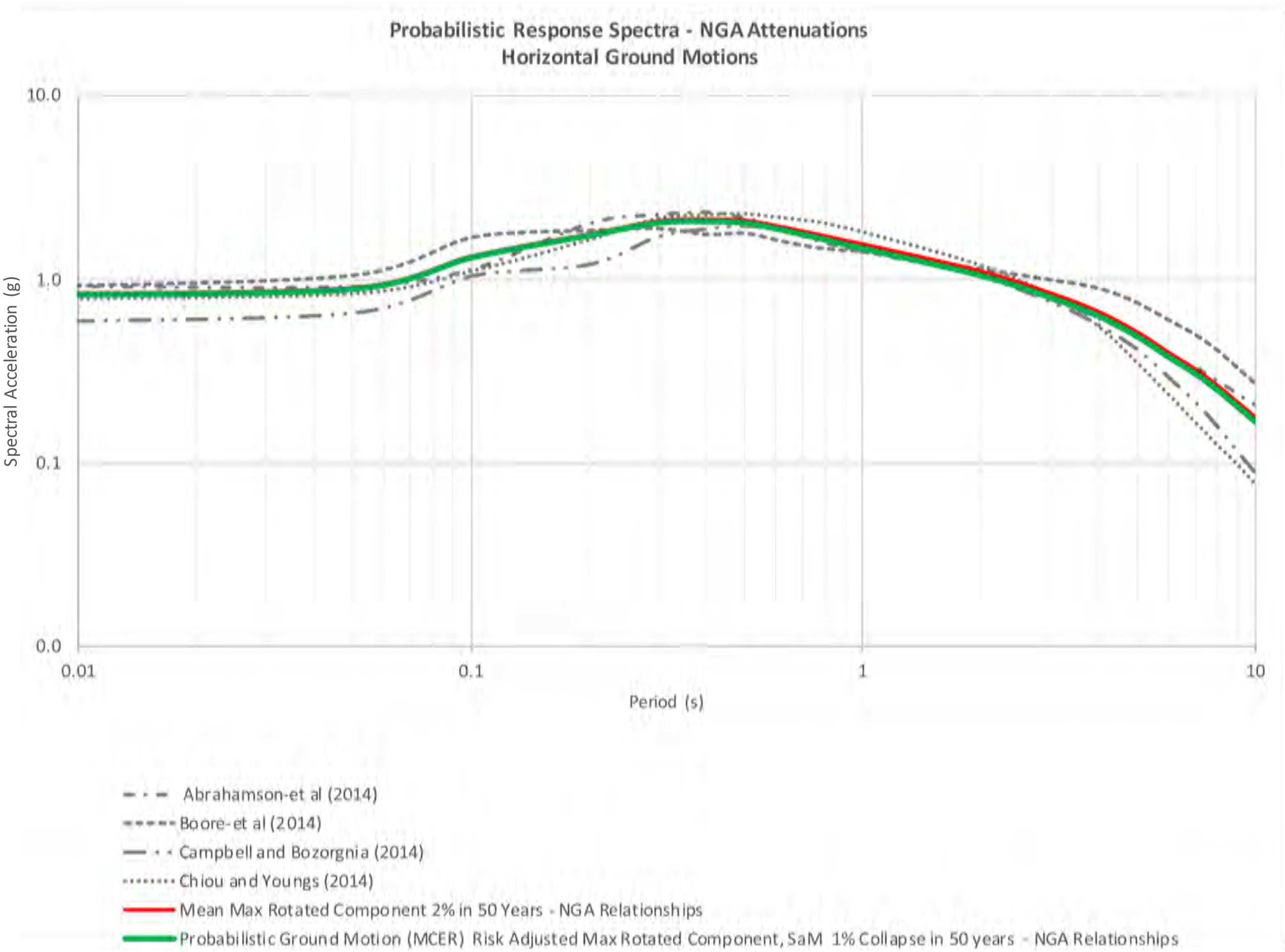
Attenuation Relationship Type	Source	Closest Distance (km)	Maximum Magnitude	Mechanism	Dip Angle (degree)	Dips Direction	Site Lies
	FM32-Contra Costa (Larkey) 2011 CFM	172.21	7.3	Strike Slip	90	--	S
	FM32-Contra Costa (Ozal - Columbus) 2011 CFM	192.58	7.1	Strike Slip	90	--	SE
	FM32-Contra Costa (Reliez Valley) 2011 CFM	175.83	7.3	Strike Slip	90	--	S
	FM32-Contra Costa (Southampton) 2011 CFM	181.29	7.2	Strike Slip	80	SW	S
	FM32-Contra Costa (Vallejo) 2011 CFM	201.39	7.0	Strike Slip	77	SW	SE
	FM32-East Huasna 2011 CFM	146.04	7.9	SS|R	90	--	NW
	FM32-Fish Slough 2011 CFM	273.92	7.3	N|SS	60	W	SW
	FM32-Franklin 2011 CFM	170.21	7.3	Strike Slip	90	--	S
	FM32-Garlock (West)	281.70	8.2	Strike Slip	90	--	NW
	FM32-Great Valley 03 Mysterious Ridge	257.22	7.4	Reverse	16-20	SW,W	S
	FM32-Great Valley 03a Dunnigan Hills	250.16	6.5	Reverse	20	NE,E	S
	FM32-Great Valley 04a Trout Creek	237.93	7.4	Reverse	20	SW	SE
	FM32-Great Valley 04b Gordon Valley	212.18	7.5	Reverse	20	SW,W	S
	FM32-Great Valley 05 Pittsburg Kirby Hills alt2	182.45	7.6	Reverse	36-90	W	S
	FM32-Great Valley 06 Midland alt2	163.31	7.7	SS|R	30	W	S
	FM32-Great Valley 07 (Orestimba)	79.16	6.9	Reverse	20	SW	S
	FM32-Great Valley 08 (Quinto)	63.15	6.8	SS|R	25	SW	S
	FM32-Great Valley 09 (Laguna Seca)	48.68	6.6	Reverse	25	SW	S
	FM32-Great Valley 10 (Panoche)	17.00	7.6	Reverse	15-24	SW	SW
	FM32-Great Valley 11	33.67	7.5	Reverse	15-16	SW	W
	FM32-Great Valley 12	36.87	7.4	Reverse	15-17	SW	W
	FM32-Great Valley 13 (Coalinga)	68.04	7.4	Reverse	15-19	SW	NW
	FM32-Great Valley 14 (Kettleman Hills)	107.41	7.0	Reverse	22	SW	NW
	FM32-Green Valley 2011 CFM	192.20	7.9	Strike Slip	84	W	S
	FM32-Greenville (No) 2011 CFM	122.25	7.8	SS|R	84	NE	S
	FM32-Greenville (So) 2011 CFM	93.39	7.8	SS|R	87	E	S
	FM32-Hartley Springs 2011 CFM	249.04	7.4	Normal	50	NE,E	SW
	FM32-Hayward (No) 2011 CFM	168.60	7.7	Strike Slip	82	NE,E	SE
	FM32-Hayward (So) 2011 CFM	116.12	7.8	Strike Slip	76	NE	S
	FM32-Hayward (So) extension 2011 CFM	95.58	7.8	Strike Slip	48	NE,E	S
	FM32-Hilton Creek 2011 CFM	258.39	7.3	Normal	50	NE	SW

Attenuation Relationship Type	Source	Closest Distance (km)	Maximum Magnitude	Mechanism	Dip Angle (degree)	Dips Direction	Site Lies
	FM32-Hosgri	45.46	7.9	SS|R	80	NE,E	N
	FM32-Hosgri (Extension)	182.11	6.5	Strike Slip	80	E	N
	FM32-Hunting Creek - Bartlett Springs connector 2011	266.97	8.0	Strike Slip	90	--	S
	FM32-Hunting Creek - Berryessa 2011 CFM	235.00	7.9	Strike Slip	90	--	S
	FM32-Independence rev 2011	272.22	7.8	N|SS	50	NE,E	W
	FM32-Kern Canyon (Lake Isabella) 2011	272.38	7.3	N|SS	60	E	W
	FM32-Kern Canyon (North Kern) 2011	262.30	7.7	Normal	60	E	W
	FM32-Kern Canyon (South Kern) 2011	262.72	7.7	Normal	60	E	W
	FM32-La Panza 2011	126.19	7.3	Strike Slip	51	NE	NW
	FM32-Lake Isabella (Seismicity)	273.44	7.1	Strike Slip	90	--	W
	FM32-Las Positas	138.45	6.4	Strike Slip	90	--	S
	FM32-Lions Head 2011 CFM	175.76	7.6	Reverse	75	N,NE	NW
	FM32-Los Alamos 2011 CFM	207.41	7.7	SS|R	30	SW	NW
	FM32-Los Alamos extension	229.36	7.6	SS|R	30	S,SW	NW
	FM32-Los Medanos - Roe Island	181.68	7.8	SS|R	39	NE	S
	FM32-Los Osos 2011	122.48	7.8	SS|R	45	S,SW	N
	FM32-Lost Hills	137.05	6.8	Reverse	29	SW	NW
	FM32-Maacama 2011 CFM	258.26	7.6	Strike Slip	63	NE	SE
	FM32-Mission (connected) 2011 CFM	122.68	7.5	Strike Slip	90	--	SE
	FM32-Mission Ridge-Arroyo Parida-Santa Ana	257.13	8.1	SS|R	70	SE,S	NW
	FM32-Mono Lake 2011 CFM	261.29	6.6	Normal	50	NE,E	SW
	FM32-Monte Vista - Shannon 2011 CFM	88.25	8.1	SS|R	61	S,SW	SE
	FM32-Monterey Bay-Tularcitos	16.19	7.9	Strike Slip	90	--	NE
	FM32-Morales (East)	209.93	6.5	Reverse	32	N	NW
	FM32-Morales (West)	189.58	6.8	Reverse	32	NE	NW
	FM32-Mount Diablo Thrust	153.51	7.8	SS|R	38	NE	S
	FM32-North Channel	234.82	7.9	SS|R	26	N,NE,N	NW
	FM32-Oak Ridge (Offshore)	285.36	7.8	Reverse	32	S	NW
	FM32-Oak Ridge (Offshore) west extension	265.15	7.8	Reverse	67	S,SW	NW
	FM32-Oceanic - West Huasna	75.92	7.8	SS|R	58	N,NE,E	NW
	FM32-Ortigalita (North)	69.80	6.8	Strike Slip	90	--	S
	FM32-Ortigalita (South)	51.51	7.2	Strike Slip	90	--	S

Attenuation Relationship Type	Source	Closest Distance (km)	Maximum Magnitude	Mechanism	Dip Angle (degree)	Dips Direction	Site Lies
	FM32-Owens Valley	282.71	7.8	N|SS	90	--	W
	FM32-Owens Valley Keough Hot Springs	278.81	7.8	N|SS	50-86	NE,E	W
	FM32-Ozena	225.85	7.6	Reverse	33	S,SW	NW
	FM32-Pilarcitos 2011 CFM	123.15	8.0	SS|R	81	NE	SE
	FM32-Pine Mtn	251.63	7.7	SS|R	45	N,NE,N	NW
	FM32-Pitas Point (Upper)	247.54	7.9	Reverse	42	N	NW
	FM32-Pleito	247.26	8.1	SS|R	46	SE,S,S	W NW
	FM32-Point Reyes 2011 CFM	213.16	7.0	Reverse	53	N,NE,E	SE
	FM32-Point Reyes 2011 connector	178.74	8.0	SS|R	53	NE	SE
	FM32-Quien Sabe 2011 CFM	38.92	7.6	Strike Slip	85	SW	S
	FM32-Red Mountain	232.94	7.9	SS|R	56	N	NW
	FM32-Reliz 2011 CFM	6.33	8.1	Strike Slip	58	SW	SE
	FM32-Rinconada 2011 CFM	24.90	7.8	SS|R	82	SW,W	N
	FM32-Robinson Creek	267.59	6.5	Normal	50	SE	SW
	FM32-Rodgers Creek - Healdsburg 2011 CFM	217.10	7.6	Strike Slip	77	NE	SE
	FM32-Round Valley	259.19	7.2	Normal	50	NE,E	W
	FM32-San Andreas (Big Bend)	239.80	8.1	SS|R	90	--	NW
	FM32-San Andreas (Carrizo) rev	180.96	8.1	SS|R	90	--	NW
	FM32-San Andreas (Cholame) rev	119.36	8.2	Strike Slip	90	--	NW
	FM32-San Andreas (Creeping Section) 2011 CFM	22.97	8.4	Strike Slip	90	--	NW
	FM32-San Andreas (Mojave N)	284.82	8.0	Strike Slip	90	--	NW
	FM32-San Andreas (North Coast) 2011 CFM	201.69	7.9	Strike Slip	90	--	SE
	FM32-San Andreas (Parkfield)	83.90	8.2	Strike Slip	90	--	NW
	FM32-San Andreas (Peninsula) 2011 CFM	102.48	8.0	SS|R	90	--	SE
	FM32-San Andreas (Santa Cruz Mts) 2011 CFM	44.08	8.1	Strike Slip	79	SW	SE
	FM32-San Cayetano	283.03	8.1	SS|R	42	N	NW
	FM32-San Gabriel	292.70	7.7	Strike Slip	61	NE	NW
	FM32-San Gregorio (North) 2011 CFM	89.04	8	SS|R	90	--	SE
	FM32-San Gregorio (South) 2011 CFM	41.69	8.2	Strike Slip	75	NE,E	NE
	FM32-San Juan	111.48	7.4	SS|R	90	--	NW

Attenuation Relationship Type	Source	Closest Distance (km)	Maximum Magnitude	Mechanism	Dip Angle (degree)	Dips Direction	Site Lies
	FM32-San Luis Bay 2011 CFM	142.33	7.8	SS|R	90	--	N
	FM32-San Luis Range - Pecho 2011 CFM	142.45	6.6	Reverse	90	--	N
	FM32-San Luis Range (So Margin)	131.27	7.9	SS|R	45	N,NE	NW
	FM32-Santa Cruz Island	288.11	7.9	SS|R	90	--	NW
	FM32-Santa Rosa Island	277.21	7.9	SS|R	90	--	NW
	FM32-Santa Ynez (East)	263.76	7.7	SS|R	70	S	NW
	FM32-Santa Ynez (West)	226.09	7.7	SS|R	70	S,SW	N
	FM32-Santa Ynez River	205.76	7.7	SS|R	70	S,SW	N
	FM32-Sargent 2011 CFM	50.44	8.1	SS|R	90	--	SE
	FM32-Shoreline	134.42	7.8	SS|R	90	--	N
	FM32-Sierra Nevada (No Extension)	291.47	7.7	N|SS	50	E	W
	FM32-Silver Creek 2011 CFM	87.86	7.8	Strike Slip	75	NE,E	S
	FM32-Sisar	294.51	7.9	Reverse	29	S	NW
	FM32-South Cuyama	158.83	7.9	Reverse	33	S,SW	NW
	FM32-Swain Ravine - Spenceville	258.33	7.4	Normal	60	NE,E	S
	FM32-Ventura-Pitas Point	275.15	8	SS|R	64	N,NW,N	NW
	FM32-West Napa 2011 CFM	209.55	7	Strike Slip	75	SW,W	SE
	FM32-West Tahoe	284.73	7.3	Normal	50	E	SW
	FM32-White Mountains	288.92	7.4	Strike Slip	90	--	W
	FM32-White Wolf	261.67	7	Normal	50	E	SW
	FM32-White Wolf (Extension)	283.19	7.6	Strike Slip	90	--	SE
	FM32-Zayante-Vergeles	42.81	8	SS|R	76	SE,S	NW
	FM31_Normal	0.00	7.9	Normal	90	--	Above
	FM31_Reverse	0.00	7.9	Reverse	90	--	Above
	FM31_StrikeSlip	0.00	7.9	Strike Slip	90	--	Above
	FM32_Normal	0.00	7.9	Normal	90	--	Above
	FM32_Reverse	0.00	7.9	Reverse	90	--	Above
	FM32_StrikeSlip	0.00	7.9	Strike Slip	90	--	Above

ATTACHMENTS



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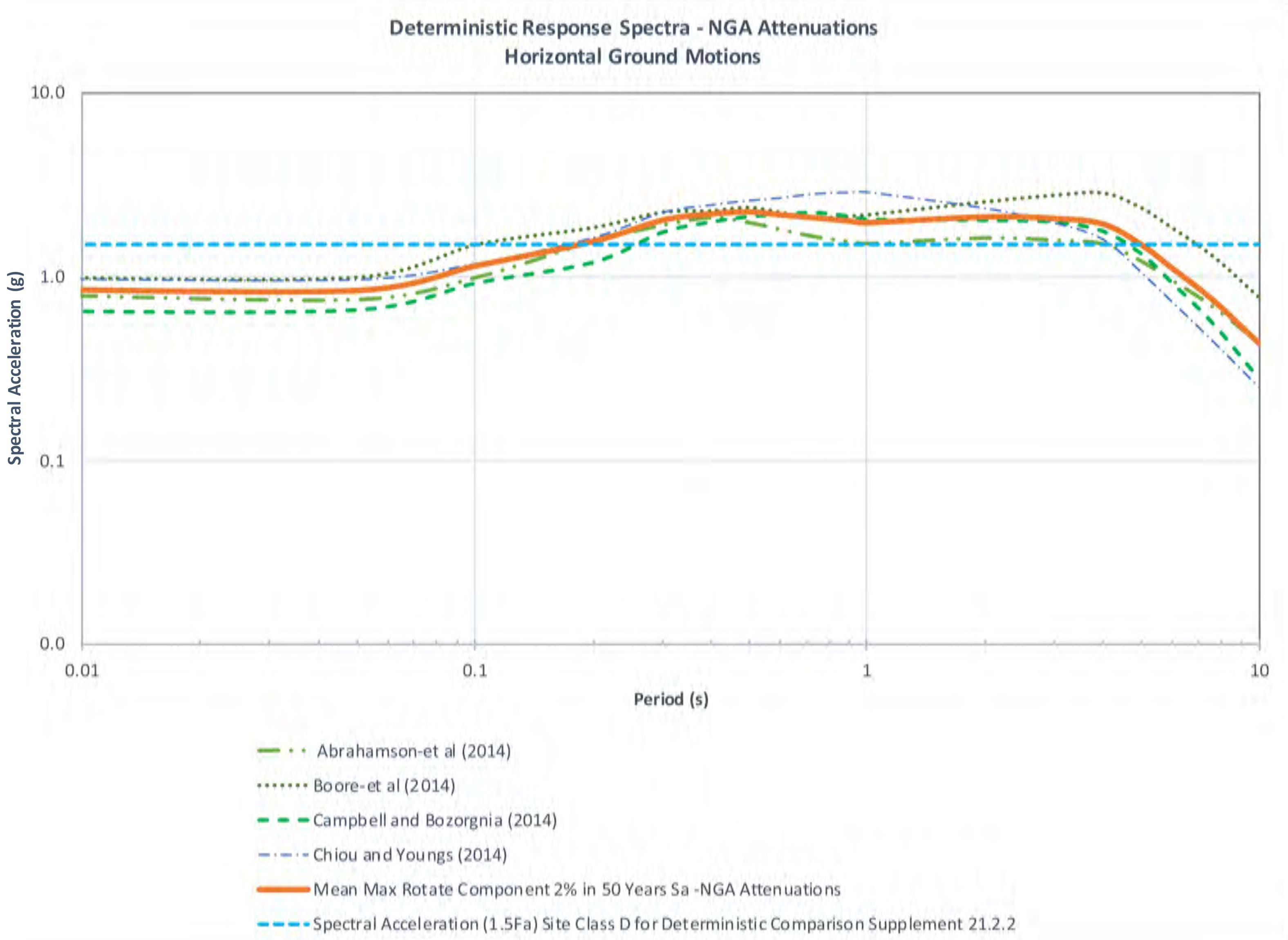
Appendix V
Figure 1
Probabilistic Response Spectra-NGA Attenuations
Prj. No: 24-1057.1
Date: 07/18/2024



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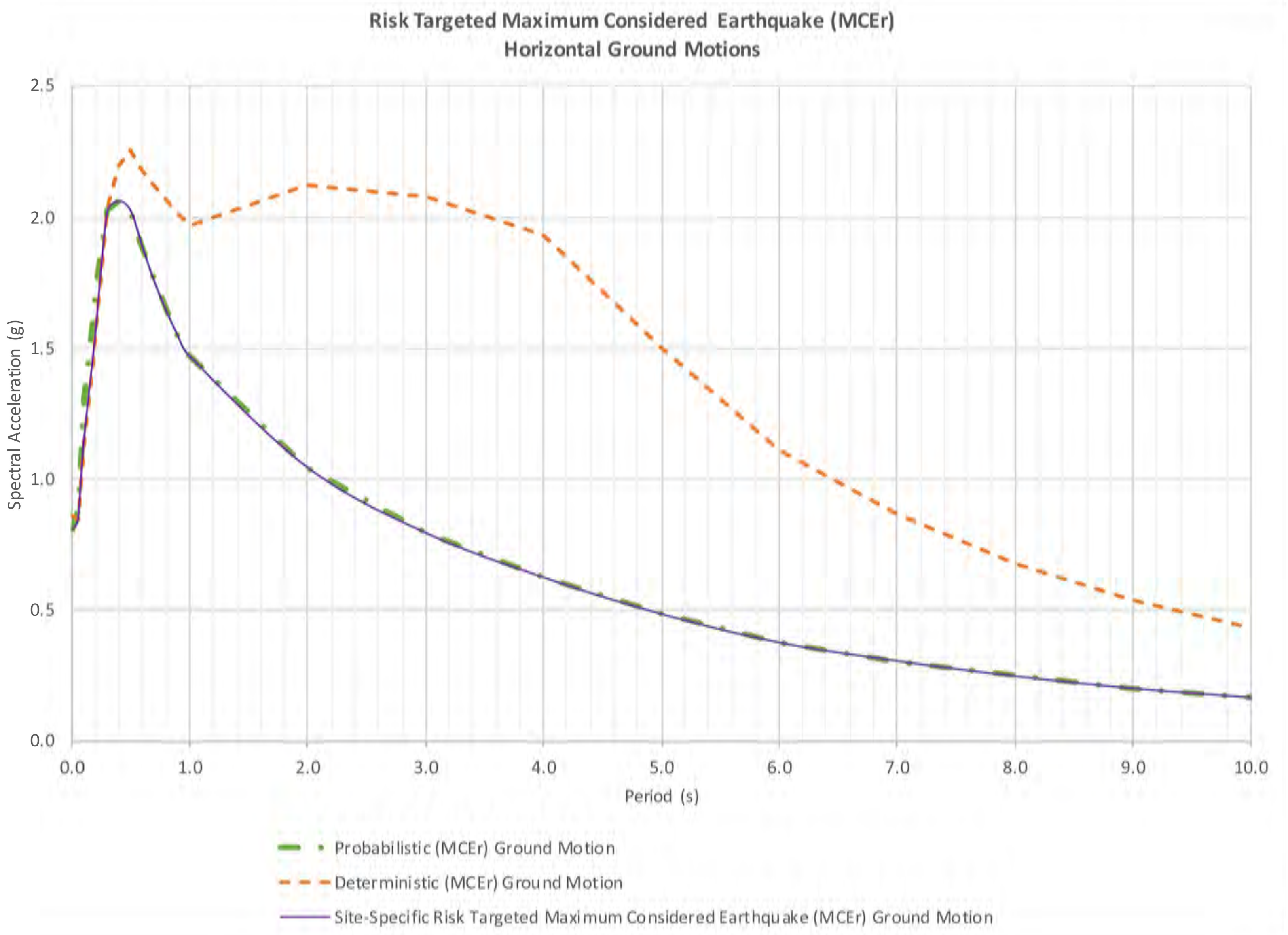
Appendix V
Figure 2
Deterministic
Response Spectra-
NGA Attenuations
Prj. No: 24-1057.1
Date: 07/18/2024



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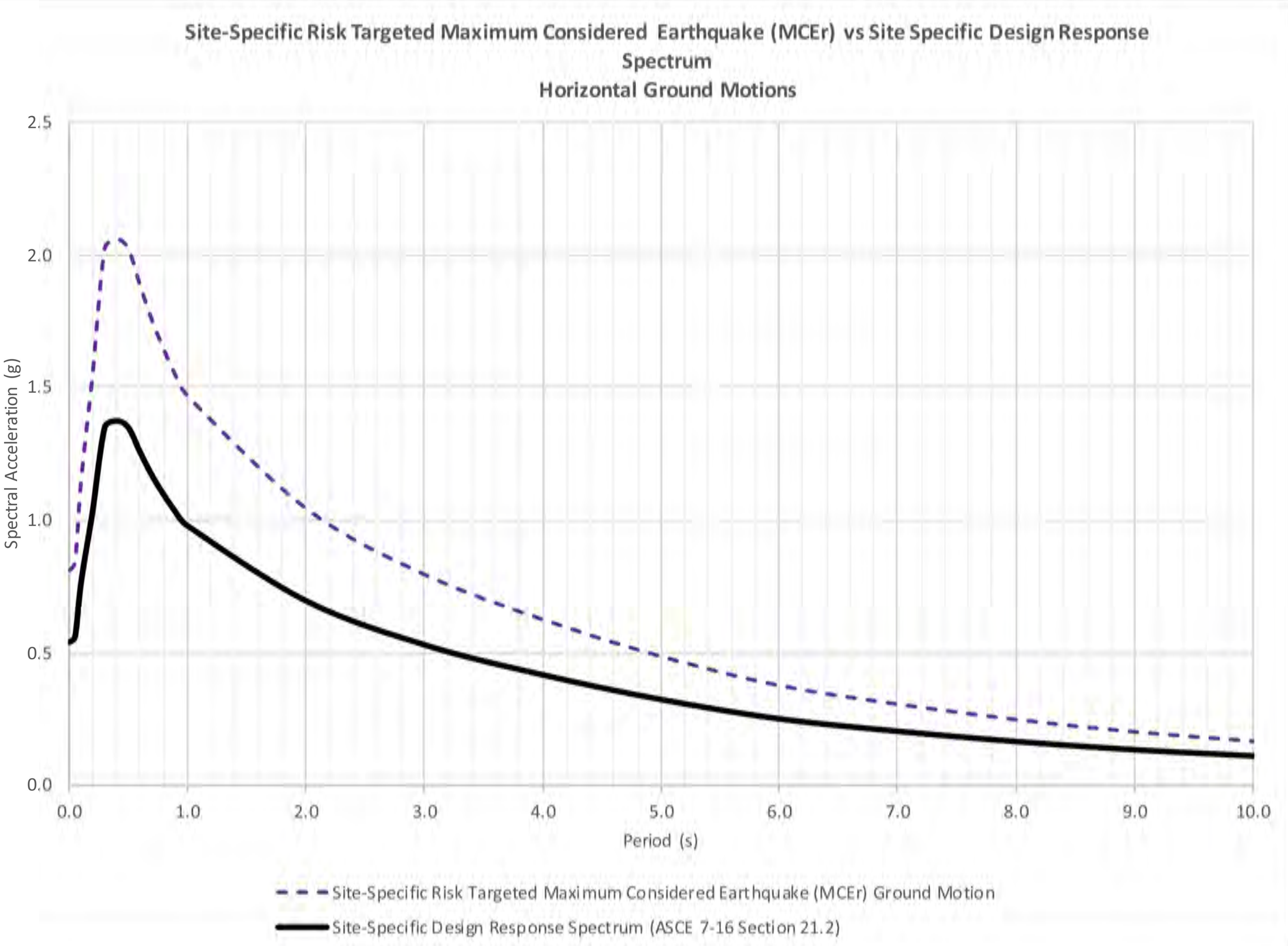
Appendix V
Figure 3
Risk Targeted Maximum Considered Earthquake (MCEr)
Prj. No: 24-1057.1
Date: 07/18/2024



Site-Specific Risk Targeted Maximum Considered Earthquake (MCEr) vs Site Specific Design Response Spectrum
Horizontal Ground Motions

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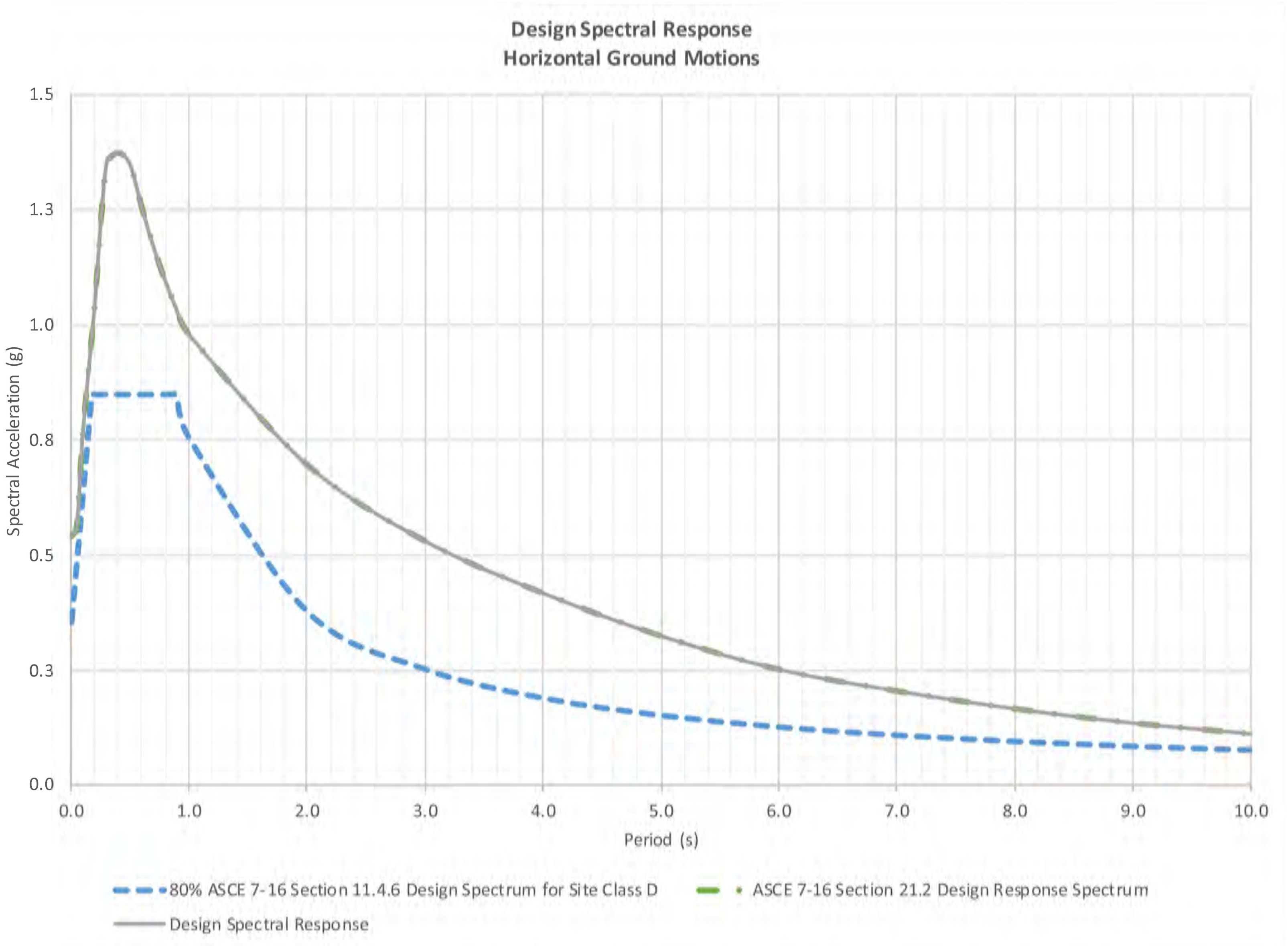
Appendix V
Figure 4
Site-Specific Risk Targeted Maximum Considered Earthquake (MCEr) vs Site Specific Design Response

Prj. No: 24-1057.1
Date: 07/18/2024



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Appendix V
Figure 5

Design Spectral Response Horizontal Ground Motions

Prj. No: 24-1057.1
Date: 07/18/2024