APPENDIX E

GEOTECHNICAL REPORT

STONE BEETLAND
SACRAMENTO, CALIFORNIA

PRELIMINARY GEOTECHNICAL REPORT

SUBMITTED TO
Mr. Clifton Taylor
Taylor Builders LLC
508 Gibson Drive, Suite 260
Roseville, CA 95678

PREPARED BY
ENGEO Incorporated

January 29, 2021

PROJECT NO.
18064.000.001

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Expect Excellence

Project No.
18064.000.001

January 29, 2021

Mr. Clifton Taylor
Taylor Builders, LLC
508 Gibson Drive, Suite 260
Roseville, CA 95678

Subject: Stone Beetland
Cosumnes River Boulevard
Sacramento, California

PRELIMINARY GEOTECHNICAL REPORT

Dear Mr. Taylor:

ENGEO prepared this preliminary geotechnical report for Taylor Builders LLC as outlined in our agreement dated November 20, 2020. We characterized the subsurface conditions at the site to provide the enclosed preliminary geotechnical recommendations for general planning purposes.

From a geotechnical standpoint, the site is suitable for the planned development provided the conclusions and preliminary recommendations presented in this report are incorporated into the preliminary design. We recommend a design-level study be performed to sufficiently assess existing fill and expansive soil conditions and to provide design-level site improvement recommendations.

If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

Stephen Blakely, PG
sb/jb/dt

Jonathon Boland, GE

REGISTERED PROFESSIONAL ENGINEER
JONATHAN BOLAND
No. 2763
GEOTECHNICAL
STATE OF CALIFORNIA

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

ENGEO prepared this preliminary geotechnical report for design of Stone Beetland in Sacramento, California. We prepared this report as outlined in our agreement dated November 20, 2020. Taylor Builders, LLC authorized ENGEO to conduct the following scope of services.

- Service plan development
- Subsurface field exploration
- Soil laboratory testing
- Data analyses and conclusions
- Report preparation

For our use, we received an untitled and undated aerial photograph showing the approximate site boundaries, and a Preliminary A.L.T.A./N.S.P.S Land Title Survey prepared by CBG Civil Engineers, dated December 15, 2020, both delivered electronically via email. We also received a Preliminary Title Report, prepared by Stewart Title of Sacramento, dated August 15, 2019, also delivered electronically via email.

This report was prepared for the exclusive use of our client and their consultants for preliminary design of this project. In the event that any changes are made in the character, design, or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without our express written consent.

1.2 PROJECT LOCATION

Figure 1 displays a Site Vicinity Map. The approximately 111-acre site is located north of Cosumnes River Boulevard, west of Morrison Creek, and approximately 1 mile east of Interstate 5 in Sacramento, California. Site access is provided from Cosumnes River Boulevard.

Figure 2 shows site boundaries and our exploratory locations. The site is bordered by a residential development and undeveloped land to the north, undeveloped land to the west, Cosumnes River Boulevard and undeveloped land to the south, and Morrison Creek to the east.

1.3 PROJECT DESCRIPTION

Based on our discussions with you, we understand site development will predominantly include single-family homes in the western portion of the site and multi-family homes in the eastern portion. While no specific development details are available, we assume that the single-family homes will likely be 1- or 2-story wood-frame buildings with associated streets, underground utilities, and landscaping; the multi-family houses will be 2- to 3-story wood-frame buildings with associated streets, parking lots, and utilities. We also assume that cuts and fills for mass grading will be minimal, likely less than 5 feet maximum.

2.0 FINDINGS

2.1 SITE BACKGROUND

We reviewed select topographic maps of the site dating back to 1894 and select aerial photographs dating back to 1937. Based on our review of select maps and photos, the site appears to have been mostly undeveloped land as far back as 1894. The 1894 topographic map depicts the site as undeveloped land with intermittent streams crossing the northeastern and southeastern portions of the site. An intermittent stream is mapped crossing the southeastern portion of the site in the 1941, 1947, and 1953 topographic maps; this stream is mapped east of the site beginning in the 1968 map, and is labelled as Morrison Creek.

PHOTO 2.1-1: 1953 Topographic Map Showing Intermittent Stream

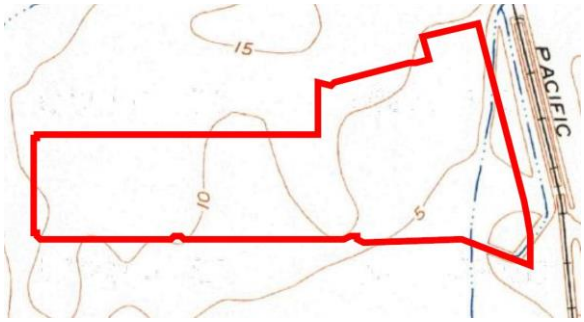
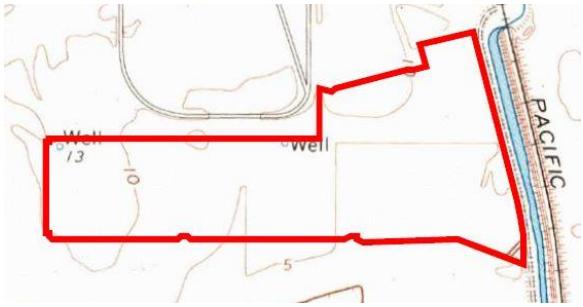


PHOTO 2.1-2: 1968 Topographic Map Showing Morrison Creek realigned



Agricultural fields and row crops are shown on site beginning in the 1957 aerial photograph; the fields remain through the 1999 photograph, with the exception of the northeastern portion of the site, which appears to have last been farmed in the 1966 photograph. Following the agricultural use, the site appears to be vacant in the 2006 through 2016 aerial photographs. Water wells are mapped in the northwestern and north-central portion of the site beginning in the 1968 topographic map. A light rail station and associated rail tracks are shown in the westernmost portion of the site in the 2016 aerial photograph. A few small garden plots are shown in the northeasternmost portion of the site in the 2009 through 2016 photographs.

The light rail station shown in the 2016 aerial photograph is the Sacramento Regional Transit (RT) Morrison Creek Station, a part of the South Sacramento Corridor Phase II Project, and was still under construction at the time of this report. The Preliminary A.L.T.A./N.S.P.S Land Title Survey indicates that this station is within an area granted to the Sacramento Regional Transit District (SRTD) as an easement (Figure 2). We reviewed a Preliminary Geotechnical Report prepared by Taber Consultants, dated May 24, 2006, and a Revised Final Geotechnical Report prepared by Blackburn Consulting, dated January 2010 for the South Sacramento Corridor Phase II Project. The reports included geotechnical recommendations and subsurface conditions at the Morrison Creek Station located on the eastern portion of the site.

The preliminary report (Taber 2006) indicated that the light rail tracks and Morrison Creek Station are underlain by the fill embankment of the Morrison Creek levee, but the report did not perform any explorations west of Morrison Creek. This preliminary report identified the presence of existing fills, medium to high expansion potential of native near-surface soil, and poor drainage of near-surface soil as the geotechnical conditions that required consideration.

The final geotechnical report (Blackburn 2010) included six boring logs from within or very near to the site and provided recommendations for expansive soil mitigation, existing fill mitigation, and other geotechnical considerations. The approximate locations of these previous borings are shown on Figure 2 and the boring logs are included in Appendix C.

We also reviewed boring logs from the DWR Urban Levee Evaluation in the vicinity of the site. Two borings were performed west of the Morrison Creek levee in the vicinity of the site. These borings, WM0009_024B and WM0009_025B, indicate that the levee consists of between 15½ and 17 feet of levee fill, which overlies native fat clay, lean clay, and clayey sand. The approximate locations of the borings are shown on Figure 2 and the boring logs are included in Appendix C.

2.2 FIELD EXPLORATION

We observed drilling of 10 borings at the locations shown on the Site Plan, Figure 2, on January 6 and January 7, 2021. An ENGEO representative observed the drilling and logged the subsurface conditions at each location. We retained a truck-mounted Mobile B24 drill rig and crew to advance the borings using 4-inch-diameter solid-flight auger methods. The borings were advanced to depths ranging from 11 to 41½ feet below existing grade. We permitted and backfilled the borings in accordance with the requirements of the Sacramento County Environmental Management Department. The location and elevations of our explorations are approximate and were estimated by a GPS-enabled smart phone and proximity to site features; they should be considered accurate only to the degree implied by the method used.

PHOTO 2.2-1: Drilling 1-B9

PHOTO 2.2-2: Surface Conditions, Looking West

We obtained bulk soil samples from drill cuttings and retrieved disturbed soil samples at various intervals in the borings using both standard penetration test and modified California drive samplers.

The blow counts for driven samples were obtained by dropping a 140-pound hammer through a 30-inch free fall. The 2-inch O.D. split-spoon sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration. In addition, 2.5-inch I.D. samples were obtained using a Modified California Sampler driven into the soil with the 140-pound hammer previously described. Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows to drive the last 1 foot of penetration; the blow counts have not been converted using any correction factors. When sampler driving was difficult, penetration was recorded only as inches penetrated for 50 hammer blows.

We used the field logs to develop the report logs in Appendix A. The logs depict subsurface conditions at the exploration locations for the date of exploration; however, subsurface conditions may vary with time.

2.3 GEOLOGY AND SEISMICITY

2.3.1 Geology

The site is located in the Great Valley Geomorphic Province. The Great Valley is an elongate, northwest-trending structural trough bound by the Coast Ranges on the west and the Sierra Nevada on the east. The Great Valley has been and is presently being filled with sediments primarily derived from surrounding mountain ranges.

As shown in Figure 3, the site is underlain by Pleistocene to Holocene alluvial deposits. Dawson (2009) mapped the underlying geologic formation at the site as the Middle unit of the Riverbank Formation (Qr_2). This formation consists of semi-consolidated red alluvium derived from the western slopes of the Sierra Nevada, and composed of gravel, sand, and silt. In the southeastern portion of the site, the Riverbank Formation is overlain by Holocene Basin deposits (Qhb). These deposits are fine-grained silt and clay derived from the same sources as the Pleistocene alluvium.

2.3.2 Seismicity

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist within the site. Fault rupture through the site, therefore, is not anticipated.

The Northern California area contains numerous active earthquake faults. Nearby active faults include the Great Valley Midland, Gordon Valley, and Trout Creek faults, located approximately 30.2, 48.3, and 48.7 miles from the site, respectively. An active fault is defined by the California Geologic Survey as one that has had surface displacement within Holocene time (about the last 11,000 years) (Bryant and Hart 2007).

Numerous small earthquakes occur every year in the Northern California Region, and larger earthquakes have been recorded and can be expected to occur in the future. Figure 4 shows the approximate locations of these faults and significant historic earthquakes recorded within the Northern California Region. The Uniform California Earthquake Rupture Forecast (UCERF 3) (Field et al. 2015) estimates the 30-year probability for a magnitude 6.7 or greater earthquake in Northern California at approximately 95 percent, considering the known active seismic sources in the region.

To determine nearby active faults that are capable of generating strong seismic ground shaking at the site, we utilized the USGS Unified Hazard Tool and deaggregated the hazard at the peak ground acceleration (PGA) for 2,475-year return period, with the resulting faults listed below in Table 2.3.2-1.

TABLE 2.3.2-1: Active Faults Capable of Producing Significant Ground Shaking at the Site (Latitude: 38.4657° Longitude: -121.4700°)

SOURCE	R_{RUP}		MOMENT MAGNITUDE M_W
	(KM)	(MILES)	
Great Valley 04b Gordon Valley [3]	48	30	6.95
Great Valley 06 (Midland) alt1 [1]	30	19	6.85
Great Valley 04a Trout Creek [2]	49	30	7.06
Hunting Creek - Berryessa [0]	66	41	7.43

*USGS Unified Hazard Tool - Edition: Dynamic Conterminous U.S. 2014 (update) (v4.2.0)

Historically, no significant damage in the Sacramento region has yet been caused by earthquakes; however, notable ground shaking has been felt from distant earthquakes. These seismic events include the 1892 Vacaville-Winters Magnitude 6.4, the 1906 San Francisco Magnitude 7.8, the 1989 Loma Prieta Magnitude 6.9, and the 2014 South Napa Magnitude 6.0 earthquakes. Although the Foothill Fault System is not mapped in the USGS database, the Cleveland Hills fault Segment near Oroville, part of the Foothills Fault System, is approximately 65 miles from the site and produced a Magnitude 5.8 earthquake in 1975. Segments of the Foothills Fault System are not considered active, but could be capable of a large magnitude earthquake.

2.4 SURFACE CONDITIONS

At the time of our exploration, the surface of the site was relatively level, and covered with a moderate to heavy growth of grasses and weeds. While no topographic data was provided, the surface elevations from Google Earth indicate site grades ranging from approximate Elevation 17 feet above mean sea level (msl) in the north to approximate Elevation 7 feet above msl to the southeast (Datum WGS 84) (across an approximate horizontal distance of 2,250 feet). A break in grade occurs at a north-south-oriented shallow ditch that separates the approximately 40-acre western portion of the site from the eastern approximately 70 acres. At this location, the ground surface is approximately 2 feet higher to the east than to the west of the ditch.

During our exploration, we observed the following additional surface conditions.

- Partially constructed Morrison Creek RT Station, with light rail tracks, equipment/maintenance buildings, and parking lot within an easement in the eastern portion of the site
- A stormwater basin located south of the Morrison Creek RT Station
- Concrete sidewalks and street lighting along Cosumnes River Boulevard
- Underground utility access panels at Cosumnes River Boulevard with utility stubs apparently extending into the site from the south, indicated by posts and signage
- Underground utility manhole access covers and signage, at the western edge of the site
- Several manholes in the central and southeastern portions of the site
- An up to approximately 7-foot-deep, east-west-aligned unlined drainage ditch at the boundary between APN 053-0010-0048 and APN 053-0010-0076
- Two inactive groundwater wells in the north-central and northwestern portion of APN 052-0010-048

- Overhead high-voltage power lines and a gravel access road located in the northern portion of the site oriented approximately east-west
- Stockpiles consisting of soil and debris in the northeastern portion of the site

PHOTO 2.4-1: Partially Constructed Morrison Creek RT Station

PHOTO 2.4-2: City of Sacramento Manhole Located Within Utility Easement

Please refer to the Site Plan, Figure 2, for more information on site features.

2.5 SUBSURFACE CONDITIONS

We observed drilling of ten borings to depths ranging between 11 and 41½ feet at the locations shown on the Site Plan, Figure 2. The borings generally encountered a surficial layer of hard fat clay or elastic silt with varying amounts of sand, extending to a minimum depth of 2½ feet. An exception was Boring 1-B4, which encountered lean clay with sand at the ground surface. The surficial clay / silt was generally underlain by lean clay with sand, sandy lean clay, or clayey sand in Borings 1-B1 through 1-B7. The clay in these borings was generally very stiff to hard and exhibited low to medium plasticity, while the sands were generally fine-grained and very dense. Borings 1-B8 through 1-B10 encountered an approximately 8- to 15½-foot-thick layer of silty sand and/or silt at depths ranging from approximately 8½ feet (1-B9) to approximately 13 feet below the ground surface (1-B8 and 1-B10). The silty sand was loose to medium dense, and generally contained between 20 percent and 40 percent fines. The silt encountered was generally stiff to hard, with varying sand content. Stiff to hard clay was encountered below the sand/silt layer. Boring 1-B10 encountered an approximately 4½-foot-thick layer of silty sand at approximately 33 feet below the ground surface.

Consult the exploration logs in Appendix A for specific subsurface conditions at the exploration locations. The logs contain the soil type, color, consistency, and visual classification in general accordance with the Unified Soil Classification System. The logs graphically depict the subsurface conditions encountered at the time of the explorations.

2.6 GROUNDWATER CONDITIONS

We observed static groundwater in several of our subsurface explorations. We summarize our observations in the table below:

TABLE 2.6-1: Groundwater Observations

EXPLORATION LOCATION	APPROX. DEPTH TO GROUNDWATER (FEET)	APPROX. GROUNDWATER ELEVATION (FEET)
1-B1	17	-2
1-B8	12	-3
1-B9	12	-2
1-B10	17	-2

We reviewed the Department of Water Resources On-line Water Data Library for depth to water in the vicinity of the site. The website identified two wells within 1 mile of the site. Well Number 07N05E18C001M is mapped at the northwestern corner of the site, and has recorded groundwater measurements since 1990. The most recent measurement recorded was 19.4 feet below ground surface in October 2017.

We also reviewed the Sustainable Groundwater Management Act (SGMA) Data Viewer (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels), a website maintained by the State of California Department of Water Resources, for local groundwater data. The data viewer plotted groundwater contours that indicated groundwater elevations in the vicinity generally between 0 and -10 feet elevation from 2017 to 2020, with groundwater flow generally to the southeast.

Fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practice, and other factors not evident at the time measurements were made.

2.7 LABORATORY TESTING

We performed laboratory tests on select soil samples to evaluate some of their engineering properties. For this project, we performed moisture content, dry density, plasticity index, expansion index, sieve analysis, and limited soil corrosion testing. Moisture contents, dry densities, fines content, and plasticity indices are recorded on the boring logs in Appendix A; laboratory data sheets are included in Appendix B.

3.0 PRELIMINARY CONCLUSIONS

From a geotechnical engineering viewpoint, in our opinion, the site is suitable for the proposed development, provided the preliminary geotechnical recommendations in this report are properly incorporated into the design plans and specifications.

The primary geotechnical concerns that could affect development on the site are existing fill and expansive soil. We summarize our conclusions below.

3.1 EXISTING FILL/LOOSE SURFACE SOIL

Our review of historical aerial photographs, topographic maps and previous reports and records indicate that portions of the site are underlain by existing fill. Background research indicates that a previous alignment of Morrison Creek once passed through the eastern portion of the site. In addition, two City of Sacramento sewer and drain utility easements cross the site oriented roughly north – south. Both the previous alignment of Morrison Creek and the City of Sacramento underground utilities represent existing fill on the site.

We observed soft/loose surface soil during our exploration. The site appears to have been annually disced, presumably for vegetation/fire control, and the upper approximately 1 foot of soil appears to consist of soft/disturbed clay. We anticipate typical site preparation as described in Section 4.1, Earthwork, will mitigate the soft/loose surface soil at the site.

Non-engineered fills can undergo excessive settlement, especially under new fill or building loads. We recommend that the design-level geotechnical investigation should further investigate and delineate the on-site fill. If documentation of previous fill placement is not obtained, we recommend complete removal and recompaction of the existing fill. We present preliminary fill removal recommendations in Section 4.1.

3.2 EXPANSIVE SOIL

We observed potentially expansive fat clay near the surface of the site in Borings 1-B1 through 1-B3, and 1-B5 through 1-B9. Our laboratory testing indicates that this soil exhibits moderate to high shrink/swell potential with variations in moisture content. The Revised Final Geotechnical Report for the South Sacramento Corridor Phase II Project (Blackburn 2010) included several tests for expansion index from within or near to the site. The tests indicated an expansion index of between 81 and 104, also indicating a moderate to high shrink/swell potential in near surface soil.

Expansive soil changes in volume with changes in moisture. They can shrink or swell and cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. Building damage due to volume changes associated with expansive soil can be reduced by: (1) using a rigid mat foundation that is designed to resist the settlement and heave of expansive soil, (2) deepening the foundations to below the zone of moisture fluctuation, i.e. by using deep footings or drilled piers, and/or (3) using footings at normal shallow depths but bottomed on a layer of select fill having a low expansion potential.

Based on the conditions encountered and our experience with similar developments in the area, it is our opinion that post-tensioned mat foundations may be the preferred foundation system for the proposed structures to mitigate expansive soil conditions. Preliminary design criteria for this foundation type are presented in Section 4.2.

We have also provided specific grading recommendations for compaction of clay soil at the site. The purpose of these recommendations is to reduce the swell potential of the clay by compacting the soil at a high moisture content and controlling the amount of compaction.

The design-level geotechnical report should investigate other expansive soil mitigation alternatives based on the final development details and layout.

3.3 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking and ground lurching. The following sections present a discussion of these hazards as they apply to the site. Based on topographic and lithologic data, the risk of regional subsidence or uplift, soil liquefaction, lateral spreading, landslides, tsunamis, flooding or seiches is considered low to negligible at the site.

3.3.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone, it is our opinion that ground rupture is unlikely at the subject property.

3.3.2 Ground Shaking

An earthquake of moderate to high magnitude generated within Northern California region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, structures should be designed using sound engineering judgment and the 2019 California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.3.3 Liquefaction

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soil most susceptible to liquefaction is clean, loose, saturated, uniformly graded, fine-grained sand. The sand encountered in our borings was generally medium to very dense and contained a significant amount of fine-grained material. Loose layers encountered in our explorations were relatively thin and discontinuous. For these reasons and based upon engineering judgment, it is our opinion that the potential for liquefaction at the site is low during seismic shaking.

3.3.4 Ground Lurching

Ground lurching is a result of the rolling motion imparted to the ground surface during energy released by an earthquake. Such rolling motion can cause ground cracks to form in weaker soil. The potential for the formation of these cracks is considered greater at contacts between deep alluvium and bedrock. Such an occurrence is possible at the site as in other locations in the northern California region, but based on the site location, it is our opinion that the offset is expected to be minor. We provide recommendations for foundation and pavement design in this report that are intended to reduce the potential for adverse impacts from lurch cracking.

3.3.5 Flooding

We reviewed the Federal Emergency Management Agency (FEMA) Flood Insurance Maps for Sacramento County, California and Incorporated Areas (Map 06067C030305H) dated August 16, 2012. The site is mapped as Zone X, an area with reduced flood risk due to levee. The Civil Engineer should review pertinent information relating to possible flood levels for the

subject site based on final pad elevations and provide appropriate design measures for development of the project, as needed.

3.4 SOIL CORROSION POTENTIAL

We obtained representative soil samples and submitted to a qualified analytical lab for determination of pH, minimum resistivity, sulfate content, and chloride content. The results are included in Appendix B and summarized in the tables below.

TABLE 3.4-1: Corrosivity Test Results

SAMPLE LOCATION	DEPTH (FEET)	PH[1]	MINIMUM RESISTIVITY[1] (OHMS-CM)	CHLORIDE[2] (PPM)	SULFATE[3] (PPM)
1-B2	2	6.40	1,050	3.5	10.1
1-B5	5½	7.15	940	2.8	11.5
1-B8	4	7.08	720	50.1	24.9

(1) Per CA DOT Test #643; (2) Per CA DOT Test #422; (3) Per CA DOT Test #417

The 2019 CBC references the 2014 American Concrete Institute Manual, ACI 318-14, Section 19.3.1 for concrete durability requirements. ACI Table 19.3.1.1 provides the following exposure categories and classes, and Table 19.3.2.1 provides requirements for concrete in contact with soil based upon the exposure class.

TABLE 3.4-2: ACI Table 19.3.1.1: Exposure Categories and Classes

CATEGORY	SEVERITY	CLASS	CONDITION	
F Freezing and thawing	Not Applicable	F0	Concrete not exposed to freezing-and-thawing cycles	
	Moderate	F1	Concrete exposed to freezing-and-thawing cycles and occasional exposure to moisture	
	Severe	F2	Concrete exposed to freezing-and-thawing cycles and in continuous contact with moisture	
	Very Severe	F3	Concrete exposed to freezing-and-thawing cycles and in continuous contact with moisture and exposed to deicing chemicals	
			WATER- SOLUBLE SULFATE IN SOIL % BY WEIGHT*	DISSOLVED SULFATE IN WATER MG/KG (PPM)**
S Sulfate	Not applicable	S0	$SO_4 < 0.10$	$SO_4 < 150$
	Moderate	S1	$0.10 \leq SO_4 < 0.20$	$150 \leq SO_4 \leq 1{,}500$ seawater
	Severe	S2	$0.20 \leq SO_4 \leq 2.00$	$1{,}500 \leq SO_4 \leq 10{,}000$
	Very severe	S3	$SO_4 > 2.00$	$SO_4 > 10{,}000$
			CONDITION	
P Requiring low permeability	Not applicable	P0	In contact with water where low permeability is not required.	
	Required	P1	In contact with water where low permeability is required.	
	Not applicable	C0	Concrete dry or protected from moisture	
	Moderate	C1	Concrete exposed to moisture but not to external sources of chlorides	

CATEGORY	SEVERITY	CLASS	CONDITION
C Corrosion protection of reinforcement	Severe	C2	Concrete exposed to moisture and an external source of chlorides from deicing chemicals, salt, brackish water, seawater, or spray from these sources

* Percent sulfate by mass in soil determined by ASTM C1580
**Concentration of dissolved sulfates in water in ppm determined by ASTM D516 or ASTM D4130

In accordance with these ACI tables, the soil at the site is categorized as being within the S0 sulfate exposure class. Considering a S0 sulfate exposure class, the code requires a minimum compressive strength of 2,500 psi. For this sulfate range, we recommend Type II cement and a concrete mix design for foundations and building slabs-on-grade that incorporates a maximum water-cement ratio of 0.50. It should be noted, however, that the project's design requirements for concrete may result in more stringent concrete specifications.

Laboratory tests on representative soil samples from the site indicate chloride concentrations in soil of less than 51 ppm. ACI Table 19.3.1.1 provides exposure categories for corrosion protection of reinforcement and references sources of chlorides from deicing chemicals, salt, brackish water, and seawater. Typical chloride concentrations for seawater are about 19,200 ppm and for brackish water may be in the range of 500 to 5,000 ppm. Since the chloride test results from the site are substantially lower than that of seawater or brackish water, we recommend an exposure class of C0 or C1 depending on the location of the structural element (i.e. protected from moisture or exposed to moisture).

The resistivity measurements indicate the soil at the site is classified as highly to extremely corrosive to buried metal piping, according to the National Association of Corrosion Engineers' 2006 *Corrosion Basics - an Introduction* interpretation of resistivity.

If desired to investigate this further, we recommend a corrosion consultant be retained to evaluate if specific corrosion recommendations are advised for the project.

3.5 2019 CBC SEISMIC DESIGN PARAMETERS

We provide the 2019 CBC seismic design parameters in Table 3.5-1, which include design spectral response acceleration parameters based on the mapped Risk-Targeted Maximum Considered Earthquake (MCE_R) spectral response acceleration parameters. We characterized the site as Site Class D in accordance with the 2019 CBC.

TABLE 3.5-1: 2019 CBC Seismic Design Parameters Latitude: 38.4657° Longitude: -121.4700°

PARAMETER	VALUE
Site Class	D
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	0.587
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	0.256
Site Coefficient, F_a	1.331
Site Coefficient, F_v	Null*
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	0.781
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	Null*
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	0.52

PARAMETER	VALUE
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	Null*
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	0.246
Site Coefficient, F_{PGA}	1.354
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	0.333

* Requires site-specific ground motion hazard analysis per ASCE 7-16 Section 11.4.8

Considering the 1- to 2-story single-family and 2- to 3-story multi-family residential development, we estimate the fundamental periods of the proposed structures to be less than $1.5T_s$ (where T_s is 0.68 seconds for this project). Therefore, the structural engineer may consider exception(s) of Section 11.4.8 of ASCE 7-16 as follows:

> "A ground motion hazard analysis is not required for structures… where, structures on Site Class D sites with S_1 greater than or equal to 0.2, provided the value of the seismic response coefficient C_s is determined by Eq. (12.8-2) of ASCE 7-16 for values of $T \leq 1.5T_S$."

4.0 PRELIMINARY RECOMMENDATIONS

The preliminary recommendations included in this report should be utilized for project planning purposes and are intended for the areas of the site that will be developed with structural improvements. These areas include, but are not limited to building pads, sidewalks, pavement areas, retaining walls, and/or soundwalls. Prior to development, we should be retained to prepare a design-level geotechnical report.

4.1 EARTHWORK

As used in this report, relative compaction refers to the in-place dry unit weight of soil expressed as a percentage of the maximum dry unit weight of the same soil, as determined by the ASTM D1557 laboratory compaction test procedure, latest edition. Compacted soil is not acceptable if it is unstable; it should exhibit only minimal flexing or pumping, as observed by an ENGEO representative. The term "moisture condition" refers to adjusting the moisture content of the soil by either drying if too wet or adding water if too dry. Expansive soil, as used in this report, refers to soil that exhibits an expansion index (EI) of less than 50.

We define "structural areas" as any area sensitive to settlement of compacted soil. These areas include, but are not limited to building pads, sidewalks, pavement areas, and retaining walls.

4.1.1 Existing Fill Removal

Although we did not identify existing fill in our borings, site background research indicates that a previous alignment of Morrison Creek once passed through the eastern portion of the site. In addition, two City of Sacramento sewer and drain utility easements cross the site oriented roughly north – south. Both the previous alignment of Morrison Creek and the City of Sacramento underground utilities represent existing fill on the site. If documentation of previous fill placement is not obtained, remove existing fill to competent native soil, or as evaluated by ENGEO. Figure 2 displays the approximate locations of existing fill based on our background research. The lateral extent and depth of fill is expected to vary and additional exploration during a design-level geotechnical investigation should further delineate fill onsite.

4.1.2 Fill Compaction

We recommend removal of existing fills, stripping of organics, scarification, moisture conditioning, and compaction of the soil prior to fill placement, following cutting operations, and in areas left at grade. For low-expansion potential native or import soil (Expansion Index less than or equal to 50), we recommend compaction of fill and trench backfill to at least 90 percent relative compaction (ASTM D-1557) and compaction of the upper 6 inches of finish pavement subgrade to at least 95 percent relative compaction prior to aggregate base placement. Soil should be compacted at a minimum of 1 percentage point over optimum moisture content. For expansive native soil (Expansion Index greater than 50), we recommend that fill be compacted within a range of 87 to 92 percent relative compaction at a moisture content at least 4 percentage points above optimum. Landscape fills can generally be compacted to a minimum of 85 percent relative compaction. Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material.

4.1.3 Acceptable Fill

In general, we anticipate the on-site soil should be suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 6 inches in maximum dimension. Imported fill should also meet the above requirements and have an Expansion Index less than 50.

4.1.4 Organic Content

We recommend material placed as engineered fill contain no more than 3 percent organic content by weight. We recommend soil samples be collected for laboratory testing to determine organic content during the design-level report. Strip organics from the ground surface to a depth of at least 2 to 3 inches below the surface. Remove strippings from the site or, if considered suitable by the landscape architect and owner, use them in landscape fill.

4.1.5 Slope Gradients

For cut and fill slopes up to 8 feet tall, construct final slope gradients to 2:1 (horizontal:vertical) or flatter. The contractor is responsible to construct temporary construction slopes in accordance with CALOSHA requirements. Final slopes should be protected from surface erosion by installation of appropriate best management practices (BMPs) or finish landscaping.

4.2 FOUNDATIONS

We recommend that 1- and 2-story single-family and 2- to 3-story multi-family structures be supported on post-tensioned (PT) mat foundations bearing on competent native soil or compacted fill. On a preliminary basis, we recommend PT mats be approximately 10 inches thick, or greater, and have a thickened edge at least 2 inches greater than the mat thickness. The thickened edge should be at least 12 inches wide. Design PT mats for a maximum average allowable bearing pressure of 1,000 pounds per square foot (psf) for dead plus live loads, with maximum localized bearing pressures of 1,500 psf at column or wall loads.

Final post-tensioned foundation design should be performed by a structural engineer based on the procedure presented by the Post-Tensioning Institute “Design of Post-Tensioned Slabs-on-Ground” Third Edition, including appropriate addenda (2004).

4.3 PAVEMENTS

4.3.1 Flexible Pavements

Based on our preliminary exploration and laboratory testing, we judged an R-value of 5 to be appropriate for preliminary pavement design. Using a preliminary design R-value of 5 and Procedure 633 of the Caltrans Highway Design Manual (including the asphalt factor of safety), we developed the preliminary pavement sections in Table 4.3.1-1.

TABLE 4.3.1-1: Preliminary Hot Mix Asphalt Pavement Sections

TRAFFIC INDEX (TI)	SECTION	
	HOT MIX ASPHALT (INCHES)	AGGREGATE BASE (INCHES)
4.5	4*	8
5.0	4*	10
6.0	4*	14
7.0	4*	17

*City of Sacramento minimum structural section (Section 15.6.2)

The City of Sacramento 2009 *Design and Procedures Manual* (Section 15 – Street Design Standards) specifies minimum traffic indexes and pavement section thicknesses for various public street classifications. The minimum values are a TI = 4.5 and a minimum structural section of 4 inches of asphalt concrete over 8 inches of aggregate base. The design-level geotechnical report should include R-value testing to confirm final design-level pavement recommendations.

4.3.2 Rigid Pavements

Use concrete pavement sections to resist heavy loads and turning forces in areas such as fire lanes or trash enclosures. Final design of rigid pavement sections and accompanying reinforcement should be performed based on estimated traffic loads and frequencies. We recommend the following preliminary minimum design sections for rigid pavements.

- Use a minimum section of 6 inches of Portland Cement concrete over 6 inches of Caltrans Class 2 Aggregate Base.
- Concrete pavement should have a minimum 28-day compressive strength of 3,500 psi.
- Provide minimum control joint spacing in accordance with Portland Cement Association guidelines.

5.0 DESIGN-LEVEL GEOTECHNICAL REPORT

This report presents findings, conclusions, and preliminary geotechnical recommendations intended for planning purposes only. Future design-level geotechnical explorations should be performed when development plans are finalized. We anticipate the design-level geotechnical report will include:

- Additional subsurface exploration based on the actual development layout.
- Further delineation of suspected undocumented fills.

- Additional laboratory testing to determine moisture density, soil corrosion potential, soil expansion potential, and verify the design R-value for flexible pavements.
- Specific recommendations for site grading, foundations, sound and/or retaining walls (if applicable), and utility trench backfill.

6.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents preliminary geotechnical recommendations for design of the improvements discussed in Section 1.3 for the Stone Beetland project in Sacramento, California. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and preliminary recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, ENGEO must be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials must be notified immediately.

This document must not be subject to unauthorized reuse, that is, reusing without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

We determined the lines designating the interface between layers on the exploration logs using visual observations. The transition between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

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Taber Consultants, 2006, Preliminary Geotechnical Report – Draft Final, South Sacramento Phase II Corridor, Environmental and Preliminary Engineering, dated May 24, 2006.

FIGURES

N

0 2000
FEET

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

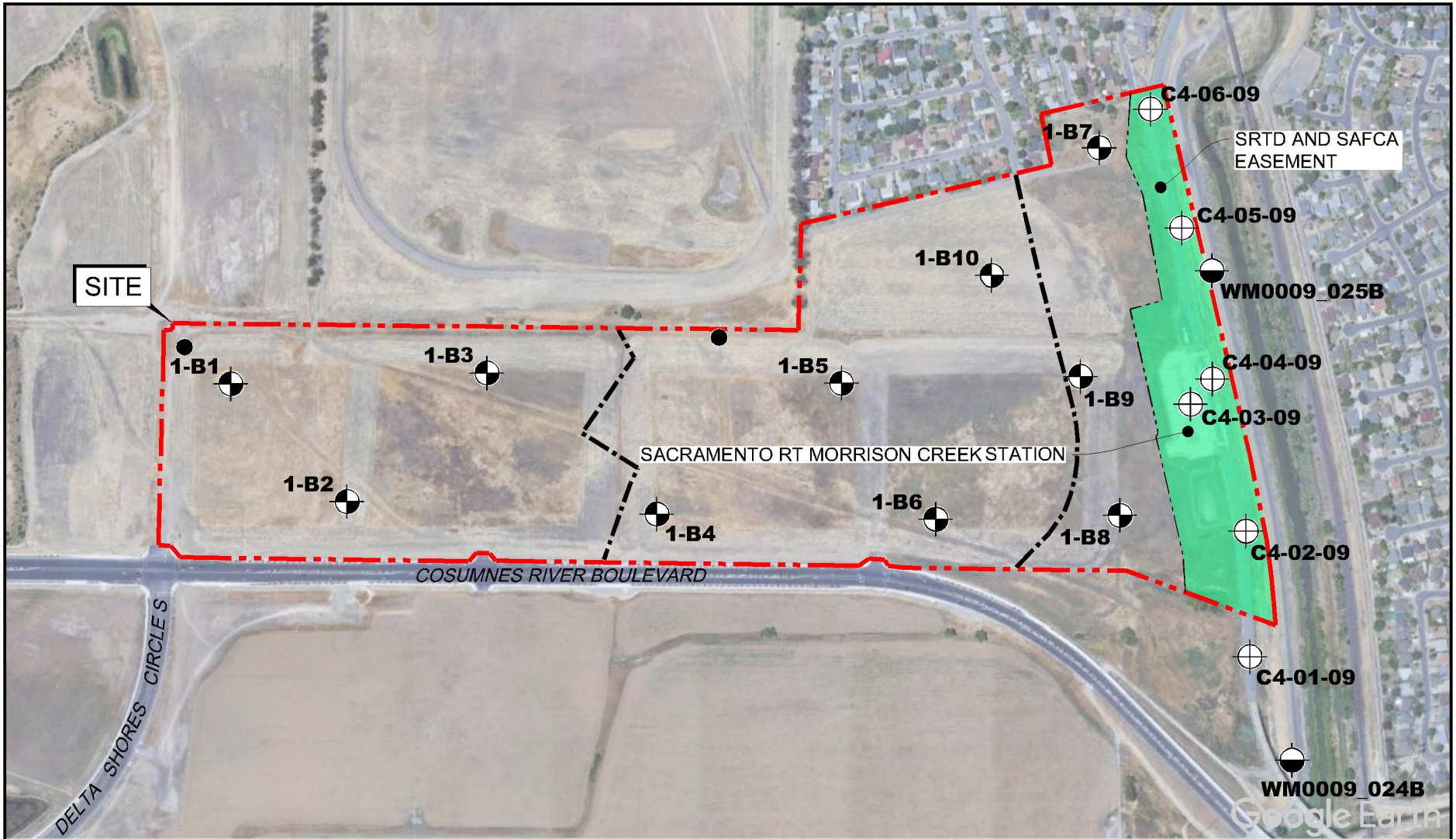
ENGEO
Expect Excellence

VICINITY MAP
STONE BEETLAND
SACRAMENTO, CALIFORNIA

PROJECT NO.: 18064.000.001	FIGURE NO. 1
SCALE: AS SHOWN	
DRAWN BY: CC	CHECKED BY: JCB

ORIGINAL FIGURE PRINTED IN COLOR

FILE PATH: \\engeo.com\files\Drafting\PROJECTS_18000 to 19999\18064\18064000001\GEX\18064000001_GEX_VM_1_0121.dwg SAVE DATE: 1/26/2021 2:04:22 PM SAVED BY: CCulbertson



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- CITY OF SACRAMENTO SEWER AND DRAIN EASEMENT
- ABANDONED GROUNDWATER WELLS
- 1-B10 BORING (ENGEO, 2020)
- WM0009_025B BORING (DWR, 2012)
- C4-05-09 BORING (BLACKBURN, 2009)

0 600 FEET

N

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence

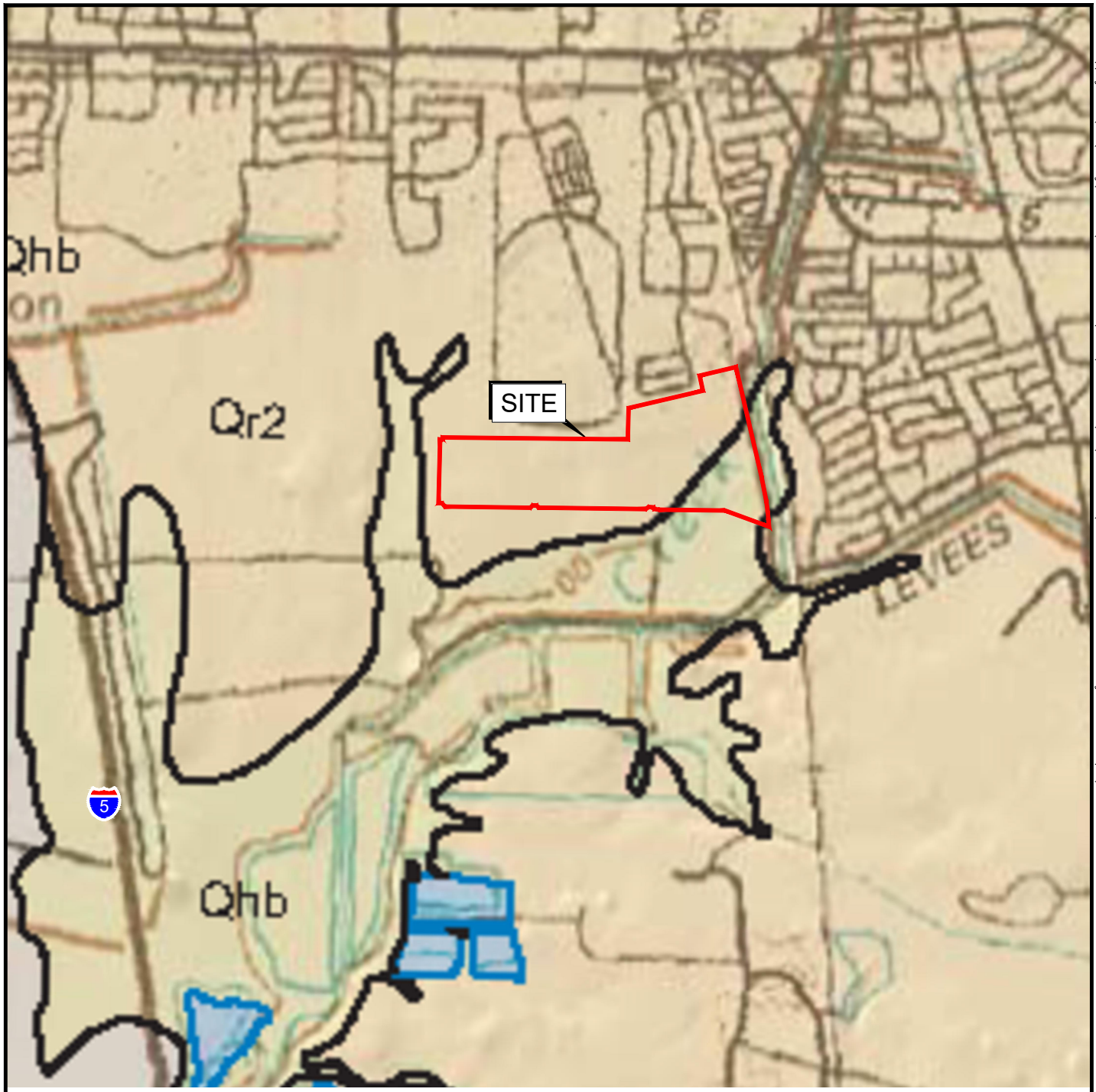
SITE SAMPLING LOCATIONS

STONE BEETLAND

SACRAMENTO, CALIFORNIA

PROJECT NO.: 18064.000.001	FIGURE NO. 2
SCALE: AS SHOWN	
DRAWN BY: CC	CHECKED BY: JCB

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

——— - - - -	GEOLOGIC CONTACT-DASHED WHERE GRADATIONAL OR APPROXIMATELY LOCATED
Qhb	HOLOCENE BASIN DEPOSITS
Qr2	RIVERBANK FORMATION, MIDDLE UNIT

N

0 2000
FEET

BASE MAP SOURCE: 30'X60' LODI QUADRANGLE, DAWSON 2009

ENGEO
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GEOLOGIC MAP
STONE BEETLAND
SACRAMENTO, CALIFORNIA

PROJECT NO.: 18064.000.001
SCALE: AS SHOWN
DRAWN BY: CC
CHECKED BY: JCB

FIGURE NO. 3

ORIGINAL FIGURE PRINTED IN COLOR

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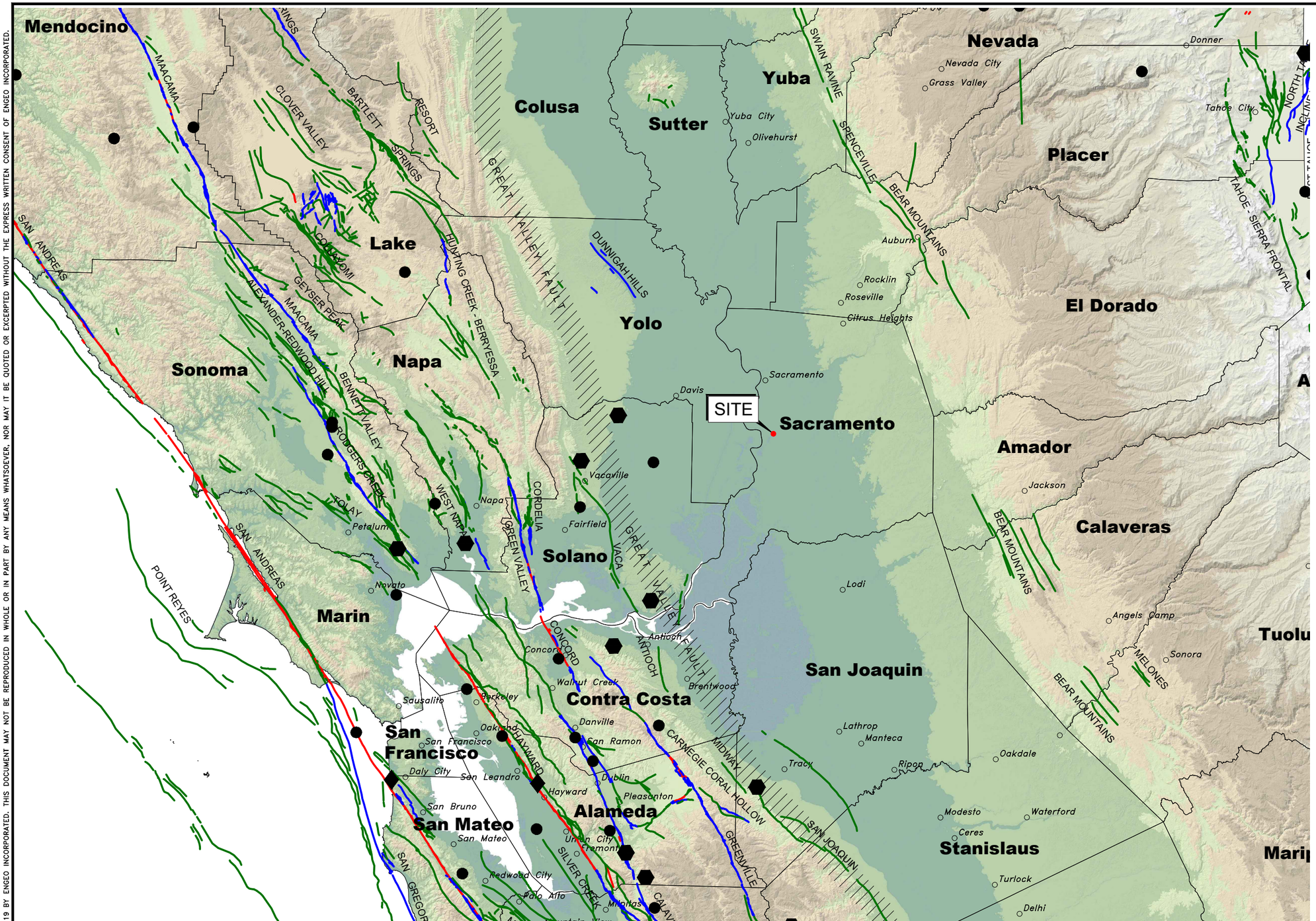

BASE MAP SOURCE:
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATASET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, NOVEMBER, 2010
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800–2000)

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REGIONAL FAULTING AND SEISMICITY
STONE BEETLAND
SACRAMENTO, CALIFORNIA

PROJECT NO.: 18064.000.001	FIGURE NO. 4
SCALE: AS SHOWN	
DRAWN BY: CC	CHECKED BY: JCB

ORIGINAL FIGURE PRINTED IN COLOR

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APPENDIX A

BORING LOG KEY
EXPLORATION LOGS

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity CL - Inorganic clay with low to medium plasticity OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity CH - Fat clay with high plasticity OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE				CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4 "	3"	12"	
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

- Modified California (3" O.D.) sampler
- California (2.5" O.D.) sampler
- S.P.T. - Split spoon sampler
- Shelby Tube
- Dames and Moore Piston
- Continuous Core
- Bag Samples
- Grab Samples
- NR No Recovery

MOISTURE CONDITION

DRY	Dusty, dry to touch
MOIST	Damp but no visible water
WET	Visible freewater

LINE TYPES

- ———— Solid - Layer Break
- – – – – – Dashed - Gradational or approximate layer break

GROUND-WATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

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LOG OF BORING 1-B1

LATITUDE: 38.46626 LONGITUDE: -121.47689

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/7/2021
HOLE DEPTH: Approx. 21½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 15 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			FAT CLAY WITH SAND (CH), dark brown, hard, moist, high plasticity, approximately 20% sand										
						38	54	17	37		14.6		>4.5* >4.5*
			Grades to yellowish red										
						50/6"				77			>4.5*
5	10		LEAN CLAY WITH SAND (CL), grayish brown, hard, moist, medium plasticity, approximately 20% sand			50/5"					16.1		>4.5* >4.5*
			CLAYEY SAND (SC), yellowish red, very dense, moist, fine-grained sand, approximately 30% fines										
10	5					50/6"							
15	0		Grades to light yellowish brown with iron staining			66					23.9		
			Wet cuttings		▼								
			LEAN CLAY WITH SAND (CL), light yellowish brown, very stiff, very moist, low plasticity, fine-grained sand										
20	-5					15				61	36.6		
			Bottom of boirng at 21½ feet. Groundwater encountered at 17 feet.										

LOG OF BORING 1-B2

Expect Excellence

LATITUDE: 38.464973 LONGITUDE: -121.475239

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/7/2021
HOLE DEPTH: Approx. 11 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 14 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			FAT CLAY (CH), very dark grayish brown, hard, moist, high plasticity			22							>4.5*
	10					33					18.4	109	4.25*
													4.5*
5			SANDY LEAN CLAY (CL), dark brown to yellowish red, hard, moist, approximately 40% sand			50/6"					19.3		>4.5*
	5												
10						50/6"							>4.5*
			Bottom of boring at 11 feet. No groundwater encountered.										

LOG OF BORING 1-B3

LATITUDE: 38.46641 LONGITUDE: -121.473281

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/7/2021
HOLE DEPTH: Approx. 11 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 14 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			FAT CLAY (CH), very dark grayish brown, hard, moist, high plasticity			43							>4.5*
													>4.5*
			SANDY LEAN CLAY (CL), light yellowish brown, hard, moist, medium plasticity, approximately 40% sand			50/6"							>4.5*
	10												
5						50/6"							>4.5*
	5												
10			Grades to yellowish red			50/6"					24.7		
			Bottom of boring at 11 feet. No groundwater encountered.										

LOG OF BORING 1-B4

LATITUDE: 38.46487 LONGITUDE: -121.470872

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/7/2021
HOLE DEPTH: Approx. 11½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 14 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			LEAN CLAY WITH SAND (CL), dark gray, hard, moist, medium to high plasticity, approximately 20% sand			38							>4.5*
	10		Grades to gray mottled with dark grayish brown			50/6"	46	18	28	75			>4.5*
5						43							>4.5*
											15.1		>4.5*
	5		Grades to SANDY LEAN CLAY (CL), light yellowish brown, hard, moist, medium plasticity, approximately 40% sand										
10						80/11"					19.6		>4.5*
													>4.5*
			Bottom of boring at 11½ feet. No groundwater encountered.										

LOG OF BORING 1-B5

Expect Excellence

LATITUDE: 38.466338 LONGITUDE: -121.468296

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/7/2021
HOLE DEPTH: Approx. 11½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 14 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			FAT CLAY WITH SAND (CH), very dark grayish brown, hard, approximately 25% sand			30							>4.5*
	10					38				78			>4.5* >4.5*
5													>4.5*
			SANDY LEAN CLAY (CL), reddish yellow, hard, moist, fine- to medium-grained sand			45				66			>4.5*
	5												
10						62							
			Bottom of boring at 11½ feet. No groundwater encountered.										

LOG - GEOTECHNICAL W/ELEV. 18064.GPJ ENGEO INC.GDT 1/26/21

LOG OF BORING 1-B6

Expect Excellence

LATITUDE: 38.464846 LONGITUDE: -121.466951

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/7/2021
HOLE DEPTH: Approx. 11½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 10 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SANDY FAT CLAY (CH), dark gray, hard, moist, high plasticity, approximately 30% sand			27							>4.5* >4.5*
						33							>4.5* >4.5*
5	5		LEAN CLAY WITH SAND (CL), yellowish red, hard, moist, medium plasticity, approximately 20% sand			35							
10	0					33							
			Bottom of boring at 11½ feet. No groundwater encountered.										

LOG - GEOTECHNICAL W/ELEV. 18064.GPJ ENGEO INC.GDT 1/26/21

ENGEO
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LOG OF BORING 1-B7

LATITUDE: 38.468969 LONGITUDE: -121.464698

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/7/2021
HOLE DEPTH: Approx. 11½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 16 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	15		FAT CLAY (CH), very dark grayish brown, hard, moist, high plasticity			38					14.1		>4.5* >4.5*
			Grades to dark brown Approximately one inch thick sand lense			42							>4.5* >4.5*
5	10		CLAYEY SAND (SC), reddish yellow, very dense, moist, fine-grained sand, approximately 20% fines			50/6					17		
			SANDY LEAN CLAY (CL), light yellowish brown, hard, moist, low plasticity, approximately 40% fine-grained sand										
10	5					63							>4.5* >4.5*
			Bottom of boring at 11½ feet. No groundwater encountered.										

ENGEO
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LOG OF BORING 1-B8

LATITUDE: 38.46491 LONGITUDE: -121.464354

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/7/2021
HOLE DEPTH: Approx. 26½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 9 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			FAT CLAY (CH), very dark grayish brown, hard, moist, high plasticity, approximately 10% sand			23					19.4	77.7	>4.5*
	5					30							>4.5*
5													>4.5*
			LEAN CLAY (CL), reddish brown, hard, moist, medium plasticity, approximately 10% sand			32					13.5	119	>4.5*
	0		FAT CLAY WITH SAND (CH), yellowish brown, hard, moist, high plasticity, approximately 20% sand										
10						42					20.9	107.4	>4.5*
	-5		SILTY SAND (SM), yellowish brown, medium dense, moist, fine-grained sand, approximately 30% low plasticity fines			30							>4.5*
15			SANDY SILT (ML), yellowish brown, very stiff, moist, low plasticity, fine-grained sand			16				53			
	-10		SILTY SAND (SM), reddish brown, medium dense, moist, fine- to coarse-grained sand, trace fine gravel			27				48			
20			Grades to fine- to medium-grained sand, approximately 30% low plasticity fines										
	-15		SANDY SILT (ML), dark greenish gray, very stiff, moist, low plasticity, fine-grained sand										
25													

LOG - GEOTECHNICAL W/ELEV. 18064.GPJ ENGEO INC.GDT 1/26/21

LOG OF BORING 1-B8

Expect Excellence

LATITUDE: 38.46491 LONGITUDE: -121.464354

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/7/2021
HOLE DEPTH: Approx. 26½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 9 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SANDY SILT (ML), dark greenish gray, very stiff, moist, low plasticity, fine-grained sand			53				56			
			Bottom of boring at 26½ feet. Groundwater encountered at 12 feet.										

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LOG OF BORING 1-B9

LATITUDE: 38.466448 LONGITUDE: -121.464925

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/6/2021
HOLE DEPTH: Approx. 41 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 10 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			FAT CLAY (CH), black, hard, moist, high plasticity			42							>4.5*
						43							>4.5*
5	5		LEAN CLAY (CL), yellowish red, hard, moist, medium plasticity, approximately 5% fine-grained sand Grades to reddish yellow, very stiff			27					21.5		3.75*
			SANDY SILT (ML), yellowish red, very stiff to hard, low plasticity, approximately 30% fine-grained sand			70					24.9		3.5* 4.5*
15	-5		SILTY SAND (SM), yellowish red, loose to medium dense, wet, fine-grained sand, low plasticity fines Wet cuttings			10				48			
			LEAN CLAY (CL), reddish yellow, hard, moist, medium plasticity										
20	-10					100/9"				93			>4.5* >4.5*
25	-15												

LOG - GEOTECHNICAL W/ELEV. 18064.GPJ ENGEO INC.GDT 1/26/21

LOG OF BORING 1-B9

Expect Excellence

LATITUDE: 38.466448 LONGITUDE: -121.464925

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/6/2021
HOLE DEPTH: Approx. 41 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 10 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			Grades to approximately 20% sand			70							4.5*
30	-20					65							4.5*
			Grades to dark greenish gray										
35	-25					50/5"							>4.5*
40	-30					50/6"							>4.5*
			Bottom of boring at 41 feet. Groundwater encountered at 12½ feet.										

LOG - GEOTECHNICAL W/ELEV. 18064.GPJ ENGEO INC.GDT 1/26/21

ENGEO
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LOG OF BORING 1-B10

LATITUDE: 38.467547 LONGITUDE: -121.466194

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/6/2021
HOLE DEPTH: Approx. 41½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 15 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			ELASTIC SILT WITH SAND (MH), light reddish brown, hard, moist, medium plasticity, approximately 20% sand			50/6"	38	22	16		12.6		>4.5*
						50/6"							>4.5*
5	10		LEAN CLAY (CL), reddish brown, hard, moist, medium plasticity			50/6"					18.4		>4.5*
10	5					50/6"							
			SILTY SAND (SM), dark yellowish red, medium dense, moist, fine- to medium-grained sand										
15	0				▼	26				21			
			Wet cuttings										
20	-5		Grades to dark gray			24							
25	-10												

LOG - GEOTECHNICAL W/ELEV. 18064.GPJ ENGEO INC.GDT 1/26/21

LOG OF BORING 1-B10

Expect Excellence

LATITUDE: 38.467547 LONGITUDE: -121.466194

Geotechnical Exploration
Stone Beetland
Sacramento, CA
18064.000.001

DATE DRILLED: 1/6/2021
HOLE DEPTH: Approx. 41½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 15 ft.

LOGGED / REVIEWED BY: B. McEvoy / JB
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), dark grey, medium dense, wet, fine- to medium-grained sand			24				95	34.8		
			ELASTIC SILT (MH), yellowish brown, stiff, moist, medium plasticity										
			SANDY LEAN CLAY (CL), dark greenish gray, very stiff, moist, medium plasticity										
30	-15					50/6"					31.9		2.5* 3.25*
			SILTY SAND (SM), dark greenish gray, dense, moist, fine-grained sand, approximately 20% fines										
35	-20					70					26		
			FAT CLAY (CH), greenish gray, very stiff, moist, high plasticity										
40	-25					16							
			Bottom of boring at 41½ feet. Groundwater encountered at 17 feet.										

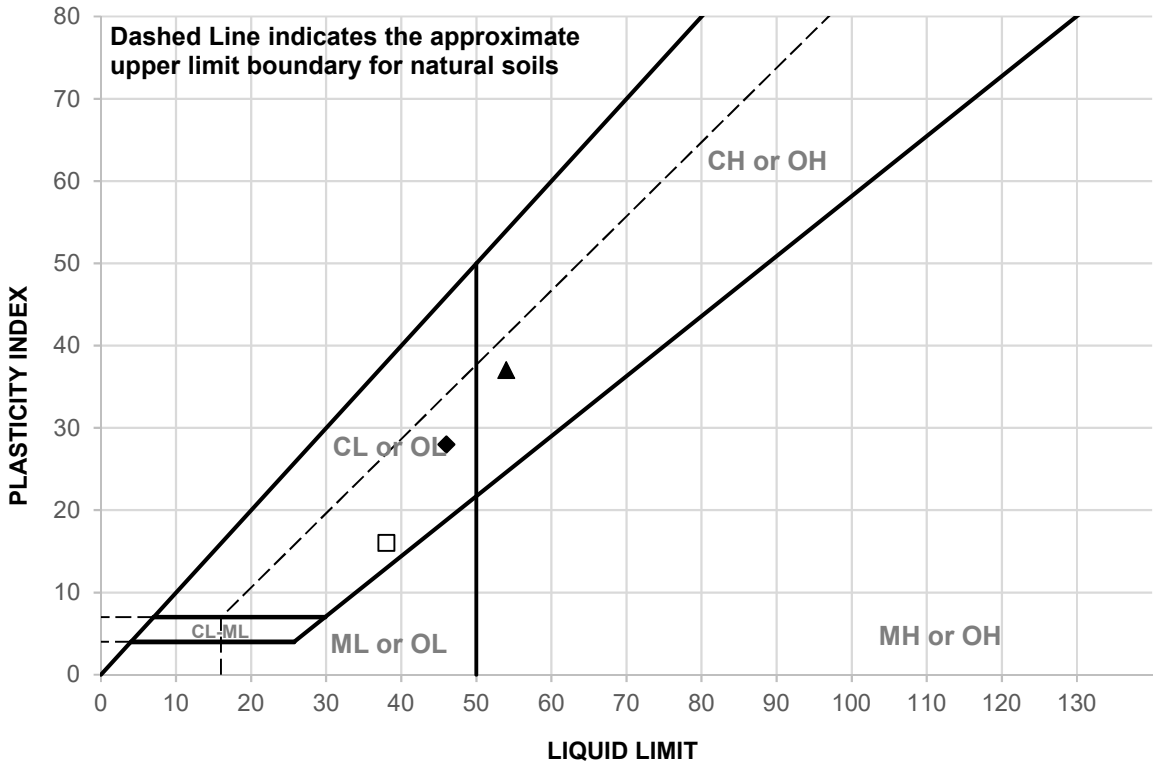
LOG - GEOTECHNICAL W/ELEV. 18064.GPJ ENGEO INC.GDT 1/26/21

APPENDIX B

LABORATORY TEST DATA

Liquid and Plastic Limits Test Report
Expansion Index
Particle Size Distribution Report
Moisture Content Report
Moisture-Density Determination Report
Analytical Results of Soil Corrosion

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B1@2.0	2 ft	See exploration logs	54	17	37
◆	1-B4@3.5	3.5 ft	See exploration logs	46	18	28
□	1-B10@1.5	1.5 ft	See exploration logs	38	22	16

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B1@2.0	PI: ASTM D4318, Wet Method	
◆	1-B4@3.5	PI: ASTM D4318, Wet Method	
□	1-B10@1.5	PI: ASTM D4318, Wet Method	

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

EXPANSION INDEX TEST REPORT
ASTM D4829

SAMPLE ID	SOIL DESCRIPTION	SAMPLE LOCATION	INITIAL DRY DENSITY (pcf)	INITIAL MOISTURE CONTENT (%)	FINAL MOISTURE CONTENT (%)	EXPANSION INDEX
1-B3@1.5	See exploration logs	1-B3 at 1.5 feet	101.0	12.4	30.9	84

TABLE 1: CLASSIFICATION OF EXPANSIVE SOIL

ASTM D4829

EXPANSION INDEX	POTENTIAL EXPANSION
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 10864.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

EXPANSION INDEX TEST REPORT
ASTM D4829

SAMPLE ID	SOIL DESCRIPTION	SAMPLE LOCATION	INITIAL DRY DENSITY (pcf)	INITIAL MOISTURE CONTENT (%)	FINAL MOISTURE CONTENT (%)	EXPANSION INDEX
1-B9@2.0	See exploration logs	1-B9 at 2.0 feet	97.4	13.0	33.2	102

TABLE 1: CLASSIFICATION OF EXPANSIVE SOIL

ASTM D4829

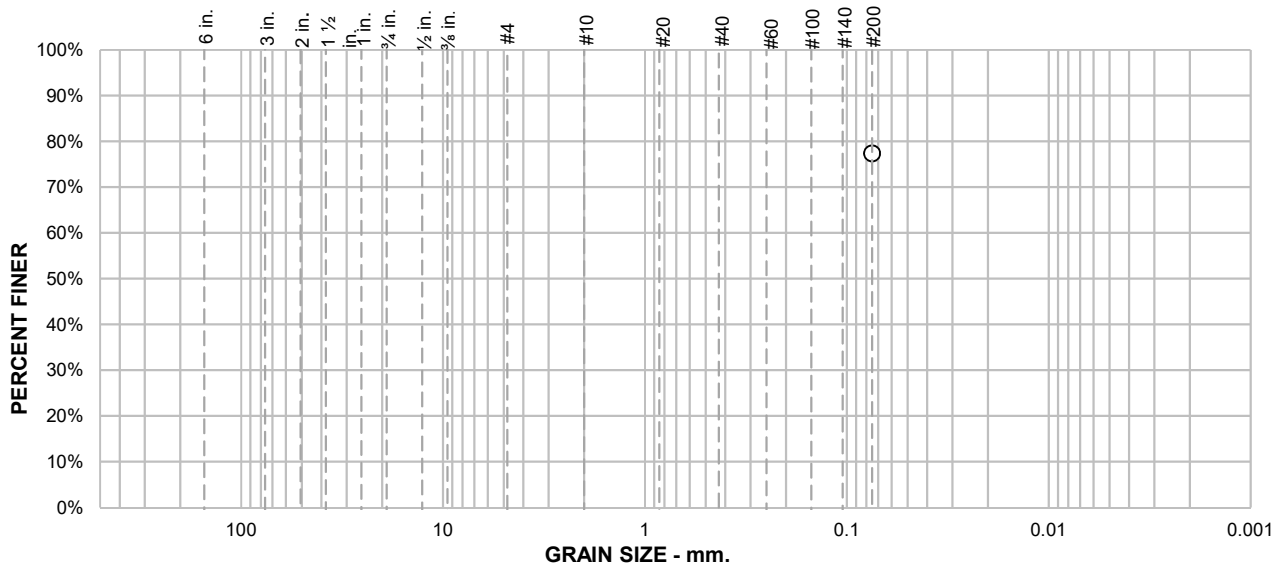
EXPANSION INDEX	POTENTIAL EXPANSION
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 10864.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B1@3.5

DEPTH (ft): 3.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						77.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	77.4		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2488

Soak time = 180 min
Dry sample weight = 352.8 g

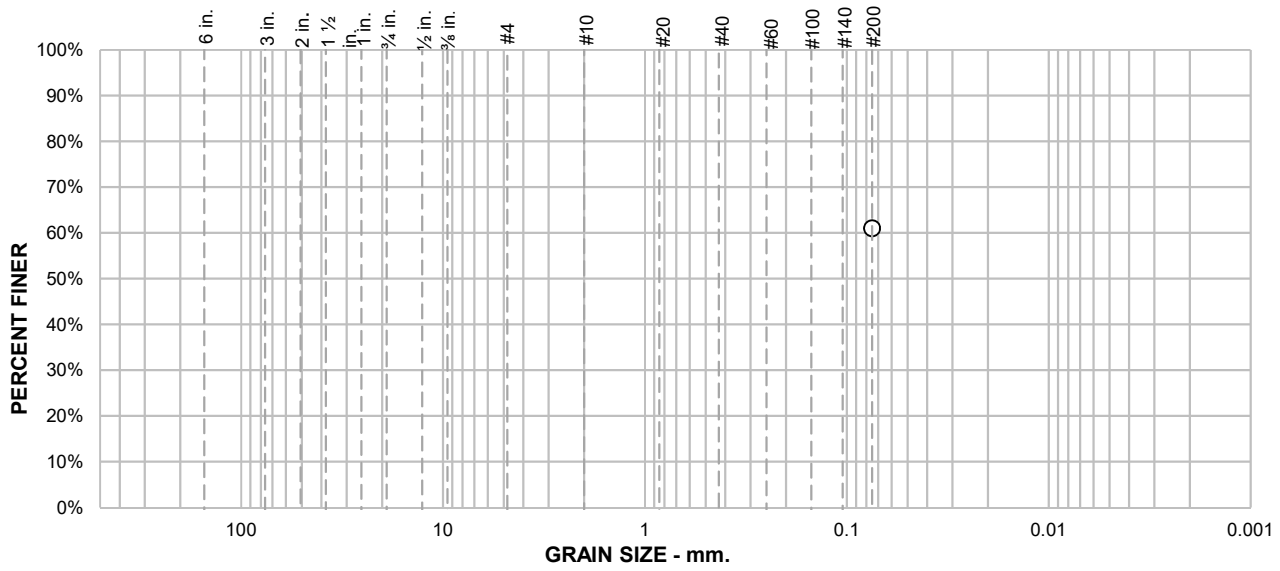
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B1@20.5

DEPTH (ft): 20.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						61.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	61.0		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 433.1 g

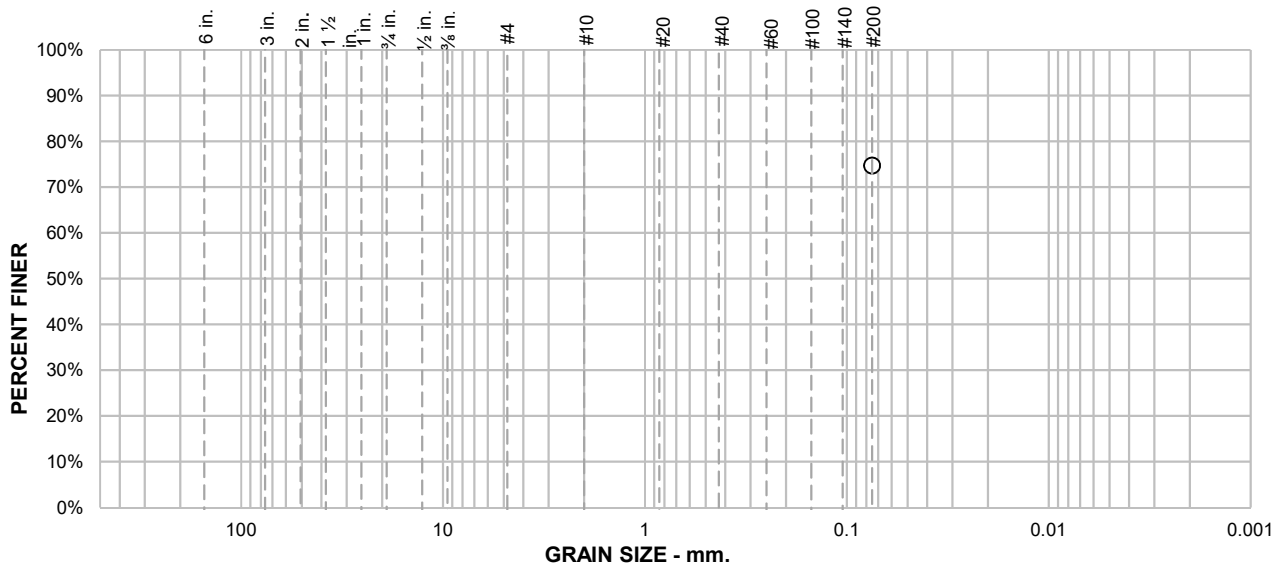
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B4@3.5

DEPTH (ft): 3.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						75	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	75		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = 18 LL = 46 PI = 28

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS = CL

REMARKS

PI: ASTM D4318, Wet Method
USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 233 g

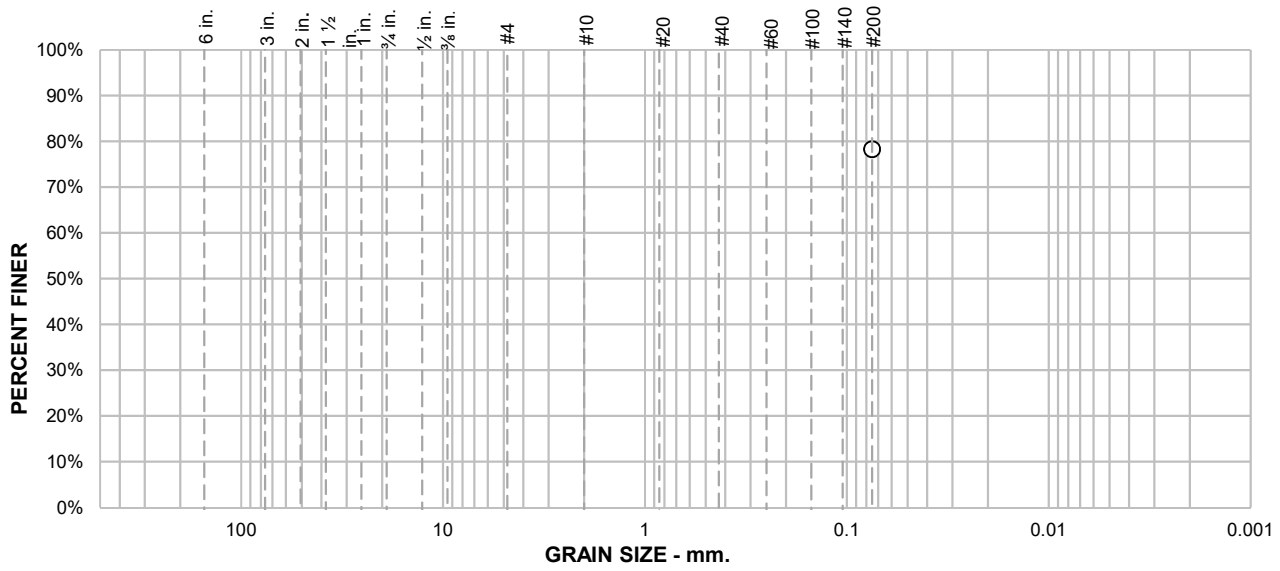
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B5@4.0

DEPTH (ft): 4

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						78.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	78.2		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 289 g

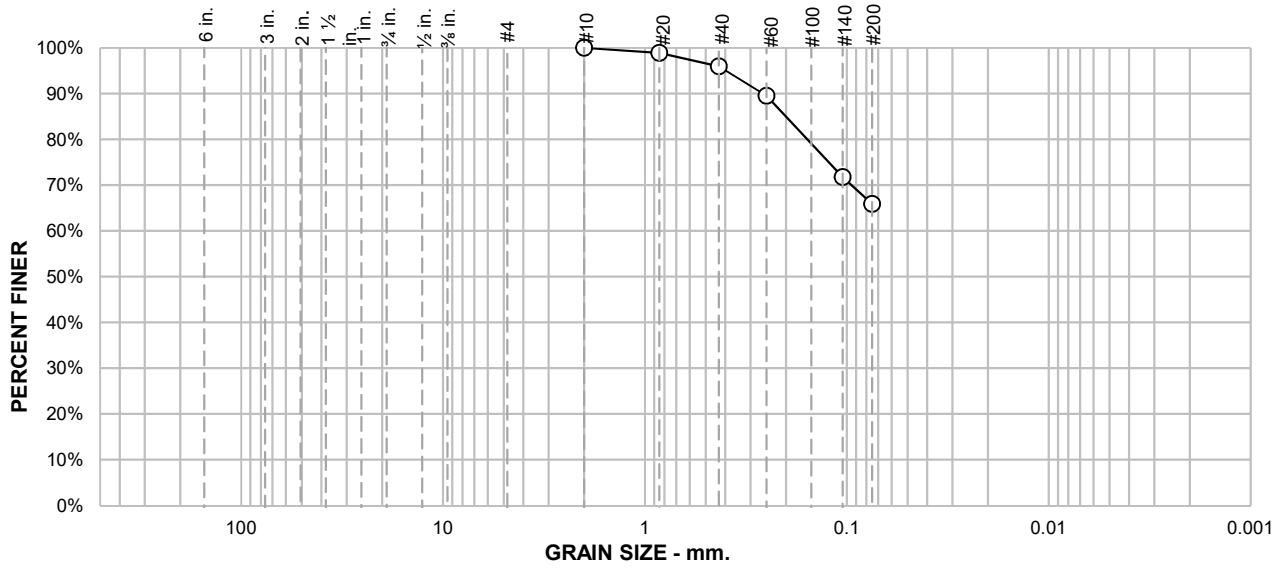
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B5@6.0

DEPTH (ft): 6

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
				4.1	30.0	65.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	98.9		
#40	95.9		
#60	89.5		
#140	71.7		
#200	65.9		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 0.2608 mm D_{85} = 0.2008 mm D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2487

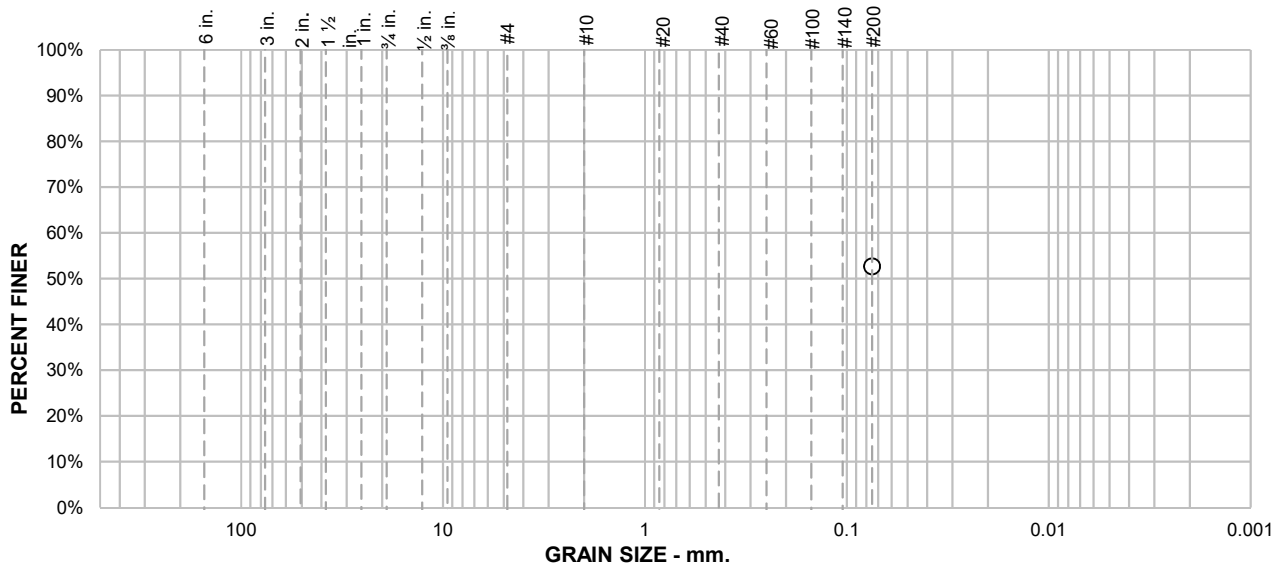
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B8@17.0

DEPTH (ft): 17

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						52.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	52.6		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 431.4 g

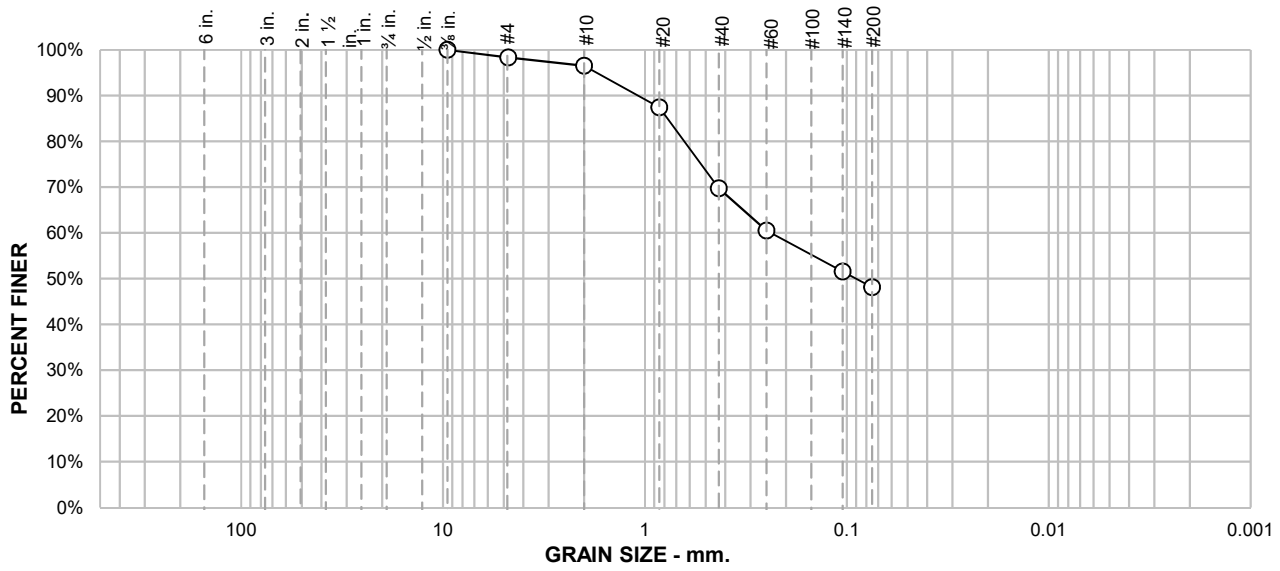
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method A



SAMPLE ID: 1-B8@20.5

DEPTH (ft): 20.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
		2	2	27	22	48	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
⅜ in.	100		
#4	98		
#10	97		
#20	87		
#40	70		
#60	61		
#140	52		
#200	48		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 1.0988 mm D_{85} = 0.7845 mm D_{60} = 0.2270 mm

D_{50} = 0.0887 mm D_{30} = D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2487

* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC

PROJECT NAME: Stone Beetland

PROJECT NO: 18064.000.001 PH002

PROJECT LOCATION: Sacramento, CA

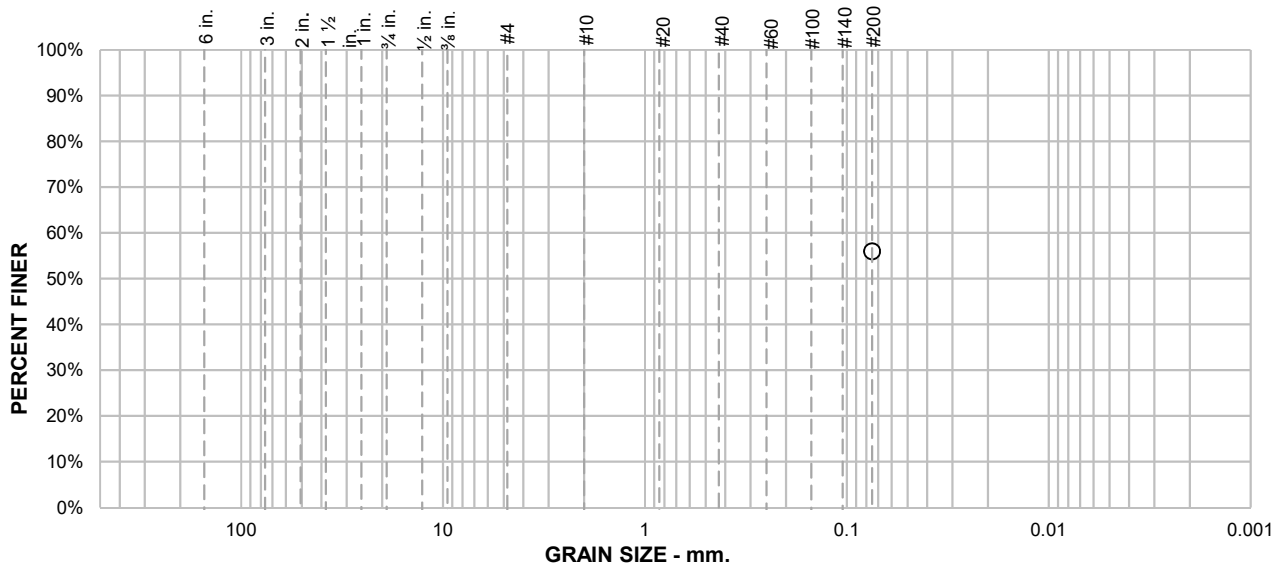
REPORT DATE: 1/18/2021

TESTED BY: R. Montalvo

REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B8@25.5

DEPTH (ft): 25.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						56.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	56.0		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 415.5 g

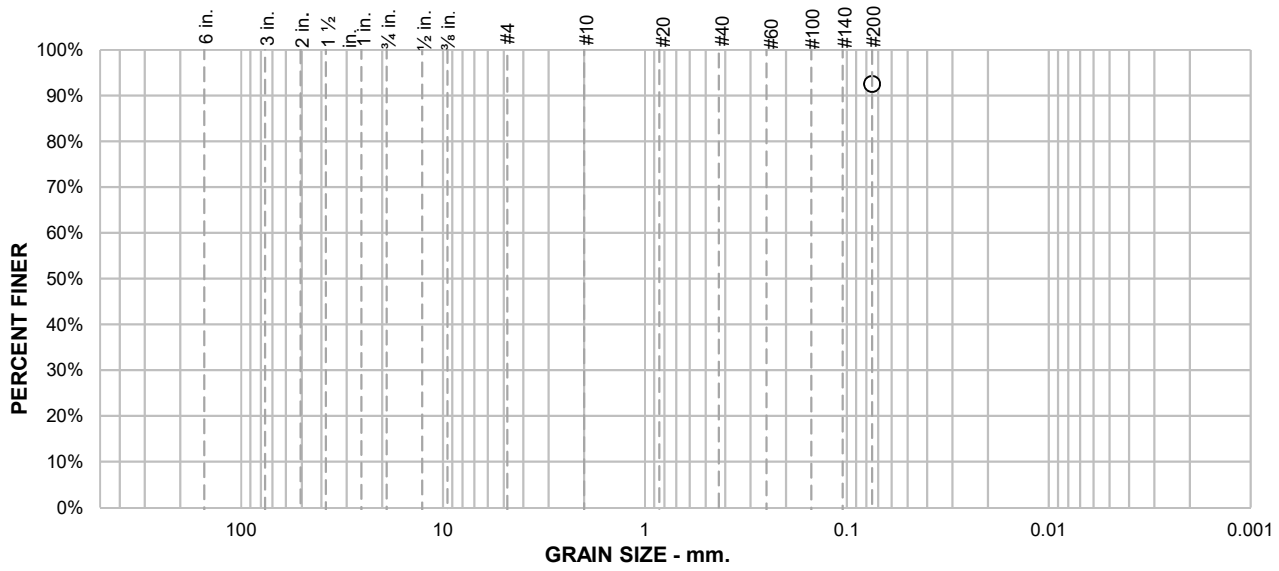
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B9@21.0

DEPTH (ft): 21

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						92.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	92.5		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 426.5 g

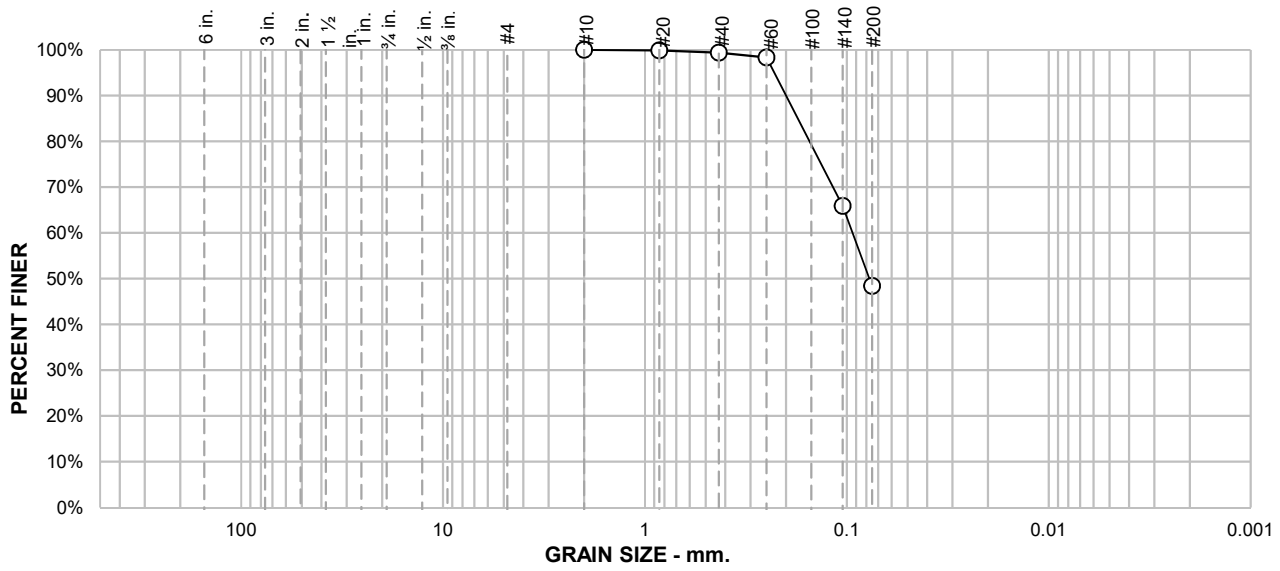
* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method A



SAMPLE ID: 1-B9@15.5

DEPTH (ft): 15.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
				1	51	48	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100		
#20	100		
#40	99		
#60	98		
#140	66		
#200	48		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 0.2013 mm D_{85} = 0.1757 mm D_{60} = 0.0939 mm

D_{50} = 0.0779 mm D_{30} = D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2487

* (no specification provided)

ENGEO Expect Excellence

CLIENT: Taylor Builders, LLC

PROJECT NAME: Stone Beetland

PROJECT NO: 18064.000.001 PH002

PROJECT LOCATION: Sacramento, CA

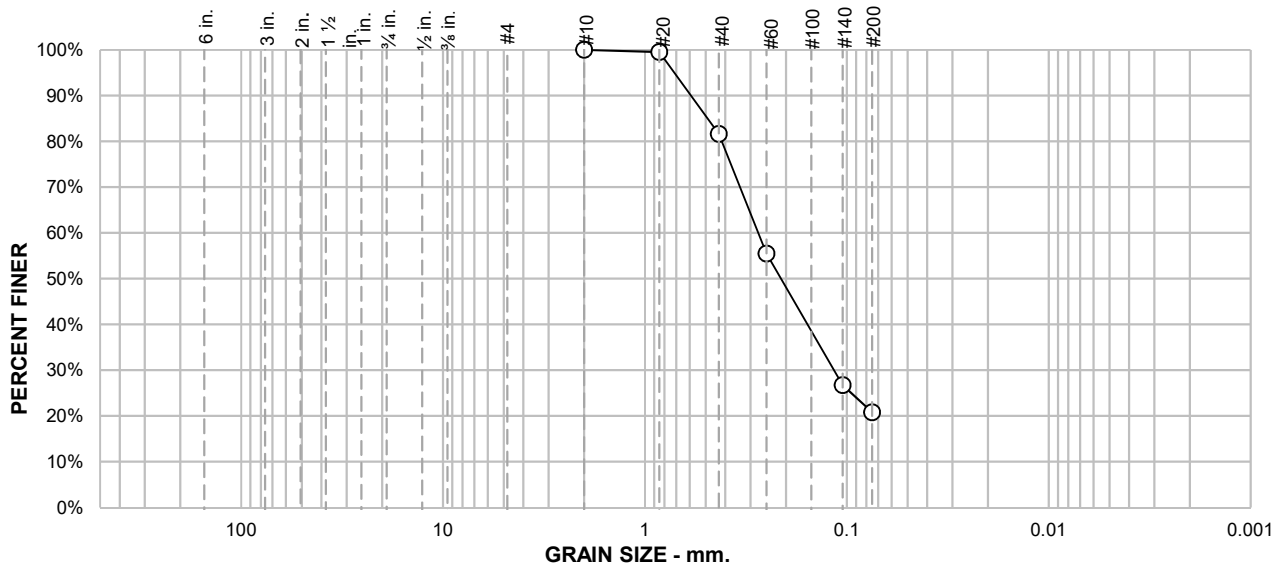
REPORT DATE: 1/18/2021

TESTED BY: R. Montalvo

REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B10@15.5

DEPTH (ft): 15.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
				18.4	60.8	20.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.5		
#40	81.6		
#60	55.5		
#140	26.7		
#200	20.8		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = 22 LL = 38 PI = 16

COEFFICIENTS

D_{90} = 0.5920 mm D_{85} = 0.4894 mm D_{60} = 0.2745 mm

D_{50} = 0.2118 mm D_{30} = 0.1160 mm D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS = SC

REMARKS

PI: ASTM D4318, Wet Method

USCS: ASTM D2487

* (no specification provided)

ENGEO Expect Excellence

CLIENT: Taylor Builders, LLC

PROJECT NAME: Stone Beetland

PROJECT NO: 18064.000.001 PH002

PROJECT LOCATION: Sacramento, CA

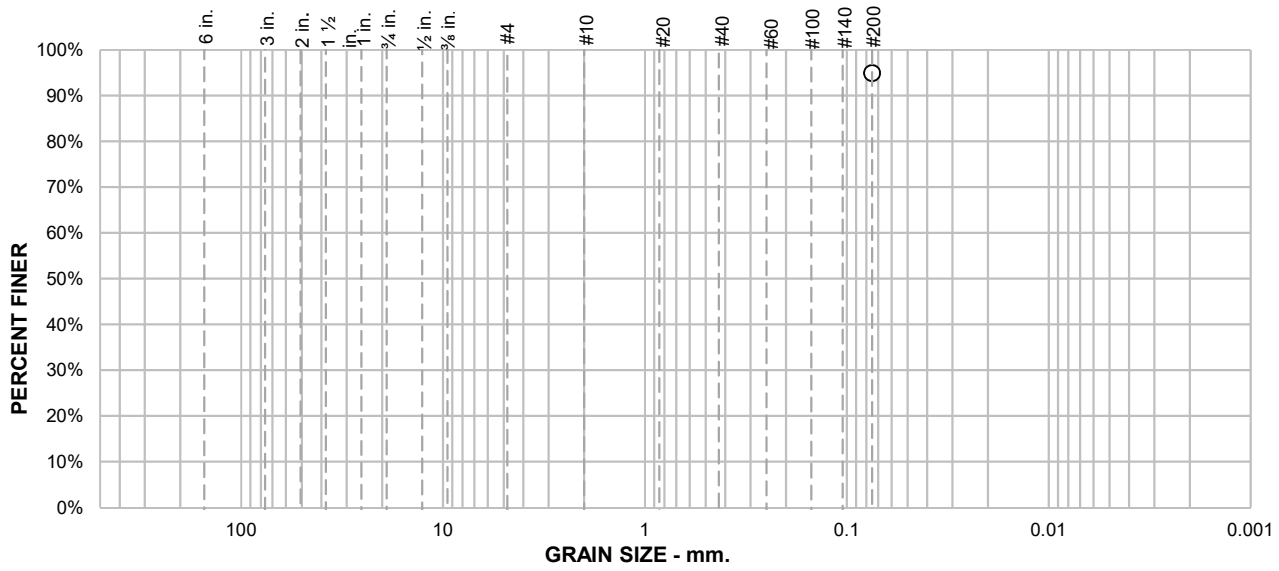
REPORT DATE: 1/18/2021

TESTED BY: R. Montalvo

REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B10@26.0

DEPTH (ft): 26

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						94.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	94.9		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 370.1 g

* (no specification provided)

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

MOISTURE CONTENT REPORT
ASTM D2216

SAMPLE ID	1-B1@2.0	1-B1@5.5	1-B1@16.0	1-B1@20	1-B2@5.0	1-B3@10.5	1-B4@6.0	1-B4@10.5
DEPTH (ft.)	2.0	5.5	16.0	20.0	5.0	10.5	6.0	10.5
METHOD A OR B	B	B	B	B	B	B	B	B
MOISTURE CONTENT (%)	14.6	16.1	23.9	36.6	19.3	24.7	15.1	19.6

SAMPLE ID	1-B7@2.0	1-B7@5.0	1-B9@6.0	1-B9@11.0	1-B10@1.5	1-B10@5.5	1-B10@26.0	1-B10@30.0
DEPTH (ft.)	2.0	5.0	6.0	11.0	1.5	5.5	26.0	30.0
METHOD A OR B	B	B	B	B	B	B	B	B
MOISTURE CONTENT (%)	14.1	17.0	21.5	24.9	12.6	18.4	34.8	31.9

SAMPLE ID	1-B10@35.5							
DEPTH (ft.)	35.5							
METHOD A OR B	B							
MOISTURE CONTENT (%)	26.0							

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

MOISTURE-DENSITY DETERMINATION REPORT
ASTM D7263

SAMPLE ID	1-B2@3.5	1-B8@2.0	1-B8@6.0	1-B8@11.0				
DEPTH (ft.)	3.5	2	6	11				
METHOD A OR B	B	B	B	B				
MOISTURE CONTENT (%)	18.4	19.4	13.5	20.9				
DRY DENSITY (pcf)	109.0	77.7	119.0	107.4				

ENGEO
Expect Excellence

CLIENT: Taylor Builders, LLC
PROJECT NAME: Stone Beetland
PROJECT NO: 18064.000.001 PH002
PROJECT LOCATION: Sacramento, CA
REPORT DATE: 1/18/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

Sunland Analytical

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

Date Reported 01/20/2021
Date Submitted 01/13/2021

To: Stephen Blakely
Engeo, Inc.
2213 Plaza Dr.
Rocklin, CA 95765

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

The reported analysis was requested for the following location:
Location : 18064.000.001 PH002 Site ID : 1-B2@2FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 83827-174809.

EVALUATION FOR SOIL CORROSION

Soil pH	6.40	
Minimum Resistivity	1.05 ohm-cm (x1000)	
Chloride	3.5 ppm	00.00035 %
Sulfate	10.1 ppm	00.00101 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

Sunland Analytical

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

Date Reported 01/20/2021
Date Submitted 01/13/2021

To: Stephen Blakely
Engeo, Inc.
2213 Plaza Dr.
Rocklin, CA 95765

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

The reported analysis was requested for the following location:
Location : 18064.000.001 PH002 Site ID : 1-B5@5.5FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 83827-174810.

EVALUATION FOR SOIL CORROSION

Soil pH	7.15	
Minimum Resistivity	0.94 ohm-cm (x1000)	
Chloride	2.8 ppm	00.00028 %
Sulfate	11.5 ppm	00.00115 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

Sunland Analytical

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

Date Reported 01/20/2021
Date Submitted 01/13/2021

To: Stephen Blakely
Engeo, Inc.
2213 Plaza Dr.
Rocklin, CA 95765

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

The reported analysis was requested for the following location:
Location : 18064.000.001 PH002 Site ID : 1-B8@4FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 83827-174811.

EVALUATION FOR SOIL CORROSION

Soil pH	7.08	
Minimum Resistivity	0.72 ohm-cm (x1000)	
Chloride	50.1 ppm	00.00501 %
Sulfate	24.9 ppm	00.00249 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

APPENDIX C

EXPLORATION LOGS BY OTHERS

LOG OF EXPLORATORY BORING C4-01-09

FILE NO.: 1575.1
PROJECT: RT South Sac Corridor Phase II
LOCATION: Sacramento, CA
CLIENT: LAN

DRILLING DATE: 5/22/09
DRILLING METHOD: 4" Solid Flight Auger
HAMMER TYPE: Automatic
LOGGED BY: KIS CHECKED BY: RBL

ELEVATION:
WATER DEPTH: 13 ft.
DATE OF READING:
TIME OF READING:

FIELD						LABORATORY						
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	LIQUID LIMIT	UNCONFINED COMPRESSIVE STRENGTH (TSF)	ADDITIONAL TESTS
		Bulk A				Fat CLAY (CH); hard, dark gray to black, dry to moist							
		1	34	>4.5									
						CLAYEY SAND (SC); dense, olive brown, moist, fine SAND							
5		2	21	>4.5									
						Poorly-graded SAND (SP); dense, orangish brown, moist, fine SAND	108	11					
10		3	55	4.5		SILT with SAND (ML); very stiff, olive brown, moist, very fine SAND	111	22					
						Poorly-graded SAND with SILT (SP-SM); very dense, orangish brown, wet, medium SAND							
15		4	55			Lean CLAY with SAND (CL); very stiff, orange brown, moist, very fine SAND	115	18					
						Lean CLAY (CL); very stiff, olive brown, moist, orange mottles							
20		5	41	>4.5		CLAYEY SAND (SC); hard, olive brown, moist, orange mottles							
						Lean CLAY (CL); hard, olive brown, moist, orange mottles							
25		6	50/6"	>4.5			105	24					
						Boring terminated at 26 feet bgs Backfilled with cement grout Groundwater encountered at 13 feet bgs							

LOG OF BOREHOLE 1575.1 C4 LOGS (STONE BOSWELL).GPJ BLACKBRN.GDT 7/27/09

Blackburn Consulting

LOG OF EXPLORATORY BORING C4-02-09

FILE NO.: 1575.1
PROJECT: RT South Sac Corridor Phase II
LOCATION: Sacramento, CA
CLIENT: LAN

DRILLING DATE: 5/22/09
DRILLING METHOD: 4" Solid Flight Auger
HAMMER TYPE: Automatic
LOGGED BY: KIS CHECKED BY: RBL

ELEVATION:
WATER DEPTH: 12 ft.
DATE OF READING:
TIME OF READING:

FIELD						LABORATORY						
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	LIQUID LIMIT	UNCONFINED COMPRESSIVE STRENGTH (TSF)	ADDITIONAL TESTS
		Bulk A				Fat CLAY (CH); stiff, black, moist				38	62		EI=104
		1	19	4.5		Lean CLAY (CL); stiff, dark gray with orange mottles, moist	114	19		27	41		
5		2	14	2.5		SANDY CLAY (CL); medium dense, grayish brown, moist, fine SAND, orange mottles	115	16	60				
						Lean CLAY with SAND (CL); stiff, orange brown, moist, fine SAND							
						Poorly-graded SAND with CLAY (SP-SC); loose, orange brown, wet, medium SAND							
10		3	6			Lean CLAY with SAND (CL); soft, orange brown, moist, fine SAND							
						CLAYEY SAND (SC); loose, orange brown, wet, medium SAND							
15		4	2			fine to medium SAND							
						SILTY CLAY (CL-ML); very stiff, greenish gray, moist, orange mottles							
20		5	40	4.5		CLAYEY SAND (SC); medium dense, dark olive brown, wet, fine SAND, orange mottles							
25		6	14										
						Boring terminated at 26.5 feet bgs Backfilled with cement grout Groundwater encountered at 12 feet bgs							

LOG OF BOREHOLE 1575.1 C4 LOGS (STONE BOSWELL).GPJ BLACKBRN.GDT 8/7/09

Blackburn Consulting

LOG OF EXPLORATORY BORING C4-03-09

FILE NO.: 1575.1
PROJECT: RT South Sac Corridor Phase II
LOCATION: Sacramento, CA
CLIENT: LAN

DRILLING DATE: 5/21/09
DRILLING METHOD: 4" Solid Flight Auger
HAMMER TYPE: Automatic
LOGGED BY: KIS CHECKED BY: RBL

ELEVATION:
WATER DEPTH: 15 ft.
DATE OF READING:
TIME OF READING:

FIELD						DESCRIPTION	LABORATORY						
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	LIQUID LIMIT	UNCONFINED COMPRESSIVE STRENGTH (TSF)	ADDITIONAL TESTS
		Bulk A				Lean CLAY (CL); very stiff to hard, orangish brown, moist, gray mottles							EI=81
		1	25	>4.5									
5		2	29	>4.5		reddish brown with orange, black and gray mottles							
10		3	21	2.0		Lean CLAY with SAND (CL); medium stiff, orangish brown, moist, fine to medium SAND							
						SANDY lean CLAY (CL); soft, orangish brown, wet, fine SAND ▼							
15		4	4										
		5	P			Lean CLAY (CL); stiff, olive brown, moist, orange mottles							
20		6	35	>4.5		with varying amounts of fine size sand							
						CLAYEY SAND (SC); medium dense, blue gray, wet, fine SAND							
25		7	23										
		8	P										
						Boring terminated at 28 feet bgs Backfilled with cement grout Groundwater encounetered at 15 feet bgs							

LOG OF BOREHOLE 1575.1 C4 LOGS (STONE BOSWELL).GPJ BLACKBRN.GDT 8/7/09

Blackburn Consulting

LOG OF EXPLORATORY BORING C4-04-09

FILE NO.: 1575.1
PROJECT: RT South Sac Corridor Phase II
LOCATION: Sacramento, CA
CLIENT: LAN

DRILLING DATE: 5/21/09
DRILLING METHOD: 4" Solid Flight Auger
HAMMER TYPE: Automatic
LOGGED BY: KIS CHECKED BY: RBL

ELEVATION:
WATER DEPTH: 15 ft.
DATE OF READING:
TIME OF READING:

FIELD						LABORATORY						
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	LIQUID LIMIT	UNCONFINED COMPRESSIVE STRENGTH (TSF)	ADDITIONAL TESTS
		Bulk A				Lean CLAY (CL); very stiff, orangish brown, moist, gray mottles							
		1	21	>4.5			115	14		17	32		
5		2	20	4.5									
						CLAYEY SAND (SC); medium dense, orangish brown, moist, medium SAND							
10		3	17	3.5			109	20					
						SANDY lean CLAY (CL); soft, brown, wet, fine to medium SAND ▼							
15		4	6										
		5	P					26	53	12	27		
						Lean CLAY (CL); very stiff, olive brown, moist, orange mottles							
20		6	36	4.5		blue gray							
						CLAYEY SAND (SC); medium dense, blue gray, moist to wet							
25		7	29				94	29					
						Boring terminated at 26.5 feet bgs Backfilled with cement grout Groundwater encountered at 15 feet bgs							

LOG OF BOREHOLE 1575.1 C4 LOGS (STONE BOSWELL).GPJ BLACKBRN.GDT 7/27/09

Blackburn Consulting

LOG OF EXPLORATORY BORING C4-05-09

FILE NO.: 1575.1
PROJECT: RT South Sac Corridor Phase II
LOCATION: Sacramento, CA
CLIENT: LAN

DRILLING DATE: 5/21/09
DRILLING METHOD: 4" Solid Flight Auger
HAMMER TYPE: Automatic
LOGGED BY: KIS CHECKED BY: RBL

ELEVATION:
WATER DEPTH: 15 ft.
DATE OF READING:
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	LIQUID LIMIT	UNCONFINED COMPRESSIVE STRENGTH (TSF)	ADDITIONAL TESTS
		Bulk A				Fat CLAY (CH); hard, black, moist							EI=89
		1	13	>4.5			87	29					
5		2	21	>4.5									
						Lean CLAY with SAND (CL); medium stiff, brown to orangish brown, moist, orange and gray mottles							
10		3	15	3.5			83	57					
						CLAYEY SAND (SC); loose, brown, wet, fine SAND							
15		4	5				105	23	45				
						FAT CLAY (CH); medium stiff, olive brown, moist, orange mottles	99	24		29	57		
20		5	16										
						CLAYEY SAND (SC); medium dense, brown to orangish brown, moist, fine SAND	98	28					
25		6	39	4.5		Lean CLAY (CL); very stiff, blue gray, moist	96	29					
						Boring terminated at 26.5 feet bgs Backfilled with cement grout Groundwater encountered at 15 feet bgs							

LOG OF BOREHOLE 1575.1 C4 LOGS (STONE BOSWELL).GPJ BLACKBRN.GDT 7/27/09

Blackburn Consulting

LOG OF EXPLORATORY BORING C4-06-09

FILE NO.: 1575.1
PROJECT: RT South Sac Corridor Phase II
LOCATION: Sacramento, CA
CLIENT: LAN

DRILLING DATE: 5/21/09
DRILLING METHOD: 4" Solid Flight Auger
HAMMER TYPE: Automatic
LOGGED BY: KIS CHECKED BY: RBL

ELEVATION:
WATER DEPTH: 13 ft.
DATE OF READING:
TIME OF READING:

FIELD						LABORATORY							
DEPTH (FEET)	SAMPLE	SAMPLE NO.	BLOWS PER FT.	POCKET PEN (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	% <200 SIEVE	PLASTICITY INDEX	LIQUID LIMIT	UNCONFINED COMPRESSIVE STRENGTH (TSF)	ADDITIONAL TESTS
		Bulk A				Fat CLAY (CH); hard, very dark gray, dry							
		1	30	>4.5									
5		2	28	>4.5		brown with orange and gray mottles							
10		3	28	>4.5		with some fine SAND, yellowish brown with orange mottles							
						CLAYEY SAND (SC); medium dense, yellowish brown, wet, medium SAND ▼							
15		4	19	3.0		Lean CLAY with SAND (CL); stiff, yellowish brown, moist, orange mottles, fine SAND							
						CLAYEY SAND (SC); medium dense, yellowish brown, wet, fine SAND, orange mottles							
20		5	21										
						Lean CLAY (CL); very stiff, yellowish brown, moist, orange mottles							
25		6	35										
						CLAYEY SAND (SC); dense, brown, wet, fine SAND							
						Boring terminated at 26.5 feet bgs Backfilled with cement grout Groundwater encountered at 13 feet bgs							

LOG OF BOREHOLE 1575.1 C4 LOGS (STONE BOSWELL).GPJ BLACKBRN.GDT 7/27/09

DATE STARTED 8/27/12 **DATE COMPLETED** 8/27/12	**GROUND ELEVATION** 23.46 ft **ELEVATION DATUM** NAVD 88		**TOTAL DEPTH OF BORING** 40.5 ft
DRILLING CONTRACTOR Gregg Drilling & Testing, Inc.	**DRILLER'S NAME** Eric Santellan **HELPER'S NAME** Louie Wense		**TOTAL DEPTH OF FILL** 17 ft
DRILLING METHOD Hollow-Stem Auger	**DRILL RIG MAKE AND MODEL** Marl M10XLS (D-44)		**CONSULTANT COMPANY** URS Corporation
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) 8" Hollow Stem	**DRILLING ROD TYPE AND DIAMETER** 2" NWJ		**FIELD LOGGER** M. Maghsoudlou
X VERTICAL ☐ **INCLINED**	**CASING TYPE, DIAMETER, INSTALLATION DEPTH** NA		**FIELD LOG REVIEWER** M. Turner
SAMPLER TYPE(S) StdCal(2.5"), D&M(2.5"x20")	**HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP** Marl, CME, 140 lbs / 30-inch drop		**HAMMER EFFICIENCY** 74.3%
BOREHOLE BACKFILL OR COMPLETION Neat bentonite cement	**GROUNDWATER READING:** **DURING DRILLING** Not encountered	**AFTER DRILLING (DATE-TIME)**	

Elevation, feet	Depth, feet	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery, %	Blows per 6 in. [Blows per ft]	N_{60}(ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content, %	Liquid Limit	Plasticity Index	Fines, % < #200	Other Lab Tests	REMARKS
	0		Road gravel, aggregate base.												
	1		[LEVEE FILL] LEAN CLAY (CL); hard; brown (10YR 4/3); moist; 93% high dry strength, no dilatancy, medium toughness fines; 7% fine sand; blocks of darker possibly fat clay within fill.		S01B	72			>4.5P	20	37	22	93	UW	S01B_001_002C
	2				S01A				>4.5P	21					S01A_002_003C
20	3														
	4		[LEVEE FILL] SANDY FAT CLAY (CH); very stiff; very dark gray (10YR 3/1); moist; 70% high plasticity, very high dry strength, no dilatancy, high toughness fines; 30% fine sand.		S02B	78			3.75P						S02B_003_004C
	5				S02A				4.0P						S02A_004_005C
	6														
	7		[LEVEE FILL] SANDY LEAN CLAY (CL); hard; dark greenish brown; moist; 70% high dry strength, no dilatancy, medium toughness fines; 30% fine sand.		S03B	83			>4.5P	26				UW	S03B_007_008C
15	8				S03A										S03A_008_009C
	9														
	10		[LEVEE FILL] SANDY FAT CLAY (CH); hard; yellowish brown (10YR 5/4); moist; 70% high dry strength, no dilatancy, medium toughness fines; 30% fine sand.		S04B	89			>4.5P	30	53	31		UW	S04B_010_011C
	11				S04A										S04A_011_012C
	12														
	13				S05B	78			>4.5P						S05B_013_014C
10	14				S05A										S05A_014_015C
	15														
FILL	16				S06A	83			2.25P	47	86	57		UW	S06A_017_018C
	17		FAT CLAY (CH); very stiff; black (10YR 2/1); moist; 95% very high dry strength, no dilatancy, high toughness fines; 5% fine sand.						2.25P						
	18														
5	19				S07B	83			2.75P						S07B_019_020C
	20				S07A				2.5P						S07A_020_021C

Final Report Version 8/14/2013

Borehole Location: Levee Crest **County:** Sacramento
Coordinates: **Northing:** 1,930,619.59 **Easting:** 6,715,753.35
Latitude: 38.46225 **Longitude:** -121.46187
Levee Station or Milepost: 1151+99 **Levee Mile:**
Levee Segment
Survey Method: GIS/LiDAR **Coord. System:** CA State Plane Zone II
Channel / River Name / Feature: Beach - Morrison Creek

LOG OF BORING
WM0009_024B
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Levee Evaluations
Engineering Support Services

DWR LEVEE U/NU SOIL LOG REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 02032014.GLB; 2/11/14

Elevation, feet	Depth, feet	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery, %	Blows per 6 in. [Blows per ft]	N_{60}(ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content, %	Liquid Limit	Plasticity Index	Fines, % < #200	Other Lab Tests	REMARKS
	20				83									
	21													
	22	LEAN CLAY with Sand (CL); very stiff; reddish brown (2.5YR 4/3); moist; 80% medium plasticity, medium dry strength, no dilatancy, medium toughness fines; 20% fine sand.		S08B	89			2.5P						S08B_022_023C
	23			S08A				2.5P	18				UW	S08A_023_024C
0	24													
	25	SANDY LEAN CLAY (CL); soft to medium stiff; reddish brown (2.5YR 4/3); moist; 65% fines; 35% fine sand.		S09B	78			0.5P						S09B_025_026C
	26			S09A					18			35	UW	S09A_026 027C
	27	CLAYEY SAND (SC); reddish brown (2.5YR 4/3); moist; 55% fine sand; 45% medium plasticity fines.												
-5	28	SILTY CLAY (CL/ML); light olive brown (2.5Y 5/3); moist; 97% low plasticity, low dry strength, slow dilatancy, low toughness fines; 3% fine sand.		S10B	89									S10B_028_029C
	29			S10A					38			97	UW	S10A_029_030C
	30	At 30 feet hard.		S11A	42			>4.5P						S11A_030_031T Dames and Moore 400 psi
	31													
	32	LEAN CLAY with Sand (CL); hard; light olive brown (2.5Y 5/3); moist; 80% fines; 20% sand; variable fines content.		S12A	78			>4.5P		38	14	80	FWK	S12A_032_034T Dames and Moore 450 psi
-10	33								32	35	11	87	PA HD UW	
	34												FWK	
	35			S13A	28			2.25P						S13A_034_035T Dames and Moore 450 psi
	36													
	37	LEAN CLAY (CL); hard; olive brown (2.5Y 4/3); moist; 90% low plasticity, medium dry strength, no dilatancy, medium toughness fines; 10% fine sand.		S14B	83			>4.5P						S14B_036_037C
	38			S14A										S14A_037_038C
-15	39													
	40			S15A	44			>4.5P	30				UW	S15A_039_040C
	41	Bottom of boring at 40.5 feet below ground surface. Backfilled with neat bentonite cement using 12 bags of cement, 25 lbs of bentonite, 60 gallons of water.												
	42													
	43													
-20	44													
	45													

Final Report Version 8/14/2013

Borehole Location: Levee Crest **County:** Sacramento
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Levee Segment
Survey Method: GIS/LiDAR **Coord. System:** CA State Plane Zone II
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LOG OF BORING
WM0009_024B
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Levee Evaluations
Engineering Support Services

DWR LEVEE U/NU SOIL LOG REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 02032014.GLB; 2/11/14

DATE STARTED 8/27/12 **DATE COMPLETED** 8/27/12	**GROUND ELEVATION** 23.50 ft **ELEVATION DATUM** NAVD 88		**TOTAL DEPTH OF BORING** 35.5 ft
DRILLING CONTRACTOR Gregg Drilling & Testing, Inc.	**DRILLER'S NAME** Eric Santellan **HELPER'S NAME** Louie Wense		**TOTAL DEPTH OF FILL** 15.5 ft
DRILLING METHOD Hollow-Stem Auger	**DRILL RIG MAKE AND MODEL** Marl M10XLS (D-44)		**CONSULTANT COMPANY** URS Corporation
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) 8" Hollow Stem	**DRILLING ROD TYPE AND DIAMETER** 2" NWJ		**FIELD LOGGER** M. Maghsoudlou
X VERTICAL ☐ **INCLINED**	**CASING TYPE, DIAMETER, INSTALLATION DEPTH** NA		**FIELD LOG REVIEWER** M. Turner
SAMPLER TYPE(S) StdCal(2.5"), D&M(2.5"x20")	**HAMMER TYPE, MAKE/MODEL, WEIGHT/DROP** Marl, CME, 140 lbs / 30-inch drop		**HAMMER EFFICIENCY** 74.3%
BOREHOLE BACKFILL OR COMPLETION Neat bentonite cement	**GROUNDWATER READING:** **DURING DRILLING** Not encountered	**AFTER DRILLING (DATE-TIME)**	

Elevation, feet	Depth, feet	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery, %	Blows per 6 in. [Blows per ft]	N_{60}(ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content, %	Liquid Limit	Plasticity Index	Fines, % < #200	Other Lab Tests	REMARKS
	0		Road gravel, aggregate base.												
	1		[LEVEE FILL] LEAN CLAY (CL); hard; brown (10YR 4/3); moist; 95% very high dry strength, no dilatancy, medium toughness fines; 5% fine sand; Blocks of darker possibly fat clay within fill.		S01B	78			>4.5P						S01B_001_002C
	2				S01A				>4.5P	16	28	15		UW	S01A_002_003C
20	3														
	4		[LEVEE FILL] LEAN CLAY with Sand (CL); hard; dark grayish brown (10YR 4/2); moist; 80% low plasticity, very high dry strength, no dilatancy, medium toughness fines; 20% fine sand.		S02B	83									S02B_004_005C
	5				S02A										S02B_005_006C
	6														
	7		At 7.5 feet 74% fines; 26% sand.		S03B	72			3.0P						S03B_007_008C
	8				S03A				>4.5P	18			74	UW	S03A_008_009C
15	9														
	10				S04A	39			3.0P						S04A_010_011C
	11		[LEVEE FILL] FAT CLAY (CH); very stiff; black (10YR 2/1); moist; 95% very high dry strength, no dilatancy, high toughness fines; 5% fine sand.						2.75P						
	12														
	13				S05B	78			2.0P						S05B_013_014C
10	14				S05A				3.0P	24	54	37		UW	S05A_014_015C
FILL	15														
	16		FAT CLAY (CH); soft to medium stiff; black (10YR 2/1); moist; 95% very high dry strength, no dilatancy, high toughness fines; 5% fine sand.		S06A	39			0.5P						S06A_016_017C
	17								3.0P	33	66	45		UW	
	18														
5	19														
	20		SANDY LEAN CLAY (CL); very stiff; brown (10YR 4/3); moist; 70% medium plasticity, medium dry strength, no		S07B	78			3.75P						S07B_019_020C
					S07A				4.0P						S07A_020_021C

Final Report Version 8/14/2013

Borehole Location: Levee Crest **County:** Sacramento
Coordinates: **Northing:** 1,932,580.23 **Easting:** 6,715,394.08
Latitude: 38.46764 **Longitude:** -121.46308
Levee Station or Milepost: 1171+96 **Levee Mile:**
Levee Segment
Survey Method: GIS/LiDAR **Coord. System:** CA State Plane Zone II
Channel / River Name / Feature: Beach - Morrison Creek

LOG OF BORING
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Levee Evaluations
Engineering Support Services

DWR LEVEE U/NU SOIL LOG REV1; GINTDWRULE; DWR OFFICIAL LIBRARY 02032014.GLB; 2/11/14

Elevation, feet	Depth, feet	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery, %	Blows per 6 in. [Blows per ft]	N_{60}(ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content, %	Liquid Limit	Plasticity Index	Fines, % < #200	Other Lab Tests	REMARKS
	20		dilatancy, medium toughness fines; 30% fine sand.			78									
	21														
	22		CLAYEY SAND (SC); dark grayish brown (10YR 4/2); moist; 52% fine sand; 48% medium plasticity fines.		S08B S08A	72				22			48	UW	S08B_022_023C S08A_023_024C
0	23														
	24														
	25		SANDY LEAN CLAY (CL); soft; brown (10YR 4/3); moist; 65% low plasticity, medium dry strength, no dilatancy, low toughness fines; 35% fine sand.		S09A	89			0.5P 0.5P						S09A_025_027T Dames and Moore 300 psi
	26														
	27				S10A										S10A_027_029T Dames and Moore 100 psi
	28														
-5	29														
	30				S11B	89			0.5P 0.5P	28	43	26		UW	S11B_029_031C
	31		At 31 feet 2" thick sand lense (SP-SM).												
	32		LEAN CLAY (CL); hard; dark greenish gray (5BG 4/1); moist; 95% low dry strength, no dilatancy, low toughness fines; 5% fine sand.		S12A	106			>4.5P						S12A_032_034T Dames and Moore 300 psi
-10	33														
	34														
	35		At 34.5 feet 96% fines; 4% sand.		S13B S13A					37	42	17	96	HD	S13B_034_035C S13A_035_036C
	36		Bottom of boring at 35.5 feet below ground surface. Backfilled with neat bentonite cement using 8 bags of cement, 18 lbs of bentonite, 45 gallons of water.												
	37														
	38														
-15	39														
	40														
	41														
	42														
	43														
-20	44														
	45														

Final Report Version 8/14/2013

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