FINAL FOUNDATION REPORT

Retaining Wall 387
Orange County, California
12-ORA-5, PM 7.2
Caltrans Project No. 1200020279 (EA 12-0F96E4)
EMI Project No. 11-137
Date: October 5, 2012

EARTH MECHANICS, INC.

Geotechnical and Earthquake Engineering

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

October 5, 2012

EMI Project No. 11-137

TRC Solutions, Inc.
123 Technology Drive West
Irvine, California 92618

Attention: Dr. Ayman Salama, P.E.

Subject: Final Foundation Report for Retaining Wall 387
Orange County, California
12-ORA-5, PM 7.2
Caltrans Project No. 1200020279 (EA 12-0F96E4)

Dear Dr. Salama:

Attached please find the Final Foundation Report for the subject retaining wall. This report contains the findings and conclusions of our field investigation and laboratory testing program. This report also contains our recommendations for the design and construction of the retaining wall foundation.

An earlier version of this report dated April 23, 2012 was submitted to Caltrans for review. Caltrans provided their comments in a memorandum dated July 26, 2012. Caltrans review comments and EMI responses are included in Appendix D. Our responses to all the review comments have been incorporated into this report.

We appreciate the opportunity to provide geotechnical design services for this project. If you have any questions, please call us.

Sincerely,

EARTH MECHANICS, INC.

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FINAL FOUNDATION REPORT

RETAINING WALL 387
ORANGE COUNTY, CALIFORNIA
12-ORA-5, PM 7.2
CALTRANS PROJECT NO. 1200020279 (EA 12-0F96E4)

Prepared for:

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EMI Project No. 11-137

October 5, 2012

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF STUDY

This Foundation Report presents the findings and conclusions of a geotechnical investigation conducted by Earth Mechanics, Inc. (EMI). It presents foundation design and construction recommendations for the proposed Retaining Wall 387 located just south of the Camino Capistrano Undercrossing (Bridge No. 55-0227) along I-5 southbound. A site location map is presented in Figure 1-1.

EMI is a subconsultant to TRC Solutions, Inc. (TRC). The geotechnical services provided for this project included the following tasks:

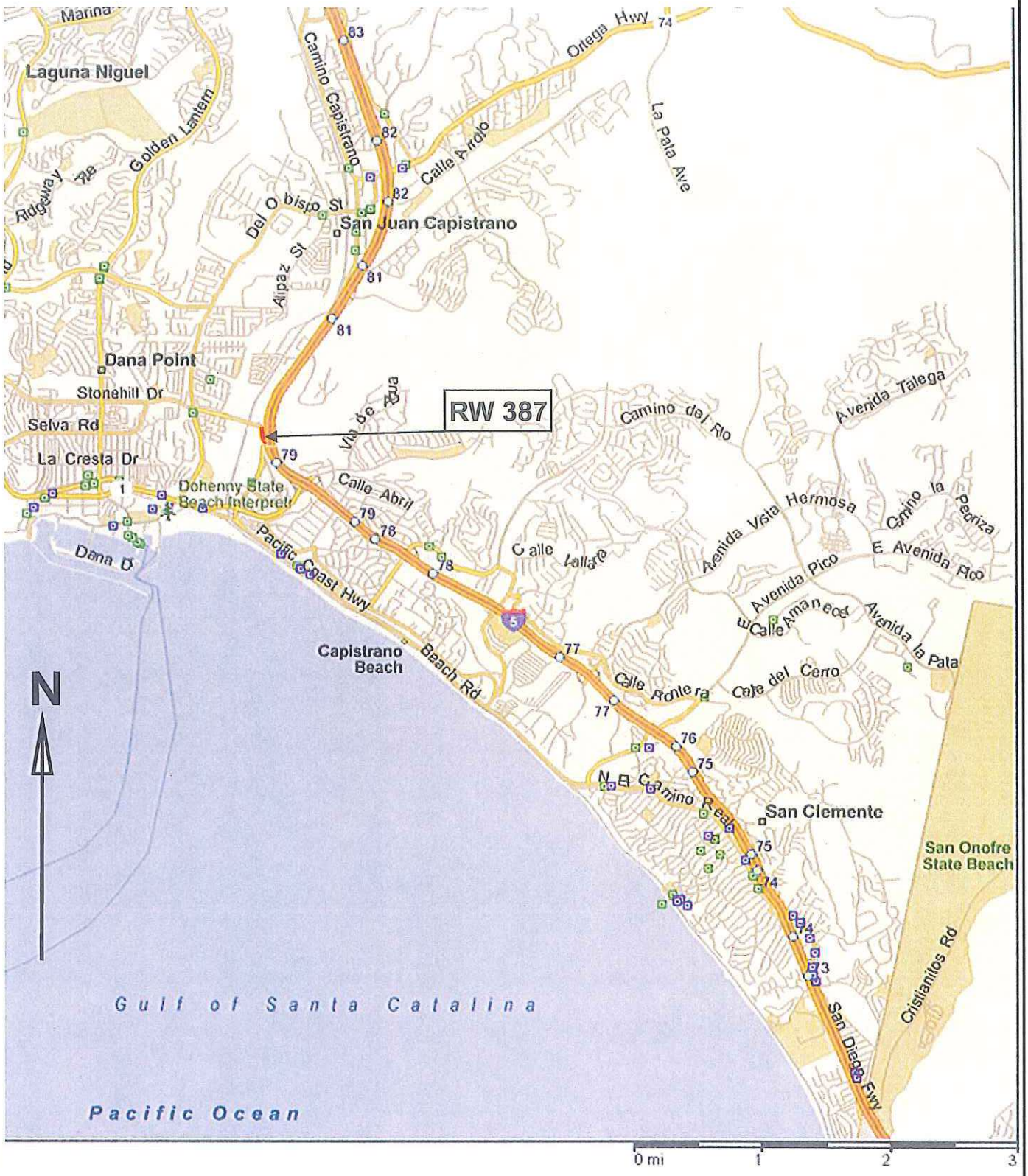
- Field exploration consisting of drilling and logging exploratory borings;
- Laboratory testing of selected bulk and relatively undisturbed soil samples;
- Engineering calculations and analysis to develop foundation design and construction recommendations; and
- Preparation of this report presenting our findings, conclusions, and recommendations.

1.2 PROJECT DESCRIPTION

The California Department of Transportation (Caltrans), in cooperation with the Orange County Transportation Authority (OCTA) and the cities of Dana Point and San Juan Capistrano, proposes to improve the I-5 corridor. The project's southern terminus is approximately 0.6 mile south of the PCH/Camino Las Ramblas Interchange (I-5 Mainline Station 340+00) in the City of Dana Point. The northern terminus of the project is approximately 0.2 mile south of San Juan Creek Road (I-5 Mainline Station 465+00) in the City of San Juan Capistrano. The total project length along the I-5 corridor is approximately 2.5 miles. However, according to the Project Report prepared in October 2011, the proposed project improves the I-5 corridor from I-5 Mainline Stations 340+00 (southern project limit) to 407+50. From I-5 Mainline Stations 407+50 to 465+00 (northern project limit), the proposed project will consist primarily of restriping the existing pavements only.

An existing Retaining Wall 391 is located parallel to the proposed Retaining Wall 387 at a horizontal distance of about 5 to 12 feet. Retaining Wall 391 is a Mechanically Stabilized Embankment (MSE) wall built in 1997. The MSE wall heights vary between 6 and 14 feet.

The proposed wall is taller than the existing MSE wall. MSE wall was considered as the proposed wall type. Since the proposed wall is taller than the existing wall, MSE wall type is not feasible because of uncertainty of extending the reinforcing strips. Therefore, Retaining Wall 387 is proposed to be a combination of Caltrans modified Type 1SWBP, modified Type 7SWBP and Type 1SWBP cantilevered retaining walls, all without the soundwall on top.



Retaining Wall 387	SITE LOCATION MAP
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Figure 1-1
Project No. 11-137	Date: 03-29-12

2.0 FIELD INVESTIGATION AND LABORATORY TESTING

2.1 FIELD INVESTIGATION

A geotechnical field investigation was conducted between October 2 and 11, 2011. Two soil borings and three cone penetration test (CPT) soundings were accomplished under the supervision of EMI. Boring information, including surveyed locations and elevations, are summarized in Table 2-1. Locations of the borings and CPTs are shown on the LOTB sheets provided in Appendix A.

Table 2-1. Geotechnical Exploration Information

Boring/ CPT	Easting	Northing	Station (A-Line) (feet)	Offset (feet)	Top of Boring El. (feet)	Bottom of Boring El. (feet)	Ground Water El. (feet)	Drilling Method
CPT-11-345	6,127,229	2,117,892	389+15	85 Lt	+130.4	+36.0	NM	CPT
CPT-11-347	6,127,140	2,118,412	394+26	85 Lt	+120.3	+30.4	NM	CPT
A-11-348	6,127,141	2,118,721	397+27	74 Lt	+116.9	+15.4	NE	HSA
A-11-349	6,127,118	2,118,868	398+69	102 Lt	+81.7	+0.2	+63.7	HSA
CPT-11-349	6,127,118	2,118,868	398+69	102 Lt	+81.7	-23.6	NM	CPT

Notes:
(1) A-Line = I-5 Mainline; NE = Not Encountered; NM = Not Measured.
(2) CPT = Cone Penetration Test; HSA = Hollow-Stem Auger.

CPT-11-345, CPT-11-347 and Boring A-11-348 were performed at the I-5 freeway level and Boring A-11-349 and CPT-11-349 were performed at the Camino Capistrano roadway level. Boring A-11-349 was performed adjacent to CPT-11-349 in order to calibrate the CPT data.

Borings were drilled using a truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers. Sampling was performed by alternating the Modified California Drive (MCD) sampler and Standard Penetration Test (SPT) sampler. The soil sampling interval was generally 5 feet.

Relatively undisturbed soil samples were obtained using a 3.25-inch outer diameter MCD sampler lined with brass rings. Each of these brass rings is 1-inch long with a 2.5-inch outside diameter. The SPT sampler (1.4-inch inside diameter) was also used to obtain soil samples. The MCD and SPT samplers were driven 18 inches into the ground or until refusal was encountered using a 140-lb automatic trip hammer free falling from a height of 30 inches. The numbers of blows to advance the sampler each 6 inches of penetration were recorded. The number of blows for the final 12 inches or shorter of driving was recorded on the LOTB sheets. Charts published by Winterkorn and Fang (1975) can be used to determine a reduction factor used to convert blowcounts recorded using the modified California Drive sampler into SPT blowcounts. Using those charts, we obtained a reduction factor of 0.5 which was used for this project.

The CPT sounding was performed using an electronic cone penetrometer in general accordance with current ASTM Standards (ASTM D5778 and ASTM D3441). The CPT equipment consisted of a cone penetrometer assembly mounted at the end of a series of hollow sounding

rods. The cone penetrometer assembly consisted of a conical tip with a 60° apex angle and a projected cross sectional area of 1.55 in² (10 cm²) and a cylindrical friction sleeve with a surface area of 23.25 in² (150 cm²). The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurements of cone tip and friction sleeve resistance during penetration. The cone penetrometer assembly is continuously pushed into the soil by a set of hydraulic rams at a standard rate of 0.79 inch per second (20 mm per second) while the cone tip resistance and sleeve friction resistance are recorded every 1.967 inches (50 mm) and stored in digital form. A specially designed all-wheel drive 25-ton truck provides the required reaction weight for pushing the cone assembly and is also used to transport and house the testing equipment. The computer generated graphical logs include tip resistance, friction resistance, and friction ratio. Soil behavior type interpretations are based on guidelines by Robertson and Campanella (1989).

2.2 LABORATORY TESTING

Soil samples considered representative of the subsurface conditions were tested to obtain or derive relevant physical and engineering soil properties. The following laboratory tests were conducted to supplement the observations recorded during the field investigation:

- In-situ Moisture Content and Unit Weight
- Percent Passing No. 200 Sieve
- Direct Shear
- Unconsolidated Undrained Triaxial
- Consolidation
- Minimum Resistivity, pH, Sulfate Content and Chloride Content

The laboratory tests were conducted in general accordance with California Test Methods or American Society for Testing and Materials (ASTM) Standards. Laboratory test results are included in Appendix B.

3.0 GEOLOGY AND SEISMICITY

3.1 PHYSIOGRAPHY

The project area is in the northwestern part of the Peninsular Ranges physiographic province. The Peninsular Ranges comprise a northwest-southeast trending group of fault-bounded ranges between the Salton Trough and the Pacific Ocean. The Santa Ana Mountains, Puente Hills, and San Joaquin Hills are ranges within the Peninsular Ranges.

The site is located on the low lying rolling hills westerly of the Santa Ana Mountains at the southerly end of the San Joaquin Hills in an area referred to as the Capistrano Embayment.

3.2 GEOLOGIC STRUCTURE

The geological structure at the site consists of slightly to moderately folded bedrock of the Capistrano formation overlain by horizontally bedded Quaternary terrace deposits and alluvium without any notable geological structures such as faults, folds, or unconformities. The northerly portion of the project is underlain by deposits of the McCracken Hill landslide which is described in Section 3.3.

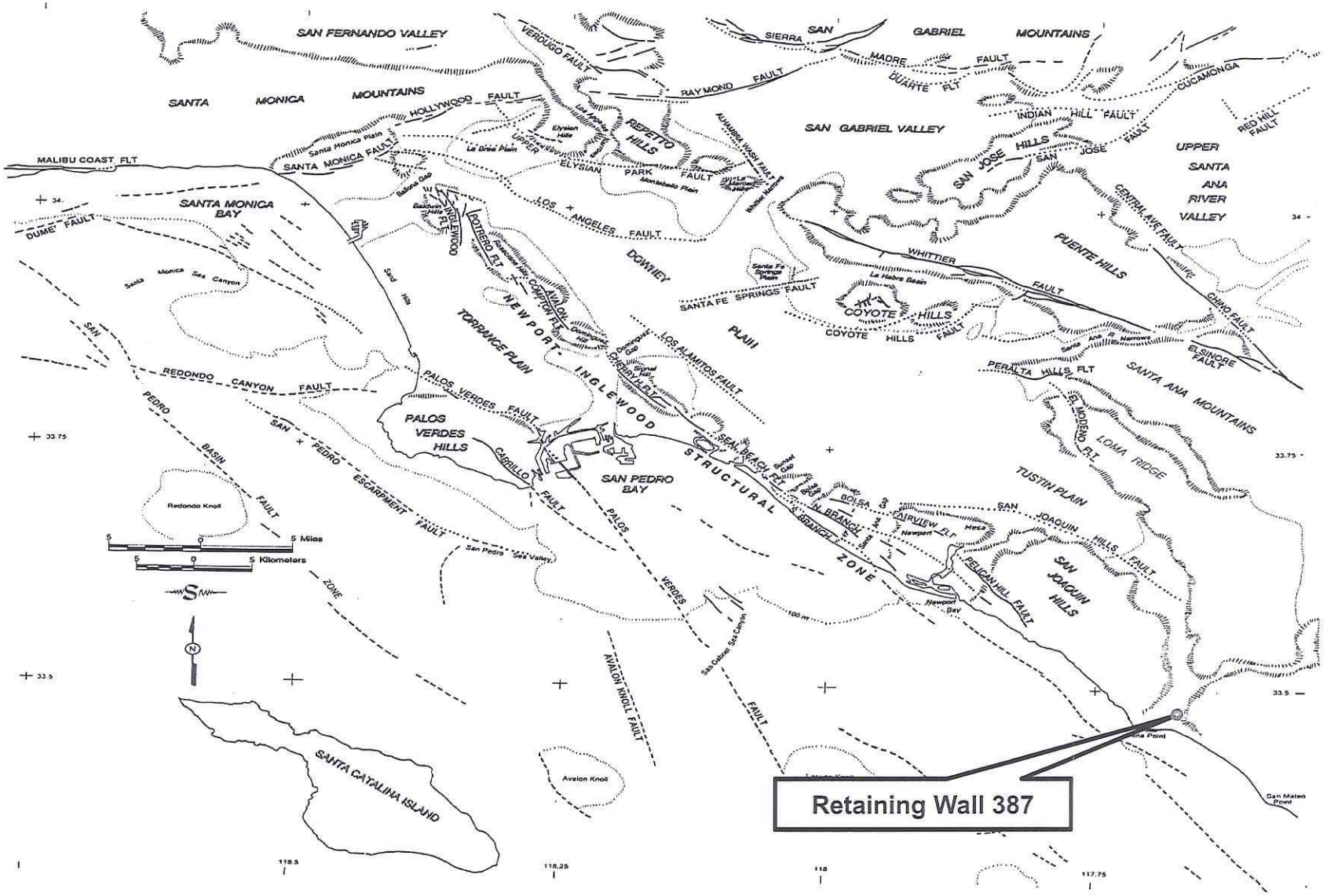
The Capistrano Formation is widespread throughout the southern part of Orange County, which is known geologically as the Capistrano Embayment. The Capistrano Embayment is the name given to the structural/stratigraphic block west of the Cristianitos Fault. Geologic faults in the region are shown on Figure 3-1. Geological structure in the Capistrano Embayment area consists primarily of a broad, gentle syncline of the Monterey and Capistrano Formations between the San Joaquin Hills and the Santa Ana Mountains. This structure originated as a deep submarine structural trough that has since been uplifted at least 3000 feet from the marine environment to its present position above sea level (Ehlig, 1989). Subsequent regional uplift during the late Pliocene and Pleistocene time resulted in folding of the bedrock units.

The bedrock of the Capistrano Formation underlying the site was found to be massive to poorly bedded. Where bedding was observed, the strikes were generally to the northeast with shallow dips less than about 10 degrees westerly. Throughout the project corridor, the dominant structural pattern is high-angle joints and fractures within the Capistrano bedrock.

Pleistocene Terrace Deposits unconformaly overlie the Capistrano Formation. The contact is generally undulatory, with a slight overall dip seaward averaging about 2 degrees. This erosional contact is marked by cobble and boulder rich beds of varying thicknesses.

3.3 GEOLOGIC HAZARD

The geological hazards present at the site include earthquake shaking and landsliding. The site lies outside identified tsunami inundation zones (CGS, 2009), and there are no large bodies of water within the site area that could generate a seiche. There are no volcanos in the region and there are no known active surface faults within the project area so ground rupture is not a factor. As shown in Figure 3-2, the California Geological Survey (CGS, 2001a) has indicated that the project alignment has a low susceptibility to liquefaction during a strong earthquake. The potential for liquefaction is discussed in detail in Section 5.2.



Retaining Wall 387

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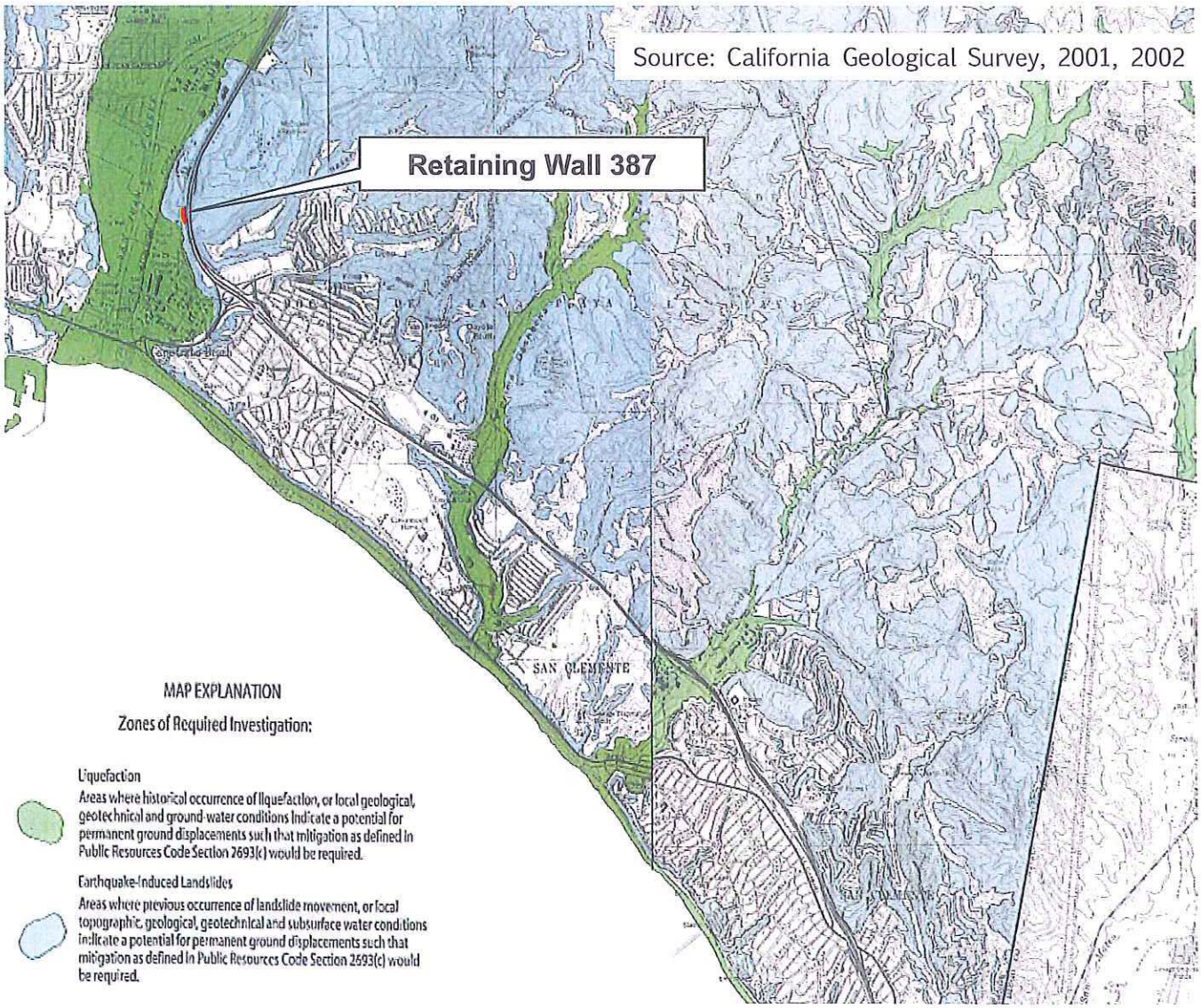
REGIONAL MAP OF ACTIVE FAULTS AND PHYSIOGRAPHY

Figure 3-1

Project No. 11-137

Date: 03-01-12



Retaining Wall 387	MAP OF LIQUEFACTION POTENTIAL Figure 3-2
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	Project No. 11-137 / Date: 03-01-12

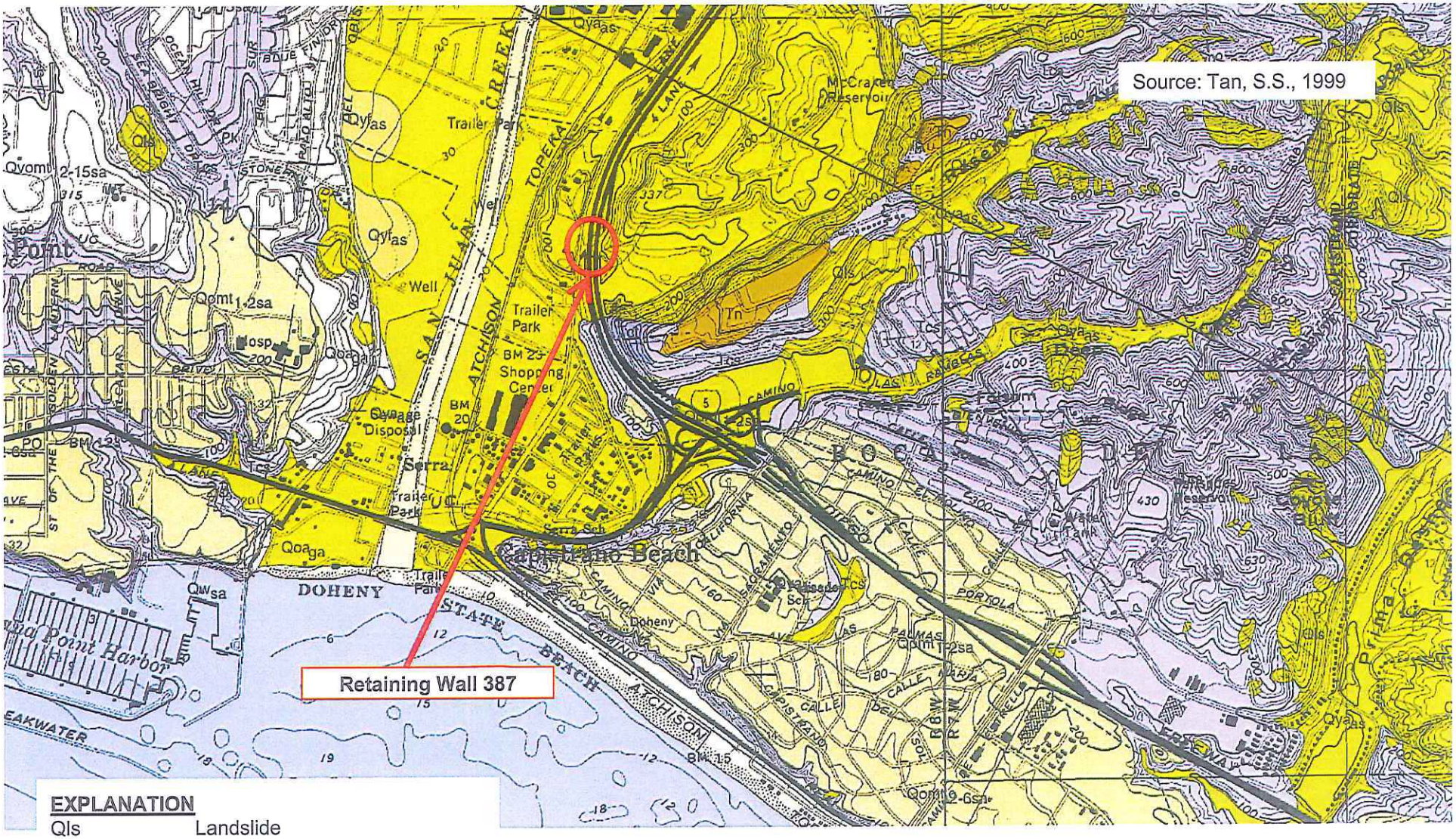
The Capistrano Formation bedrock underlying the majority of the site is notoriously susceptible to landsliding. The landslides are shown in Figure 3-3. At the north of PCH/Camino Las Ramblas Interchange, the I-5 alignment traverses the McCracken Hill Landslide. The remnant headscarp of this ancient landslide is defined by a west to northwest facing slope that extends for about 7000 feet on the eastern side of the I-5 Freeway (AMEC, 2006a and 2006b). It is believed that the landslide occurred between 11,000 to 30,000 years ago when the sea level was lower than present day and San Juan Creek carved a deep channel on its course to the Pacific Ocean. During the Pleistocene, the climate was considerably wetter than present day and this combined with the loss of support at the toe of the slope due to erosion by San Juan Creek are believed to have been causative factors in the landslide failure. Since the landslide failure, a considerable thickness of alluvium has infilled the ancestral San Juan Creek channel with deposits more than 130 feet thick forming a natural buttress for the landslide mass. Extensive investigations of the landslide performed by Leighton and Associates (Leighton, 2004) and AMEC (AMEC, 2006a, 2006b, and 2000a through 2000e) in conjunction with proposed residential developments in the area indicate that the landslide is stable.

In addition, a smaller landslide is present along the PCH NB on-ramp to I-5 SB. The slope ascending from the PCH NB on-ramp to I-5 SB is underlain by Quaternary Terrace Deposits overlying bedrock of the Capistrano Formation. A landslide measuring approximately 150 feet wide by 300 feet long was observed on this slope during field mapping. Research of files at the City of Dana Point did not reveal any geologic reports relating to the landslide or details of when it occurred. Based on the geomorphology of the slide it appears to have been a shallow failure involving the Terrace Deposits and possibly the weathered upper portion of the underlying bedrock. It is estimated the landslide is likely less than about 30 feet deep. Proposed grading performed in conjunction with the project is not considered to have an impact on this landslide.

Bedrock exposures along Via Canon (southwesterly of the landslide, outside the limits of the geologic map) indicate that the bedding is variable but generally dips south to southeast at angles ranging from 5 to 22 degrees. This bedding orientation is generally considered favorable to the gross stability of the slope.

3.4 SEISMICITY

The project is in seismically active Southern California. The present-day seismotectonic stress field in the Los Angeles region is one of north-northeasterly compression. This is indicated by the geologic structures, earthquake focal-mechanism solutions, and geodetic measurements. These data suggest crustal shortening of between 0.2 and 0.35 inch per year across the greater Los Angeles area (Argus et al., 1999).



Retaining Wall 387

GEOLOGICAL MAP

Figure 3-3

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

Project No. 11-137

Date: 03-01-12

Historical earthquake epicenter maps show widespread seismicity throughout the region. Although historical earthquakes occur in proximity to known faults, they are difficult to directly associate with mapped faults. Part of this difficulty is due to the fact that the basin is underlain by several poorly known subsurface thrust faults, generally referred to as blind thrust faults. Ward (1994) estimated that about 40 percent of seismic moment cannot be associated with known faults. Earthquakes occur primarily as loose clusters along the Newport-Inglewood Structural Zone (NISZ), the southern margin of the Santa Monica Mountains, the margin between the Santa Susana-San Fernando Valley and the southern margin of the San Gabriel Mountains, and in the Coyote Hills-Puente Hills area. There is no clustering or alignment of earthquakes in proximity to the site. There are fewer earthquakes in the site region than anywhere else in the Los Angeles Basin area. This apparent lack of earthquake activity suggests that the site area is tectonically stable and suggests that there are no unrecognized active faults at the site.

The largest historical earthquake within the Los Angeles Basin was the 1933 Long Beach event which had a moment magnitude (M_W) of about 6.4 (M_L = 6.3). This earthquake did not rupture the surface but is believed to have been associated with the NISZ (Benioff, 1938). The association was based on abundant ground failures along the NISZ trend but no unequivocal surface rupture was identified. Reevaluation of the seismicity data by Hauksson and Gross (1991) relocated the 1933 earthquake hypocenter to a depth of about 6 miles below the Huntington Beach-Newport Beach city boundary.

Other major earthquakes in the region include the 1994 Northridge and the 1971 San Fernando earthquake both of which occurred in the San Fernando Valley region. The 1994 earthquake had a M_W of about 6.7 (M_S = 6.8, M_L = 6.4), and occurred on a southerly dipping subsurface fault which was unknown prior to the earthquake. The main shock occurred at a depth of about 12 miles. Earthquake aftershocks clearly defined the rupture surface dipping about 35 degrees southerly from a depth of about 1.2 or 1.9 miles to 14 miles (Hauksson et al, 1995). The causative fault was never identified with certainty. The event may have occurred on an eastern extension of the Oakridge fault (Yeats and Huftile, 1995), a southerly dipping feature fault bounding the Ventura Basin and the Santa Susana Mountains.

The 1971 San Fernando earthquake was of similar size (M_W = 6.7, M_S = 6.4, M_L = 6.4) to the 1994 event but did involve surface rupture. The 1971 event occurred on a northerly dipping thrust fault that dips from the northern side of the San Fernando Valley to a depth of about 9 miles under the San Gabriel Mountains. Several mapped surface faults were involved such as the Sylmar fault, Tujunga fault, and Lakeview fault. These faults are commonly considered to be part of the Sierra Madre fault system which extends easterly from the San Fernando Valley, along the base of the San Gabriel Mountains on the north side of the San Gabriel Valley, and to the Cucamonga fault in the San Bernardino area.

The 1987 Whittier earthquake (M_L = 5.9, M_W = 5.9) occurred on a subsurface fault dipping under the Puente Hills to about 10 miles beneath the San Gabriel Basin (Shaw and Shearer, 1999; Shaw et al., 2002). This event did not rupture the ground surface.

A magnitude 5.4 earthquake occurred at a depth of about 9 miles on 29 July 2008. The epicenter was in the Chino Hills area between the Chino fault and the Whittier fault. Preliminary data were inconclusive with regard to the causative fault. Detailed analysis by Shao and Hauksson (2009)

indicated a rupture plane striking N71°W, dipping 62 degrees northeast. They suggested a preference for the Whittier fault being the causative fault but were uncertain, primarily because the Whittier fault is supposed to dip at about 80 degrees. The aftershock pattern formed a subhorizontal alignment indicating the possibility that the event could have been associated with a subsurface thrust fault such as one of the blind faults of the Puente Hills Blind Thrust Fault System or with a blind fault under the Peralta Hills.

Another significant earthquake was the 1812 earthquake which caused damage at the San Juan Capistrano Mission. The location and magnitude of the 1812 earthquake are unknown because of the sparse population at the time, but geological studies (Jacoby et al., 1987; Fumal et al., 1993; Weldon et al., 2004) postulate that it did not occur in the Capistrano area, but rather was a large ($M_W > 7.0$) distant event on the San Andreas fault in the Wrightwood area of the San Gabriel Mountains.

The earliest documented earthquake in the region was reported by the Portola´ expedition as they camped near the Santa Ana River in 1769. This event has been attributed by various geoscientists to just about every fault in the Los Angeles area but it could just as well have been a distant event that shook a wide area as did the 1971 San Fernando, the 1987 Whittier, and the 1994 Northridge events, as well as many other more-distant events (for example, 1992 Landers event).

4.0 SUBSURFACE CONDITIONS

4.1 SOIL CONDITIONS

The existing freeway surface elevation is between +115 and +134 feet within the proposed wall limits, and Camino Capistrano Street surface elevation is between +40 and +80 feet. Based on the recent field investigation, the site is underlain primarily by lean clay, lean clay with sand and silt with sand.

The idealized soil profile and design strength parameters for foundation design are presented in Table 4-1. The undrained shear strength in Table 4-1 is the shear strength obtained from laboratory test results and CPT data (Robertson and Campanella, 1989).

Table 4-1. Idealized Soil Profile and Strength Parameters

Approximate Elevation (feet)	Predominant Soil Type	Equivalent SPT Blowcount* (blows/foot)	Total Unit Weight (pcf)	Undrained Shear Strength (psf)
From Begin Wall to A-Line Station 395+43 (CPT-11-345 and CPT-11-347)				
+130 to +45	Silty Clay to Clay	-	120	2000
+45 to +30	Silty Clay to Clay	-	120	3000
From A-Line Station 395+43 to End Wall (Boring A-11-348)				
+120 to +75	Lean Clay	(6) to 16 Average = 12	120	2000
+75 to +55	Lean Clay	4 to (12) Average = 9	120	1400
+55 to +30	Lean Clay	5 to (29) Average = 14	120	2000

* Values in ( ) are converted SPT blowcounts corrected for sampler size; correction factor from Modified California Drive sampler blowcounts to SPT blowcounts is 0.5.

4.2 GROUNDWATER CONDITIONS

Groundwater was encountered only in one boring at elevation +63.7 feet during the recent field investigation and it appears to be perched water. Groundwater during construction may be different from those reported above because groundwater level can fluctuate due to variations in seasonal precipitation, irrigation, groundwater injection or extraction, or numerous other man-made and natural influences.

Based on California Geological Survey, Division of Mines and Geology (CGS, 2001b), the highest historical groundwater at the project site is 5 to 10 feet below the ground surface. So, there is a major discrepancy between the CGS data and measured groundwater data described above. Based on our past experience, the CGS historical high groundwater data is often based on limited data and may or may not reflect actual site conditions. We believe the historical high groundwater data reported by CGS is likely to be either a perched water zone or the original ground surface is significantly lower than the current ground surface. In both cases, it does not appear to be representative of the site conditions. However, a conservative groundwater depth of 10 feet below the Camino Capistrano roadway is used for the liquefaction analyses.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SEISMIC DESIGN CRITERIA

We have determined the design ARS curve based on the 2010 Seismic Design Criteria (SDC) (Caltrans, 2010a) and Geotechnical Services Design Manual (Caltrans, 2009a) procedures. The peak ground acceleration (PGA) is the zero-period spectral acceleration in the ARS curve. A PGA of 0.408g is obtained from the design ARS curve.

For analyzing global slope stability, Section 3.10 of the Caltrans Guidelines for Structures Foundation Reports (Caltrans, 2009b) recommends using a horizontal seismic coefficient equal to one-third of the peak acceleration but not exceeding 0.2. Therefore, a horizontal seismic coefficient of 0.136 was used in the slope stability analysis.

As presented in Section 11.8.6 of AASHTO (2007), the seismic earth pressures can be computed using a seismic coefficient equal to half of the peak acceleration. Therefore, a seismic coefficient of 0.204g can be used for the computation of seismic earth pressures.

5.2 LIQUEFACTION

Liquefaction analysis was performed using the available site-specific subsurface information from borings and CPTs. As discussed in Section 4.2, there is a major discrepancy between CGS groundwater data and measured groundwater data. A conservative groundwater depth of 10 feet below the Camino Capistrano roadway is used for the liquefaction analyses.

The liquefaction potential of saturated, granular materials below the groundwater table was evaluated using the procedures outlined by Seed et al. (1983), Seed and Harder (1990), and updated by NCEER (1997). Results of the liquefaction analyses are included in Appendix C. Based on the analyses, granular materials susceptible to liquefaction were encountered only in the CPTs. The liquefiable layer is less than 0.7 feet thick, and it is isolated and discontinuous. Therefore, the liquefaction potential is concluded to be low. Furthermore, as discussed in Section 3.3, the California Geological Survey (CGS, 2001a) has also indicated that the project alignment has a low susceptibility to liquefaction during a strong earthquake.

The seismically-induced settlement calculation is also presented in Appendix C. In the liquefiable layer, seismically-induced settlement is expected to be no more than 0.2 inches. Since this liquefiable layer is relatively thin, isolated and discontinuous, the seismically-induced settlement is not expected to adversely impact the retaining wall.

5.3 SOIL CORROSIVITY

Three soil samples were tested for pH, minimum resistivity, soluble chloride content and soluble sulfate content. The test results are summarized in Table 5-1. Minimum resistivities were between 270 and 760 ohm-cm. The pH values were between 7.6 and 8.1. The soluble sulfate measurements were between 680 and 6,400 parts per million (ppm), and the soluble chloride measurements were between 341 and 649 ppm.

Table 5-1. Soil Corrosion Test Results

Boring	Location (A-Line Stations)		Sample Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Soluble Sulfate Content (ppm)	Soluble Chloride Content (ppm)
	Station (feet)	Offset (feet)						
A-11-348	397+27	74 Lt	20.0	CL	270	7.6	6,400	649
A-11-349	398+69	102 Lt	5.0	CL	760	8.1	680	392
A-11-349	398+69	102 Lt	50.0	CL	510	8.0	1,800	341

Based on the Caltrans Corrosion Guidelines (2003b), soils are considered corrosive if the pH is 5.5 or less, or the sulfate concentration is 2,000 ppm or greater, or the chloride concentration is 500 ppm or greater. Based on the test results and the Caltrans criteria, the on-site soils are considered to be corrosive to bare metals and concrete.

For the above measured chloride concentration, minimum concrete cover over reinforcement should be in accordance with Table 8.22.1 of the Caltrans BDS (Caltrans, 2003a) for "Corrosive soil above MLLW level with chloride concentration between 500 and 5,000 ppm". For the above measured sulfate concentration, cement type should be in accordance with Table 8.22.2 of the Caltrans BDS (Caltrans, 2003a) for "Sulfate Concentration from 2,000 to 15,000". Additional corrosion protection requirements for concrete structural members are presented in Section 8.22 of the Caltrans BDS (Caltrans, 2003b).

5.4 FOUNDATION DESIGN

Retaining Wall 387 is proposed to be a combination of Caltrans modified Type 1SWBP, modified Type 7SWBP and Type 1SWBP cantilevered retaining walls, all without the soundwall on top. The retaining wall pertinent data is presented in Table 5-2.

Table 5-2. Retaining Wall 387 Pertinent Data

Wall Type	Location (A-Line Stations)		Length (feet)	Height (feet)	Bottom of Footing Elevation (feet)	Backfill Slope Condition	Wall Face Slope Condition
	Begin Wall	End Wall					
7SWBP (Modified)	388+90.32 115.60 Lt	391+18.59 108.79 Lt	245	10 to 16	+107.50 to +119.00	Level	2H:1V
1SWBP (Modified)	391+18.59 108.79 Lt	397+02.38 93.32 Lt	590	14 to 24	+95.50 to +105.50	Level	2H:1V
1SWBP	397+02.38 93.32 Lt	397+43.21 92.75 Lt	42	18 to 24	+91.50 to +98.50	Level	2H:1V

For the Caltrans modified Type 1SWBP, modified Type 7SWBP and Type 1SWBP cantilevered retaining walls, structural engineers proposed vertical and battered Caltrans Standard Class 90 (Alternative "X") 12-inch square concrete driven piles (Caltrans, 2010b).

It is anticipated that the piles will be driven prior to backfilling the retaining wall. As presented in Section 3.11.8 (AASHTO, 2007), downdrag forces will be fully developed if the relative vertical settlement between the pile and surrounding soil is greater than 0.4 inches. Based on the calculations included in Appendix C, the relative settlement between pile and soil is less than 0.4 inches. Therefore, downdrag force will not develop.

5.4.1 Foundation Data Provided by Structural Designers

Per Caltrans policy, the LRFD Service Limit State I load, and Strength Limit State and Extreme Event Limit State load combinations are used for the design of pile footings.

The foundation design data sheets are presented in Table 5-3. Foundation loads were provided by the structural designers following the latest Caltrans Memo To Designers (Caltrans, 2008) and presented in Table 5-4.

Table 5-3. Foundation Design Data Sheet

Wall Type	Design Height	Design Method	Pile Type	Cut-off Elevation (feet)	Pile Cap Size (feet)		Number of Pile per Support
					B	L	
7SWBP Modified	10	LRFD	Class 90 Alt X	+119.25	7.25	12.00	4
	10			+118.25	7.25	12.00	4
	12			+116.75	7.75	24.00	8
	14			+114.75	8.00	24.00	9
	14			+112.75	8.00	24.00	9
	16			+110.75	9.00	48.00	19
	16			+109.75	9.00	48.00	19
	16			+107.75	9.00	48.00	19
1SWBP Modified	18	LRFD	Class 90 Alt X	+105.75	11.00	48.00	22
	18			+105.75	11.00	48.00	20
	18			+103.75	11.00	48.00	20
	20			+100.75	11.50	48.00	22
	22			+98.25	14.00	48.00	26
	24			+96.75	14.00	96.00	60
	22			+95.75	13.50	96.00	56
	20			+97.75	11.50	48.00	22
	16			+100.25	10.75	48.00	14
	14			+102.25	10.00	62.00	15
1SWBP	18	LRFD	Class 90 Alt X	+98.75	11.25	14.00	5
	20			+95.25	12.00	14.00	5
	24			+91.75	14.25	14.00	8

Table 5-4. Foundation Design Loads

Wall Type	Design Height (feet)	Service-I Limit State (kips)			Strength Limit State (Controlling Group, kips)				Extreme Event Limit State (Controlling Group, kips)			
		Total Load		Perm. Loads	Compression		Tension		Compression		Tension	
		Per Support	Max. Per Pile	Per Support	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
7SWBP Modified	10	85	36	85	108	52	N/A	8	85	58	N/A	16
	10	85	36	85	108	52	N/A	8	85	58	N/A	16
	12	196	41	196	250	69	N/A	20	196	83	N/A	34
	14	211	40	211	270	70	N/A	34	211	84	N/A	52
	14	211	40	211	270	70	N/A	34	211	84	N/A	52
	16	482	49	482	612	74	N/A	40	482	90	N/A	63
	16	482	49	482	612	74	N/A	40	482	90	N/A	63
	16	482	49	482	612	74	N/A	40	482	90	N/A	63
1SWBP Modified	18	758	52	758	987	76	N/A	4	758	85	N/A	16
	18	896	65	896	1174	94	N/A	0	896	101	N/A	11
	18	896	65	896	1174	94	N/A	0	896	101	N/A	11
	20	1128	72	1128	1480	104	N/A	3	1128	111	N/A	21
	22	1390	88	1390	1824	108	N/A	0	1390	89	N/A	25
	24	3076	79	3076	4028	93	N/A	26	3076	106	N/A	71
	22	2365	68	2365	3088	79	N/A	18	2365	85	N/A	50
	20	1128	79	1128	1480	113	N/A	2	1128	122	N/A	19
	16	916	90	916	1204	126	N/A	0	916	129	N/A	0
	14	970	80	970	1273	113	N/A	0	970	116	N/A	0
1SWBP	18	304	72	304	399	102	N/A	0	304	105	N/A	6
	20	364	89	364	478	126	N/A	0	364	132	N/A	16
	24	526	82	526	691	112	N/A	12	526	130	N/A	54

5.4.2 Axial Pile Capacity

Foundation design recommendations are presented in Table 5-5. The Pile Data Table for the contract plans is presented in Table 5-6.

According to Section 10.8.3.6.3 (AASHTO, 2007), a pile-group efficiency factor (GEF) of 0.65 is used for a center-to-center pile spacing of 2.5 times the pile diameter, and a GEF of 1.0 is used for a center-to-center spacing of 4.0 times the pile diameter or greater. Linear interpolation can be used to determine the GEF for intermediate spacing. Based on the pile layout provided by the structural designers, a GEF of 0.9 was used to compute available group axial pile capacities. As a result, the "nominal driving resistance" is about 11 percent larger than the "nominal resistance" in Table 5-6.

Table 5-5. Retaining Wall Foundation Design Recommendations

Wall Type (Pile Type)	Wall H (feet)	Cut-off El. (feet)	Service-I Limit State Loads per Pile (kips)	Total Wall Settl. (inch)	Required Factored Nominal Resistance (kips)				Design Tip El. (feet)	Spec. Tip El. (feet)	Nominal Driving Resis. (kips)
					Strength Limit		Extreme Event				
					Comp. (ϕ=0.7)	Tension (ϕ=0.7)	Comp. (ϕ=1.0)	Tension (ϕ=1.0)			
7SWBP Modified (Class 90 Alt X)	10	+119.25	36	1	52	8	58	16	+89 (a-I) +99 (a-II) +109 (b-I) +109 (b-II) +94 (d)	+89	90
	10	+118.25	36	1	52	8	58	16	+88 (a-I) +98 (a-II) +108 (b-I) +108 (b-II) +93 (d)	+88	90
	12	+116.75	41	1	69	20	83	34	+86 (a-I) +91 (a-II) +106 (b-I) +101 (b-II) +91 (d)	+86	110
	14	+114.75	40	1	70	34	84	52	+84 (a-I) +89 (a-II) +99 (b-I) +94 (b-II) +89 (d)	+84	120
	14	+112.75	40	1	70	34	84	52	+82 (a-I) +87 (a-II) +97 (b-I) +92 (b-II) +87 (d)	+82	120
	16	+110.75	49	1	74	40	90	63	+75 (a-I) +85 (a-II) +90 (b-I) +85 (b-II) +85 (d)	+75	120
	16	+109.75	49	1	74	40	90	63	+74 (a-I) +84 (a-II) +89 (b-I) +84 (b-II) +84 (d)	+74	120
	16	+107.75	49	1	74	40	90	63	+72 (a-I) +82 (a-II) +87 (b-I) +82 (b-II) +82 (d)	+72	120
1SWBP Modified (Class 90 Alt X)	18	+105.75	52	1	76	4	85	16	+70 (a-I) +80 (a-II) +95 (b-I) +95 (b-II) +80 (d)	+70	120
	18	+105.75	65	1	94	0	101	11	+65 (a-I) +75 (a-II) +95 (b-II) +80 (d)	+65	150
	18	+103.75	65	1	94	0	101	11	+63 (a-I) +73 (a-II) +93 (b-II) +78 (d)	+63	150
	20	+100.75	72	1	104	3	111	21	+55 (a-I) +65 (a-II) +90 (b-I) +90 (b-II) +85 (c) +75 (d)	+55	170

Wall Type (Pile Type)	Wall H (feet)	Cut-off El. (feet)	Service-I Limit State Loads per Pile (kips)	Total Wall Settl. (inch)	Required Factored Nominal Resistance (kips)				Design Tip El. (feet)	Spec. Tip El. (feet)	Nominal Driving Resis. (kips)
					Strength Limit		Extreme Event				
					Comp. (ϕ=0.7)	Tension (ϕ=0.7)	Comp. (ϕ=1.0)	Tension (ϕ=1.0)			
1SWBP Modified (Class 90 Alt X)	22	+98.25	88	1	108	0	89	25	+53 (a-I) +73 (a-II) +88 (b-II) +81 (c) +73 (d)	+53	180
	24	+96.75	79	1	93	26	106	71	+56 (a-I) +66 (a-II) +81 (b-I) +66 (b-II) +75 (c) +71 (d)	+56	150
	22	+95.75	68	1	79	18	85	50	+55 (a-I) +65 (a-II) +85 (b-I) +75 (b-II) +80 (c) +70 (d)	+55	130
	20	+97.75	79	1	113	2	122	19	+42 (a-I) +57 (a-II) +87 (b-I) +87 (b-II) +85 (c) +72 (d)	+42	180
	16	+100.25	90	1	126	0	129	0	+45 (a-I) +60 (a-II) +75 (d)	+45	200
	14	+102.25	80	1	113	0	116	0	+47 (a-I) +62 (a-II) +77 (d)	+47	180
1SWBP (Class 90 Alt X)	18	+98.75	72	1	102	0	105	6	+48 (a-I) +63 (a-II) +88 (b-II) +73 (d)	+48	170
	20	+95.25	89	1	126	0	132	16	+40 (a-I) +50 (a-II) +85 (b-II) +70 (d)	+40	200
	24	+91.75	82	1	112	12	130	54	+41 (a-I) +51 (a-II) +81 (b-I) +66 (b-II) +66 (d)	+41	180

Notes:

1. Design tip elevations are controlled by the following demands: (a-I) Compression (Strength Limit), (a-II) Compression (Extreme Event), (b-I) Tension (Strength Limit), (b-II) Tension (Extreme Event), (c) Settlement and (d) Lateral Load.
2. There are no tip elevations for Tension and Settlement in some of the wall heights.
3. The specified tip elevations shall not be raised above the design tip elevation for Tension, Settlement and Lateral Load.

Table 5-6. Pile Data Table

Wall Type	Wall Height (feet)	Pile Type	Nominal Resistance (kips)		Design Tip Elevations (feet)	Specified Tip Elevation (feet)	Nominal Driving Resistance (kips)
			Compression	Tension			
7SWBP Modified	10	Class 90 Alt X	80	20	+89 (a) +109 (b) +94 (d)	+89	90
	10		80	20	+88 (a) +108 (b) +93 (d)	+88	90
	12		100	40	+86 (a) +101 (b) +91 (d)	+86	120
	14		100	60	+84 (a) +94 (b) +89 (d)	+84	120
	14		100	60	+82 (a) +92 (b) +87 (d)	+82	120
	16		110	70	+75 (a) +85 (b) +85 (d)	+75	130
	16		110	70	+74 (a) +84 (b) +84 (d)	+74	130
	16		110	70	+72 (a) +82 (b) +82 (d)	+72	130
1SWBP Modified	18	Class 90 Alt X	110	20	+70 (a) +95 (b) +80 (d)	+70	130
	18		140	20	+65 (a) +95 (b) +80 (d)	+65	160
	18		140	20	+63 (a) +93 (b) +78 (d)	+63	160
	20		150	30	+55 (a) +90 (b) +85 (c) +75 (d)	+55	170

Wall Type	Wall Height (feet)	Pile Type	Nominal Resistance (kips)		Design Tip Elevations (feet)	Specified Tip Elevation (feet)	Nominal Driving Resistance (kips)
			Compression	Tension			
1SWBP Modified	22	Class 90 Alt X	160	30	+53 (a) +88 (b) +81 (c) +73 (d)	+53	180
	24		140	80	+56 (a) +66 (b) +75 (c) +71 (d)	+56	160
	22		120	50	+55 (a) +75 (b) +80 (c) +70 (d)	+55	140
	20		170	20	+42 (a) +87 (b) +85 (c) +72 (d)	+42	190
	16		180	0	+45 (a) +75 (d)	+45	200
	14		170	0	+47 (a) +77 (d)	+47	190
1SWBP	18	Class 90 Alt X	150	10	+48 (a) +88 (b) +73 (d)	+48	170
	20		180	20	+40 (a) +85 (b) +70 (d)	+40	200
	24		160	60	+41 (a) +66 (b) +66 (d)	+41	180

Notes:

1. Design tip elevations are controlled by the following demands: (a) Compression (b) Tension, (c) Settlement and (d) Lateral Load.
2. There are no design tip elevations for Tension and Tolerable Settlement in some of the wall heights.
3. The specified tip elevations shall not be raised above the design tip elevation for Tension, Settlement and Lateral Load.

5.4.3 Lateral Pile Capacity

Results of lateral pile analysis in terms of pile-head shear and lateral deflection for a free-head condition are presented in Appendix C and summarized in Table 5-7. The maximum bending moment and the location of maximum moment are also presented Table 5-7. The solutions presented in Table 5-7 are entirely based on soil resistance and linear pile properties. Therefore, these values may be limited by the flexural strength (plastic moment) of the piles and pile-head connection details. Based on the pile layout provided by the structural designers, a group efficiency factor of 0.85 was used for the lateral solutions. The structural designer should compare the lateral pile demands with the results in Table 5-7 to determine whether the wall deflections are within tolerable limits.

Table 5-7. Lateral Pile Solutions

Wall (Pile type)	Wall Height (feet)	Pile Head Deflection (inch)	Pile Head Shear (kips)	Maximum Moment (kip-inch)	Depth to Max. Moment from Pile Top (feet)
Class 90 Alt X	Varies	¼	12.5	348	4.2
		½	17.9	566	4.8
		1	25.7	923	5.4
		2	36.5	1507	6.0
		5	52.0	2839	6.9

5.5 LATERAL EARTH PRESSURES

For retaining wall design, static active lateral earth pressure of 36 psf per foot of depth is recommended for a free draining, level and compacted backfill. For seismic incremental pressure, an inverted triangular pressure distribution with a horizontal pressure of 17H psf (H is the height of the wall) at the top of the wall is recommended for a free draining, level and compacted backfill. The inverted triangular seismic incremental pressure should be added to the static pressure to determine the total pressure for earthquake design.

If applicable, a uniform lateral pressure due to traffic loading, equivalent to a vertical pressure produced by at least 2 feet of earth with a soil unit weight of 120 lb/ft^3, should be added to the above lateral earth pressure. Using an active earth pressure of 0.3, the recommended uniform lateral earth pressure due to traffic loading is 72 psf.

5.6 GLOBAL STABILITY ANALYSES

Global stability analyses were performed using the computer program SLIDE 5.0 (Rocscience, 2006) for both static and pseudostatic conditions. Results are presented in Appendix C. As shown in Appendix C, four critical sections were selected for the analysis, two sections in each idealized soil profile as presented in Table 4-1:

- Sections at I-5 mainline Station 388+90 and Station 394+00 have the maximum slope height and maximum wall height, respectively, for idealized soil profile applicable from Begin-Wall to Station 395+43, and

- Sections at I-5 mainline Station 395+50 and Station 397+40 have the maximum slope height and maximum wall height, respectively, for idealized soil profile applicable from Station 395+43 to End-Wall.

The calculated factor of safety for a deep-seated failure is greater than the minimum required 1.5 under static condition with a 2-foot soil surcharge to represent traffic loading. Slope stability analysis under pseudo-static condition was performed using a seismic coefficient equal to 0.136 (which is the smaller of either one-third the horizontal peak ground acceleration or 0.2g) in accordance with guidelines provided in Section 3.10 of the Caltrans Guidelines for Structures Foundation Reports (Caltrans, 2009d). Analysis indicates that the calculated factor of safety is greater than the required minimum of 1.1 under pseudo-static condition.

5.7 SETTLEMENT AND WAITING PERIOD

Up to 15 feet of fill will be placed behind the proposed retaining wall. As shown in Appendix C, the maximum calculated soil settlement is about 0.8 inches. We recommend a minimum waiting period of 5 calendar days. Pavement materials and other settlement-sensitive utilities and surface structures should not be constructed on-top and within the retaining wall backfill until the waiting period is over. Depending on the actual settlement, additional fill may need to be placed to re-establish the finished subgrade elevation.

6.0 CONSTRUCTION RECOMMENDATIONS

6.1 EARTHWORK

Earthwork should be performed in accordance with Caltrans Standard Specifications, Section 19 (Caltrans, 2010c). Appropriate measures should be taken to prevent damage to adjacent structures and utilities. Any design and construction of temporary sloping, sheeting, or shoring should be made the contractor's responsibility. It should be noted that it is the responsibility of the contractor to oversee the safety of the workers in the field during construction. The contractor shall conform to all applicable occupational and health standards, rules, regulations, and orders established by the State of California. In addition, other State, County, or Municipal regulations may supersede the recommendations presented in this section. If a trench shoring design and safety plan is required, the geotechnical consultant should review the plan to confirm that recommendations presented in this report have been applied to the design.

As mentioned in Section 1.2, the proposed retaining wall will be constructed almost parallel to an existing MSE wall. The horizontal clearance between the existing and proposed walls varies from 5 to 12 feet. Extra precautions should be exercised so that the existing MSE wall will not be undermined during construction of the proposed retaining wall.

Some of the proposed pile-footing bottom elevations are located near or below the elevation of the existing MSE wall leveling pad. Therefore, temporary shoring or temporary support system will need to be considered in order to protect the existing MSE wall. In addition, slot cuts should be considered (i.e., the new wall should be constructed in segments). A maximum slot-cut length of 150 feet is recommended, and this length may need to be reduced depending on the actual field conditions.

During the recent field investigation conducted on October 2 and 11, 2011, groundwater was encountered at elevation +63.7 feet. Groundwater was not encountered in all the other borings. Therefore, groundwater is not anticipated to be encountered during pile footing construction. However, groundwater level can fluctuate due to seasonal rainfall amount, local irrigation and groundwater recharge program and other man-made conditions. If groundwater is encountered during pile footing construction, it should be controlled in accordance with Section 19-3.03D of the Caltrans Standard Specifications (2010c).

Subdrains installed to relieve water pressure behind the existing MSE wall should be protected in-place and these subdrains must remain functional during and after construction of the proposed retaining wall.

6.2 PILE CONSTRUCTION

Piles should be driven at least to the specified tip elevation and the bearing value should be checked with the pile-driving formula given in Section 49-2.01A(4)(b) of the Caltrans Standard Specifications (2010c). However, if the specified tip elevation is reached without achieving the design load, pile driving should continue until bearing is attained. In this case, it may be prudent to allow the pile to "set up" before continuing the driving.

The selected pile-driving hammer such as diesel-type hammers should be able to deliver sufficient energy to drive the piles at a penetration rate of not less than 1/8 inch per blow at the required bearing value. Vibratory hammers and predrilling are not allowed for pile installation.

Difficult pile driving is anticipated due to the presence of localized dense and hard soil layers, caving soils and ground water. Contractor should be prepared for hard driving conditions. The northern end of Retaining Wall 387 is immediately adjacent to the new widened Abutment 1 of Camino Capistrano UC (Bridge No. 55-0227). Due to the complex geology in this area, bedrock contact is highly variable and uncertain (EMI, 2012). Therefore, early pile refusal may be encountered for the retaining wall piles adjacent to Abutment 1 of Camino Capistrano UC. We recommend extending the main reinforcement of the Caltrans Standard Class 90 Alternative "X" piles by 10 feet for the piles supporting the portion of Retaining Wall 387 from I-5 mainline Station 395+43 to end of the wall. If early pile refusal is encountered for any of these piles, the pile can be cut-off without compromising the lateral pile capacity.

Pile driving will be conducted adjacent to the existing MSE Wall 391. Pile driving will induce ground vibration which could result in settlement of the MSE backfill and the soil underlying the MSE wall. For this reason, we recommend monitoring of the existing MSE wall. If excessive movement is detected, the pile driving operation should terminate immediately and the Engineer be consulted for mitigations.

6.3 RETAINING WALL BACKFILL AND BACKDRAIN

Onsite soils are not suitable for use as wall backfill in between existing MSE wall and proposed retaining walls. Materials placed behind retaining walls should be Structure Backfill per Section 19-3.0E (Caltrans 2010c).

Backfill should be compacted in accordance with Section 19-5 of the Caltrans Standard Specifications (2010c). Backfill should be placed in loose lifts not exceeding 8 inches in thickness, moisture-conditioned to near optimum moisture content, and compacted to at least 90 percent relative compaction. The relative compaction should be based on the maximum density determined by California Test Method 216. Jetting or flooding to compact backfill is not recommended. Heavy compaction equipment, such as vibratory rollers, dozers, or loaders, should not be used adjacent to the walls in order to avoid damaging the walls due to large lateral earth pressures.

Backdrains should be installed behind the proposed retaining wall to relieve hydrostatic pressure. Backdrains should be constructed in accordance with Bridge Detail 3-1 on Sheet B0-3 per Caltrans Standard Plans (2010b) or the geocomposite drain alternative per Section 6 of the Caltrans Bridge Design Details (1992).

6.4 REVIEW OF CONSTRUCTION PLANS

Recommendations contained in this report are based on draft plans. The geotechnical consultant should review the final construction plans and specifications in order to confirm that the general intent of the recommendations contained in this report have been incorporated into the final construction documents. Recommendations contained in this report may require modification or additional recommendations may be necessary based on the final design.

6.5 GEOTECHNICAL OBSERVATION AND TESTING

It is recommended that inspections and testing be performed by the geotechnical consultant during the following stages of construction:

- Grading operations, including excavations and placement of compacted fill
- Shoring installation
- Footing excavations and pile constructions
- Backdrain installation and backfilling of retaining walls
- Removal or installation of support of buried utilities or structures
- When any unusual subsurface conditions are encountered

7.0 LIMITATIONS

This report is intended for the use of OCTA, TRC and Caltrans for design and construction of Retaining Wall 387. This report is based on the project as described and the information obtained from the exploratory borings at the approximate locations indicated on the attached LOTB sheets. The findings and recommendations contained in this report are based on the results of the field investigation, laboratory tests, and engineering analyses. In addition, soils and subsurface conditions encountered in the exploratory borings are presumed to be representative of the project site. However, subsurface conditions and characteristics of soils between exploratory borings can vary. The findings reflect an interpretation of the direct evidence obtained. The recommendations presented in this report are based on the assumption that an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. EMI should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations contained in this report are applicable to the specific design element(s) and location(s) which is (are) the subject of this report. They have no applicability to any other design elements or to any other locations and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of EMI.

EMI has no responsibility for construction means, methods, techniques, sequences, or procedures; for safety precautions or programs in connection with the construction; for the acts or omissions of the CONTRACTOR or any other person performing any of the construction; or for the failure of any worker to carry out the construction in accordance with the Final Construction Drawings and Specifications.

Services performed by EMI have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended.

8.0 REFERENCES

American Association of State Highway and Transportation Officials (AASHTO), 2007. AASHTO LRFD Bridge Design Specification, 4th Edition with 2008 and 2009 Interim Changes. Washington, DC: AASHTO.

American Society for Testing and Materials (ASTM), 2007, Annual Book of Standards. Soil and Rock; Dimension Stone; Geosynthetics. Vol. 04.08.

Argus, D.F., Heflin, M.B., Donnellan, A., Webb, F.H., Dong, D., Hurst, K.J., Jefferson, D.C., Lyzenga, G.A., Watkins, M.M., and Zumberge, J.F., 1999, Shortening and thickening of metropolitan Los Angeles measured and inferred by using geodesy: Geology, v. 27, p. 703-706.

Amec Earth and Environmental, Inc. (AMEC), 2006a, Geotechnical Report of Rough Grading, Lot 94 (Garden Lots area), TTM 14196, Window Hill Area, Pacific Point Project, San Juan Capistrano, California, June 23.

AMEC, 2006b, Geotechnical Report of Rough Grading, Lots 105 through 150, TTM 15609, Harbor Vista Lots – West Valley, Pacific Point Project, San Juan Capistrano, California, August 24.

AMEC, 2000a, Geotechnical Evaluation and Response to Review Comments, La Mirada/Calita Slope Area, "AL" Category Perimeter Slope, Pacific Point Project, San Juan Capistrano, California, October 6.

AMEC, 2000b, Previous Review Letters, Pacific Point Project, San Juan Capistrano, California, July 27.

AMEC, 2000c, Second Geotechnical Review Response, La Mirada/Calita Slope Area, "AL" Category Perimeter Slope, Pacific Point Project, San Juan Capistrano, California, December 6.

AMEC, 2000d, Settlement Monitoring, Pacific Point Project, San Juan Capistrano, California, September 26.

AMEC, 2000e, Transfer of Responsibility of Geotechnical Consultant of Record, Pacific Point Project, San Juan Capistrano, California, December 7.

Benioff, H., 1938, The Determination of The Extent of Faulting With Application To The Long Beach Earthquake, Bulletin of The Seismological Society of America, v. 28, p. 77-84.

California Department of Transportation (Caltrans), California Test Methods.

Caltrans, 2011, Amendments to AASHTO LRFD Bridge Design Specifications, Fourth Edition, November.

Caltrans, 2010a, Seismic Design Criteria, Version 1.6, November.

Caltrans, 2010b, Standard Plans.

Caltrans, 2010c, Standard Specifications.

Caltrans, 2009a, Foundation Report Preparation for Bridge Foundations, Division of Engineering Services, Geotechnical Services, December.

Caltrans, 2009b, Geotechnical Services Design Manual, Division of Engineering Services, Geotechnical Services, Version 1.0, August.

Caltrans, 2008, Memo to Designers 3-1, Supersedes Memo to Designers 3-1 Dated December 2000, July.

Caltrans, 2004, Bridge Design Specifications, Section 5, August.

Caltrans, 2003a, Bridge Design Specifications, Section 8, September.

Caltrans, 2003b, Corrosion Guidelines, Version 1.0, September.

Caltrans, 1996, Memo to Designers 5-3, Attachment A, May.

Caltrans, 1992, Bridge Design Details, Section 6, November.

California Geological Survey, 2009, Tsunami Inundation Map For Emergency Planning, Dana Point and San Juan Capistrano Quadrangles, Division of Mines and Geology, March 15.

California Geological Survey, 2001a, Seismic Hazard Zones, Dana Point Quadrangle, Division of Mines and Geology, Official Map, December 21.

California Geological Survey, 2001b, Seismic Hazard Zone Report For The Dana Point 7.5-Minute Quadrangle, Orange County, California, Department of Conservation, Division of Mines and Geology.

Earth Mechanics, Inc. (EMI), 2012, Foundation Report, Camino Capistrano Undercrossing (Bridge No. 55-0227L), Orange County, California, 12-ORA-5, PM 7.4, Caltrans Project No. 1200020279 (EA 12-0F96E4), In Progress.

Ehlig, P., 1989, The Late Cenozoic Evolution of The Capistrano Embayment in Engineering Geology Along Coastal Orange County, Association of Engineering Geologists, Southern California Section, Annual Field Trip guide book, p. 79-87, September 23.

Fumal, T.E., Pezzopane, S.K., Weldon, R.J. II, and Schwartz D.P., 1993, A 100-year Average Recurrence Interval for the San Andreas Fault at Wrightwood, California, Science, v. 259, p. 199-203.

Hauksson, E., Jones, L.M., and Hutton, K., 1995, The 1994 Northridge Earthquake Sequence in California, Seismological and Tectonic Aspects, Journal of Geophysical Research, v. 100, p. 12,335.

Hauksson, E. and Gross, S., 1991, Source Parameters of The 1933 Long Beach Earthquake, Bulletin of The Seismological Society of American, v. 81, p. 81-98.

Jacoby, G., Sheppard, P., and Sieh, K., 1987, Was the 8 December 1812 California Earthquake Produced By The San Andreas Fault, Evidence From Trees Near Wrightwood, Seismological Research Letters, v. 58, p. 14.

Lam, I.P., and Martin, G.R., 1986, Seismic Design of Highway Bridge Foundations, FHWA Report Nos. FHWA A/RD-86/102.

Leighton and Associates, Inc., 2004, Report of Partial Rough Grading for the North and South Valley and North Estate Lots Area, Pacific Point Project, City of San Juan Capistrano, California, March 12.

NCEER (1997),"Proceeding of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils", T. L. Youd and I. M. Idriss Editors, Technical Report NCEER-97-0022, NCEER, Buffalo, NY.

Rocscience, 2006, "SLIDE 5.0 – 2D Limit Equilibrium Slope Stability Program", Toronto, Canada.

Seed, R.B. and Harder, L.F., Jr. (1990), "SPT-Based Analysis of Cyclic Pore Pressure Generation and Undrained Residual Strength", in Proceedings, H. Bolton Seed Memorial Symposium, BiTech Publishers, Ltd., P. 351-376.

Seed, H. B., Idriss, I. M., and Arango, I. (1983),"Evaluation of Liquefaction Potential Using Field Performance Data", Journal of Geotechnical Engineering, ASCE, Vol. 109, No. 3, pp. 458-482.

Shao, G., and Hauksson, E., 2009, A Finite Fault Study of the 29 July 2008 M_W = 5.4 Chino Hills Earthquake, Seismological Research Letters, v. 80, p.320-321.

Shaw, J.H., Plesch, A., Dolan, J.F., Pratt, T.L., and Fiore, P., 2002, Puente Hills Blind-Thrust System, Los Angeles, California, Bulletin of the Seismological Society of America, v. 92, p. 2946-2960.

Shaw, J.H., and Shearer, P.M., 1999, An Elusive Blind-Thrust Fault Beneath Metropolitan Los Angeles, Science, v. 283, p.1516, March 5.

U.S. Geological Survey (USGS), 2008a, Documentation for the 2008 Update of the United States National Seismic Hazard Maps: U.S. Geological Survey Open-File Report 2008-1128, 61p.

U.S. Geological Survey (USGS), 2008b, USGS Probabilistic Seismic Hazard Analysis, http://eqint.cr.usgs.gov/deaggint/2008/index.php.

Ward, S.N., 1994, A Multidisciplinary Approach to Seismic Hazard in Southern California, Bulletin of the Seismological Society of America, v. 84, p. 1293-1309.

Weldon, R., Scharer, K., Fumal, T., and Biasi, G., 2004, Wrightwood and the Earthquake Cycle, What a Long Recurrence Record Tells Us About How Faults Work, Geological Society of America, GSA Today, v. 14, no. 9, p. 4-10.

Winterkorn, H.F. and Fang, H.Y., 1975, Foundation Design Handbook, Van Nostrand Reinhold Company, New York, NY.

Yeats, R.S., and Huftile, G.J., 1995, The Oak Ridge Fault System and the 1994 Northridge Earthquake, Nature, v. 373, p. 418-420.

Appendix A

LOG OF TEST BORING SHEETS

BENCH MARK

Designation: F-785 Elev = 75.717 feet (NAVD 88); 73.413 feet (NGVD29)
Described by OCS 2003 - Found 3¼" US Coast and Geodectic Survey Bronzed Disk Stamped "F 785 1946", Set in the Top of a Concrete Bridge Abutment. Monument is Located in the Southwesterly Corner of the Atchinso\Topeka and Santa Fe Railway Overcrossing of San Mateo Creek, 69 ft. Northerly Along the Railway from the Centerline of the Interstate 5 Freeway Southbound Onramp at Camino Capistrano Prolonged to the West and 150± Westerly from the Centerline of Camino Capistrano. Monument is Set 2.0 ft. below the Tracks.

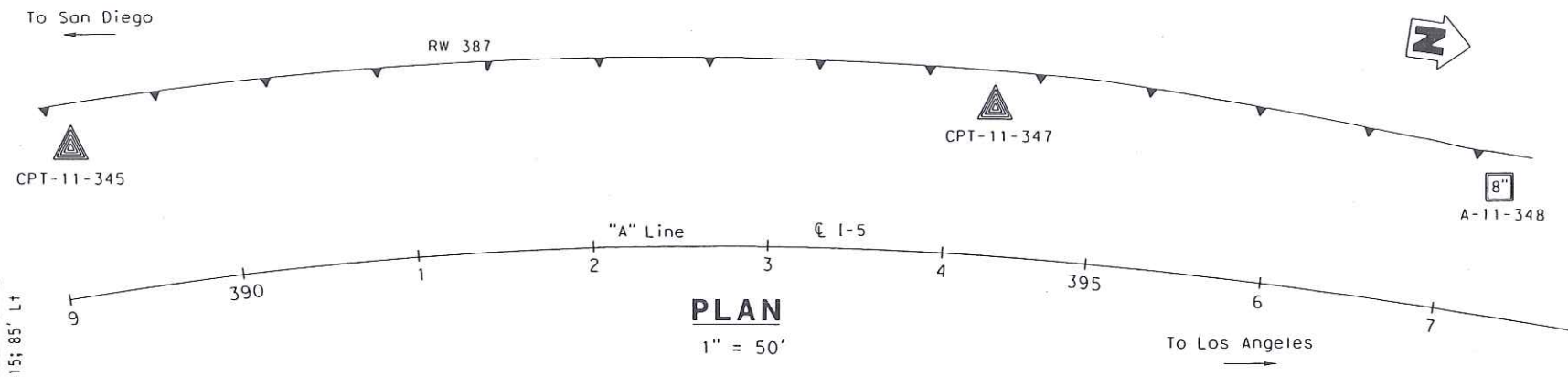
NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

(2) 2.4" samples were taken using a California Modified Sampler.

(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to to advance the drive sampler.

(4) Conversion factor from 2.4" Modified California Ring Sampler blowcounts to Standard Penetration Test (SPT) blowcounts is 0.5.



PLAN
1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
12	ORA	5	6.2/8.7		

GEOTECHNICAL PROFESSIONAL DATE

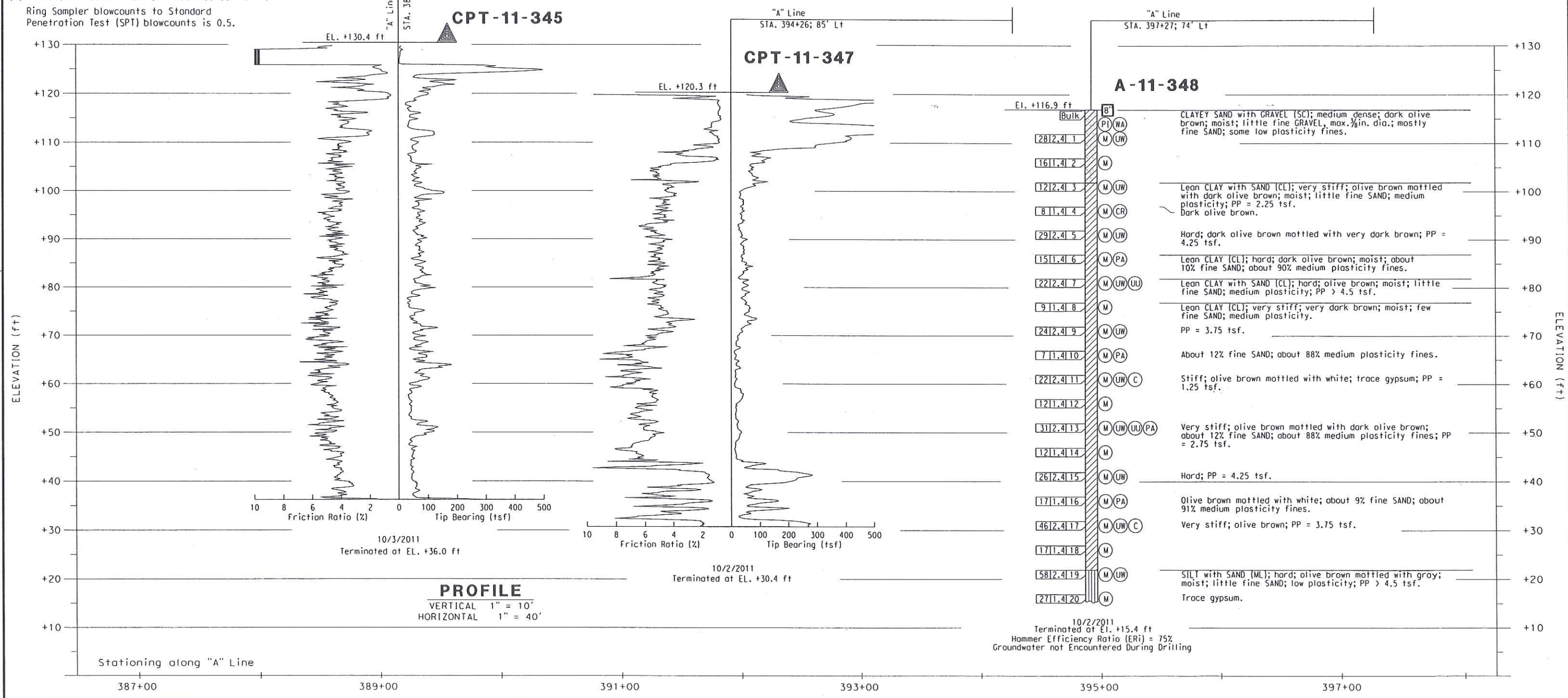
REGISTERED PROFESSIONAL ENGINEER — S. PIRATHIVIRAJ — NO. GE 2963 — EXP. 12-31-13 — GEOTECHNICAL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

ORANGE COUNTY TRANSPORTATION AUTHORITY
550 S. MAIN STREET
ORANGE, CA 92863-1584

EARTH MECHANICS, INC.
17800 NEWHOPE STREET, SUITE B
FOUNTAIN VALLEY, CA 92708



PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. Fang	R. Jie		PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	S. PIRATHIVIRAJ PROJECT ENGINEER	BRIDGE NO. -
SIGN OFF DATE	CHECKED BY	S. PIRATHIVIRAJ	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011				POST MILES 7.2

RETAINING WALL 387

LOG OF TEST BORINGS 1 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

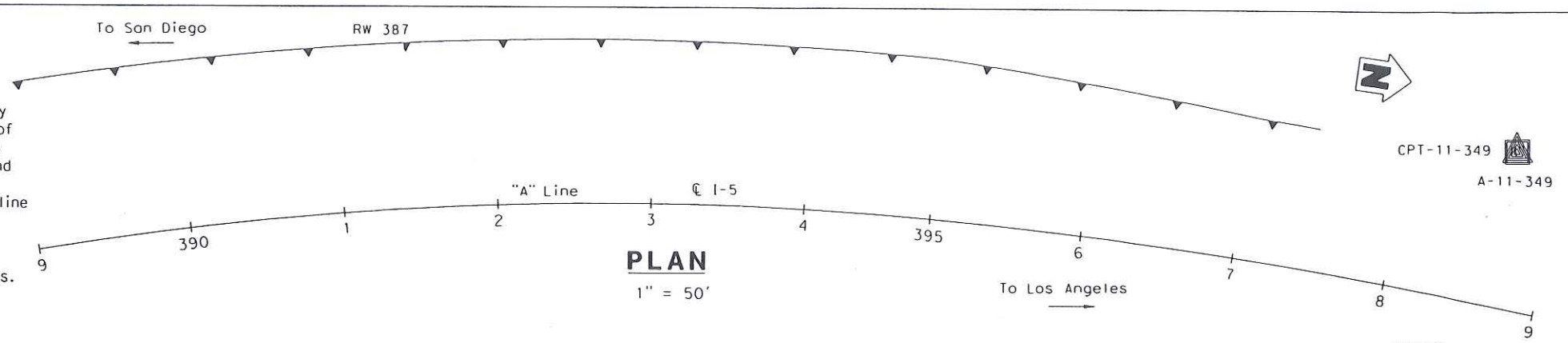
UNIT: 2998
PROJECT NUMBER & PHASE: 12000202791

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES | SHEET | OF

BENCH MARK

Designation: F-785 Elev = 75.717 feet (NAVD 88); 73.413 feet (NGVD29) Described by OCS 2003 - Found 3¼" US Coast and Geodectic Survey Bronzed Disk Stamped "F 785 1946", Set in the Top of a Concrete Bridge Abutment. Monument is Located in the Southwesterly Corner of the Atchinso\Topeka and Santa Fe Railway Overcrossing of San Mateo Creek, 69 ft. Northerly Along the Railway from the Centerline of the Interstate 5 Freeway Southbound Onramp at Camino Capistrano Prolonged to the West and 150± Westerly from the Centerline of Camino Capistrano. Monument is Set 2.0 ft. below the Tracks.



PLAN
1" = 50'

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	ORA	5	6.2/8.7		

GEOTECHNICAL PROFESSIONAL DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — S. PIRATHIVIRAJ — NO. GE 2963 — EXP. 12-31-13 — GEOTECHNICAL — STATE OF CALIFORNIA

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NOTES:

(1) This LOTB sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2010).

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(3) An automatic trip hammer system consisting of a hammer weight of 140 lbs falling a distance of 30" was used to advance the drive sampler.

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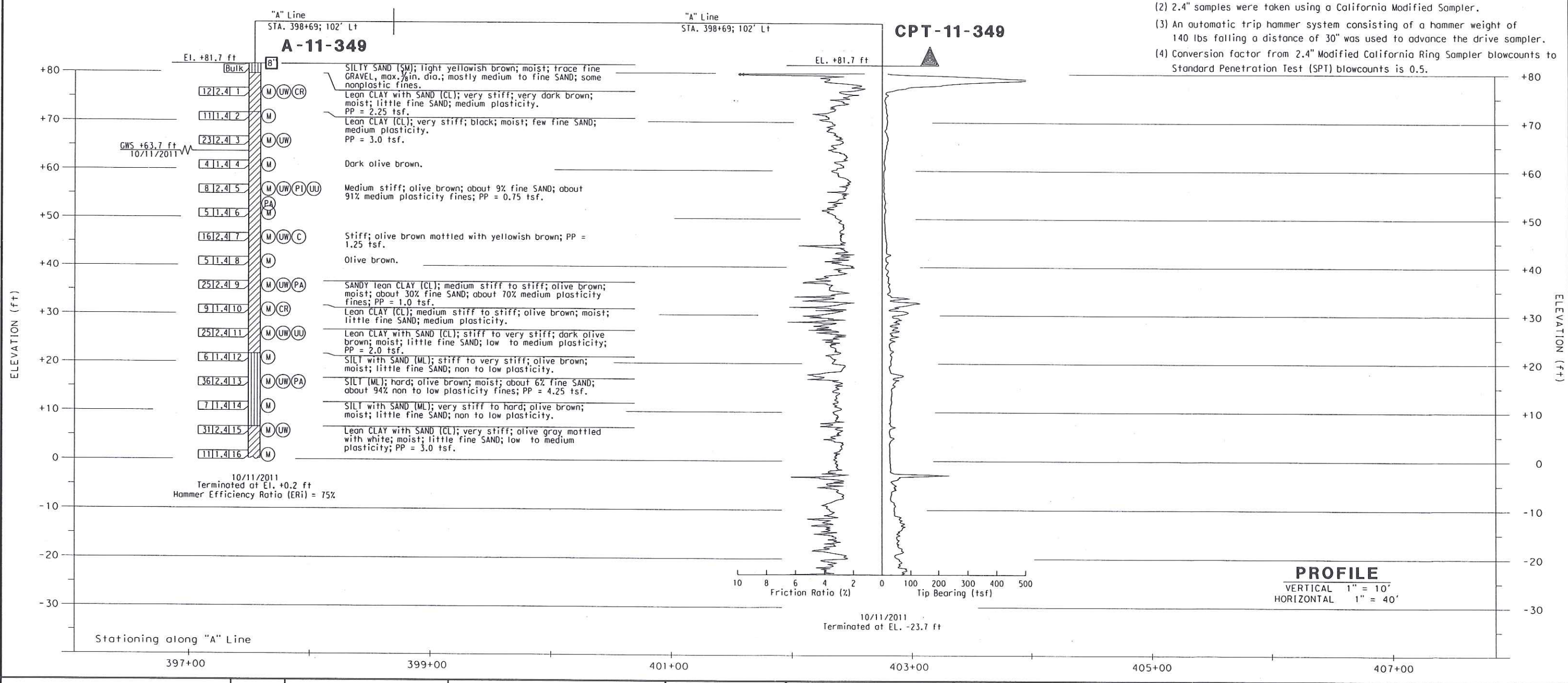


PROFILE
VERTICAL 1" = 10'
HORIZONTAL 1" = 40'

DESIGN OVERSIGHT	DRAWN BY	J. Fang	R. Jie	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	S. PIRATHIVIRAJ PROJECT ENGINEER	BRIDGE NO. -	RETAINING WALL 387
SIGN OFF DATE	CHECKED BY	S. PIRATHIVIRAJ	FIELD INVESTIGATION BY: DATE: 9/2011, 10/2011			POST MILES 7.2	LOG OF TEST BORINGS 2 OF 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2998
PROJECT NUMBER & PHASE: 12000202791

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES | SHEET | OF

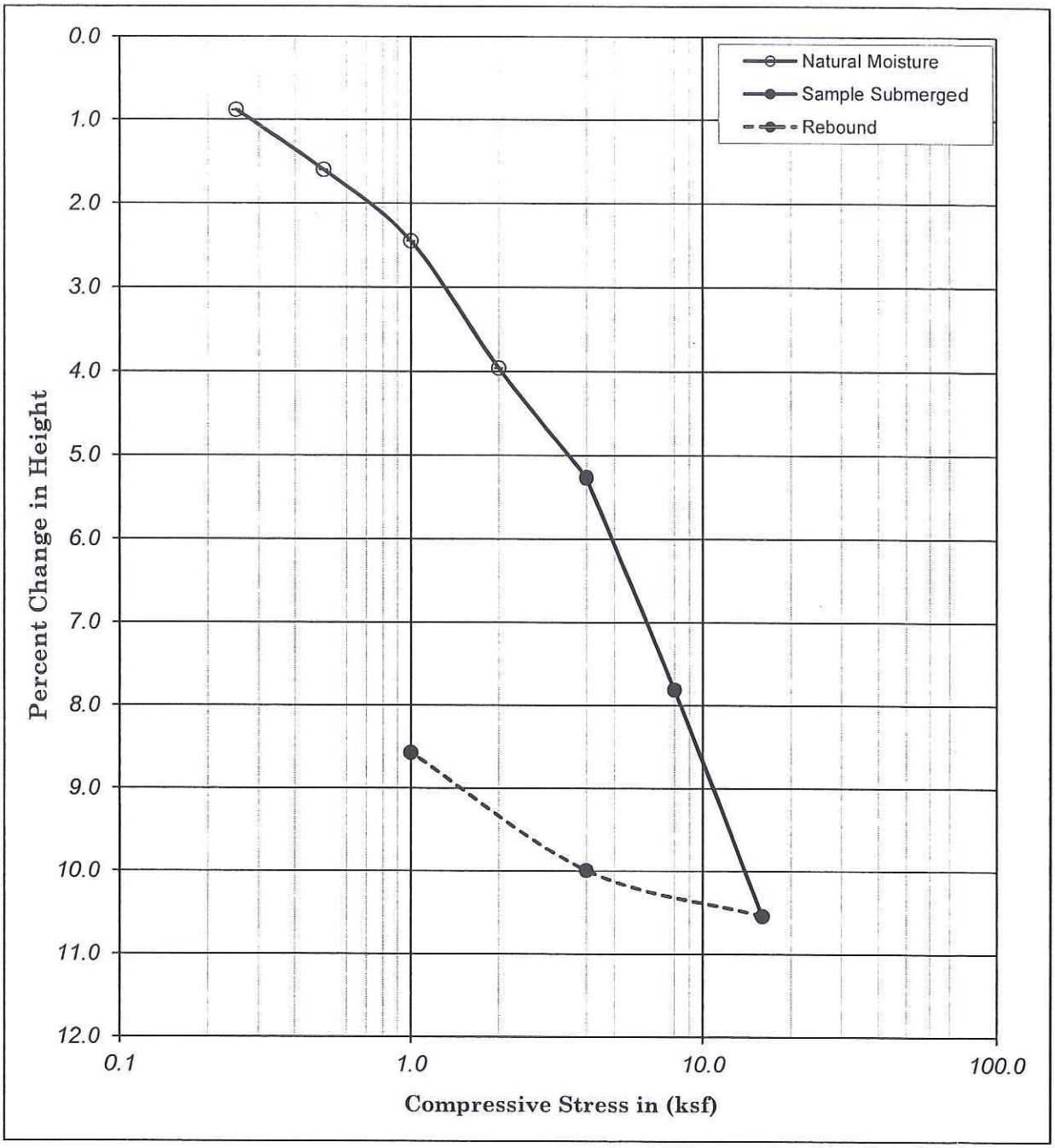
Appendix B

LABORATORY TEST RESULTS

TABLE B-1 SUMMARY OF LABORATORY TEST RESULTS

Project No. : 11-137 Project Name : Retaining Wall 387

Boring No.	Sample No.	Sample Depth (ft)	Soil Identification (group symbol) ASTM D2488/D2487	Moisture Content ASTM D2216 (%)	Total Unit Weight ASTM D2937 (pcf)	Pocket Penetrometer (tsf)	Torvane Shear (tsf)	Grain Size Distribution GR:SA:FI (%)	Sand Equivalent (CT-217)	Atterberg Limits ASTM D4318 (LL/PL/PI)	Soil-Minimum Resisivity CT-532 (ohm-cm)	Soil-pH CT-532	Soil-Soluble Sulfate Content CT-417 (ppm)	Soil-Moisture Free Chloride Content CT-422 (ppm)
A-11-348	B-0	0-5	SC					0:72:28		29/17/12				
A-11-348	D-1	5	SM	4.1	127.2									
A-11-348	S-2	10	SM	5.3										
A-11-348	D-3	15	CL	25.5	116.2	2.25								
A-11-348	S-4	20	CL	25.3							270	7.6	6400	649
A-11-348	D-5	25	CL	22.2	121.3	4.25								
A-11-348	S-6	30	CL	21.1				0:10:90						
A-11-348	D-7	35	CL	18.2	121.4	>4.5								
A-11-348	S-8	40	CL	20.7										
A-11-348	D-9	45	CL	20.9	124.7	3.75								
A-11-348	S-10	50	CL	25.5				0:12:88						
A-11-348	D-11	55	CL	25.4	122.1	1.25								
A-11-348	S-12	60	CL	24.9										
A-11-348	D-13	65	CL	24.3	123.7	2.75		0:12:88						
A-11-348	S-14	70	CL	24.5										
A-11-348	D-15	75	CL	22.4	125.2	4.25								
A-11-348	S-16	80	CL	24.1				0:9:91						
A-11-348	D-17	85	CL	25.1	123.9	3.75								
A-11-348	S-18	90	CL	22.8										
A-11-348	D-19	95	ML	22.0	125.1	>4.5								
A-11-348	S-20	100	CL	23.7										
A-11-349	D-1	5	CL	26.1	116.3	2.25					760	8.1	680	392
A-11-349	S-2	10	CL	20.5										
A-11-349	D-3	15	CL	21.4	125.8	3.0								
A-11-349	S-4	20	CL	28.5										
A-11-349	D-5	25	CL	23.1	122.7	0.75		0:9:91		35/19/16				
A-11-349	S-6	30	CL	27.1										
A-11-349	D-7	35	CL	26.6	122.8	1.25								
A-11-349	S-8	40	CL	25.4										
A-11-349	D-9	45	CL	23.0	125.4	1.0		0:30:70						
A-11-349	S-10	50	CL	25.2							510	8.0	1800	341
A-11-349	D-11	55	CL	23.1	125.5	2.0								
A-11-349	S-12	60	ML	26.5										
A-11-349	D-13	65	ML	26.0	121.9	4.25		0:6:94						
A-11-349	S-14	70	ML	27.7										
A-11-349	D-15	75	CL	23.8	124.2	3.0								
A-11-349	S-16	80	CL	27.9										



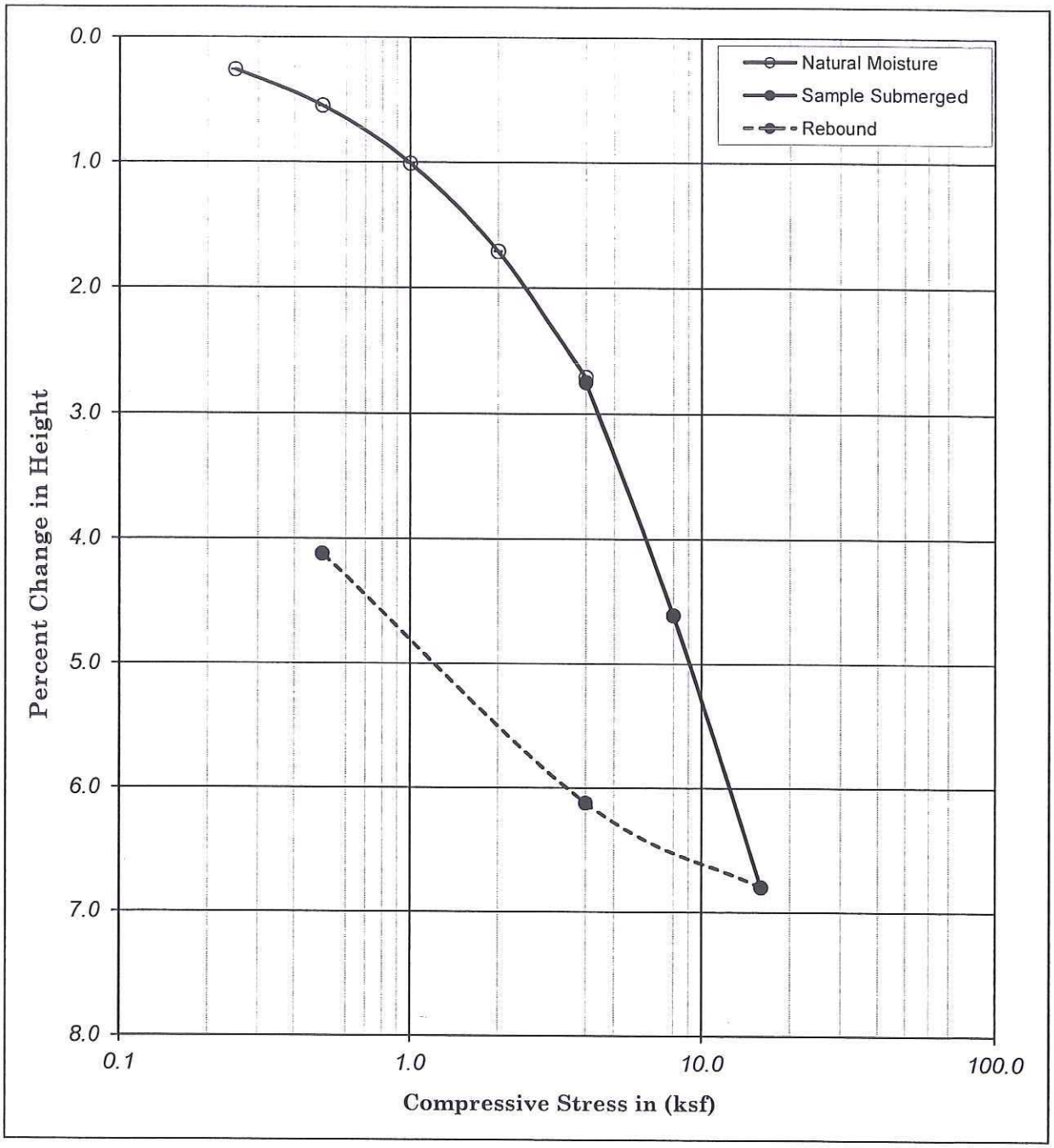
Boring No.	: A-11-348		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m^3)	Percent Saturation	Void Ratio
Sample No.	: D-11		Plastic Limit :	-						
Depth (ft)	: 55.0	56.5	Plastic Index :	-	Initial	26.38	96.76	15.23	95.99	0.74
Depth (m)	: 16.78	17.23	Specific Gravity :	2.70	Final	22.77	105.84	16.66	103.74	0.59
Description : Very dark gray, Elastic SILT (MH)										

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

I-5 HOV Improvement Project
PCH to San Juan Creek Road

Project No. : 11-137 12/04/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



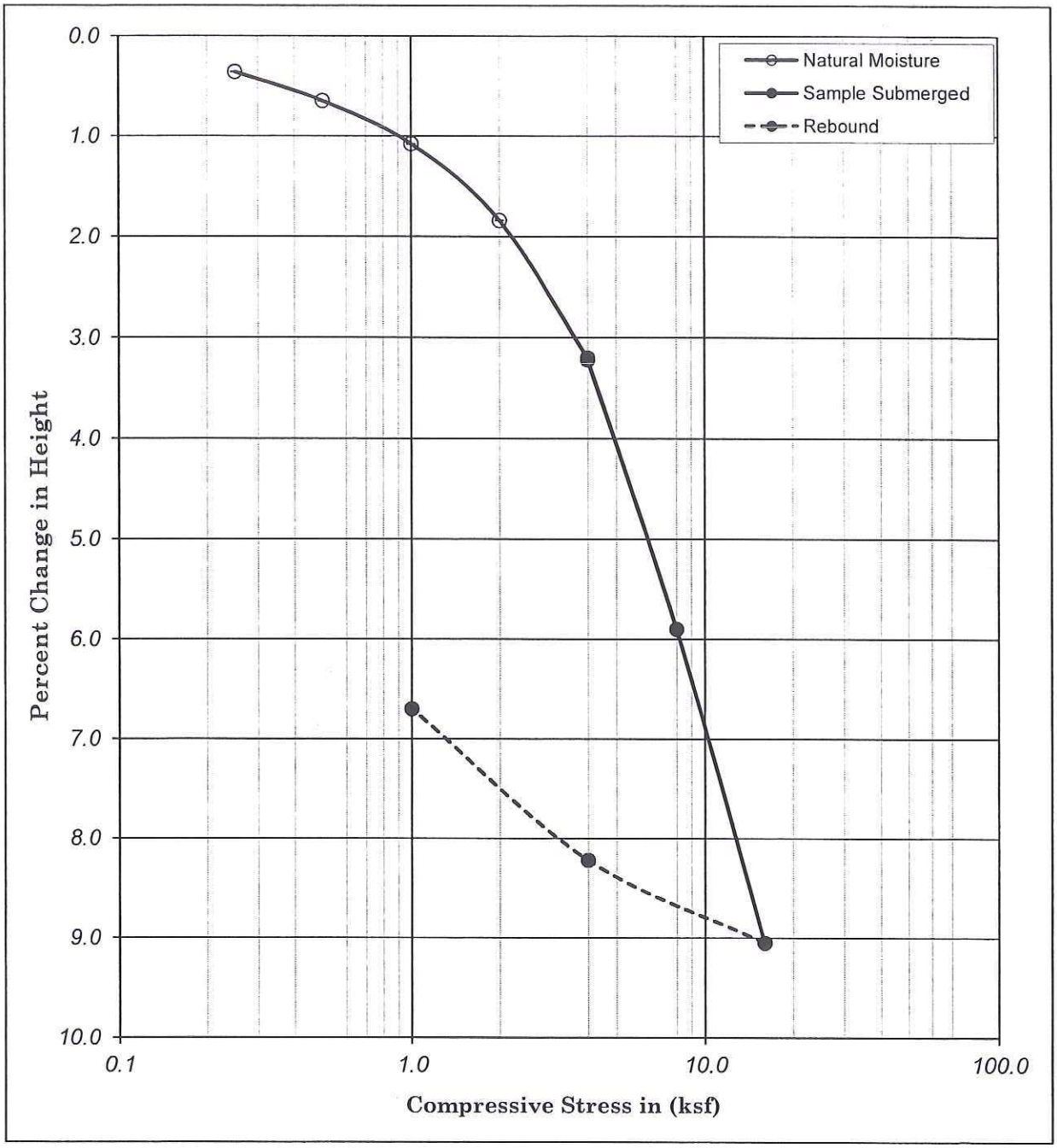
Boring No. : A-11-348				Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No. : D-17				Plastic Limit :	-						
Depth	(ft) : 85.0		86.5	Plastic Index :	-	Initial	26.59	98.69	15.53	101.43	0.71
	(m) : 25.93		26.38	Specific Gravity :	2.70	Final	26.20	102.94	16.20	110.98	0.64
Description : Olive-brown, Lean CLAY (CL)											

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

I-5 HOV Improvement Project
PCH to San Juan Creek Road

Project No. : 11-137 12/04/11

CONSOLIDATION TEST
(ASTM D-2435 / CT-219)



Boring No.	: A-11-349		Liquid Limit :	-		Moisture Content (%)	Dry Density (pcf)	Dry Density (kN/m³)	Percent Saturation	Void Ratio
Sample No.	: D-7		Plastic Limit :	-						
Depth (ft)	: 35.0	36.5	Plastic Index :	-	Initial	27.93	97.23	15.30	102.79	0.73
Depth (m)	: 10.68	11.13	Specific Gravity :	2.70	Final	26.02	104.22	16.40	113.81	0.62

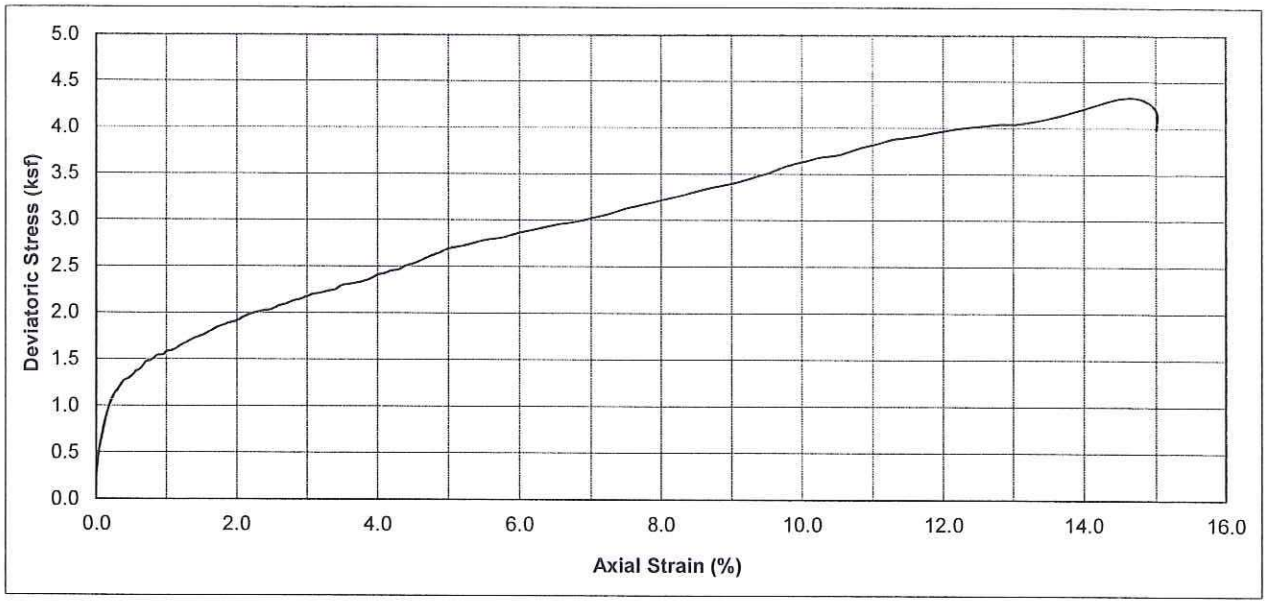
Description : *Olive-brown with yellowish brown, Lean CLAY (CL)*

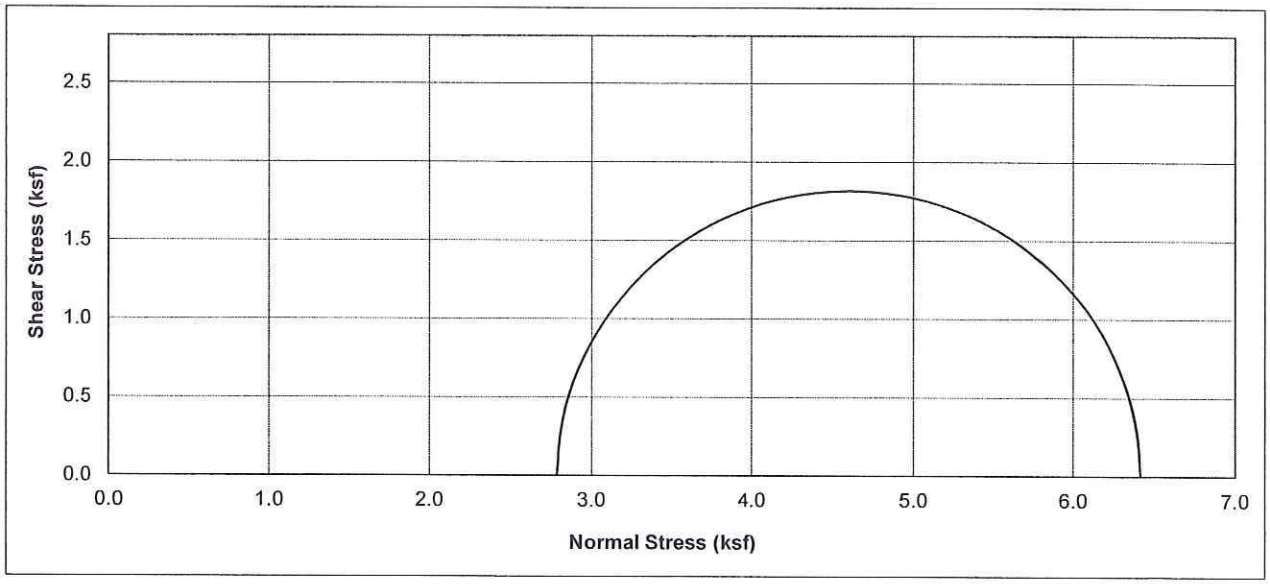
Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

I-5 HOV Improvement Project
PCH to San Juan Creek Road

Project No. : *11-137* *12/04/11*

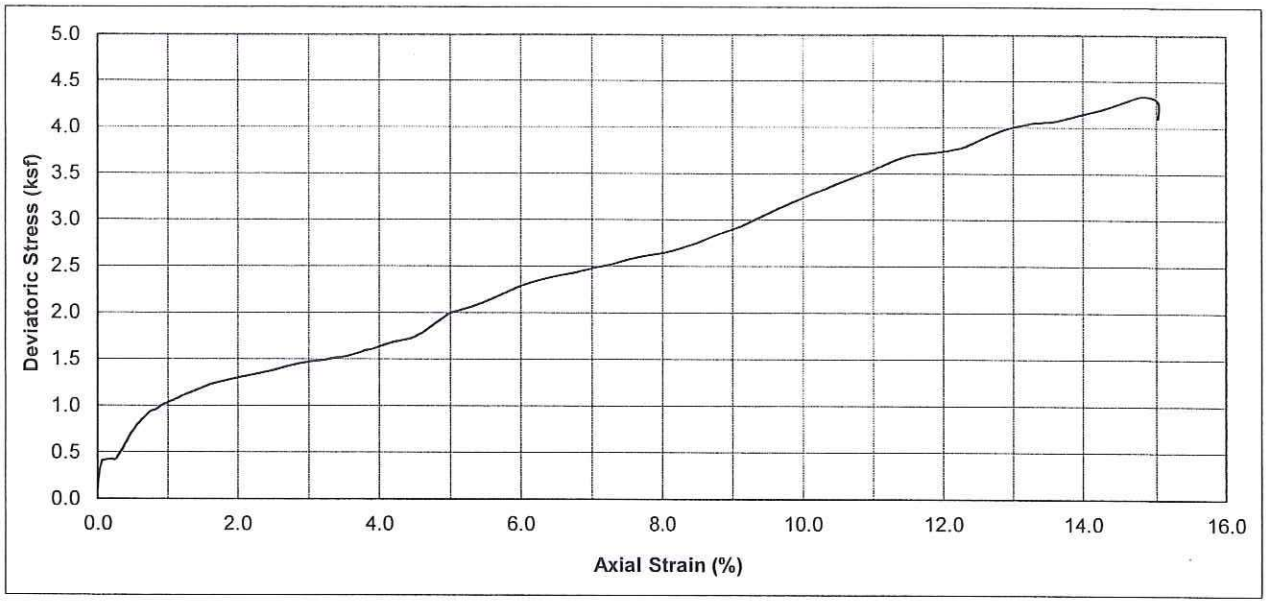
CONSOLIDATION TEST
(ASTM D-2435 / CT-219)

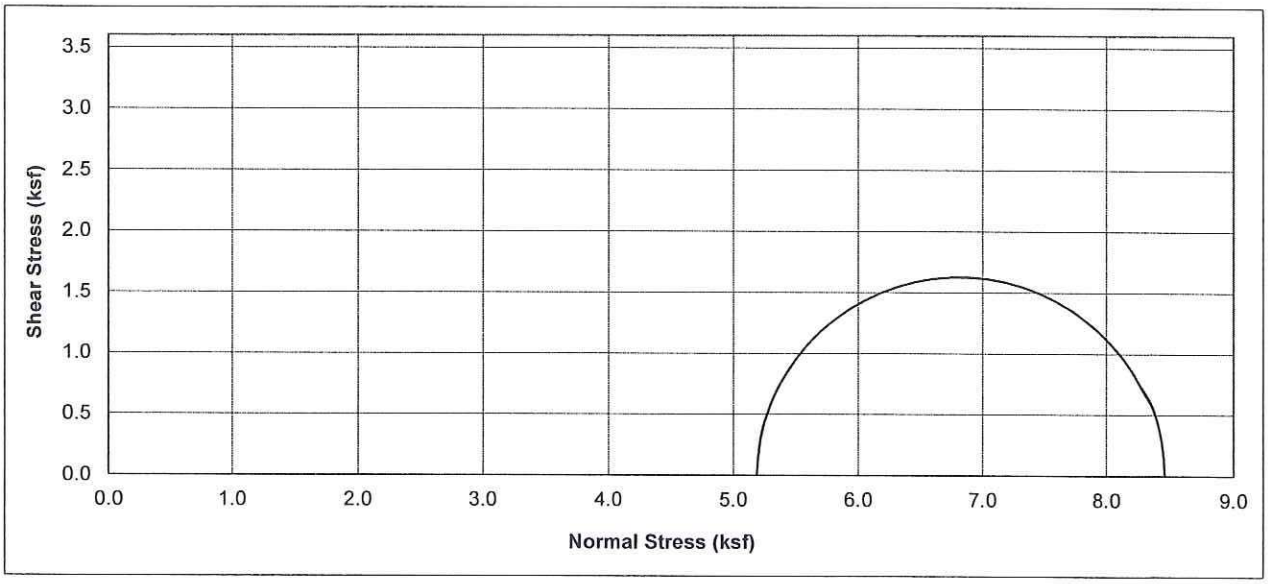




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-348	D-7	35	Olive brown , Lean CLAY with SAND (CL)	103.7	18.22	2.79	3.63	78.8

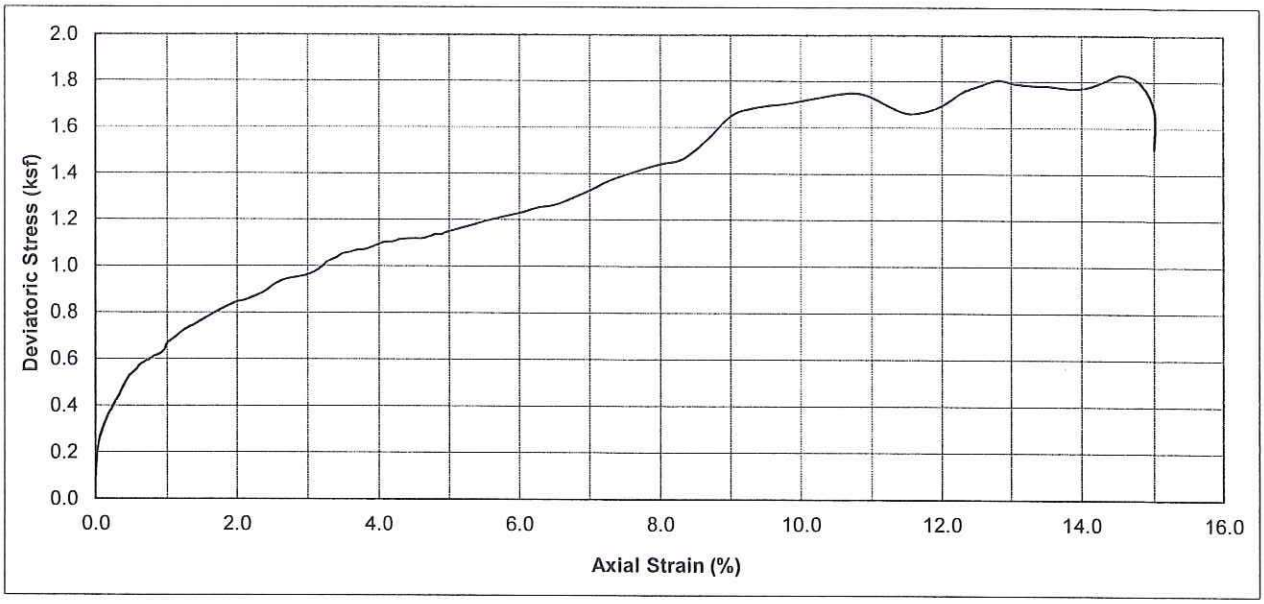
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	I-5 HOV Improvement Project PCH to San Juan Creek Road
	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850)
Project No. : 11-137 / Date : 11/02/11	Figure No. :

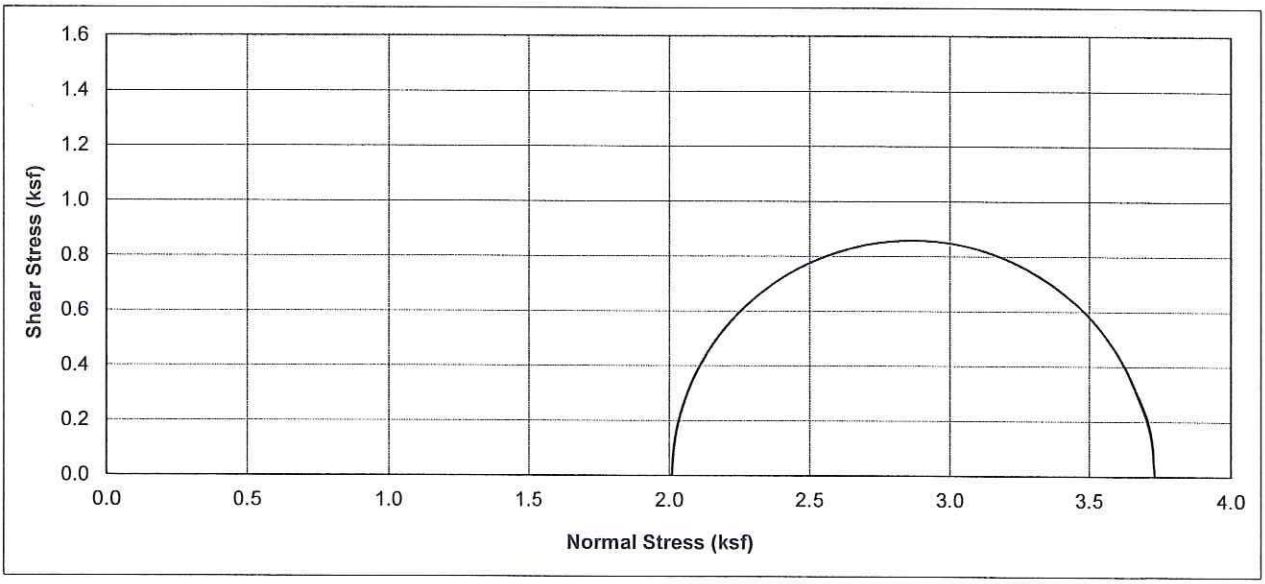




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-348	D-13	65	Olive brown , Lean CLAY with gypsum(CL)	99.6	24.33	5.19	3.25	95.0

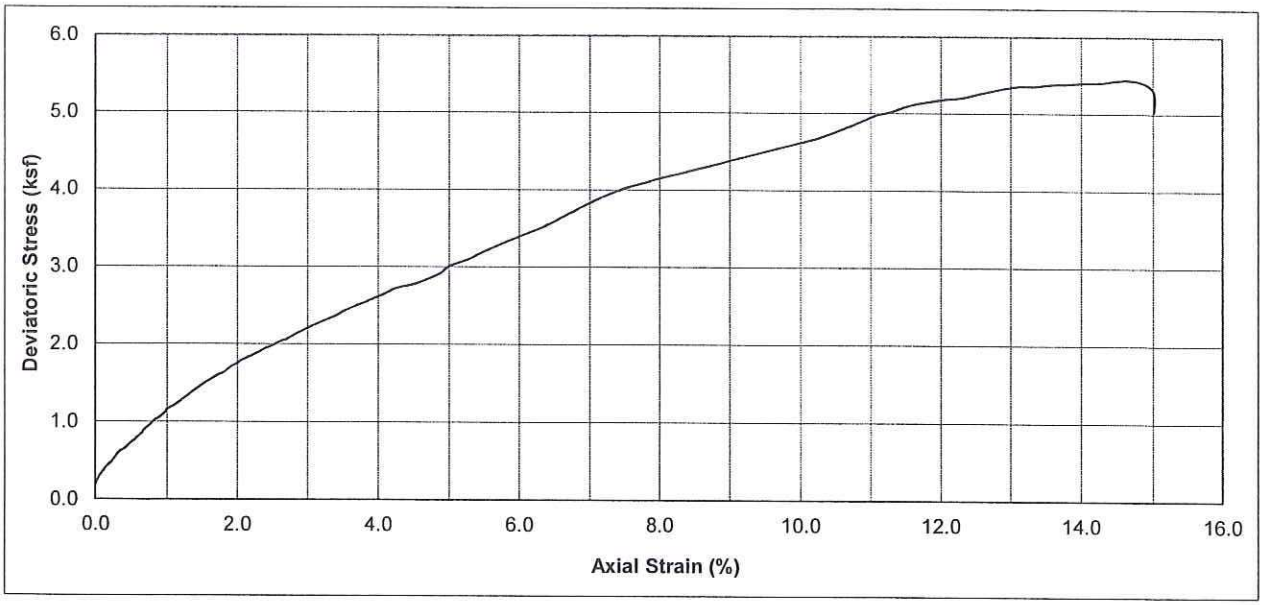
Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	**I-5 HOV Improvement Project** **PCH to San Juan Creek Road**
Project No. : 11-137 **Date :** 11/02/11	**UNCONSOLIDATED UNDRAINED TEST** **(ASTM D2850)** Figure No. :

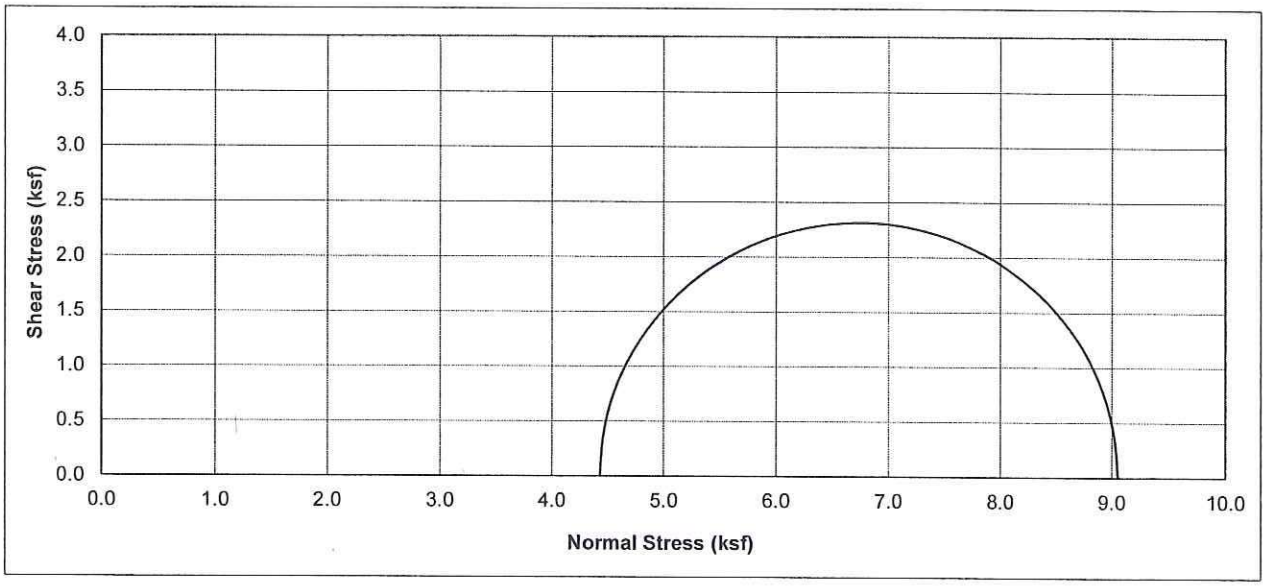




Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-349	D-5	25	Olive brown , Lean CLAY (CL)	98.0	26.47	2.01	1.72	99.3

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	**I-5 HOV Improvement Project** **PCH to San Juan Creek Road**
Project No. : 11-137 **Date :** 11/02/11	**UNCONSOLIDATED UNDRAINED TEST** **(ASTM D2850)** Figure No. :





Boring No.	Sample No.	Depth (ft)	Soil Type	Dry Density (pcf)	Moisture Content (%)	Conf. Stress (ksf)	10% Axial Strain Dev. Stress (ksf)	Initial Saturation (%)
A-11-349	D-11	55	Olive brown , Lean CLAY with SAND (CL)	102.5	23.12	4.43	4.63	96.9

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	I-5 HOV Improvement Project PCH to San Juan Creek Road
Project No. : 11-137 / Date : 11/02/11	UNCONSOLIDATED UNDRAINED TEST (ASTM D2850) Figure No. :

Appendix C

DESIGN CALCULATIONS

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering
17800 Newhope Street
Suite B
Fountain Valley, CA 92708

CPT Number: CPT-11-345
Project Name: Retaining Wall 387
Project Number: 11-137
Location: Orange County
California

Computed by: SP
Checked by:

Date: 04/12/12
Date: 4/16/12

Figure No.:

Reference:

1) Seed, R.B., et al, *Recent Advances in Soil Liquefaction Engineering: A Unified and Consistent Framework*, Keynote Presentation, 26th Annual ASCE Los Angeles Geotechnical Spring Seminar, April 30, 2003.
2) Youd, T.L. & Idriss, I.M., et al, *Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils.* ASCE Journal of Geotechnical and Geoenvironmental Engineering, Pp. 817-833, October 2001.
3) Pradel D., *Procedure to Evaluate Earthquake-induced Settlements in Dry Sandy Soils*, ASCE Journal of Geotechnical and Geoenvironmental Engineering, Pp. 364-368, April 1998.
4) Tokimatsu, K. & Seed, H.B., *Evaluation of Settlements in Sands due to Earthquake Shaking*, ASCE Journal of Geotechnical Engineering, Pp. 861-878, August 1987.
5) Jefferies, M.G. & Davies, M.P., *Use of CPT to Estimate Equivalent SPT N_{60}*, ASTM Geotechnical Testing Journal, Vol.17, No. 4, Pp. 458-567, 1993.
6) Robertson, P.K. et al, *Use of Piezometer Cone Data*, Proceedings of the ASCE Specialty Conference In Situ 86: Use of In Situ Tests in Geotechnical Engineering, Blacksburg, Pp. 1263-1280, 1986.

Surface Elevation = 130.4 ft MSL
Design Magnitude, M_w = 7.50
PGA, a_{max} = 0.408 g
Earthquake Scaling Factor, MSF = 1.000 for M_w = 7.5
Design Water Level = 71.7 ft MSL
Water Level at Investigation = 36.3 ft MSL
Req'd Factor of Safety = 1

Summary of Seismically Induced Settlement:

Dry Settlement (in)	0.206
Post-liquefaction Settlement (in)	0.000
Total Settlement (in)	**0.206**

Depth	Elev.	Unit Weight (pcf)		σ_o	τ_s	Frict. Ratio	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60CS}$	Stresses at Exploration Water Level		Stresses at Design Water Level		I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance			Fines Correction		$CRR_{7.5}$	r_d	CSR_{eq}	$CSR_{7.5}$	FS	a	b	Max Shear Modulus	Cyclic Shear Strain	Norm. Vol. Strain	Dry Settle.	Post-Liq. $(N_1)_{60CS}$	Post-Liq. Vol. Strain	Layer Post-Liq. Settle.
		γ_{MOIST}	γ_{SAT}										σ_v	σ_v'	σ_v	σ_v'			n	C_n	q_{c1N}	Kc	$(q_{c1N})_{cs}$							G_{max}	γ	ε_{vc}	ΔS		ε	ΔS
(ft)	(ft, MSL)			(tsf)	(tsf)	(%)							(tsf)	(tsf)	(tsf)	(tsf)														(tsf)	(%)	(%)	(in)		(%)	(in)
0.33	130.1	115.0	115.0	1.1	0.7	63.6	97	1	4	5.00	1.20	10	0.019	0.019	0.019	0.019	3.48	non-LIQ CLAY	1	1.70	NA	13.77	non-LIQ	non-LIQ	0.999	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
0.49	129.9	115.0	115.0	5.0	0.6	16.0	41	1	8	5.00	1.20	15	0.028	0.028	0.028	0.028	2.72	non-LIQ CLAY	1	1.70	NA	4.13	non-LIQ	non-LIQ	0.999	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
0.66	129.7	115.0	115.0	10.3	0.5	4.9	35	3	14	5.00	1.20	22	0.038	0.038	0.038	0.038	2.60	SAND	0.5	1.70	16.5	3.30	54.6	0.10	0.998	0.26	0.260	Above Water	0.12	57944	171.3	0.02	0.04	0.001	NA	NA	0.000
0.82	129.6	115.0	115.0	7.3	0.4	5.5	35	2	9	4.97	1.20	15	0.047	0.047	0.047	0.047	2.59	SILT	0.7	1.70	11.7	3.25	38.2	0.08	0.998	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
0.98	129.4	115.0	115.0	3.4	0.2	5.9	36	1	4	5.00	1.20	10	0.056	0.056	0.056	0.056	2.62	non-LIQ CLAY	1	1.70	NA	3.45	non-LIQ	non-LIQ	0.998	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.15	129.3	115.0	115.0	5.6	0.3	5.4	42	2	6	5.00	1.20	12	0.066	0.066	0.066	0.066	2.73	SILT	0.7	1.70	9.0	4.23	38.1	0.08	0.997	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.31	129.1	115.0	115.0	10.8	0.8	7.4	39	3	11	5.00	1.20	18	0.075	0.075	0.075	0.075	2.67	SILT	0.7	1.70	17.4	3.79	65.8	0.11	0.997	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.48	128.9	115.0	115.0	17.0	3.3	19.4	44	5	17	5.00	1.20	25	0.085	0.085	0.085	0.085	2.77	non-LIQ CLAY	1	1.70	NA	4.54	non-LIQ	non-LIQ	0.997	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.64	128.8	115.0	115.0	7.6	4.0	52.6	84	3	10	5.00	1.20	17	0.094	0.094	0.094	0.094	3.34	non-LIQ CLAY	1	1.70	NA	11.32	non-LIQ	non-LIQ	0.996	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.80	128.6	115.0	115.0	8.2	4.5	54.9	86	3	11	5.00	1.20	16	0.104	0.104	0.104	0.104	3.36	non-LIQ CLAY	1	1.70	NA	11.63	non-LIQ	non-LIQ	0.996	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.97	128.4	115.0	115.0	5.6	4.7	83.9	111	3	9	5.00	1.20	16	0.113	0.113	0.113	0.113	3.62	non-LIQ CLAY	1	1.70	NA	16.45	non-LIQ	non-LIQ	0.995	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
2.13	128.3	115.0	115.0	5.7	4.6	80.7	111	3	9	5.00	1.20	16	0.122	0.122	0.122	0.122	3.62	non-LIQ CLAY	1	1.70	NA	16.43	non-LIQ	non-LIQ	0.995	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
2.30	128.1	115.0	115.0	6.3	3.5	55.6	97	3	8	5.00	1.20	15	0.132	0.132	0.132	0.132	3.48	non-LIQ CLAY	1	1.70	NA	13.67	non-LIQ	non-LIQ	0.995	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
2.46	127.9	115.0	115.0	5.7	2.3	40.4	90	2	7	5.00	1.20	13	0.141	0.141	0.141	0.141	3.40	non-LIQ CLAY	1	1.70	NA	12.34	non-LIQ	non-LIQ	0.994	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
2.62	127.8	115.0	115.0	6.5	1.6	24.6	73	2	6	5.00	1.20	13	0.151	0.151	0.151	0.151	3.21	non-LIQ CLAY	1	1.70	NA	9.33	non-LIQ	non-LIQ	0.994	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
2.79	127.6	115.0	115.0	4.4	1.3	29.5	89	2	5	5.00	1.20	11	0.160	0.160	0.160	0.160	3.39	non-LIQ CLAY	1	1.70	NA	12.23	non-LIQ	non-LIQ	0.993	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
2.95	127.5	115.0	115.0	5.3	1.1	20.8	76	2	5	5.00	1.20	11	0.170	0.170	0.170	0.170	3.24	non-LIQ CLAY	1	1.70	NA	9.75	non-LIQ	non-LIQ	0.993	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
3.12	127.3	115.0	115.0	3.6	1.0	26.3	92	2	4	5.00	1.20	10	0.179	0.179	0.179	0.179	3.43	non-LIQ CLAY	1	1.70	NA	12.85	non-LIQ	non-LIQ	0.993	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
3.28	127.1	115.0	115.0	2.9	0.9	31.0	107	1	3	5.00	1.20	9	0.189	0.189	0.189	0.189	3.59	non-LIQ CLAY	1	1.70	NA	15.72	non-LIQ	non-LIQ	0.992	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
3.45	127.0	115.0	115.0	3.3	0.9	27.3	101	2	4	5.00	1.20	9	0.198	0.198	0.198	0.198	3.52	non-LIQ CLAY	1	1.70	NA	14.42	non-LIQ	non-LIQ	0.992	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
3.61	126.8	115.0	115.0	2.5	0.8	32.0	117	1	3	5.00	1.20	9	0.208	0.208	0.208	0.208	3.68	non-LIQ CLAY	1	1.70	NA	17.57	non-LIQ	non-LIQ	0.992	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
3.77	126.6	115.0	115.0	3.5	0.7	20.0	92	2	3	5.00	1.20	9	0.217	0.217	0.217	0.217	3.43	non-LIQ CLAY	1	1.70	NA	12.78	non-LIQ	non-LIQ	0.991	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
3.94	126.5	115.0	115.0	2.6	0.7	26.9	113	1	3	5.00	1.20	9	0.227	0.227	0.227	0.227	3.64	non-LIQ CLAY	1	1.70	NA	16.76	non-LIQ	non-LIQ	0.991	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
4.10	126.3	115.0	115.0	2.7	0.8	29.6	116	1	3	5.00	1.20	9	0.236	0.236	0.236	0.236	3.67	non-LIQ CLAY	1	1.70	NA	17.41	non-LIQ	non-LIQ	0.990	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
4.27	126.1	115.0	115.0	2.5	2.4	96.0	168	3	5	5.00	1.20	11	0.246	0.246	0.246	0.246	4.10	non-LIQ CLAY	1	1.70	NA	27.73	non-LIQ	non-LIQ	0.990	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
4.43	126.0	115.0	115.0	13.4	3.4	25.4	70	5	10	5.00	1.20	17	0.255	0.255	0.255	0.255	3.17	non-LIQ CLAY	1	1.70	NA	6.77	non-LIQ	non-LIQ	0.990	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
4.59	125.8	115.0	115.0	292.5	3.4	1.2	3	48	96	0.00	1.00	96	0.264	0.264	0.264	0.264	1.48	SAND	0.5	1.70	469.9	1.00	469.9	non-LIQ	0.989	0.26	0.260	Above Water	0.13	18099	860.4	0.01	0.00	0.000	NA	NA	0.000
4.76	125.6	115.0	115.0	336.6	4.6	1.4	3	56	110	0.00	1.00	110	0.274	0.274	0.274	0.274	1.51	SAND	0.5	1.70	540.8	1.00	540.8	non-LIQ	0.989	0.26	0.260	Above Water	0.13	17708	916.3	0.01	0.00	0.000	NA	NA	0.000
4.92	125.5	115.0	115.0	298.6	5.2	1.7	5	52	100	0.00	1.00	100	0.283	0.283	0.283	0.283	1.64	SAND	0.5	1.70	479.7	1.00	479.7	non-LIQ	0.989	0.26	0.260	Above Water	0.13	17360	902.1	0.01	0.00	0.000	NA	NA	0.000
5.09	125.3	115.0	115.0	320.3	5.8	1.8	5	55	105	0.00	1.00	105	0.293	0.293	0.293	0.293	1.64	SAND	0.5	1.70	514.6	1.00	512.7	non-LIQ	0.988	0.26	0.260	Above Water	0.13	17010	934.5	0.01	0.00	0.000	NA	NA	0.000
5.25	125.2	115.0	115.0	397.0	6.3	1.6	4	67	125	0.00	1.00	125	0.302	0.302	0.302	0.302	1.55	SAND	0.5	1.70	637.8	1.00	637.8	non-LIQ	0.988	0.26	0.260	Above Water	0.13	16697	1004.4	0.01	0.00	0.000	NA	NA	0.000
5.41	125.0	115.0	115.0	489.7	6.4	1.3	2	79	146	0.00	1.00	146	0.311	0.311	0.311	0.311	1.44	SAND	0.5	1.70	786.8	1.00	786.8	non-LIQ	0.987	0.26	0.260	Above Water	0.13	16399	1075.1	0.01	0.00	0.000	NA	NA	0.000
5.58	124.8	115.0	115.0	498.6	5.9	1.2	2	80	145	0.00	1.00	145	0.321	0.321	0.321	0.321	1.40	SAND	0.5	1.70	801.1	1.00	801.1	non-LIQ	0.987	0.26	0.260	Above Water	0.13	16097	1088.2	0.01	0.00	0.000	NA	NA	0.000
5.74	124.7	115.0	115.0	462.0	5.6	1.2	2	74	133	0.00	1.00	133	0.330	0.330	0.330	0.330	1.43	SAND	0.5	1.70	742.3	1.00	742.3	non-LIQ	0.987	0.26	0.260	Above Water	0.13	15827	1073.8	0.01	0.00	0.000	NA	NA	0.000
5.91	124.5	115.0	115.0	398.3	4.4	1.1	2	64	113	0.00	1.00	113	0.340	0.340	0.340	0.340	1.42	SAND	0.5	1.70	639.9	1.00	639.9	non-LIQ	0.986	0.26	0.260	Above Water	0.13	15552	1031.3	0.01	0.00	0.000	NA	NA	0.000
6.07	124.3	115.0	115.0	318.7	2.9	0.9	2	51	89	0.00	1.00	89	0.349	0.349	0.349	0.349	1.40	SAND	0.5	1.70	512.0	1.00	512.0	non-LIQ	0.986	0.26	0.260	Above Water	0.13	15305	963.8	0.01	0.00	0.000	NA	NA	0.000
6.23	124.2	115.0	115.0	225.1	1.6	0.7	2	36	62	0.00	1.00	62	0.358	0.358	0.358	0.358	1.40	SAND	0.5	1.70	361.7	1.00	361.7	non-LIQ	0.985	0.26	0.260	Above Water	0.13	15068	866.4	0.02	0.00	0.000	NA	NA	0.000
6.40	124.0	115.0	115.0	134.9	1.1	0.8	4	23	39	0.00	1.00	39	0.368	0.368	0.368	0.368	1.60	SAND	0.5	1.70	216.2	1.00	216.2	non-LIQ	0.985	0.26	0.260	Above Water	0.13	14826	753.1	0.02	0.01	0.000	NA	NA	0.000
6.56	123.8	115.0	115.0	73.3	1.2	1.6	13	14	24	1.97	1.04	27	0.377	0.377	0.377	0.377	2.01	SAND	0.5	1.67	116.0	1.31	152.5	0.41	0.985	0.26	0.260	Above Water	0.13	14608	650.5	0.03	0.02	0.001	NA	NA	0.000
6.73	123.7	115.0	115.0	56.1	1.1	2.0	17	12	19	3.12	1.06	24	0.387	0.387	0.387	0.387	2.15	SAND	0.5	1.65	87.7	1.56	136.6	0.32	0.984	0.26	0.260	Above Water	0.13	14386	611.5	0.04	0.04	0.001	NA	NA	0.000
6.89	123.5	115.0	115.0	55.2	1.3	2.4	20	12	19	3.55	1.08	24	0.396	0.396	0.396	0.396	2.22	SAND	0.5	1.63	85.3	1.71	146.2	0.37	0.984	0.26	0.260	Above Water	0.13	14184	618.6	0.04	0.04	0.001	NA	NA	0.000
7.05	123.4	115.0	115.0	47.4	1.5	3.2	25	11	17	4.28	1.11	24	0.405	0.405	0.405	0.405	2.36	SAND	0.5	1.62	72.4	2.16	156.5	0.44	0.984	0.26	0.260	Above Water	0.13	13990	604.8	0.04	0.05	0.002	NA	NA	0.000
7.22	123.2	115.0	115.0	58.6	2.5	4.3	26	14	22	4.42	1.13	29	0.415	0.415	0.415	0.415	2.40	SAND	0.5	1.60	88.7	2.31	204.7	non-LIQ	0.983	0.26	0.260	Above Water	0.13	13792	658.7	0.03	0.03	0.001	NA	NA	0.000
7.38	123.0	115.0	115.0	99.6	2.7	2.7	16	20	32	2.75	1.05	37	0.424	0.424	0.424	0.424	2.10	SAND	0.5	1.58	148.6	1.45	217.4	non-LIQ	0.983	0.26	0.260	Above Water	0.14	13611	758.5	0.03	0.01	0.001	NA	NA	0.000
7.55	122.9	115.0	115.0	199.5	4.5	2.3	10	37	58	0.74	1.02	60	0.434	0.434	0.434	0.434	1.87	SAND	0.5	1.56	294.4	1.16	341.0	non-LIQ	0.982	0.26	0.260	Above Water	0.14	13427	934.6	0.02	0.00	0.000	NA	NA	0.000
7.71	122.7	115.0	115.0	188.3	5.6	3.0	13	37	57	1.73	1.03	61	0.443	0.443	0.443	0.443	1.98	SAND	0.5	1.54	274.9	1.28	351.8	non-LIQ	0.982	0.26	0.260	Above Water	0.14	13259	936.9	0.02	0.01	0.000	NA	NA	0.000
7.87	122.5	115.0	115.0	110.5	5.1	4.6	22	24	37	3.86	1.09	44	0.453	0.453	0.453	0.453	2.27	SAND	0.5	1.53	159.7	1.86	297.8	non-LIQ	0.982	0.26	0.260	Above Water	0.14	13096	821.2	0.02	0.01	0.000	NA	NA	0.000
8.04	122.4	115.0	115.0	105.9	6.1	5.8	25	24	37	4.29	1.12	45	0.462	0.462	0.462	0.462	2.37	SAND	0.5	1.51	151.4	2.18	329.9	non-LIQ	0.981	0.26	0.260	Above Water	0.14	12929	826.6	0.02	0.01	0.000	NA	NA	0.000
8.20	122.2	115.0	115.0	149.8	6.0	4.0	17	31	47	3.12	1.06	53	0.472	0.472	0.472	0.472	2.15	SAND	0.5	1.50	212.1	1.56	330.9	non-LIQ	0.981	0.26	0.260	Above Water	0.14	12778	906.1	0.02	0.01	0.000	NA	NA	0.000
8.37	122.0	115.0	115.0	155.5	4.3	2.8	13	31	46	1.98	1.04	49	0.481	0.481	0.481	0.481	2.01	SAND	0.5	1.48	217.9	1.32	286.9	non-LIQ	0.980	0.26	0.260	Above Water	0.14	12621	906.7	0.02	0.01	0.000	NA	NA	0.000
8.53	121.9	115.0	115.0	193.1	3.2	1.7	8	35	51	0.23	1.01	52	0.490	0.490	0.490	0.490	1.78	SAND	0.5	1.47	268.0	1.09	292.5	non-LIQ	0.980	0.26	0.260	Above Water	0.14	12479	952.8	0.02	0.01	0.000	NA	NA	0.000

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_Q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
8.69	121.7	115.0	115.0	148.8	3.6	2.4	12	29	42	1.70	1.03	45	0.500	0.500	0.500	0.500	1.98	SAND	0.5	1.46	204.6	1.28	261.0	non-LIQ	0.980	0.26	0.260	Above Water	0.14	12340	901.0	0.02	0.01	0.000	NA	NA	0.000
8.86	121.5	115.0	115.0	133.2	3.3	2.5	14	26	38	2.05	1.04	42	0.509	0.509	0.509	0.509	2.02	SAND	0.5	1.44	181.4	1.33	240.8	non-LIQ	0.979	0.26	0.260	Above Water	0.14	12198	878.4	0.02	0.01	0.000	NA	NA	0.000
9.02	121.4	115.0	115.0	121.9	3.7	3.0	16	25	36	2.65	1.06	41	0.519	0.519	0.519	0.519	2.12	SAND	0.5	1.43	164.6	1.49	244.5	non-LIQ	0.979	0.26	0.260	Above Water	0.14	12067	868.9	0.03	0.01	0.000	NA	NA	0.000
9.19	121.2	115.0	115.0	80.9	3.8	4.7	26	19	26	4.35	1.12	34	0.528	0.528	0.528	0.528	2.38	SAND	0.5	1.42	106.2	2.23	241.1	non-LIQ	0.979	0.26	0.260	Above Water	0.14	11933	791.6	0.03	0.02	0.001	NA	NA	0.000
9.35	121.1	115.0	115.0	86.9	2.8	3.2	20	19	26	3.64	1.08	32	0.538	0.538	0.538	0.538	2.23	SAND	0.5	1.40	115.2	1.75	201.9	non-LIQ	0.978	0.26	0.260	Above Water	0.14	11810	798.3	0.03	0.02	0.001	NA	NA	0.000
9.51	120.9	115.0	115.0	109.1	2.9	2.7	16	22	31	2.78	1.05	36	0.547	0.547	0.547	0.547	2.11	SAND	0.5	1.39	143.4	1.47	210.7	non-LIQ	0.978	0.26	0.260	Above Water	0.14	11690	851.3	0.03	0.02	0.001	NA	NA	0.000
9.68	120.7	115.0	115.0	110.7	2.6	2.3	15	22	31	2.43	1.05	35	0.557	0.557	0.557	0.557	2.06	SAND	0.5	1.38	144.2	1.39	201.1	non-LIQ	0.977	0.26	0.260	Above Water	0.14	11567	855.5	0.03	0.02	0.001	NA	NA	0.000
9.84	120.6	115.0	115.0	82.6	2.4	2.9	20	18	24	3.56	1.08	30	0.566	0.566	0.566	0.566	2.22	SAND	0.5	1.37	106.8	1.72	183.4	non-LIQ	0.977	0.26	0.260	Above Water	0.14	11453	796.9	0.03	0.03	0.001	NA	NA	0.000
10.01	120.4	115.0	115.0	67.9	1.4	2.1	18	14	19	3.25	1.07	24	0.576	0.576	0.576	0.576	2.17	SAND	0.5	1.36	87.0	1.60	139.3	0.33	0.977	0.26	0.260	Above Water	0.14	11336	745.8	0.04	0.04	0.002	NA	NA	0.000
10.17	120.2	115.0	115.0	90.4	0.9	1.0	10	17	23	0.74	1.02	24	0.585	0.585	0.585	0.585	1.87	SAND	0.5	1.35	114.9	1.16	133.2	0.30	0.976	0.26	0.260	Above Water	0.14	11229	792.9	0.04	0.03	0.001	NA	NA	0.000
10.34	120.1	115.0	115.0	103.2	0.7	0.7	6	18	24	0.06	1.01	25	0.595	0.595	0.595	0.595	1.72	SAND	0.5	1.33	130.1	1.05	136.7	0.32	0.976	0.26	0.260	Above Water	0.14	11118	818.8	0.04	0.03	0.001	NA	NA	0.000
10.50	119.9	115.0	115.0	101.5	0.7	0.7	7	18	24	0.09	1.01	24	0.604	0.604	0.604	0.604	1.73	SAND	0.5	1.32	127.0	1.06	134.5	0.31	0.976	0.26	0.260	Above Water	0.14	11016	819.6	0.04	0.03	0.001	NA	NA	0.000
10.66	119.7	115.0	115.0	100.6	0.5	0.5	5	17	23	0.01	1.00	23	0.613	0.613	0.613	0.613	1.65	SAND	0.5	1.31	124.9	1.01	125.8	0.26	0.975	0.26	0.260	Above Water	0.14	10916	814.1	0.04	0.03	0.001	NA	NA	0.000
10.83	119.6	115.0	115.0	82.2	0.4	0.5	7	15	19	0.08	1.01	19	0.623	0.623	0.623	0.623	1.73	SAND	0.5	1.30	101.3	1.06	107.0	0.19	0.975	0.26	0.260	Above Water	0.14	10813	771.5	0.04	0.05	0.002	NA	NA	0.000
10.99	119.4	115.0	115.0	73.9	0.4	0.5	8	13	17	0.30	1.01	18	0.632	0.632	0.632	0.632	1.79	SAND	0.5	1.29	90.4	1.10	99.6	0.17	0.974	0.26	0.260	Above Water	0.14	10719	754.2	0.05	0.06	0.002	NA	NA	0.000
11.16	119.2	115.0	115.0	63.6	0.5	0.8	11	12	16	1.36	1.03	18	0.642	0.642	0.642	0.642	1.94	SAND	0.5	1.28	77.2	1.23	95.0	0.16	0.974	0.26	0.260	Above Water	0.14	10620	734.2	0.05	0.07	0.003	NA	NA	0.000
11.32	119.1	115.0	115.0	58.1	0.4	0.7	12	11	14	1.39	1.03	16	0.651	0.651	0.651	0.651	1.95	SAND	0.5	1.27	70.0	1.24	86.5	0.14	0.974	0.26	0.260	Above Water	0.14	10530	716.1	0.06	0.08	0.003	NA	NA	0.000
11.48	118.9	115.0	115.0	52.7	0.4	0.8	13	10	13	1.94	1.04	16	0.660	0.660	0.660	0.660	2.01	SAND	0.5	1.27	63.1	1.31	82.6	0.13	0.973	0.26	0.260	Above Water	0.14	10442	701.9	0.06	0.10	0.004	NA	NA	0.000
11.65	118.8	115.0	115.0	52.6	0.7	1.3	16	11	14	3.13	1.06	18	0.670	0.670	0.670	0.670	2.15	SAND	0.5	1.26	62.5	1.56	97.7	0.17	0.973	0.26	0.260	Above Water	0.14	10350	718.8	0.06	0.09	0.004	NA	NA	0.000
11.81	118.6	115.0	115.0	62.6	1.4	2.2	21	14	17	3.73	1.08	22	0.679	0.679	0.679	0.679	2.25	SAND	0.5	1.25	73.9	1.80	132.6	0.30	0.972	0.26	0.260	Above Water	0.14	10266	775.3	0.05	0.06	0.002	NA	NA	0.000
11.98	118.4	115.0	115.0	51.2	1.8	3.5	29	12	15	4.61	1.14	22	0.689	0.689	0.689	0.689	2.45	SAND	0.5	1.24	60.0	2.55	152.7	0.41	0.972	0.26	0.260	Above Water	0.14	10178	751.0	0.05	0.08	0.003	NA	NA	0.000
12.14	118.3	115.0	115.0	33.8	1.7	5.0	37	9	11	5.00	1.20	18	0.698	0.698	0.698	0.698	2.64	non-LIQ CLAY	1	1.52	NA	3.55	non-LIQ	non-LIQ	0.972	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.30	118.1	115.0	115.0	26.1	1.1	4.2	39	7	8	5.00	1.20	15	0.707	0.707	0.707	0.707	2.67	non-LIQ CLAY	1	1.50	NA	3.76	non-LIQ	non-LIQ	0.971	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.47	117.9	115.0	115.0	25.4	1.0	3.9	38	7	8	5.00	1.20	15	0.717	0.717	0.717	0.717	2.66	non-LIQ CLAY	1	1.48	NA	3.72	non-LIQ	non-LIQ	0.971	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.63	117.8	115.0	115.0	22.8	1.0	4.4	42	6	8	5.00	1.20	14	0.726	0.726	0.726	0.726	2.73	non-LIQ CLAY	1	1.46	NA	4.24	non-LIQ	non-LIQ	0.971	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.80	117.6	115.0	115.0	26.9	1.1	4.1	38	7	9	5.00	1.20	15	0.736	0.736	0.736	0.736	2.66	non-LIQ CLAY	1	1.44	NA	3.72	non-LIQ	non-LIQ	0.970	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.96	117.4	115.0	115.0	38.2	1.4	3.7	34	10	11	4.93	1.19	19	0.745	0.745	0.745	0.745	2.57	SAND	0.5	1.19	43.0	3.16	136.0	0.31	0.970	0.26	0.260	Above Water	0.14	9709	712.6	0.07	0.14	0.005	NA	NA	0.000
13.12	117.3	115.0	115.0	44.5	1.5	3.4	31	11	13	4.75	1.16	20	0.754	0.754	0.754	0.754	2.50	SAND	0.5	1.18	49.8	2.77	137.9	0.32	0.969	0.26	0.260	Above Water	0.14	9638	744.1	0.07	0.11	0.004	NA	NA	0.000
13.29	117.1	115.0	115.0	33.6	1.5	4.5	37	9	10	5.00	1.20	17	0.764	0.764	0.764	0.764	2.63	non-LIQ CLAY	1	1.38	NA	3.50	non-LIQ	non-LIQ	0.969	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.45	117.0	115.0	115.0	29.4	1.5	5.1	41	8	9	5.00	1.20	16	0.773	0.773	0.773	0.773	2.72	non-LIQ CLAY	1	1.37	NA	4.11	non-LIQ	non-LIQ	0.969	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.62	116.8	115.0	115.0	32.5	1.4	4.3	37	9	10	5.00	1.20	17	0.783	0.783	0.783	0.783	2.64	non-LIQ CLAY	1	1.35	NA	3.55	non-LIQ	non-LIQ	0.968	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.78	116.6	115.0	115.0	36.7	1.5	4.1	36	9	11	5.00	1.20	18	0.792	0.792	0.792	0.792	2.61	SILT	0.7	1.22	42.5	3.39	144.1	0.36	0.968	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.94	116.5	115.0	115.0	34.7	1.6	4.6	38	9	10	5.00	1.20	18	0.802	0.802	0.802	0.802	2.64	non-LIQ CLAY	1	1.32	NA	3.60	non-LIQ	non-LIQ	0.967	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
14.11	116.3	115.0	115.0	41.6	1.6	3.8	34	11	12	4.94	1.19	19	0.811	0.811	0.811	0.811	2.57	SAND	0.5	1.14	44.9	3.17	142.3	0.35	0.967	0.26	0.260	Above Water	0.15	9226	754.4	0.07	0.13	0.005	NA	NA	0.000
14.27	116.1	115.0	115.0	71.5	1.5	2.1	20	15	17	3.55	1.08	22	0.821	0.821	0.821	0.821	2.22	SAND	0.5	1.14	76.7	1.71	131.4	0.29	0.967	0.26	0.260	Above Water	0.15	9164	859.4	0.05	0.06	0.002	NA	NA	0.000
14.44	116.0	115.0	115.0	77.7	1.7	2.2	19	17	19	3.48	1.07	24	0.830	0.830	0.830	0.830	2.21	SAND	0.5	1.13	82.9	1.68	139.6	0.33	0.966	0.26	0.260	Above Water	0.15	9099	685.6	0.05	0.05	0.002	NA	NA	0.000
14.60	115.8	115.0	115.0	55.3	2.0	3.6	29	13	15	4.66	1.15	22	0.839	0.839	0.839	0.839	2.47	SAND	0.5	1.12	58.7	2.62	154.0	0.42	0.966	0.26	0.260	Above Water	0.15	9039	625.2	0.06	0.09	0.003	NA	NA	0.000
14.76	115.6	115.0	115.0	41.3	1.9	4.6	36	11	12	5.00	1.20	19	0.849	0.849	0.849	0.849	2.61	non-LIQ CLAY	1	1.25	NA	3.36	non-LIQ	non-LIQ	0.966	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
14.93	115.5	115.0	115.0	37.9	1.5	4.0	36	10	11	5.00	1.20	18	0.858	0.858	0.858	0.858	2.61	SILT	0.7	1.16	41.5	3.38	140.3	0.34	0.965	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
15.09	115.3	115.0	115.0	37.2	1.5	4.0	36	10	11	5.00	1.20	18	0.868	0.868	0.868	0.868	2.60	non-LIQ CLAY	1	1.22	NA	3.36	non-LIQ	non-LIQ	0.965	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
15.26	115.1	115.0	115.0	37.4	1.6	4.3	37	10	11	5.00	1.20	18	0.877	0.877	0.877	0.877	2.62	non-LIQ CLAY	1	1.21	NA	3.48	non-LIQ	non-LIQ	0.964	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
15.42	115.0	115.0	115.0	51.2	1.7	3.3	30	12	13	4.68	1.15	20	0.887	0.887	0.887	0.887	2.48	SAND	0.5	1.09	52.9	2.66	140.4	0.34	0.964	0.26	0.260	Above Water	0.15	8747	819.9	0.07	0.11	0.004	NA	NA	0.000
15.58	114.8	115.0	115.0	68.5	2.0	2.9	24	16	17	4.22	1.11	23	0.896	0.896	0.896	0.896	2.35	SAND	0.5	1.09	70.4	2.11	148.5	0.38	0.964	0.26	0.260	Above Water	0.15	8693	888.8	0.06	0.07	0.003	NA	NA	0.000
15.75	114.7	115.0	115.0	55.1	1.9	3.4	29	13	14	4.66	1.15	21	0.906	0.906	0.906	0.906	2.47	SAND	0.5	1.08	56.3	2.62	147.3	0.38	0.963	0.26	0.260	Above Water	0.15	8637	845.0	0.06	0.10	0.004	NA	NA	0.000
15.91	114.5	115.0	115.0	37.9	1.6	4.2	37	10	11	5.00	1.20	18	0.915	0.915	0.915	0.915	2.63	non-LIQ CLAY	1	1.16	NA	3.52	non-LIQ	non-LIQ	0.963	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.08	114.3	115.0	115.0	36.8	1.3	3.5	35	9	10	5.00	1.20	17	0.925	0.925	0.925	0.925	2.60	SILT	0.7	1.10	38.2	3.34	127.6	0.27	0.963	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.24	114.2	115.0	115.0	35.6	1.2	3.4	35	9	10	5.00	1.20	17	0.934	0.934	0.934	0.934	2.60	SILT	0.7	1.09	36.7	3.34	122.5	0.25	0.962	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.40	114.0	115.0	115.0	34.1	1.2	3.5	36	9	9	5.00	1.20	16	0.943	0.943	0.943	0.943	2.62	non-LIQ CLAY	1	1.12	NA	3.45	non-LIQ	non-LIQ	0.962	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.57	113.8	115.0	115.0	34.3	1.2	3.5	36	9	9	5.00	1.20	16	0.953	0.953	0.953	0.953	2.62	non-LIQ CLAY	1	1.11	NA	3.45	non-LIQ	non-LIQ	0.961	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.73	113.7	115.0	115.0	33.8	1.3	3.8	38	9	9	5.00	1.20	16	0.962	0.962	0.962	0.962	2.66	non-LIQ CLAY	1	1.10	NA	3.69	non-LIQ	non-LIQ	0.961	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.90	113.5	115.0	115.0	33.1	1.3	3.9	39	9	9	5.00	1.20	16	0.972	0.972	0.972	0.972	2.67	non-LIQ CLAY	1	1.09	NA	3.80	non-LIQ	non-LIQ	0.961	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.06	113.3	115.0	115.0	31.0	1.3	4.2	41	8	9	5.00	1.20	15	0.981	0.981	0.981	0.981	2.72	non-LIQ CLAY	1	1.08	NA	4.12	non-LIQ	non-LIQ	0.960	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.23	113.2	115.0	115.0	32.1	1.2	3.7	39	9	9	5.00	1.20	16	0.991	0.991	0.991	0.991	2.66	non-LIQ CLAY	1	1.07	NA	3.82	non-LIQ	non-LIQ	0.960	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.39	113.0	115.0	115.0	35.3	1.5	4.2	40	9	10	5.00	1.20	17	1.000	1.000	1.000	1.000	2.66	non-LIQ CLAY	1	1.06	NA	3.88	non-LIQ	non-LIQ	0.959	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.55	112.9	115.0	115.0	42.2	1.5	3.6	34	11	11	4.95	1.19	18	1.009	1.009	1.009	1.009	2.58	SAND	0.5	1.02	40.8	3.22	131.5	0.29	0.959	0.25	0.250	Above Water	0.15	8094	816.3	0.08	0.16	0.006	NA	NA	0.000
17.72	112.7	115.0	115.0	54.8	1.6	2.9	28	13	13	4.57	1.14	20	1.019	1.019	1.019	1.019	2.44	SAND	0.5	1.02	52.8	2.48	130.9	0.29	0.959	0.25	0.250	Above Water	0.15	8047	873.3	0.07	0.11	0.004	NA	NA	0.000
17.88	112.5	115.0	115.0	79.7	1.7	2.1	20	17	17	3.59	1.08	22	1.028	1.028	1.028	1.028	2.23	SAND	0.5	1.01	76.4	1.73	132.3	0.30	0.958	0.25	0.250	Above Water	0.15	8004	961.6	0.05	0.06	0.002	NA	NA	0.000
18.05	112.4	115.0	115.0	104.8	1.9	1.8	16	21	22	2.65	1.05	25	1.038	1.038	1.038	1.038	2.09	SAND	0.5	1.01	100.0	1.44	143.9	0.36	0.958	0.25	0.250	Above Water	0.15	7959	1037.6	0.05	0.04	0.002	NA	NA	0.000
18.21	112.2	115.0	115.0	119.7	2.3	1.9	15	24	24	2.47	1.05	28	1.047	1.047	1.047	1.047	2.07	SAND	0.5	1.01	113.7	1.40	159.5	0.46	0.958	0.25	0.250	Above Water	0.15	7917	1084.7	0.04	0.03	0.001	NA	NA	0.000
18.37	112.0	115.0	115.0	123.1	2.6	2.1	16	25	25	2.66	1.05	29	1.056	1.056	1.056	1.056	2.09	SAND	0.5	1.00	116.4	1.44	167.9	non-LIQ	0.957	0.25	0.250	Above Water	0.15	7875	1101.5	0.04	0.03	0.001	NA	NA	0.000
18.54	111.9	115.0	115.0	120.2	2.7	2.2	16	25	25	2.88	1.06	29	1.066	1.066	1.066	1.066	2.12	SAND	0.5	1.00	113.2	1.49	169.1	non-LIQ	0.957	0.25	0.250	Above Water	0.15	7832	1100.3	0.04	0.03	0.001	NA	NA	0.000
18.70	111.7	115.0	115.0	122.5	2.5	2.0	15	25	25	2.60	1.05	29	1.075	1.075	1.075	1.075	2.09	SAND	0.5	0.99	114.8	1.43	164.2	non-LIQ	0.956	0.25	0.250	Above Water	0.15	7792	1105.2	0.04	0.03	0.001	NA	NA	0.000
18.87	111.5	115.0	115.0	123.7	2.5	2.0	15	25	25	2.57	1.05	29	1.085	1.085	1.085	1.085	2.08	SAND	0.5	0.99	115.4	1.42	164.1	non-LIQ	0.956	0.25	0.250	Above Water	0.15	7749	1111.5	0.04	0.03	0.001	NA	NA	0.000
19.03	111.4	115.0	115.0	115.1	2.4	2.1	16	24	23	2.83	1.06	27	1.094	1.094	1.094	1.094	2.11	SAND	0.5	0.98	107.0	1.48	158.4	0.45	0.956	0.25	0.250	Above Water	0.15	7710	1093.0	0.04	0.04	0.001	NA	NA	0.000
19.19	111.2	115.0	115.0	93.0	2.4	2.6	21	20	20	3.72	1.08	25	1.103	1.103	1.103	1.103	2.25	SAND	0.5	0.98	86.1	1.79	154.2	0.42	0.955	0.25	0.250	Above Water	0.15	7672	1039.8	0.05	0.05	0.002	NA	NA	0.000
19.36	111.0	115.0	115.0	70.1	2.7	3.9	29	17	16	4.64	1.15	23	1.113	1.113	1.113	1.113	2.46	SAND	0.5	0.97	64.6	2.59	167.0	non-LIQ	0.955	0.25	0.250	Above Water	0.15	7631	979.9	0.06	0.07	0.003	NA	NA	0.000
19.52	110.9	115.0	115.0	53.7	2.7	5.0	37	14	14	5.00	1.20	21	1.122	1.122	1.122	1.122	2.64	non-LIQ CLAY	1	0.94	NA	3.57	non-LIQ	non-LIQ	0.954	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
19.69	110.7	115.0	115.0	43.4	2.4	5.5	43	12	12	5.00	1.20	19	1.132	1.132	1.132	1.132	2.74	non-LIQ CLAY	1	0.93	NA	4.29	non-LIQ	non-LIQ	0.954	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
19.85	110.6	115.0	115.0	40.1	2.0	5.0	42	11	11	5.00	1.20	18	1.141	1.141	1.141	1.141	2.73	non-LIQ CLAY	1	0.93	NA	4.25	non-LIQ	non-LIQ	0.954	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.01	110.4	115.0	115.0	44.7	1.8	4.0	37	12	11	5.00	1.20	18	1.151	1.151	1.151	1.151	2.64	non-LIQ CLAY	1	0.92	NA	3.56	non-LIQ	non-LIQ	0.953	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.18	110.2	115.0	115.0	58.2	2.0	3.4	30	14	13	4.73	1.16	20	1.160	1.160	1.160	1.160	2.49	SAND	0.5	0.95	52.5	2.72	143.1	0.35	0.953	0.25	0.250	Above Water	0.15	7444	938.0	0.07	0.11	0.004	NA	NA	0.000
20.34	110.1	115.0	115.0	67.8	2.2	3.2	28	16	15	4.52	1.13	22	1.170	1.170	1.170	1.170	2.43	SAND	0.5	0.95	60.9	2.42	147.7	0.38	0.953	0.25	0.250	Above Water	0.15	7408	979.6	0.06	0.09	0.003	NA	NA	0.000
20.51	109.9	115.0	115.0	68.5	2.4	3.5	28	16	15	4.60	1.14	22	1.179	1.179	1.179	1.179	2.45	SAND	0.5	0.95	61.3	2.52	154.7	0.42	0.952	0.25	0.250	Above Water	0.15	7371	989.1	0.06	0.08	0.003	NA	NA	0.000
20.67	109.7	115.0	115.0	62.3	2.5	4.0	32	15	14	4.81	1.17	22	1.189	1.189	1.189	1.189	2.52	SAND	0.5	0.94	55.6	2.88	160.2	non-LIQ	0.952	0.25	0.250	Above Water	0.15	7337	972.0	0.07	0.10	0.004	NA	NA	0.000
20.83	109.6	115.0	115.0	57.5	2.4	4.2	33	14	14	4.91	1.18	21	1.198	1.198	1.198	1.198	2.56	SAND	0.5	0.94	51.1	3.09	158.1	0.45	0.951	0.25	0.250	Above Water	0.16	7303	954.7	0.07	0.11	0.004	NA	NA	0.000
21.00	109.4	115.0	115.0	49.9	2.0	4.0	36	13	12	5.00	1.20	19	1.208	1.208	1.208	1.208	2.61	non-LIQ CLAY	1	0.88	NA	3.42	non-LIQ	non-LIQ	0.951	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.16	109.2	115.0	115.0	46.7	2.0	4.3	38	12	11	5.00	1.20	19	1.217	1.217	1.217	1.217	2.66	non-LIQ CLAY	1	0.87	NA	3.71	non-LIQ	non-LIQ	0.951	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.33	109.1	115.0	115.0	46.7	1.8	3.9	37	12	11	5.00	1.20	19	1.226	1.226	1.226	1.226	2.63	non-LIQ CLAY	1	0.86	NA	3.52	non-LIQ	non-LIQ	0.950	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.49	108.9	115.0	115.0	44.9	1.9	4.2	39	12	11	5.00	1.20	18	1.236	1.236	1.236	1.236	2.67	non-LIQ CLAY	1	0.86	NA	3.81	non-LIQ	non-LIQ	0.950	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.65	108.8	115.0	115.0	49.0	2.0	4.1	37	13	12	5.00	1.20	19	1.245	1.245	1.245	1.245	2.64	non-LIQ CLAY	1	0.85	NA	3.56	non-LIQ	non-LIQ	0.950	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.82	108.6	115.0	115.0	48.4	2.0	4.1	38	13	12	5.00	1.20	19	1.255	1.255	1.255	1.255	2.65	non-LIQ CLAY	1	0.84	NA	3.62	non-LIQ	non-LIQ	0.949	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.98	108.4	115.0	115.0	51.0	2.4	4.7	39	14	12	5.00	1.20	20	1.264	1.264	1.264	1.264	2.67	non-LIQ CLAY	1	0.84	NA	3.60	non-LIQ	non-LIQ	0.949	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.15	108.3	115.0	115.0	62.1	2.2	3.5	30	15	14	4.74	1.16	21	1.274	1.274	1.274	1.274	2.50	SAND	0.5	0.91	53.5	2.75	146.9	0.37	0.948	0.25	0.250	Above Water	0.16	7039	989.4	0.07	0.11	0.004	NA	NA	0.000
22.31	108.1	115.0	115.0	60.5	2.3	3.8	32	15	14	4.82	1.17	21	1.283	1.283	1.283	1.283	2.53	SAND	0.5	0.91	51.9	2.91	151.0	0.40	0.948	0.25	0.250	Above Water	0.16	7009	988.1	0.07	0.11	0.004	NA	NA	0.000
22.47	107.9	115.0	115.0	58.0	2.0	3.4	31	14	13	4.78	1.16	20	1.292	1.292	1.292	1.292	2.51	SAND	0.5	0.90	49.6	2.83	140.2	0.34	0.948	0.25	0.250	Above Water	0.16	6979	974.2	0.07	0.13	0.005	NA	NA	0.000
22.64	107.8	115.0	115.0	45.1	1.9	4.2	40	12	11	5.00	1.20	18	1.302	1.302	1.302	1.302	2.69	non-LIQ CLAY	1	0.81	NA	3.91	non-LIQ	non-LIQ	0.947	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	Normalization of Tip Resistance C_Q	Normalization of Tip Resistance q_{c1N}	Fines Correction Kc	Fines Correction $(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
22.80	107.6	115.0	115.0	32.2	1.6	5.0	49	9	8	5.00	1.20	15	1.311	1.311	1.311	1.311	2.85	non-LIQ CLAY	1	0.81	NA	5.26	non-LIQ	non-LIQ	0.947	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.97	107.4	115.0	115.0	31.2	1.5	4.8	49	9	8	5.00	1.20	15	1.321	1.321	1.321	1.321	2.86	non-LIQ CLAY	1	0.80	NA	5.29	non-LIQ	non-LIQ	0.946	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.13	107.3	115.0	115.0	34.5	1.4	4.1	45	10	9	5.00	1.20	15	1.330	1.330	1.330	1.330	2.78	non-LIQ CLAY	1	0.80	NA	4.58	non-LIQ	non-LIQ	0.946	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.30	107.1	115.0	115.0	41.1	1.7	4.1	42	11	10	5.00	1.20	17	1.340	1.340	1.340	1.340	2.72	non-LIQ CLAY	1	0.79	NA	4.17	non-LIQ	non-LIQ	0.946	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.46	106.9	115.0	115.0	43.8	1.7	3.9	40	12	10	5.00	1.20	17	1.349	1.349	1.349	1.349	2.69	non-LIQ CLAY	1	0.78	NA	3.89	non-LIQ	non-LIQ	0.945	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.62	106.8	115.0	115.0	40.3	1.9	4.7	44	11	10	5.00	1.20	17	1.358	1.358	1.358	1.358	2.77	non-LIQ CLAY	1	0.78	NA	4.56	non-LIQ	non-LIQ	0.945	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.79	106.6	115.0	115.0	41.9	1.9	4.5	43	12	10	5.00	1.20	17	1.368	1.368	1.368	1.368	2.75	non-LIQ CLAY	1	0.77	NA	4.38	non-LIQ	non-LIQ	0.945	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.95	106.5	115.0	115.0	44.7	2.0	4.5	42	12	11	5.00	1.20	18	1.377	1.377	1.377	1.377	2.73	non-LIQ CLAY	1	0.77	NA	4.20	non-LIQ	non-LIQ	0.944	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.12	106.3	115.0	115.0	43.3	2.0	4.6	43	12	10	5.00	1.20	18	1.387	1.387	1.387	1.387	2.75	non-LIQ CLAY	1	0.76	NA	4.38	non-LIQ	non-LIQ	0.944	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.28	106.1	115.0	115.0	38.5	1.9	4.9	47	11	10	5.00	1.20	17	1.396	1.396	1.396	1.396	2.81	non-LIQ CLAY	1	0.76	NA	4.89	non-LIQ	non-LIQ	0.943	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.44	106.0	115.0	115.0	44.5	1.7	3.8	40	12	10	5.00	1.20	17	1.405	1.405	1.405	1.405	2.69	non-LIQ CLAY	1	0.75	NA	3.92	non-LIQ	non-LIQ	0.943	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.61	105.8	115.0	115.0	46.9	2.2	4.7	42	13	11	5.00	1.20	18	1.415	1.415	1.415	1.415	2.74	non-LIQ CLAY	1	0.75	NA	4.26	non-LIQ	non-LIQ	0.943	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.77	105.6	115.0	115.0	55.1	3.1	5.6	43	15	13	5.00	1.20	21	1.424	1.424	1.424	1.424	2.74	non-LIQ CLAY	1	0.74	NA	4.30	non-LIQ	non-LIQ	0.942	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.94	105.5	115.0	115.0	115.3	3.5	3.0	22	25	22	3.87	1.09	28	1.434	1.434	1.434	1.434	2.28	SAND	0.5	0.86	93.6	1.87	175.3	non-LIQ	0.942	0.25	0.250	Above Water	0.16	6555	1223.9	0.05	0.05	0.002	NA	NA	0.000
25.10	105.3	115.0	115.0	65.4	2.9	4.4	36	17	14	5.00	1.20	22	1.443	1.443	1.443	1.443	2.62	non-LIQ CLAY	1	0.73	NA	3.43	non-LIQ	non-LIQ	0.941	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.26	105.1	115.0	115.0	57.2	2.4	4.2	38	15	13	5.00	1.20	20	1.452	1.452	1.452	1.452	2.64	non-LIQ CLAY	1	0.73	NA	3.61	non-LIQ	non-LIQ	0.941	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.43	105.0	115.0	115.0	75.2	2.4	3.2	27	18	15	4.52	1.13	22	1.462	1.462	1.462	1.462	2.43	SAND	0.5	0.85	60.5	2.42	146.2	0.37	0.941	0.25	0.250	Above Water	0.16	6479	1092.2	0.07	0.10	0.004	NA	NA	0.000
25.59	104.8	115.0	115.0	76.9	3.0	3.9	30	19	16	4.70	1.15	23	1.471	1.471	1.471	1.471	2.48	SAND	0.5	0.85	61.6	2.68	165.2	non-LIQ	0.940	0.25	0.250	Above Water	0.16	6455	1112.5	0.07	0.09	0.003	NA	NA	0.000
25.76	104.6	115.0	115.0	69.7	3.1	4.4	36	18	15	5.00	1.20	23	1.481	1.481	1.481	1.481	2.61	non-LIQ CLAY	1	0.71	NA	3.36	non-LIQ	non-LIQ	0.940	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.92	104.5	115.0	115.0	59.1	3.0	5.1	41	16	13	5.00	1.20	21	1.490	1.490	1.490	1.490	2.70	non-LIQ CLAY	1	0.71	NA	4.00	non-LIQ	non-LIQ	0.940	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.08	104.3	115.0	115.0	60.1	2.4	4.0	37	16	13	5.00	1.20	21	1.500	1.500	1.500	1.500	2.62	non-LIQ CLAY	1	0.71	NA	3.46	non-LIQ	non-LIQ	0.939	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.25	104.2	115.0	115.0	57.9	2.6	4.5	39	15	13	5.00	1.20	20	1.509	1.509	1.509	1.509	2.67	non-LIQ CLAY	1	0.70	NA	3.81	non-LIQ	non-LIQ	0.939	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.41	104.0	115.0	115.0	52.0	2.4	4.6	41	14	12	5.00	1.20	19	1.519	1.519	1.519	1.519	2.72	non-LIQ CLAY	1	0.70	NA	4.14	non-LIQ	non-LIQ	0.938	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.58	103.8	115.0	115.0	52.9	2.2	4.2	40	14	12	5.00	1.20	19	1.528	1.528	1.528	1.528	2.68	non-LIQ CLAY	1	0.69	NA	3.88	non-LIQ	non-LIQ	0.938	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.74	103.7	115.0	115.0	62.0	2.4	3.9	36	16	13	5.00	1.20	21	1.538	1.538	1.538	1.538	2.61	non-LIQ CLAY	1	0.69	NA	3.40	non-LIQ	non-LIQ	0.938	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.90	103.5	115.0	115.0	61.2	2.4	3.9	36	16	13	5.00	1.20	21	1.547	1.547	1.547	1.547	2.62	non-LIQ CLAY	1	0.68	NA	3.47	non-LIQ	non-LIQ	0.937	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.07	103.3	115.0	115.0	43.3	2.1	4.8	46	12	10	5.00	1.20	17	1.557	1.557	1.557	1.557	2.80	non-LIQ CLAY	1	0.68	NA	4.82	non-LIQ	non-LIQ	0.937	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.23	103.2	115.0	115.0	45.4	2.0	4.4	44	13	10	5.00	1.20	17	1.566	1.566	1.566	1.566	2.76	non-LIQ CLAY	1	0.68	NA	4.46	non-LIQ	non-LIQ	0.937	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.40	103.0	115.0	115.0	53.3	2.3	4.3	41	14	12	5.00	1.20	19	1.576	1.576	1.576	1.576	2.70	non-LIQ CLAY	1	0.67	NA	4.02	non-LIQ	non-LIQ	0.936	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.56	102.8	115.0	115.0	53.3	2.4	4.5	41	14	12	5.00	1.20	19	1.585	1.585	1.585	1.585	2.72	non-LIQ CLAY	1	0.67	NA	4.13	non-LIQ	non-LIQ	0.936	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.72	102.7	115.0	115.0	71.9	2.7	3.8	31	18	14	4.76	1.16	21	1.594	1.594	1.594	1.594	2.50	SAND	0.5	0.81	55.4	2.79	154.5	0.42	0.935	0.25	0.250	Above Water	0.17	6153	1121.1	0.08	0.11	0.004	NA	NA	0.000
27.89	102.5	115.0	115.0	60.2	2.6	4.3	39	16	13	5.00	1.20	21	1.604	1.604	1.604	1.604	2.67	non-LIQ CLAY	1	0.66	NA	3.78	non-LIQ	non-LIQ	0.935	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.05	102.4	115.0	115.0	53.0	2.3	4.3	41	14	12	5.00	1.20	19	1.613	1.613	1.613	1.613	2.71	non-LIQ CLAY	1	0.66	NA	4.10	non-LIQ	non-LIQ	0.935	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.22	102.2	115.0	115.0	51.5	2.2	4.3	42	14	11	5.00	1.20	19	1.623	1.623	1.623	1.623	2.72	non-LIQ CLAY	1	0.65	NA	4.15	non-LIQ	non-LIQ	0.934	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.38	102.0	115.0	115.0	45.2	2.3	5.1	47	13	10	5.00	1.20	18	1.632	1.632	1.632	1.632	2.82	non-LIQ CLAY	1	0.65	NA	4.95	non-LIQ	non-LIQ	0.934	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.54	101.9	115.0	115.0	63.4	2.5	3.9	37	16	13	5.00	1.20	21	1.641	1.641	1.641	1.641	2.63	non-LIQ CLAY	1	0.64	NA	3.53	non-LIQ	non-LIQ	0.933	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.71	101.7	115.0	115.0	81.8	3.0	3.7	29	20	16	4.64	1.15	23	1.651	1.651	1.651	1.651	2.46	SAND	0.5	0.80	61.9	2.58	160.0	0.46	0.933	0.25	0.250	Above Water	0.17	6024	1176.3	0.07	0.10	0.004	NA	NA	0.000
28.87	101.5	115.0	115.0	76.0	2.9	3.8	31	18	15	4.75	1.16	22	1.660	1.660	1.660	1.660	2.50	SAND	0.5	0.80	57.3	2.76	158.3	0.45	0.933	0.25	0.250	Above Water	0.17	6004	1156.6	0.08	0.11	0.004	NA	NA	0.000
29.04	101.4	115.0	115.0	58.1	2.5	4.3	40	16	12	5.00	1.20	20	1.670	1.670	1.670	1.670	2.69	non-LIQ CLAY	1	0.63	NA	3.94	non-LIQ	non-LIQ	0.932	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.20	101.2	115.0	115.0	54.7	2.2	4.0	40	15	12	5.00	1.20	19	1.679	1.679	1.679	1.679	2.69	non-LIQ CLAY	1	0.63	NA	3.96	non-LIQ	non-LIQ	0.932	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.36	101.0	115.0	115.0	52.3	2.2	4.2	42	14	11	5.00	1.20	19	1.688	1.688	1.688	1.688	2.72	non-LIQ CLAY	1	0.63	NA	4.18	non-LIQ	non-LIQ	0.932	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.53	100.9	115.0	115.0	61.1	2.3	3.8	37	16	13	5.00	1.20	20	1.698	1.698	1.698	1.698	2.64	non-LIQ CLAY	1	0.62	NA	3.59	non-LIQ	non-LIQ	0.931	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.69	100.7	115.0	115.0	77.3	2.9	3.8	30	19	15	4.73	1.16	22	1.707	1.707	1.707	1.707	2.49	SAND	0.5	0.79	57.5	2.73	157.0	0.44	0.931	0.25	0.250	Above Water	0.17	5904	1172.9	0.08	0.11	0.004	NA	NA	0.000
29.86	100.5	115.0	115.0	88.2	3.4	3.9	29	21	17	4.64	1.15	24	1.717	1.717	1.717	1.717	2.46	SAND	0.5	0.79	65.4	2.58	168.8	non-LIQ	0.930	0.25	0.250	Above Water	0.17	5884	1221.9	0.07	0.09	0.004	NA	NA	0.000
30.02	100.4	115.0	115.0	86.7	3.8	4.4	31	21	17	4.77	1.16	24	1.726	1.726	1.726	1.726	2.51	SAND	0.5	0.78	64.2	2.81	180.4	non-LIQ	0.930	0.25	0.250	Above Water	0.17	5865	1226.3	0.07	0.09	0.003	NA	NA	0.000
30.19	100.2	115.0	115.0	106.3	4.5	4.2	28	25	20	4.56	1.14	27	1.736	1.736	1.736	1.736	2.44	SAND	0.5	0.78	78.4	2.47	193.9	non-LIQ	0.928	0.25	0.250	Above Water	0.17	5845	1300.4	0.06	0.06	0.003	NA	NA	0.000
30.35	100.1	115.0	115.0	111.6	4.6	4.1	27	26	20	4.48	1.13	27	1.745	1.745	1.745	1.745	2.42	SAND	0.5	0.78	82.1	2.38	195.1	non-LIQ	0.927	0.25	0.250	Above Water	0.17	5827	1319.5	0.06	0.06	0.002	NA	NA	0.000
30.51	99.9	115.0	115.0	142.9	4.9	3.4	22	32	25	3.91	1.09	31	1.754	1.754	1.754	1.754	2.28	SAND	0.5	0.78	104.9	1.90	199.0	non-LIQ	0.926	0.25	0.250	Above Water	0.17	5809	1407.6	0.05	0.04	0.002	NA	NA	0.000
30.68	99.7	115.0	115.0	156.9	5.3	3.4	21	34	26	3.75	1.09	32	1.764	1.764	1.764	1.764	2.25	SAND	0.5	0.77	114.8	1.81	207.5	non-LIQ	0.924	0.25	0.250	Above Water	0.17	5789	1448.5	0.05	0.04	0.002	NA	NA	0.000
30.84	99.6	115.0	115.0	154.5	5.6	3.6	22	34	26	3.91	1.08	33	1.773	1.773	1.773	1.773	2.28	SAND	0.5	0.77	112.8	1.89	213.5	non-LIQ	0.923	0.24	0.240	Above Water	0.17	5771	1449.6	0.05	0.03	0.001	NA	NA	0.000
31.01	99.4	115.0	115.0	152.2	5.7	3.7	22	34	26	3.99	1.10	33	1.783	1.783	1.783	1.783	2.30	SAND	0.5	0.77	110.8	1.94	215.3	non-LIQ	0.922	0.24	0.240	Above Water	0.17	5752	1448.3	0.05	0.04	0.001	NA	NA	0.000
31.17	99.2	115.0	115.0	93.9	5.1	5.4	37.1	24.5	18.8	5.0	1.2	28.0	1.79	1.79	1.79	1.79	2.64	non-LIQ CLAY	1	0.59	NA	3.55	non-LIQ	non-LIQ	0.920	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.33	99.1	115.0	115.0	75.4	3.9	5.2	39.9	20.2	15.5	5.0	1.2	24.0	1.80	1.80	1.80	1.80	2.69	non-LIQ CLAY	1	0.59	NA	3.92	non-LIQ	non-LIQ	0.919	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.50	98.9	115.0	115.0	70.5	3.2	4.5	39.0	18.7	14.3	5.0	1.2	22.0	1.81	1.81	1.81	1.81	2.67	non-LIQ CLAY	1	0.58	NA	3.80	non-LIQ	non-LIQ	0.918	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.66	98.7	115.0	115.0	65.6	2.7	4.1	38.8	17.4	13.2	5.0	1.2	21.0	1.82	1.82	1.82	1.82	2.67	non-LIQ CLAY	1	0.58	NA	3.77	non-LIQ	non-LIQ	0.916	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.83	98.6	115.0	115.0	51.3	2.6	5.1	46.8	14.7	11.2	5.0	1.2	18.0	1.83	1.83	1.83	1.83	2.81	non-LIQ CLAY	1	0.58	NA	4.91	non-LIQ	non-LIQ	0.915	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.99	98.4	115.0	115.0	60.0	2.8	4.7	42.5	16.5	12.5	5.0	1.2	20.0	1.84	1.84	1.84	1.84	2.74	non-LIQ CLAY	1	0.58	NA	4.29	non-LIQ	non-LIQ	0.914	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.15	98.3	115.0	115.0	114.1	3.6	3.2	23.7	25.7	19.5	4.1	1.1	26.0	1.85	1.85	1.85	1.85	2.33	SAND	0.5	0.76	82	2.05	167	non-LIQ	0.912	0.240	0.240	Above Water	0.17	5628.93	1337.90	0.06	0.06	0.00	NA	NA	0.00
32.32	98.1	115.0	115.0	93.4	3.5	3.7	28.4	22.2	16.7	4.6	1.1	24.0	1.86	1.86	1.86	1.86	2.45	SAND	0.5	0.75	67	2.52	168	non-LIQ	0.911	0.240	0.240	Above Water	0.17	5611.15	1276.03	0.07	0.08	0.00	NA	NA	0.00
32.48	97.9	115.0	115.0	66.0	2.9	4.4	40.1	17.7	13.3	5.0	1.2	21.0	1.87	1.87	1.87	1.87	2.69	non-LIQ CLAY	1	0.57	NA	3.95	non-LIQ	non-LIQ	0.910	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.65	97.8	115.0	115.0	55.0	2.5	4.5	44.1	15.3	11.5	5.0	1.2	19.0	1.88	1.88	1.88	1.88	2.77	non-LIQ CLAY	1	0.56	NA	4.51	non-LIQ	non-LIQ	0.908	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.81	97.6	115.0	115.0	68.4	2.6	3.8	37.4	17.9	13.4	5.0	1.2	21.0	1.89	1.89	1.89	1.89	2.64	non-LIQ CLAY	1	0.56	NA	3.59	non-LIQ	non-LIQ	0.907	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.97	97.4	115.0	115.0	70.2	2.8	4.0	37.8	18.4	13.8	5.0	1.2	22.0	1.90	1.90	1.90	1.90	2.65	non-LIQ CLAY	1	0.56	NA	3.64	non-LIQ	non-LIQ	0.906	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.14	97.3	115.0	115.0	67.2	2.8	4.2	39.3	17.9	13.3	5.0	1.2	21.0	1.91	1.91	1.91	1.91	2.68	non-LIQ CLAY	1	0.56	NA	3.84	non-LIQ	non-LIQ	0.904	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.30	97.1	115.0	115.0	70.2	2.8	4.0	38.0	18.4	13.7	5.0	1.2	21.0	1.91	1.91	1.91	1.91	2.65	non-LIQ CLAY	1	0.55	NA	3.67	non-LIQ	non-LIQ	0.903	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.47	96.9	115.0	115.0	69.4	2.7	3.9	37.9	18.2	13.5	5.0	1.2	21.0	1.92	1.92	1.92	1.92	2.65	non-LIQ CLAY	1	0.55	NA	3.65	non-LIQ	non-LIQ	0.902	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.63	96.8	115.0	115.0	64.3	2.5	3.9	39.3	17.1	12.7	5.0	1.2	20.0	1.93	1.93	1.93	1.93	2.68	non-LIQ CLAY	1	0.55	NA	3.84	non-LIQ	non-LIQ	0.900	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.79	96.6	115.0	115.0	53.2	2.4	4.5	45.3	15.0	11.1	5.0	1.2	18.0	1.94	1.94	1.94	1.94	2.79	non-LIQ CLAY	1	0.54	NA	4.68	non-LIQ	non-LIQ	0.899	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.96	96.4	115.0	115.0	44.1	2.0	4.5	49.3	12.9	9.5	5.0	1.2	16.0	1.95	1.95	1.95	1.95	2.86	non-LIQ CLAY	1	0.54	NA	5.28	non-LIQ	non-LIQ	0.898	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.12	96.3	115.0	115.0	50.3	2.5	5.0	48.3	14.6	10.7	5.0	1.2	18.0	1.96	1.96	1.96	1.96	2.84	non-LIQ CLAY	1	0.54	NA	5.12	non-LIQ	non-LIQ	0.896	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.29	96.1	115.0	115.0	71.8	2.8	3.9	37.8	18.8	13.8	5.0	1.2	22.0	1.97	1.97	1.97	1.97	2.65	non-LIQ CLAY	1	0.54	NA	3.64	non-LIQ	non-LIQ	0.895	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.45	96.0	115.0	115.0	74.7	3.1	4.1	38.1	19.6	14.4	5.0	1.2	22.0	1.98	1.98	1.98	1.98	2.66	non-LIQ CLAY	1	0.53	NA	3.68	non-LIQ	non-LIQ	0.894	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.61	95.8	115.0	115.0	90.9	3.6	4.0	30.0	22.0	16.0	4.7	1.2	23.0	1.99	1.99	1.99	1.99	2.48	SAND	0.5	0.73	63	2.69	168	non-LIQ	0.892	0.240	0.240	Above Water	0.18	5385.34	1301.22	0.07	0.09	0.00	NA	NA	0.00
34.78	95.6	115.0	115.0	83.6	3.9	4.7	38.3	22.0	16.0	5.0	1.2	24.0	2.00	2.00	2.00	2.00	2.66	non-LIQ CLAY	1	0.53	NA	3.70	non-LIQ	non-LIQ	0.891	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.94	95.5	115.0	115.0	65.0	3.7	5.7	46.1	18.5	13.4	5.0	1.2	21.0	2.01	2.01	2.01	2.01	2.80	non-LIQ CLAY	1	0.53	NA	4.80	non-LIQ	non-LIQ	0.890	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.11	95.3	115.0	115.0	65.5	3.3	5.0	43.9	18.2	13.2	5.0	1.2	21.0	2.02	2.02	2.02	2.02	2.76	non-LIQ CLAY	1	0.52	NA	4.48	non-LIQ	non-LIQ	0.888	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.27	95.1	115.0	115.0	65.3	3.5	5.4	45.1	18.4	13.3	5.0	1.2	21.0	2.03	2.03	2.03	2.03	2.79	non-LIQ CLAY	1	0.52	NA	4.66	non-LIQ	non-LIQ	0.887	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.43	95.0	115.0	115.0	72.5	3.5	4.8	41.5	19.7	14.2	5.0	1.2	22.0	2.04	2.04	2.04	2.04	2.72	non-LIQ CLAY	1	0.52	NA	4.15	non-LIQ	non-LIQ	0.886	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.60	94.8	115.0	115.0	74.3	3.5	4.7	40.8	20.1	14.4	5.0	1.2	22.0	2.05	2.05	2.05	2.05	2.71	non-LIQ CLAY	1	0.52	NA	4.04	non-LIQ	non-LIQ	0.884	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.76	94.6	115.0	115.0	66.5	2.9	4.4	41.6	18.1	13.0	5.0	1.2	21.0	2.06	2.06	2.06	2.06	2.72	non-LIQ CLAY	1	0.51	NA	4.15	non-LIQ	non-LIQ	0.883	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.93	94.5	115.0	115.0	59.8	2.9	4.8	45.4	16.9	12.1	5.0	1.2	20.0	2.07	2.07	2.07	2.07	2.79	non-LIQ CLAY	1	0.51	NA	4.70	non-LIQ	non-LIQ	0.882	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.09	94.3	115.0	115.0	59.4	3.0	5.1	46.3	16.9	12.1	5.0	1.2	20.0	2.08	2.08	2.08	2.08	2.81	non-LIQ CLAY	1	0.51	NA	4.84	non-LIQ	non-LIQ	0.880	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.26	94.1	115.0	115.0	70.8	3.7	5.2	43.7	19.7	14.0	5.0	1.2	22.0	2.08	2.08	2.08	2.08	2.76	non-LIQ CLAY	1	0.51	NA	4.45	non-LIQ	non-LIQ	0.879	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.42	94.0	115.0	115.0	82.8	3.9	4.7	39.3	22.0	15.7	5.0	1.2	24.0	2.09	2.09	2.09	2.09	2.68	non-LIQ CLAY	1	0.51	NA	3.84	non-LIQ	non-LIQ	0.878	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.58	93.8	115.0	115.0	71.2	3.5	4.9	42.7	19.6	13.9	5.0	1.2	22.0	2.10	2.10	2.10	2.10	2.74	non-LIQ CLAY	1	0.50	NA	4.31	non-LIQ	non-LIQ	0.876	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.75	93.7	115.0	115.0	68.6	3.4	5.0	43.6	19.1	13.5	5.0	1.2	21.0	2.11	2.11	2.11	2.11	2.76	non-LIQ CLAY	1	0.50	NA	4.44	non-LIQ	non-LIQ	0.875	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.91	93.5	115.0	115.0	74.6	3.5	4.7	41.3	20.2	14.3	5.0	1.2	22.0	2.12	2.12	2.12	2.12	2.72	non-LIQ CLAY	1	0.50	NA	4.11	non-LIQ	non-LIQ	0.874	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.08	93.3	115.0	115.0	93.6	3.7	4.0	30.0	22.6	16.0	4.7	1.2	23.0	2.13	2.13	2.13	2.13	2.49	SAND	0.5	0.70	62	2.70	168	non-LIQ	0.872	0.230	0.230	Above Water	0.18	5167.14	1344.84	0.07	0.09	0.00	NA	NA	0.00
37.24	93.2	115.0	115.0	86.2	3.8	4.4	38.0	22.6	15.9	5.0	1.2	24.0	2.14	2.14	2.14	2.14	2.65	non-LIQ CLAY	1	0.49	NA	3.66	non-LIQ	non-LIQ	0.871	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
37.40	93.0	115.0	115.0	79.1	3.2	4.0	38.2	20.8	14.6	5.0	1.2	23.0	2.15	2.15	2.15	2.15	2.66	non-LIQ CLAY	1	0.49	NA	3.69	non-LIQ	non-LIQ	0.870	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.57	92.8	115.0	115.0	71.3	3.2	4.5	41.7	19.4	13.6	5.0	1.2	21.0	2.16	2.16	2.16	2.16	2.72	non-LIQ CLAY	1	0.49	NA	4.17	non-LIQ	non-LIQ	0.868	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.73	92.7	115.0	115.0	66.0	3.0	4.5	43.4	18.3	12.8	5.0	1.2	20.0	2.17	2.17	2.17	2.17	2.75	non-LIQ CLAY	1	0.49	NA	4.41	non-LIQ	non-LIQ	0.867	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.90	92.5	115.0	115.0	55.8	2.9	5.2	49.1	16.3	11.4	5.0	1.2	19.0	2.18	2.18	2.18	2.18	2.85	non-LIQ CLAY	1	0.49	NA	5.25	non-LIQ	non-LIQ	0.866	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.06	92.3	115.0	115.0	62.5	2.6	4.2	43.1	17.3	12.0	5.0	1.2	19.0	2.19	2.19	2.19	2.19	2.75	non-LIQ CLAY	1	0.48	NA	4.37	non-LIQ	non-LIQ	0.864	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.22	92.2	115.0	115.0	67.9	3.1	4.6	43.2	18.8	13.0	5.0	1.2	21.0	2.20	2.20	2.20	2.20	2.75	non-LIQ CLAY	1	0.48	NA	4.38	non-LIQ	non-LIQ	0.863	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.39	92.0	115.0	115.0	59.8	3.0	5.0	47.3	17.2	11.9	5.0	1.2	19.0	2.21	2.21	2.21	2.21	2.82	non-LIQ CLAY	1	0.48	NA	4.98	non-LIQ	non-LIQ	0.862	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.55	91.9	115.0	115.0	50.7	2.4	4.7	49.8	14.9	10.3	5.0	1.2	17.0	2.22	2.22	2.22	2.22	2.86	non-LIQ CLAY	1	0.48	NA	5.36	non-LIQ	non-LIQ	0.860	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.72	91.7	115.0	115.0	46.7	2.2	4.7	51.6	14.0	9.6	5.0	1.2	17.0	2.23	2.23	2.23	2.23	2.89	non-LIQ CLAY	1	0.48	NA	5.63	non-LIQ	non-LIQ	0.859	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.88	91.5	115.0	115.0	52.4	2.0	3.8	45.6	14.8	10.2	5.0	1.2	17.0	2.24	2.24	2.24	2.24	2.79	non-LIQ CLAY	1	0.47	NA	4.73	non-LIQ	non-LIQ	0.858	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.04	91.4	115.0	115.0	57.6	2.4	4.2	45.2	16.2	11.2	5.0	1.2	18.0	2.24	2.24	2.24	2.24	2.79	non-LIQ CLAY	1	0.47	NA	4.67	non-LIQ	non-LIQ	0.856	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.21	91.2	115.0	115.0	55.7	2.6	4.7	47.9	16.1	11.0	5.0	1.2	18.0	2.25	2.25	2.25	2.25	2.83	non-LIQ CLAY	1	0.47	NA	5.07	non-LIQ	non-LIQ	0.855	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.37	91.0	115.0	115.0	64.2	2.4	3.7	41.6	17.5	11.9	5.0	1.2	19.0	2.26	2.26	2.26	2.26	2.72	non-LIQ CLAY	1	0.47	NA	4.15	non-LIQ	non-LIQ	0.854	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.54	90.9	115.0	115.0	60.3	3.1	5.1	48.2	17.5	11.9	5.0	1.2	19.0	2.27	2.27	2.27	2.27	2.84	non-LIQ CLAY	1	0.47	NA	5.11	non-LIQ	non-LIQ	0.852	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.70	90.7	115.0	115.0	87.5	3.0	3.4	29.5	21.0	14.3	4.7	1.2	21.0	2.28	2.28	2.28	2.28	2.47	SAND	0.5	0.68	56	2.64	148	0.384	0.851	0.230	0.230	Above Water	0.18	4959.75	1342.63	0.08	0.11	0.00	NA	NA	0.00
39.86	90.5	115.0	115.0	74.7	4.1	5.5	45.3	21.1	14.3	5.0	1.2	22.0	2.29	2.29	2.29	2.29	2.79	non-LIQ CLAY	1	0.46	NA	4.69	non-LIQ	non-LIQ	0.850	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.03	90.4	115.0	115.0	82.8	3.7	4.5	40.1	22.2	15.1	5.0	1.2	23.0	2.30	2.30	2.30	2.30	2.69	non-LIQ CLAY	1	0.46	NA	3.95	non-LIQ	non-LIQ	0.848	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.19	90.2	115.0	115.0	98.8	3.8	3.8	29.5	23.8	16.1	4.7	1.2	23.0	2.31	2.31	2.31	2.31	2.47	SAND	0.5	0.68	63	2.64	167	non-LIQ	0.847	0.220	0.220	Above Water	0.18	4923.38	1403.81	0.06	0.08	0.00	NA	NA	0.00
40.36	90.0	115.0	115.0	81.9	3.3	4.0	38.8	21.7	14.6	5.0	1.2	23.0	2.32	2.32	2.32	2.32	2.67	non-LIQ CLAY	1	0.46	NA	3.77	non-LIQ	non-LIQ	0.846	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.52	89.9	115.0	115.0	63.0	2.9	4.6	45.9	17.9	12.0	5.0	1.2	19.0	2.33	2.33	2.33	2.33	2.80	non-LIQ CLAY	1	0.45	NA	4.77	non-LIQ	non-LIQ	0.844	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.68	89.7	115.0	115.0	65.2	3.2	4.9	46.4	18.6	12.5	5.0	1.2	20.0	2.34	2.34	2.34	2.34	2.81	non-LIQ CLAY	1	0.45	NA	4.84	non-LIQ	non-LIQ	0.843	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.85	89.6	115.0	115.0	78.1	3.6	4.6	42.0	21.3	14.3	5.0	1.2	22.0	2.35	2.35	2.35	2.35	2.73	non-LIQ CLAY	1	0.45	NA	4.21	non-LIQ	non-LIQ	0.842	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.01	89.4	115.0	115.0	77.6	3.7	4.8	42.7	21.4	14.3	5.0	1.2	22.0	2.36	2.36	2.36	2.36	2.74	non-LIQ CLAY	1	0.45	NA	4.31	non-LIQ	non-LIQ	0.840	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.18	89.2	115.0	115.0	73.3	3.1	4.2	41.9	20.0	13.4	5.0	1.2	21.0	2.37	2.37	2.37	2.37	2.73	non-LIQ CLAY	1	0.45	NA	4.20	non-LIQ	non-LIQ	0.839	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.34	89.1	115.0	115.0	63.4	2.7	4.3	44.8	17.8	11.9	5.0	1.2	19.0	2.38	2.38	2.38	2.38	2.78	non-LIQ CLAY	1	0.45	NA	4.62	non-LIQ	non-LIQ	0.838	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.50	88.9	115.0	115.0	61.8	2.3	3.7	43.2	17.1	11.4	5.0	1.2	19.0	2.39	2.39	2.39	2.39	2.75	non-LIQ CLAY	1	0.44	NA	4.38	non-LIQ	non-LIQ	0.836	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.67	88.7	115.0	115.0	55.8	2.4	4.3	47.7	16.1	10.7	5.0	1.2	18.0	2.40	2.40	2.40	2.40	2.83	non-LIQ CLAY	1	0.44	NA	5.05	non-LIQ	non-LIQ	0.835	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.83	88.6	115.0	115.0	56.8	2.8	4.9	49.8	16.7	11.1	5.0	1.2	18.0	2.41	2.41	2.41	2.41	2.86	non-LIQ CLAY	1	0.44	NA	5.36	non-LIQ	non-LIQ	0.834	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.00	88.4	115.0	115.0	73.8	2.9	3.9	41.0	20.0	13.2	5.0	1.2	21.0	2.42	2.42	2.42	2.42	2.71	non-LIQ CLAY	1	0.44	NA	4.07	non-LIQ	non-LIQ	0.832	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.16	88.2	115.0	115.0	69.0	3.3	4.8	45.5	19.5	12.9	5.0	1.2	20.0	2.42	2.42	2.42	2.42	2.79	non-LIQ CLAY	1	0.44	NA	4.71	non-LIQ	non-LIQ	0.831	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.32	88.1	115.0	115.0	72.5	3.1	4.3	42.8	20.0	13.2	5.0	1.2	21.0	2.43	2.43	2.43	2.43	2.74	non-LIQ CLAY	1	0.43	NA	4.32	non-LIQ	non-LIQ	0.830	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.49	87.9	115.0	115.0	74.4	3.1	4.2	42.0	20.3	13.4	5.0	1.2	21.0	2.44	2.44	2.44	2.44	2.73	non-LIQ CLAY	1	0.43	NA	4.20	non-LIQ	non-LIQ	0.828	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.65	87.8	115.0	115.0	66.5	3.0	4.5	45.5	18.8	12.3	5.0	1.2	20.0	2.45	2.45	2.45	2.45	2.79	non-LIQ CLAY	1	0.43	NA	4.71	non-LIQ	non-LIQ	0.827	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.82	87.6	115.0	115.0	68.1	3.0	4.4	44.7	19.1	12.5	5.0	1.2	20.0	2.46	2.46	2.46	2.46	2.76	non-LIQ CLAY	1	0.43	NA	4.59	non-LIQ	non-LIQ	0.826	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.98	87.4	115.0	115.0	78.0	3.1	4.0	40.6	21.0	13.8	5.0	1.2	22.0	2.47	2.47	2.47	2.47	2.70	non-LIQ CLAY	1	0.43	NA	4.01	non-LIQ	non-LIQ	0.824	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.15	87.3	115.0	115.0	87.5	3.3	3.8	37.8	22.9	15.0	5.0	1.2	23.0	2.48	2.48	2.48	2.48	2.65	non-LIQ CLAY	1	0.43	NA	3.64	non-LIQ	non-LIQ	0.823	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.31	87.1	115.0	115.0	76.8	3.1	3.9	40.3	21.2	13.8	5.0	1.2	22.0	2.49	2.49	2.49	2.49	2.70	non-LIQ CLAY	1	0.42	NA	3.98	non-LIQ	non-LIQ	0.822	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.47	86.9	115.0	115.0	63.7	2.4	3.8	43.7	17.7	11.5	5.0	1.2	19.0	2.50	2.50	2.50	2.50	2.76	non-LIQ CLAY	1	0.42	NA	4.46	non-LIQ	non-LIQ	0.820	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.64	86.8	115.0	115.0	72.6	2.5	3.4	39.9	19.4	12.6	5.0	1.2	20.0	2.51	2.51	2.51	2.51	2.69	non-LIQ CLAY	1	0.42	NA	3.93	non-LIQ	non-LIQ	0.819	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.80	86.6	115.0	115.0	71.1	2.9	4.1	43.0	19.6	12.7	5.0	1.2	20.0	2.52	2.52	2.52	2.52	2.75	non-LIQ CLAY	1	0.42	NA	4.36	non-LIQ	non-LIQ	0.818	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.97	86.4	115.0	115.0	77.7	3.3	4.2	42.1	21.3	13.8	5.0	1.2	22.0	2.53	2.53	2.53	2.53	2.73	non-LIQ CLAY	1	0.42	NA	4.22	non-LIQ	non-LIQ	0.816	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.13	86.3	115.0	115.0	70.0	3.2	4.6	45.4	19.8	12.8	5.0	1.2	20.0	2.54	2.54	2.54	2.54	2.79	non-LIQ CLAY	1	0.42	NA	4.69	non-LIQ	non-LIQ	0.815	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.29	86.1	115.0	115.0	53.5	3.1	5.8	55.4	16.6	10.7	5.0	1.2	18.0	2.55	2.55	2.55	2.55	2.95	non-LIQ CLAY	1	0.42	NA	6.24	non-LIQ	non-LIQ	0.814	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.46	85.9	115.0	115.0	41.5	2.2	5.3	59.8	13.4	8.6	5.0	1.2	15.0	2.56	2.56	2.56	2.56	3.02	non-LIQ CLAY	1	0.41	NA	6.97	non-LIQ	non-LIQ	0.812	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.62	85.8	115.0	115.0	44.2	1.7	3.8	52.5	13.4	8.6	5.0	1.2	15.0	2.57	2.57	2.57	2.57	2.91	non-LIQ CLAY	1	0.41	NA	5.78	non-LIQ	non-LIQ	0.811	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.79	85.6	115.0	115.0	67.2	2.6	3.9	43.7	18.7	12.0	5.0	1.2	19.0	2.58	2.58	2.58	2.58	2.76	non-LIQ CLAY	1	0.41	NA	4.45	non-LIQ	non-LIQ	0.809	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.95	85.5	115.0	115.0	78.3	3.8	4.9	44.6	21.9	14.0	5.0	1.2	22.0	2.58	2.58	2.58	2.58	2.78	non-LIQ CLAY	1	0.41	NA	4.58	non-LIQ	non-LIQ	0.808	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.11	85.3	115.0	115.0	93.6	3.8	4.1	38.5	24.7	15.8	5.0	1.2	24.0	2.59	2.59	2.59	2.59	2.66	non-LIQ CLAY	1	0.41	NA	3.74	non-LIQ	non-LIQ	0.807	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.28	85.1	115.0	115.0	86.3	4.0	4.6	42.1	23.6	15.1	5.0	1.2	23.0	2.60	2.60	2.60	2.60	2.73	non-LIQ CLAY	1	0.41	NA	4.23	non-LIQ	non-LIQ	0.806	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.44	85.0	115.0	115.0	77.4	3.4	4.4	43.3	21.4	13.6	5.0	1.2	21.0	2.61	2.61	2.61	2.61	2.75	non-LIQ CLAY	1	0.40	NA	4.40	non-LIQ	non-LIQ	0.804	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.61	84.8	115.0	115.0	66.6	3.0	4.5	46.8	19.1	12.1	5.0	1.2	20.0	2.62	2.62	2.62	2.62	2.81	non-LIQ CLAY	1	0.40	NA	4.90	non-LIQ	non-LIQ	0.803	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.77	84.6	115.0	115.0	55.9	2.1	3.8	47.4	16.1	10.2	5.0	1.2	17.0	2.63	2.63	2.63	2.63	2.82	non-LIQ CLAY	1	0.40	NA	5.00	non-LIQ	non-LIQ	0.802	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.93	84.5	115.0	115.0	52.9	2.0	3.8	48.8	15.4	9.8	5.0	1.2	17.0	2.64	2.64	2.64	2.64	2.85	non-LIQ CLAY	1	0.40	NA	5.21	non-LIQ	non-LIQ	0.800	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.10	84.3	115.0	115.0	66.6	2.6	3.9	44.6	18.7	11.8	5.0	1.2	19.0	2.65	2.65	2.65	2.65	2.78	non-LIQ CLAY	1	0.40	NA	4.58	non-LIQ	non-LIQ	0.799	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.26	84.1	115.0	115.0	81.4	3.3	4.1	41.4	22.1	14.0	5.0	1.2	22.0	2.66	2.66	2.66	2.66	2.72	non-LIQ CLAY	1	0.40	NA	4.13	non-LIQ	non-LIQ	0.798	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.43	84.0	115.0	115.0	83.8	4.0	4.8	43.6	23.3	14.7	5.0	1.2	23.0	2.67	2.67	2.67	2.67	2.76	non-LIQ CLAY	1	0.40	NA	4.44	non-LIQ	non-LIQ	0.796	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.59	83.8	115.0	115.0	83.5	3.7	4.4	42.5	22.9	14.4	5.0	1.2	22.0	2.68	2.68	2.68	2.68	2.74	non-LIQ CLAY	1	0.39	NA	4.28	non-LIQ	non-LIQ	0.795	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.75	83.7	115.0	115.0	75.5	3.7	4.9	46.2	21.5	13.5	5.0	1.2	21.0	2.69	2.69	2.69	2.69	2.80	non-LIQ CLAY	1	0.39	NA	4.81	non-LIQ	non-LIQ	0.794	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.92	83.5	115.0	115.0	70.6	3.3	4.7	46.8	20.2	12.7	5.0	1.2	20.0	2.70	2.70	2.70	2.70	2.81	non-LIQ CLAY	1	0.39	NA	4.90	non-LIQ	non-LIQ	0.792	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.08	83.3	115.0	115.0	77.6	3.5	4.5	44.4	21.7	13.6	5.0	1.2	21.0	2.71	2.71	2.71	2.71	2.77	non-LIQ CLAY	1	0.39	NA	4.55	non-LIQ	non-LIQ	0.791	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.25	83.2	115.0	115.0	82.7	3.9	4.7	44.0	23.1	14.4	5.0	1.2	22.0	2.72	2.72	2.72	2.72	2.76	non-LIQ CLAY	1	0.39	NA	4.49	non-LIQ	non-LIQ	0.789	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.41	83.0	115.0	115.0	76.7	4.1	5.3	47.7	22.2	13.8	5.0	1.2	22.0	2.73	2.73	2.73	2.73	2.83	non-LIQ CLAY	1	0.39	NA	5.04	non-LIQ	non-LIQ	0.788	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.57	82.8	115.0	115.0	90.2	4.6	5.1	43.8	25.1	15.6	5.0	1.2	24.0	2.74	2.74	2.74	2.74	2.76	non-LIQ CLAY	1	0.39	NA	4.47	non-LIQ	non-LIQ	0.787	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.74	82.7	115.0	115.0	87.4	4.8	5.5	45.8	24.8	15.4	5.0	1.2	23.0	2.75	2.75	2.75	2.75	2.80	non-LIQ CLAY	1	0.39	NA	4.75	non-LIQ	non-LIQ	0.785	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.90	82.5	115.0	115.0	113.0	5.1	4.5	38.0	29.7	18.4	5.0	1.2	27.0	2.75	2.75	2.75	2.75	2.65	non-LIQ CLAY	1	0.38	NA	3.67	non-LIQ	non-LIQ	0.784	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.07	82.3	115.0	115.0	80.6	4.9	6.1	49.3	23.6	14.6	5.0	1.2	23.0	2.76	2.76	2.76	2.76	2.86	non-LIQ CLAY	1	0.38	NA	5.28	non-LIQ	non-LIQ	0.783	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.23	82.2	115.0	115.0	73.9	4.3	5.8	50.3	21.9	13.5	5.0	1.2	21.0	2.77	2.77	2.77	2.77	2.87	non-LIQ CLAY	1	0.38	NA	5.44	non-LIQ	non-LIQ	0.781	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.39	82.0	115.0	115.0	72.5	4.0	5.5	49.8	21.4	13.2	5.0	1.2	21.0	2.78	2.78	2.78	2.78	2.86	non-LIQ CLAY	1	0.38	NA	5.36	non-LIQ	non-LIQ	0.780	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.56	81.8	115.0	115.0	65.1	3.2	4.9	50.0	19.2	11.8	5.0	1.2	19.0	2.79	2.79	2.79	2.79	2.87	non-LIQ CLAY	1	0.38	NA	5.40	non-LIQ	non-LIQ	0.779	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.72	81.7	115.0	115.0	49.5	2.5	5.1	56.6	15.6	9.6	5.0	1.2	16.0	2.80	2.80	2.80	2.80	2.98	non-LIQ CLAY	1	0.38	NA	6.47	non-LIQ	non-LIQ	0.778	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.89	81.5	115.0	115.0	49.8	2.7	5.4	58.1	15.9	9.7	5.0	1.2	17.0	2.81	2.81	2.81	2.81	2.99	non-LIQ CLAY	1	0.38	NA	6.68	non-LIQ	non-LIQ	0.776	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.05	81.4	115.0	115.0	54.1	2.7	5.0	54.7	16.7	10.2	5.0	1.2	17.0	2.82	2.82	2.82	2.82	2.94	non-LIQ CLAY	1	0.38	NA	6.12	non-LIQ	non-LIQ	0.775	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.22	81.2	115.0	115.0	57.3	2.7	4.7	52.4	17.3	10.6	5.0	1.2	18.0	2.83	2.83	2.83	2.83	2.91	non-LIQ CLAY	1	0.37	NA	5.76	non-LIQ	non-LIQ	0.773	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.38	81.0	115.0	115.0	53.3	2.6	4.9	54.7	16.5	10.0	5.0	1.2	17.0	2.84	2.84	2.84	2.84	2.94	non-LIQ CLAY	1	0.37	NA	6.13	non-LIQ	non-LIQ	0.772	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.54	80.9	115.0	115.0	55.4	3.1	5.6	56.5	17.4	10.6	5.0	1.2	18.0	2.85	2.85	2.85	2.85	2.97	non-LIQ CLAY	1	0.37	NA	6.42	non-LIQ	non-LIQ	0.771	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.71	80.7	115.0	115.0	75.2	3.8	5.1	48.0	21.8	13.3	5.0	1.2	21.0	2.86	2.86	2.86	2.86	2.83	non-LIQ CLAY	1	0.37	NA	5.09	non-LIQ	non-LIQ	0.769	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.87	80.5	115.0	115.0	82.7	4.4	5.3	47.1	23.8	14.4	5.0	1.2	22.0	2.87	2.87	2.87	2.87	2.82	non-LIQ CLAY	1	0.37	NA	4.95	non-LIQ	non-LIQ	0.768	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.04	80.4	115.0	115.0	109.0	4.2	3.9	36.9	28.3	17.2	5.0	1.2	26.0	2.88	2.88	2.88	2.88	2.63	non-LIQ CLAY	1	0.37	NA	3.53	non-LIQ	non-LIQ	0.767	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.20	80.2	115.0	115.0	72.3	4.4	6.1	52.5	21.8	13.2	5.0	1.2	21.0	2.89	2.89	2.89	2.89	2.91	non-LIQ CLAY	1	0.37	NA	5.77	non-LIQ	non-LIQ	0.765	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.36	80.0	115.0	115.0	95.0	4.2	4.4	41.6	25.9	15.6	5.0	1.2	24.0	2.90	2.90	2.90	2.90	2.72	non-LIQ CLAY	1	0.37	NA	4.15	non-LIQ	non-LIQ	0.764	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.53	79.9	115.0	115.0	127.0	5.4	4.3	36.1	32.7	19.7	5.0	1.2	29.0	2.91	2.91	2.91	2.91	2.61	non-LIQ CLAY	1	0.36	NA	3.42	non-LIQ	non-LIQ	0.763	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.69	79.7	115.0	115.0	99.2	5.4	5.4	44.4	27.8	16.7	5.0	1.2	25.0	2.91	2.91	2.91	2.91	2.77	non-LIQ CLAY	1	0.36	NA	4.55	non-LIQ	non-LIQ	0.761	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.86	79.5	115.0	115.0	74.9	4.3	5.7	50.9	22.3	13.4	5.0	1.2	21.0	2.92	2.92	2.92	2.92	2.88	non-LIQ CLAY	1	0.36	NA	5.53	non-LIQ	non-LIQ	0.760	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.02	79.4	115.0	115.0	60.2	3.2	5.3	54.3	18.5	11.1	5.0	1.2	18.0	2.93	2.93	2.93	2.93	2.94	non-LIQ CLAY	1	0.36	NA	6.06	non-LIQ	non-LIQ	0.759	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.18	79.2	115.0	115.0	49.4	2.7	5.5	59.6	16.0	9.6	5.0	1.2	16.0	2.94	2.94	2.94	2.94	3.02	non-LIQ CLAY	1	0.35	NA	6.93	non-LIQ	non-LIQ	0.757	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.35	79.1	115.0	115.0	45.9	2.3	5.0	59.9	14.9	8.9	5.0	1.2	16.0	2.95	2.95	2.95	2.95	3.02	non-LIQ CLAY	1	0.36	NA	6.97	non-LIQ	non-LIQ	0.756	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.51	78.9	115.0	115.0	41.6	2.3	5.5	64.5	14.1	8.4	5.0	1.2	15.0	2.96	2.96	2.96	2.96	3.09	non-LIQ CLAY	1	0.36	NA	7.75	non-LIQ	non-LIQ	0.755	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.68	78.7	115.0	115.0	44.5	2.3	5.2	61.4	14.6	8.7	5.0	1.2	15.0	2.97	2.97	2.97	2.97	3.04	non-LIQ CLAY	1	0.36	NA	7.23	non-LIQ	non-LIQ	0.753	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.84	78.6	115.0	115.0	43.1	2.9	6.7	67.7	15.0	8.9	5.0	1.2	16.0	2.98	2.98	2.98	2.98	3.13	non-LIQ CLAY	1	0.35	NA	8.32	non-LIQ	non-LIQ	0.752	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60CS}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_Q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60CS}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
52.00	78.4	115.0	115.0	61.0	3.2	5.2	54.2	18.7	11.1	5.0	1.2	18.0	2.99	2.99	2.99	2.99	2.93	non-LIQ CLAY	1	0.35	NA	6.04	non-LIQ	non-LIQ	0.751	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.17	78.2	115.0	115.0	74.0	3.6	4.9	46.7	21.6	12.8	5.0	1.2	20.0	3.00	3.00	3.00	3.00	2.85	non-LIQ CLAY	1	0.35	NA	5.19	non-LIQ	non-LIQ	0.749	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.33	78.1	115.0	115.0	64.0	3.4	5.3	53.5	19.5	11.6	5.0	1.2	19.0	3.01	3.01	3.01	3.01	2.92	non-LIQ CLAY	1	0.35	NA	5.93	non-LIQ	non-LIQ	0.748	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.50	77.9	115.0	115.0	39.0	2.4	6.2	69.0	13.7	8.1	5.0	1.2	15.0	3.02	3.02	3.02	3.02	3.15	non-LIQ CLAY	1	0.35	NA	8.54	non-LIQ	non-LIQ	0.747	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.66	77.7	115.0	115.0	28.9	1.7	5.9	77.4	11.0	6.5	5.0	1.2	13.0	3.03	3.03	3.03	3.03	3.25	non-LIQ CLAY	1	0.35	NA	10.04	non-LIQ	non-LIQ	0.745	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.82	77.6	115.0	115.0	27.5	1.5	5.5	77.5	10.5	6.2	5.0	1.2	12.0	3.04	3.04	3.04	3.04	3.26	non-LIQ CLAY	1	0.35	NA	10.06	non-LIQ	non-LIQ	0.744	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.99	77.4	115.0	115.0	34.2	1.6	4.7	67.5	11.9	7.0	5.0	1.2	13.0	3.05	3.05	3.05	3.05	3.13	non-LIQ CLAY	1	0.35	NA	8.27	non-LIQ	non-LIQ	0.743	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.15	77.3	115.0	115.0	38.5	1.8	4.7	64.1	13.0	7.6	5.0	1.2	14.0	3.06	3.06	3.06	3.06	3.08	non-LIQ CLAY	1	0.35	NA	7.70	non-LIQ	non-LIQ	0.741	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.32	77.1	115.0	115.0	40.6	1.7	4.2	60.7	13.2	7.8	5.0	1.2	14.0	3.07	3.07	3.07	3.07	3.03	non-LIQ CLAY	1	0.35	NA	7.11	non-LIQ	non-LIQ	0.740	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.48	76.9	115.0	115.0	35.6	1.5	4.2	64.5	12.0	7.1	5.0	1.2	13.0	3.08	3.08	3.08	3.08	3.09	non-LIQ CLAY	1	0.34	NA	7.77	non-LIQ	non-LIQ	0.739	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.64	76.8	115.0	115.0	30.0	1.5	5.0	73.3	11.0	6.4	5.0	1.2	13.0	3.08	3.08	3.08	3.08	3.20	non-LIQ CLAY	1	0.34	NA	9.30	non-LIQ	non-LIQ	0.737	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.81	76.6	115.0	115.0	30.0	1.3	4.3	70.5	10.7	6.3	5.0	1.2	13.0	3.09	3.09	3.09	3.09	3.17	non-LIQ CLAY	1	0.34	NA	6.80	non-LIQ	non-LIQ	0.736	0.200	0.200	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.97	76.4	115.0	115.0	35.2	1.5	4.3	65.4	12.0	7.0	5.0	1.2	13.0	3.10	3.10	3.10	3.10	3.10	non-LIQ CLAY	1	0.34	NA	7.91	non-LIQ	non-LIQ	0.735	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.14	76.3	115.0	115.0	35.8	1.6	4.5	65.9	12.3	7.1	5.0	1.2	14.0	3.11	3.11	3.11	3.11	3.11	non-LIQ CLAY	1	0.34	NA	7.99	non-LIQ	non-LIQ	0.733	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.30	76.1	115.0	115.0	34.2	1.6	4.7	68.2	12.0	7.0	5.0	1.2	13.0	3.12	3.12	3.12	3.12	3.14	non-LIQ CLAY	1	0.34	NA	8.40	non-LIQ	non-LIQ	0.732	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.46	75.9	115.0	115.0	33.6	1.6	4.8	69.2	11.9	6.9	5.0	1.2	13.0	3.13	3.13	3.13	3.13	3.15	non-LIQ CLAY	1	0.34	NA	8.57	non-LIQ	non-LIQ	0.731	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.63	75.8	115.0	115.0	35.3	1.8	5.1	69.2	12.5	7.2	5.0	1.2	14.0	3.14	3.14	3.14	3.14	3.15	non-LIQ CLAY	1	0.34	NA	8.57	non-LIQ	non-LIQ	0.729	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.79	75.6	115.0	115.0	40.6	2.0	4.9	64.5	13.7	8.0	5.0	1.2	15.0	3.15	3.15	3.15	3.15	3.09	non-LIQ CLAY	1	0.34	NA	7.76	non-LIQ	non-LIQ	0.728	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.96	75.4	115.0	115.0	60.3	3.0	5.0	54.7	18.6	10.8	5.0	1.2	18.0	3.16	3.16	3.16	3.16	2.94	non-LIQ CLAY	1	0.33	NA	6.13	non-LIQ	non-LIQ	0.727	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.12	75.3	115.0	115.0	83.6	3.8	4.5	46.1	23.8	13.7	5.0	1.2	21.0	3.17	3.17	3.17	3.17	2.80	non-LIQ CLAY	1	0.33	NA	4.81	non-LIQ	non-LIQ	0.725	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.28	75.1	115.0	115.0	88.3	4.1	4.6	45.5	25.0	14.4	5.0	1.2	22.0	3.18	3.18	3.18	3.18	2.79	non-LIQ CLAY	1	0.33	NA	4.71	non-LIQ	non-LIQ	0.724	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.45	75.0	115.0	115.0	80.8	4.0	5.0	48.4	23.5	13.5	5.0	1.2	21.0	3.19	3.19	3.19	3.19	2.84	non-LIQ CLAY	1	0.33	NA	5.15	non-LIQ	non-LIQ	0.723	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.61	74.8	115.0	115.0	64.4	3.4	5.3	54.6	19.9	11.4	5.0	1.2	19.0	3.20	3.20	3.20	3.20	2.94	non-LIQ CLAY	1	0.33	NA	6.11	non-LIQ	non-LIQ	0.721	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.78	74.6	115.0	115.0	52.7	3.1	5.9	61.6	17.3	10.0	5.0	1.2	17.0	3.21	3.21	3.21	3.21	3.05	non-LIQ CLAY	1	0.33	NA	7.26	non-LIQ	non-LIQ	0.720	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.94	74.5	115.0	115.0	52.7	2.6	4.9	58.2	16.8	9.6	5.0	1.2	17.0	3.22	3.22	3.22	3.22	3.00	non-LIQ CLAY	1	0.33	NA	6.70	non-LIQ	non-LIQ	0.719	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.11	74.3	115.0	115.0	54.1	2.8	5.2	58.6	17.3	9.9	5.0	1.2	17.0	3.23	3.23	3.23	3.23	3.00	non-LIQ CLAY	1	0.33	NA	6.76	non-LIQ	non-LIQ	0.717	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.27	74.1	115.0	115.0	54.9	2.6	4.7	56.6	17.2	9.9	5.0	1.2	17.0	3.24	3.24	3.24	3.24	2.97	non-LIQ CLAY	1	0.33	NA	6.44	non-LIQ	non-LIQ	0.716	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.43	74.0	115.0	115.0	40.1	2.3	5.7	68.8	14.1	8.1	5.0	1.2	15.0	3.24	3.24	3.24	3.24	3.15	non-LIQ CLAY	1	0.33	NA	8.51	non-LIQ	non-LIQ	0.715	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.60	73.8	115.0	115.0	36.4	2.0	5.5	70.9	13.0	7.4	5.0	1.2	14.0	3.25	3.25	3.25	3.25	3.17	non-LIQ CLAY	1	0.33	NA	8.67	non-LIQ	non-LIQ	0.713	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.76	73.6	115.0	115.0	37.0	2.3	6.2	73.1	13.5	7.7	5.0	1.2	14.0	3.26	3.26	3.26	3.26	3.20	non-LIQ CLAY	1	0.32	NA	9.27	non-LIQ	non-LIQ	0.712	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.93	73.5	115.0	115.0	52.2	2.2	4.2	56.0	16.3	9.3	5.0	1.2	16.0	3.27	3.27	3.27	3.27	2.96	non-LIQ CLAY	1	0.32	NA	6.34	non-LIQ	non-LIQ	0.711	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.09	73.3	115.0	115.0	38.6	2.4	6.2	72.0	14.0	7.9	5.0	1.2	15.0	3.28	3.28	3.28	3.28	3.19	non-LIQ CLAY	1	0.32	NA	9.07	non-LIQ	non-LIQ	0.709	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.25	73.2	115.0	115.0	46.2	2.5	5.4	64.0	15.5	8.8	5.0	1.2	16.0	3.29	3.29	3.29	3.29	3.08	non-LIQ CLAY	1	0.32	NA	7.68	non-LIQ	non-LIQ	0.708	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.42	73.0	115.0	115.0	51.3	2.8	5.5	61.5	16.9	9.5	5.0	1.2	16.0	3.30	3.30	3.30	3.30	3.04	non-LIQ CLAY	1	0.32	NA	7.25	non-LIQ	non-LIQ	0.707	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.58	72.8	115.0	115.0	61.2	3.1	5.1	55.8	19.1	10.8	5.0	1.2	18.0	3.31	3.31	3.31	3.31	2.96	non-LIQ CLAY	1	0.32	NA	6.30	non-LIQ	non-LIQ	0.705	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.75	72.7	115.0	115.0	64.1	3.1	4.8	53.9	19.6	11.1	5.0	1.2	18.0	3.32	3.32	3.32	3.32	2.93	non-LIQ CLAY	1	0.32	NA	6.00	non-LIQ	non-LIQ	0.704	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.91	72.5	115.0	115.0	47.0	3.2	6.8	68.7	16.5	9.3	5.0	1.2	16.0	3.33	3.33	3.33	3.33	3.14	non-LIQ CLAY	1	0.32	NA	8.48	non-LIQ	non-LIQ	0.703	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.07	72.3	115.0	115.0	70.8	3.4	4.8	51.7	21.2	12.0	5.0	1.2	19.0	3.34	3.34	3.34	3.34	2.90	non-LIQ CLAY	1	0.32	NA	5.65	non-LIQ	non-LIQ	0.701	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.24	72.2	115.0	115.0	75.0	4.0	5.3	52.4	22.6	12.7	5.0	1.2	20.0	3.35	3.35	3.35	3.35	2.91	non-LIQ CLAY	1	0.32	NA	5.76	non-LIQ	non-LIQ	0.700	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.40	72.0	115.0	115.0	74.5	4.4	5.9	54.5	23.0	12.9	5.0	1.2	20.0	3.36	3.36	3.36	3.36	2.94	non-LIQ CLAY	1	0.32	NA	6.10	non-LIQ	non-LIQ	0.699	0.190	0.190	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.57	71.8	115.0	115.0	76.2	4.5	5.9	54.1	23.4	13.1	5.0	1.2	21.0	3.37	3.37	3.37	3.37	2.93	non-LIQ CLAY	1	0.31	NA	6.03	non-LIQ	non-LIQ	0.697	0.180	0.180	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.73	71.7	115.0	115.0	127.8	5.2	4.1	37.8	33.5	18.7	5.0	1.2	27.0	3.38	3.38	3.38	3.38	2.65	non-LIQ CLAY	1	0.31	NA	3.64	non-LIQ	non-LIQ	0.696	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.89	71.5	115.0	115.0	133.6	5.5	4.1	37.3	34.8	19.5	5.0	1.2	28.0	3.39	3.39	3.39	3.38	2.64	non-LIQ CLAY	1	0.31	NA	3.57	non-LIQ	non-LIQ	0.695	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.06	71.3	115.0	115.0	107.2	5.0	4.7	43.1	29.6	16.5	5.0	1.2	25.0	3.40	3.40	3.40	3.39	2.75	non-LIQ CLAY	1	0.31	NA	4.37	non-LIQ	non-LIQ	0.693	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.22	71.2	115.0	115.0	72.1	4.3	6.0	55.8	22.5	12.5	5.0	1.2	20.0	3.41	3.41	3.41	3.40	2.96	non-LIQ CLAY	1	0.31	NA	6.30	non-LIQ	non-LIQ	0.692	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.39	71.0	115.0	115.0	82.9	3.7	4.5	47.5	23.9	13.3	5.0	1.2	21.0	3.41	3.41	3.41	3.41	2.83	non-LIQ CLAY	1	0.31	NA	5.01	non-LIQ	non-LIQ	0.691	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.55	70.9	115.0	115.0	68.5	3.6	5.3	54.6	21.1	11.7	5.0	1.2	19.0	3.42	3.42	3.42	3.42	2.94	non-LIQ CLAY	1	0.31	NA	6.12	non-LIQ	non-LIQ	0.689	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.71	70.7	115.0	115.0	53.2	2.8	5.3	60.9	17.4	9.7	5.0	1.2	17.0	3.43	3.43	3.43	3.43	3.04	non-LIQ CLAY	1	0.31	NA	7.14	non-LIQ	non-LIQ	0.688	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.88	70.5	115.0	115.0	46.1	2.3	5.0	63.7	15.5	8.6	5.0	1.2	15.0	3.44	3.44	3.44	3.44	3.06	non-LIQ CLAY	1	0.31	NA	7.62	non-LIQ	non-LIQ	0.687	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.04	70.4	115.0	115.0	47.7	2.3	4.8	62.2	15.8	8.7	5.0	1.2	15.0	3.45	3.45	3.45	3.45	3.05	non-LIQ CLAY	1	0.31	NA	7.37	non-LIQ	non-LIQ	0.685	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.21	70.2	115.0	115.0	58.7	2.9	4.9	57.4	18.6	10.3	5.0	1.2	17.0	3.46	3.46	3.46	3.46	2.98	non-LIQ CLAY	1	0.31	NA	6.57	non-LIQ	non-LIQ	0.684	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.37	70.0	115.0	115.0	69.5	3.8	5.5	55.4	21.6	11.9	5.0	1.2	19.0	3.47	3.47	3.47	3.47	2.95	non-LIQ CLAY	1	0.30	NA	6.24	non-LIQ	non-LIQ	0.683	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.53	69.9	115.0	115.0	93.4	4.5	4.8	46.8	26.7	14.7	5.0	1.2	23.0	3.48	3.48	3.48	3.48	2.81	non-LIQ CLAY	1	0.30	NA	4.90	non-LIQ	non-LIQ	0.681	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.70	69.7	115.0	115.0	72.9	3.8	5.2	53.5	22.2	12.2	5.0	1.2	20.0	3.49	3.49	3.49	3.48	2.92	non-LIQ CLAY	1	0.30	NA	5.94	non-LIQ	non-LIQ	0.680	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.86	69.5	115.0	115.0	53.0	3.4	6.4	65.5	18.1	9.9	5.0	1.2	17.0	3.50	3.50	3.50	3.49	3.10	non-LIQ CLAY	1	0.30	NA	7.93	non-LIQ	non-LIQ	0.679	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.03	69.4	115.0	115.0	53.7	3.1	5.8	63.0	17.9	9.8	5.0	1.2	17.0	3.51	3.51	3.51	3.50	3.07	non-LIQ CLAY	1	0.30	NA	7.51	non-LIQ	non-LIQ	0.677	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.19	69.2	115.0	115.0	48.8	3.2	6.6	68.3	17.1	9.4	5.0	1.2	16.0	3.52	3.52	3.52	3.51	3.14	non-LIQ CLAY	1	0.30	NA	8.43	non-LIQ	non-LIQ	0.676	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.35	69.1	115.0	115.0	50.3	3.2	6.4	66.9	17.4	9.5	5.0	1.2	16.0	3.53	3.53	3.53	3.52	3.12	non-LIQ CLAY	1	0.30	NA	8.18	non-LIQ	non-LIQ	0.675	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.52	68.9	115.0	115.0	71.4	3.5	4.9	53.2	21.7	11.9	5.0	1.2	19.0	3.54	3.54	3.54	3.53	2.92	non-LIQ CLAY	1	0.30	NA	5.88	non-LIQ	non-LIQ	0.673	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.68	68.7	115.0	115.0	94.4	3.8	4.0	44.0	26.3	14.4	5.0	1.2	22.0	3.55	3.55	3.55	3.54	2.76	non-LIQ CLAY	1	0.30	NA	4.49	non-LIQ	non-LIQ	0.672	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.85	68.6	115.0	115.0	102.0	3.9	3.8	41.7	27.8	15.2	5.0	1.2	23.0	3.56	3.56	3.56	3.55	2.72	non-LIQ CLAY	1	0.30	NA	4.17	non-LIQ	non-LIQ	0.671	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.01	68.4	115.0	115.0	87.3	4.1	4.7	48.2	25.3	13.8	5.0	1.2	22.0	3.57	3.57	3.57	3.56	2.84	non-LIQ CLAY	1	0.30	NA	5.12	non-LIQ	non-LIQ	0.669	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.17	68.2	115.0	115.0	76.2	4.1	5.4	53.6	23.3	12.7	5.0	1.2	20.0	3.57	3.57	3.57	3.57	2.93	non-LIQ CLAY	1	0.30	NA	5.96	non-LIQ	non-LIQ	0.668	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.34	68.1	115.0	115.0	76.0	3.8	5.0	52.4	23.0	12.5	5.0	1.2	20.0	3.58	3.58	3.58	3.58	2.91	non-LIQ CLAY	1	0.30	NA	5.76	non-LIQ	non-LIQ	0.667	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.50	67.9	115.0	115.0	55.7	3.3	5.9	63.2	18.6	10.1	5.0	1.2	17.0	3.59	3.59	3.59	3.59	3.07	non-LIQ CLAY	1	0.29	NA	7.54	non-LIQ	non-LIQ	0.665	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.67	67.7	115.0	115.0	52.9	3.1	5.9	64.4	17.9	9.7	5.0	1.2	17.0	3.60	3.60	3.60	3.60	3.09	non-LIQ CLAY	1	0.29	NA	7.75	non-LIQ	non-LIQ	0.664	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.83	67.6	115.0	115.0	77.9	2.6	3.6	46.4	22.2	12.0	5.0	1.2	19.0	3.61	3.61	3.61	3.61	2.81	non-LIQ CLAY	1	0.29	NA	4.84	non-LIQ	non-LIQ	0.663	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.00	67.4	115.0	115.0	42.8	2.4	5.6	69.7	15.2	8.2	5.0	1.2	15.0	3.62	3.62	3.62	3.62	3.16	non-LIQ CLAY	1	0.29	NA	8.65	non-LIQ	non-LIQ	0.661	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.16	67.2	115.0	115.0	34.2	1.5	4.4	71.6	12.3	6.7	5.0	1.2	13.0	3.63	3.63	3.63	3.63	3.18	non-LIQ CLAY	1	0.29	NA	9.01	non-LIQ	non-LIQ	0.660	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.32	67.1	115.0	115.0	37.9	1.8	4.7	70.1	13.5	7.3	5.0	1.2	14.0	3.64	3.64	3.64	3.64	3.16	non-LIQ CLAY	1	0.29	NA	8.73	non-LIQ	non-LIQ	0.659	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.49	66.9	115.0	115.0	51.0	2.5	5.1	63.0	17.0	9.2	5.0	1.2	16.0	3.65	3.65	3.65	3.65	3.07	non-LIQ CLAY	1	0.29	NA	7.50	non-LIQ	non-LIQ	0.657	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.65	66.8	115.0	115.0	76.4	3.3	4.3	50.2	22.6	12.1	5.0	1.2	20.0	3.66	3.66	3.66	3.65	2.87	non-LIQ CLAY	1	0.29	NA	5.41	non-LIQ	non-LIQ	0.656	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.82	66.6	115.0	115.0	118.6	4.6	3.9	39.8	31.7	17.0	5.0	1.2	25.0	3.67	3.67	3.67	3.66	2.69	non-LIQ CLAY	1	0.29	NA	3.90	non-LIQ	non-LIQ	0.655	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.98	66.4	115.0	115.0	93.8	4.0	4.3	45.8	26.6	14.3	5.0	1.2	22.0	3.68	3.68	3.68	3.67	2.80	non-LIQ CLAY	1	0.29	NA	4.75	non-LIQ	non-LIQ	0.653	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.14	66.3	115.0	115.0	65.6	3.7	5.6	58.8	21.0	11.3	5.0	1.2	19.0	3.69	3.69	3.69	3.68	3.00	non-LIQ CLAY	1	0.29	NA	6.79	non-LIQ	non-LIQ	0.652	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.31	66.1	115.0	115.0	68.7	3.6	5.2	56.3	21.5	11.5	5.0	1.2	19.0	3.70	3.70	3.70	3.69	2.97	non-LIQ CLAY	1	0.29	NA	6.39	non-LIQ	non-LIQ	0.651	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.47	65.9	115.0	115.0	90.6	4.0	4.4	47.2	26.0	13.9	5.0	1.2	22.0	3.71	3.71	3.71	3.70	2.82	non-LIQ CLAY	1	0.29	NA	4.96	non-LIQ	non-LIQ	0.649	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.64	65.8	115.0	115.0	97.8	4.6	4.7	46.8	28.0	14.9	5.0	1.2	23.0	3.72	3.72	3.72	3.71	2.81	non-LIQ CLAY	1	0.28	NA	4.90	non-LIQ	non-LIQ	0.648	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.80	65.6	115.0	115.0	94.2	4.9	5.2	49.4	27.6	14.7	5.0	1.2	23.0	3.73	3.73	3.73	3.72	2.86	non-LIQ CLAY	1	0.28	NA	5.29	non-LIQ	non-LIQ	0.647	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.96	65.4	115.0	115.0	95.8	4.4	4.6	46.9	27.5	14.6	5.0	1.2	23.0	3.74	3.74	3.74	3.73	2.82	non-LIQ CLAY	1	0.28	NA	4.92	non-LIQ	non-LIQ	0.645	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.13	65.3	115.0	115.0	67.6	3.4	5.0	56.2	21.2	11.2	5.0	1.2	18.0	3.74	3.74	3.74	3.74	2.97	non-LIQ CLAY	1	0.28	NA	6.37	non-LIQ	non-LIQ	0.644	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.29	65.1	115.0	115.0	53.3	2.7	5.1	62.4	17.7	9.4	5.0	1.2	16.0	3.75	3.75	3.75	3.75	3.06	non-LIQ CLAY	1	0.28	NA	7.41	non-LIQ	non-LIQ	0.643	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.46	64.9	115.0	115.0	46.7	2.8	6.0	69.6	16.5	8.8	5.0	1.2	16.0	3.76	3.76	3.76	3.76	3.16	non-LIQ CLAY	1	0.28	NA	8.65	non-LIQ	non-LIQ	0.641	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.62	64.8	115.0	115.0	82.5	3.7	4.5	49.8	24.3	12.9	5.0	1.2	20.0	3.77	3.77	3.77	3.77	2.86	non-LIQ CLAY	1	0.28	NA	5.36	non-LIQ	non-LIQ	0.640	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.78	64.6	115.0	115.0	90.1	3.9	4.3	47.4	25.9	13.7	5.0	1.2	21.0	3.78	3.78	3.78	3.78	2.82	non-LIQ CLAY	1	0.28	NA	4.99	non-LIQ	non-LIQ	0.639	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.95	64.5	115.0	115.0	56.9	3.9	6.9	67.1	19.7	10.4	5.0	1.2	17.0	3.79	3.79	3.79	3.79	3.12	non-LIQ CLAY	1	0.28	NA	8.21	non-LIQ	non-LIQ	0.637	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.11	64.3	115.0	115.0	82.1	4.0	4.9	51.5	24.6	13.0	5.0	1.2	21.0	3.80	3.80	3.80	3.80	2.89	non-LIQ CLAY	1	0.28	NA	5.63	non-LIQ	non-LIQ	0.636	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.28	64.1	115.0	115.0	141.3	5.1	3.6	36.3	36.5	19.2	5.0	1.2	28.0	3.81	3.81	3.81	3.81	2.62	non-LIQ CLAY	1	0.28	NA	3.45	non-LIQ	non-LIQ	0.635	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.44	64.0	115.0	115.0	179.1	6.2	3.5	24.0	40.5	21.3	4.2	1.1	28.0	3.82	3.82	3.82	3.82	2.34	SAND	0.5	0.53	89	2.06	185	non-LIQ	0.633	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_Q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
66.60	63.8	115.0	115.0	179.5	6.5	3.6	24.5	40.9	21.5	4.2	1.1	28.0	3.83	3.83	3.83	3.82	2.35	SAND	0.5	0.53	89	2.13	190	non-LIQ	0.632	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.77	63.6	115.0	115.0	134.8	6.7	5.0	42.3	36.9	19.4	5.0	1.2	28.0	3.84	3.84	3.84	3.83	2.73	non-LIQ CLAY	1	0.28	NA	4.25	non-LIQ	non-LIQ	0.631	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.93	63.5	115.0	115.0	135.3	6.4	4.7	41.4	36.8	19.3	5.0	1.2	28.0	3.85	3.85	3.85	3.84	2.72	non-LIQ CLAY	1	0.27	NA	4.13	non-LIQ	non-LIQ	0.629	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.10	63.3	115.0	115.0	149.9	6.1	4.1	37.3	39.1	20.5	5.0	1.2	30.0	3.86	3.86	3.86	3.85	2.64	non-LIQ CLAY	1	0.27	NA	3.58	non-LIQ	non-LIQ	0.628	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.26	63.1	115.0	115.0	107.1	5.3	4.9	46.6	30.6	16.0	5.0	1.2	24.0	3.87	3.87	3.87	3.86	2.81	non-LIQ CLAY	1	0.27	NA	4.88	non-LIQ	non-LIQ	0.627	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.42	63.0	115.0	115.0	79.4	4.2	5.3	54.2	24.4	12.7	5.0	1.2	20.0	3.88	3.88	3.88	3.87	2.94	non-LIQ CLAY	1	0.27	NA	6.05	non-LIQ	non-LIQ	0.625	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.59	62.8	115.0	115.0	67.1	3.9	5.8	60.1	21.8	11.4	5.0	1.2	19.0	3.89	3.89	3.89	3.88	3.02	non-LIQ CLAY	1	0.27	NA	7.01	non-LIQ	non-LIQ	0.624	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.75	62.7	115.0	115.0	72.3	3.9	5.4	56.9	22.8	11.9	5.0	1.2	19.0	3.90	3.90	3.90	3.89	2.98	non-LIQ CLAY	1	0.27	NA	6.48	non-LIQ	non-LIQ	0.623	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.92	62.5	115.0	115.0	64.8	3.6	5.6	60.2	21.0	11.0	5.0	1.2	18.0	3.91	3.91	3.91	3.90	3.03	non-LIQ CLAY	1	0.27	NA	7.03	non-LIQ	non-LIQ	0.621	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.08	62.3	115.0	115.0	58.2	3.1	5.3	62.2	19.3	10.0	5.0	1.2	17.0	3.91	3.91	3.91	3.91	3.05	non-LIQ CLAY	1	0.27	NA	7.37	non-LIQ	non-LIQ	0.620	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.24	62.2	115.0	115.0	51.5	3.2	6.2	68.8	18.1	9.4	5.0	1.2	16.0	3.92	3.92	3.92	3.92	3.14	non-LIQ CLAY	1	0.27	NA	8.50	non-LIQ	non-LIQ	0.619	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.41	62.0	115.0	115.0	87.5	3.9	4.5	49.3	25.7	13.3	5.0	1.2	21.0	3.93	3.93	3.93	3.93	2.86	non-LIQ CLAY	1	0.27	NA	5.29	non-LIQ	non-LIQ	0.617	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.57	61.8	115.0	115.0	82.3	4.4	5.3	54.0	25.2	13.1	5.0	1.2	21.0	3.94	3.94	3.94	3.94	2.93	non-LIQ CLAY	1	0.27	NA	6.02	non-LIQ	non-LIQ	0.616	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.74	61.7	115.0	115.0	70.8	4.5	6.4	61.0	23.2	12.0	5.0	1.2	19.0	3.95	3.95	3.95	3.95	3.04	non-LIQ CLAY	1	0.27	NA	7.16	non-LIQ	non-LIQ	0.615	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.90	61.5	115.0	115.0	76.7	4.5	5.9	57.5	24.3	12.6	5.0	1.2	20.0	3.96	3.96	3.96	3.96	2.99	non-LIQ CLAY	1	0.27	NA	6.58	non-LIQ	non-LIQ	0.613	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.07	61.3	115.0	115.0	96.0	4.5	4.7	48.5	27.9	14.4	5.0	1.2	22.0	3.97	3.97	3.97	3.97	2.84	non-LIQ CLAY	1	0.27	NA	5.15	non-LIQ	non-LIQ	0.612	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.23	61.2	115.0	115.0	106.5	4.9	4.6	46.1	30.3	15.6	5.0	1.2	24.0	3.98	3.98	3.98	3.98	2.80	non-LIQ CLAY	1	0.27	NA	4.80	non-LIQ	non-LIQ	0.611	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.39	61.0	115.0	115.0	102.2	4.9	4.8	47.7	29.5	15.2	5.0	1.2	23.0	3.99	3.99	3.99	3.98	2.83	non-LIQ CLAY	1	0.27	NA	5.03	non-LIQ	non-LIQ	0.609	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.56	60.8	115.0	115.0	98.4	4.9	5.0	49.1	28.8	14.8	5.0	1.2	23.0	4.00	4.00	4.00	3.99	2.85	non-LIQ CLAY	1	0.26	NA	5.26	non-LIQ	non-LIQ	0.608	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.72	60.7	115.0	115.0	79.6	4.5	5.7	56.2	24.9	12.8	5.0	1.2	20.0	4.01	4.01	4.01	4.00	2.97	non-LIQ CLAY	1	0.26	NA	6.37	non-LIQ	non-LIQ	0.607	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.89	60.5	115.0	115.0	68.1	3.9	5.7	60.3	22.1	11.4	5.0	1.2	19.0	4.02	4.02	4.02	4.01	3.03	non-LIQ CLAY	1	0.26	NA	7.04	non-LIQ	non-LIQ	0.605	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.05	60.4	115.0	115.0	65.6	3.2	4.9	58.2	20.9	10.7	5.0	1.2	18.0	4.03	4.03	4.03	4.02	3.00	non-LIQ CLAY	1	0.26	NA	6.69	non-LIQ	non-LIQ	0.604	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.21	60.2	115.0	115.0	48.3	2.6	5.4	68.4	16.9	8.7	5.0	1.2	15.0	4.04	4.04	4.04	4.03	3.14	non-LIQ CLAY	1	0.26	NA	8.44	non-LIQ	non-LIQ	0.603	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.38	60.0	115.0	115.0	35.8	2.0	5.6	78.8	13.8	7.1	5.0	1.2	13.0	4.05	4.05	4.05	4.04	3.27	non-LIQ CLAY	1	0.26	NA	10.30	non-LIQ	non-LIQ	0.601	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.54	59.9	115.0	115.0	33.8	2.0	5.9	82.2	13.4	6.9	5.0	1.2	13.0	4.06	4.06	4.06	4.05	3.31	non-LIQ CLAY	1	0.26	NA	10.92	non-LIQ	non-LIQ	0.600	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.71	59.7	115.0	115.0	39.5	2.4	6.1	77.5	15.0	7.7	5.0	1.2	14.0	4.07	4.07	4.07	4.06	3.26	non-LIQ CLAY	1	0.26	NA	10.06	non-LIQ	non-LIQ	0.599	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.87	59.5	115.0	115.0	74.0	3.2	4.3	53.3	22.5	11.5	5.0	1.2	19.0	4.08	4.08	4.08	4.07	2.92	non-LIQ CLAY	1	0.26	NA	5.91	non-LIQ	non-LIQ	0.597	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.03	59.4	115.0	115.0	76.8	3.8	4.9	55.0	23.8	12.1	5.0	1.2	20.0	4.08	4.08	4.08	4.08	2.95	non-LIQ CLAY	1	0.26	NA	6.17	non-LIQ	non-LIQ	0.596	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.20	59.2	115.0	115.0	66.2	3.4	5.1	59.3	21.3	10.8	5.0	1.2	18.0	4.09	4.09	4.09	4.09	3.01	non-LIQ CLAY	1	0.26	NA	6.88	non-LIQ	non-LIQ	0.595	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.36	59.0	115.0	115.0	48.3	2.6	5.4	68.9	17.0	8.6	5.0	1.2	15.0	4.10	4.10	4.10	4.10	3.15	non-LIQ CLAY	1	0.26	NA	8.52	non-LIQ	non-LIQ	0.593	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.53	58.9	115.0	115.0	37.7	1.9	5.0	75.4	14.1	7.1	5.0	1.2	14.0	4.11	4.11	4.11	4.11	3.23	non-LIQ CLAY	1	0.26	NA	9.68	non-LIQ	non-LIQ	0.592	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.69	58.7	115.0	115.0	34.2	1.7	5.0	78.5	13.1	6.7	5.0	1.2	13.0	4.12	4.12	4.12	4.12	3.27	non-LIQ CLAY	1	0.26	NA	10.24	non-LIQ	non-LIQ	0.591	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.85	58.6	115.0	115.0	39.1	2.1	5.4	75.7	14.6	7.4	5.0	1.2	14.0	4.13	4.13	4.13	4.13	3.23	non-LIQ CLAY	1	0.26	NA	9.73	non-LIQ	non-LIQ	0.589	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.02	58.4	115.0	115.0	43.6	2.2	5.0	71.0	15.6	7.9	5.0	1.2	14.0	4.14	4.14	4.14	4.14	3.17	non-LIQ CLAY	1	0.26	NA	8.89	non-LIQ	non-LIQ	0.588	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.18	58.2	115.0	115.0	43.0	2.2	5.1	71.7	15.5	7.8	5.0	1.2	14.0	4.15	4.15	4.15	4.15	3.18	non-LIQ CLAY	1	0.25	NA	9.02	non-LIQ	non-LIQ	0.587	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.35	58.1	115.0	115.0	44.6	2.1	4.7	69.0	15.7	7.9	5.0	1.2	15.0	4.16	4.16	4.16	4.15	3.15	non-LIQ CLAY	1	0.25	NA	8.54	non-LIQ	non-LIQ	0.585	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.51	57.9	115.0	115.0	38.6	1.9	4.9	74.5	14.3	7.2	5.0	1.2	14.0	4.17	4.17	4.17	4.16	3.22	non-LIQ CLAY	1	0.25	NA	9.53	non-LIQ	non-LIQ	0.584	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.67	57.7	115.0	115.0	32.7	1.6	4.9	80.2	12.8	6.4	5.0	1.2	13.0	4.18	4.18	4.18	4.17	3.29	non-LIQ CLAY	1	0.25	NA	10.56	non-LIQ	non-LIQ	0.583	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.84	57.6	115.0	115.0	30.4	1.4	4.6	81.7	12.0	6.0	5.0	1.2	12.0	4.19	4.19	4.19	4.18	3.31	non-LIQ CLAY	1	0.25	NA	10.84	non-LIQ	non-LIQ	0.581	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.00	57.4	115.0	115.0	32.1	1.5	4.7	80.1	12.5	6.3	5.0	1.2	13.0	4.20	4.20	4.20	4.19	3.29	non-LIQ CLAY	1	0.25	NA	10.54	non-LIQ	non-LIQ	0.580	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.17	57.2	115.0	115.0	34.1	1.6	4.7	78.1	13.1	6.5	5.0	1.2	13.0	4.21	4.21	4.21	4.20	3.26	non-LIQ CLAY	1	0.25	NA	10.17	non-LIQ	non-LIQ	0.579	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.33	57.1	115.0	115.0	32.9	1.6	4.9	80.2	12.8	6.4	5.0	1.2	13.0	4.22	4.22	4.22	4.21	3.29	non-LIQ CLAY	1	0.25	NA	10.56	non-LIQ	non-LIQ	0.577	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.49	56.9	115.0	115.0	35.0	1.5	4.3	75.4	13.1	6.5	5.0	1.2	13.0	4.23	4.23	4.23	4.22	3.23	non-LIQ CLAY	1	0.25	NA	9.69	non-LIQ	non-LIQ	0.576	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.66	56.7	115.0	115.0	36.0	1.6	4.4	75.3	13.4	6.7	5.0	1.2	13.0	4.24	4.24	4.24	4.23	3.23	non-LIQ CLAY	1	0.25	NA	9.66	non-LIQ	non-LIQ	0.575	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.82	56.6	115.0	115.0	38.0	1.7	4.5	73.7	14.0	7.0	5.0	1.2	13.0	4.24	4.24	4.24	4.24	3.21	non-LIQ CLAY	1	0.25	NA	9.37	non-LIQ	non-LIQ	0.573	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.99	56.4	115.0	115.0	43.9	1.9	4.3	68.5	15.4	7.7	5.0	1.2	14.0	4.25	4.25	4.25	4.25	3.14	non-LIQ CLAY	1	0.25	NA	8.45	non-LIQ	non-LIQ	0.572	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.15	56.3	115.0	115.0	44.3	1.9	4.3	68.1	15.5	7.7	5.0	1.2	14.0	4.26	4.26	4.26	4.26	3.14	non-LIQ CLAY	1	0.25	NA	8.38	non-LIQ	non-LIQ	0.571	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.31	56.1	115.0	115.0	42.4	1.8	4.2	69.3	15.0	7.5	5.0	1.2	14.0	4.27	4.27	4.27	4.27	3.15	non-LIQ CLAY	1	0.25	NA	8.60	non-LIQ	non-LIQ	0.569	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.48	55.9	115.0	115.0	37.4	1.6	4.3	73.6	13.7	6.8	5.0	1.2	13.0	4.28	4.28	4.28	4.28	3.21	non-LIQ CLAY	1	0.25	NA	9.36	non-LIQ	non-LIQ	0.568	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.64	55.8	115.0	115.0	35.7	1.6	4.5	76.2	13.4	6.7	5.0	1.2	13.0	4.29	4.29	4.29	4.29	3.24	non-LIQ CLAY	1	0.25	NA	9.83	non-LIQ	non-LIQ	0.567	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.81	55.6	115.0	115.0	35.0	1.8	5.1	79.9	13.6	6.8	5.0	1.2	13.0	4.30	4.30	4.30	4.30	3.29	non-LIQ CLAY	1	0.25	NA	10.50	non-LIQ	non-LIQ	0.565	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.97	55.4	115.0	115.0	43.1	1.8	4.2	68.8	15.1	7.5	5.0	1.2	14.0	4.31	4.31	4.31	4.31	3.14	non-LIQ CLAY	1	0.25	NA	8.50	non-LIQ	non-LIQ	0.564	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.13	55.3	115.0	115.0	42.8	2.0	4.7	71.3	15.4	7.6	5.0	1.2	14.0	4.32	4.32	4.32	4.31	3.18	non-LIQ CLAY	1	0.24	NA	8.94	non-LIQ	non-LIQ	0.563	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.30	55.1	115.0	115.0	40.0	1.8	4.5	72.8	14.6	7.2	5.0	1.2	14.0	4.33	4.33	4.33	4.32	3.20	non-LIQ CLAY	1	0.24	NA	9.21	non-LIQ	non-LIQ	0.561	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.46	54.9	115.0	115.0	41.5	1.9	4.6	72.0	15.0	7.4	5.0	1.2	14.0	4.34	4.34	4.34	4.33	3.19	non-LIQ CLAY	1	0.24	NA	9.07	non-LIQ	non-LIQ	0.560	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.63	54.8	115.0	115.0	41.6	1.9	4.6	71.9	15.1	7.4	5.0	1.2	14.0	4.35	4.35	4.35	4.34	3.19	non-LIQ CLAY	1	0.24	NA	9.06	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.79	54.6	115.0	115.0	41.6	1.7	4.1	69.8	14.8	7.3	5.0	1.2	14.0	4.36	4.36	4.36	4.35	3.16	non-LIQ CLAY	1	0.24	NA	8.68	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.96	54.4	115.0	115.0	42.1	1.7	4.0	69.3	14.9	7.3	5.0	1.2	14.0	4.37	4.37	4.37	4.36	3.15	non-LIQ CLAY	1	0.24	NA	8.59	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.12	54.3	115.0	115.0	42.3	1.7	4.0	69.1	14.9	7.3	5.0	1.2	14.0	4.38	4.38	4.38	4.37	3.15	non-LIQ CLAY	1	0.24	NA	8.55	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.28	54.1	115.0	115.0	41.7	1.9	4.6	72.1	15.1	7.4	5.0	1.2	14.0	4.39	4.39	4.39	4.38	3.19	non-LIQ CLAY	1	0.24	NA	9.09	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.45	54.0	115.0	115.0	37.1	2.0	5.4	79.6	14.4	7.1	5.0	1.2	13.0	4.40	4.40	4.40	4.39	3.28	non-LIQ CLAY	1	0.24	NA	10.46	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.61	53.8	115.0	115.0	36.7	1.9	5.2	79.2	14.2	7.0	5.0	1.2	13.0	4.41	4.41	4.41	4.40	3.28	non-LIQ CLAY	1	0.24	NA	10.38	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.78	53.6	115.0	115.0	32.5	1.6	4.9	82.6	13.0	6.4	5.0	1.2	13.0	4.41	4.41	4.41	4.41	3.32	non-LIQ CLAY	1	0.24	NA	11.00	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.94	53.5	115.0	115.0	34.1	1.6	4.7	79.9	13.3	6.5	5.0	1.2	13.0	4.42	4.42	4.42	4.42	3.29	non-LIQ CLAY	1	0.24	NA	10.50	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.10	53.3	115.0	115.0	34.2	1.8	5.3	82.4	13.6	6.7	5.0	1.2	13.0	4.43	4.43	4.43	4.43	3.32	non-LIQ CLAY	1	0.24	NA	10.95	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.27	53.1	115.0	115.0	42.6	1.8	4.2	70.3	15.2	7.4	5.0	1.2	14.0	4.44	4.44	4.44	4.44	3.17	non-LIQ CLAY	1	0.24	NA	8.77	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.43	53.0	115.0	115.0	41.9	1.8	4.3	71.2	15.1	7.3	5.0	1.2	14.0	4.45	4.45	4.45	4.45	3.18	non-LIQ CLAY	1	0.24	NA	8.94	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.60	52.8	115.0	115.0	40.4	1.9	4.7	74.3	14.9	7.3	5.0	1.2	14.0	4.46	4.46	4.46	4.46	3.22	non-LIQ CLAY	1	0.24	NA	9.49	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.76	52.6	115.0	115.0	42.5	2.4	5.6	76.6	16.0	7.8	5.0	1.2	14.0	4.47	4.47	4.47	4.47	3.25	non-LIQ CLAY	1	0.24	NA	9.90	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.92	52.5	115.0	115.0	56.0	2.8	5.0	65.7	19.1	9.3	5.0	1.2	16.0	4.48	4.48	4.48	4.48	3.10	non-LIQ CLAY	1	0.24	NA	7.96	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.09	52.3	115.0	115.0	94.3	3.6	3.8	47.9	27.3	13.3	5.0	1.2	21.0	4.49	4.49	4.49	4.48	2.83	non-LIQ CLAY	1	0.24	NA	5.07	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.25	52.2	115.0	115.0	100.0	4.2	4.2	48.3	29.1	14.1	5.0	1.2	22.0	4.50	4.50	4.50	4.49	2.84	non-LIQ CLAY	1	0.24	NA	5.13	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.42	52.0	115.0	115.0	76.9	3.9	5.1	57.8	24.4	11.8	5.0	1.2	19.0	4.51	4.51	4.51	4.50	2.99	non-LIQ CLAY	1	0.23	NA	6.62	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.58	51.8	115.0	115.0	65.7	3.6	5.5	63.3	22.0	10.6	5.0	1.2	18.0	4.52	4.52	4.52	4.51	3.07	non-LIQ CLAY	1	0.23	NA	7.56	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.74	51.7	115.0	115.0	62.7	3.5	5.6	65.0	21.3	10.3	5.0	1.2	17.0	4.53	4.53	4.53	4.52	3.09	non-LIQ CLAY	1	0.23	NA	7.85	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.91	51.5	115.0	115.0	58.6	3.7	6.3	69.6	20.7	10.0	5.0	1.2	17.0	4.54	4.54	4.54	4.53	3.16	non-LIQ CLAY	1	0.23	NA	8.64	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.07	51.3	115.0	115.0	89.0	4.2	4.7	53.2	27.1	13.1	5.0	1.2	21.0	4.55	4.55	4.55	4.54	2.92	non-LIQ CLAY	1	0.23	NA	5.68	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.24	51.2	115.0	115.0	128.6	4.8	3.7	41.6	35.0	16.9	5.0	1.2	25.0	4.56	4.56	4.56	4.55	2.72	non-LIQ CLAY	1	0.23	NA	4.16	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.40	51.0	115.0	115.0	134.2	5.6	4.2	42.6	36.9	17.8	5.0	1.2	26.0	4.57	4.57	4.57	4.56	2.74	non-LIQ CLAY	1	0.23	NA	4.30	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering
17800 Newhope Street
Suite B
Fountain Valley, CA 92708

CPT Number: CPT-11-347
Project Name: Retaining Wall 387
Project Number: 11-137
Location: Orange County
California

Computed by: SP
Checked by: LC

Date: 04/12/12
Date: 4/16/12

Figure No.: _____

Reference:

1) Seed, R.B., et al, *Recent Advances in Soil Liquefaction Engineering: A Unified and Consistent Framework,* Keynote Presentation, 26th Annual ASCE Los Angeles Geotechnical Spring Seminar, April 30, 2003.
2) Youd, T.L. & Idriss, I.M., et al, *Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils.* ASCE Journal of Geotechnical and Geoenvironmental Engineering, Pp. 817-833, October 2001.
3) Pradel D., *Procedure to Evaluate Earthquake-induced Settlements in Dry Sandy Soils,* ASCE Journal of Geotechnical and Geoenvironmental Engineering, Pp. 364-368, April 1998.
4) Tokimatsu, K. & Seed, H.B., *Evaluation of Settlements in Sands due to Earthquake Shaking,* ASCE Journal of Geotechnical Engineering, Pp. 861-878, August 1987.
5) Jefferies, M.G. & Davies, M.P., *Use of CPT to Estimate Equivalent SPT N_{60}*, ASTM Geotechnical Testing Journal, Vol.17, No. 4, Pp. 458-567, 1993.
6) Robertson, P.K. et al, *Use of Piezometer Cone Data*, Proceedings of the ASCE Specialty Conference In Situ 86: Use of In Situ Tests in Geotechnical Engineering, Blacksburg, Pp. 1263-1280, 1986.

Surface Elevation = 120.3 ft MSL
Design Magnitude, M_w = 7.50
PGA, a_{max} = 0.408 g
Earthquake Scaling Factor, MSF = 1.000 for M_w = 7.5
Design Water Level = 71.7 ft MSL
Water Level at Investigation = 30.8 ft MSL
Req'd Factor of Safety = 1

Summary of Seismically Induced Settlement:

Dry Settlement (in)	0.101
Post-liquefaction Settlement (in)	0.000
Total Settlement (in)	**0.101**

Depth	Elev.	Unit Weight (pcf)		q_c	f_s	Frict. Ratio	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level		Stresses at Design Water Level		I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance			Fines Correction		$CRR_{7.5}$	r_d	CSR_{fs}	$CSR_{7.5}$	FS	a	b	Max Shear Modulus	Cyclic Shear Strain	Norm. Vol. Strain	Dry Settle.	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain	Layer Post-Liq. Settle.
													σ_v	σ'_v	σ_v	σ'_v																					
(ft)	(ft, MSL)	γ^t_{MOIST}	γ^t_{SAT}	(tsf)	(tsf)	(%)							(tsf)	(tsf)	(tsf)	(tsf)			n	C_Q	q_{c1N}	Kc	$(q_{c1N})_{cs}$							G_{max} (tsf)	γ (%)	ε_{vc} (%)	ΔS (in)		ε (%)	ΔS (in)
0.33	120.0	115.0	115.0	6.5	2.9	44.6	60	2	16	5.00	1.20	24	0.019	0.019	0.019	0.019	3.02	non-LIQ CLAY	1	1.70	NA	6.97	non-LIQ	non-LIQ	0.999	0.26	0.260	Above Water	NA	NA	NA	NA	NA	NA	0.000
0.49	119.8	115.0	115.0	52.9	5.0	9.5	27	12	76	4.45	1.13	90	0.028	0.028	0.028	0.028	2.41	SAND	0.5	1.70	85.0	2.34	198.7	non-LIQ	0.999	0.26	0.260	Above Water	0.12	69281	259.7	0.00	0.00	0.000	NA	NA	0.000
0.66	119.6	115.0	115.0	86.1	2.7	3.1	11	16	86	1.08	1.02	90	0.038	0.038	0.038	0.038	1.91	SAND	0.5	1.70	138.3	1.20	165.7	non-LIQ	0.998	0.26	0.260	Above Water	0.12	57944	315.1	0.00	0.00	0.000	NA	NA	0.000
0.82	119.5	115.0	115.0	274.6	2.9	1.1	0	43	202	0.00	1.00	202	0.047	0.047	0.047	0.047	1.30	SAND	0.5	1.70	441.2	1.00	441.2	non-LIQ	0.998	0.26	0.260	Above Water	0.13	50868	465.9	0.00	0.00	0.000	NA	NA	0.000
0.98	119.3	115.0	115.0	245.9	4.1	1.7	3	41	177	0.00	1.00	177	0.056	0.056	0.056	0.056	1.52	SAND	0.5	1.70	395.1	1.00	395.1	non-LIQ	0.998	0.26	0.260	Above Water	0.13	45709	487.4	0.00	0.00	0.000	NA	NA	0.000
1.15	119.2	115.0	115.0	188.2	6.0	3.2	9	35	139	0.50	1.02	142	0.066	0.066	0.066	0.066	1.83	SAND	0.5	1.70	302.4	1.13	341.7	non-LIQ	0.997	0.26	0.260	Above Water	0.13	41526	487.5	0.00	0.00	0.000	NA	NA	0.000
1.31	119.0	115.0	115.0	222.0	8.9	4.0	11	42	158	1.10	1.02	163	0.075	0.075	0.075	0.075	1.91	SAND	0.5	1.70	356.7	1.20	428.0	non-LIQ	0.997	0.26	0.260	Above Water	0.13	38404	543.2	0.00	0.00	0.000	NA	NA	0.000
1.48	118.8	115.0	115.0	468.4	7.3	1.6	2	76	267	0.00	1.00	267	0.085	0.085	0.085	0.085	1.44	SAND	0.5	1.70	752.6	1.00	752.6	non-LIQ	0.997	0.26	0.260	Above Water	0.13	35693	667.6	0.00	0.00	0.000	NA	NA	0.000
1.64	118.7	115.0	115.0	761.1	6.3	0.8	0	113	377	0.00	1.00	377	0.094	0.094	0.094	0.094	1.14	SAND	0.5	1.70	1222.8	1.00	1222.8	non-LIQ	0.996	0.26	0.260	Above Water	0.13	33560	811.7	0.00	0.00	0.000	NA	NA	0.000
1.80	118.5	115.0	115.0	636.4	5.2	0.8	0	94	301	0.00	1.00	301	0.104	0.104	0.104	0.104	1.15	SAND	0.5	1.70	1022.5	1.00	1022.5	non-LIQ	0.996	0.26	0.260	Above Water	0.13	31737	789.3	0.00	0.00	0.000	NA	NA	0.000
1.97	118.3	115.0	115.0	543.1	5.0	0.9	0	82	251	0.00	1.00	251	0.113	0.113	0.113	0.113	1.22	SAND	0.5	1.70	872.6	1.00	872.6	non-LIQ	0.995	0.26	0.260	Above Water	0.13	30065	776.6	0.00	0.00	0.000	NA	NA	0.000
2.13	118.2	115.0	115.0	472.5	4.6	1.0	0	72	213	0.00	1.00	213	0.122	0.122	0.122	0.122	1.26	SAND	0.5	1.70	759.1	1.00	759.1	non-LIQ	0.995	0.26	0.260	Above Water	0.13	28688	764.2	0.01	0.00	0.000	NA	NA	0.000
2.30	118.0	115.0	115.0	444.7	4.2	0.9	0	68	193	0.00	1.00	193	0.132	0.132	0.132	0.132	1.26	SAND	0.5	1.70	714.5	1.00	714.5	non-LIQ	0.995	0.26	0.260	Above Water	0.13	27397	768.4	0.01	0.00	0.000	NA	NA	0.000
2.46	117.8	115.0	115.0	438.6	4.0	0.9	0	67	183	0.00	1.00	183	0.141	0.141	0.141	0.141	1.25	SAND	0.5	1.70	704.7	1.00	704.7	non-LIQ	0.994	0.26	0.260	Above Water	0.13	26313	781.6	0.01	0.00	0.000	NA	NA	0.000
2.62	117.7	115.0	115.0	424.3	3.7	0.9	0	65	171	0.00	1.00	171	0.151	0.151	0.151	0.151	1.24	SAND	0.5	1.70	681.7	1.00	681.7	non-LIQ	0.994	0.26	0.260	Above Water	0.13	25337	788.7	0.01	0.00	0.000	NA	NA	0.000
2.79	117.5	115.0	115.0	409.1	3.4	0.8	0	62	160	0.00	1.00	160	0.160	0.160	0.160	0.160	1.23	SAND	0.5	1.70	657.3	1.00	657.3	non-LIQ	0.993	0.26	0.260	Above Water	0.13	24399	795.0	0.01	0.00	0.000	NA	NA	0.000
2.95	117.4	115.0	115.0	389.7	2.9	0.7	0	59	147	0.00	1.00	147	0.170	0.170	0.170	0.170	1.20	SAND	0.5	1.70	626.1	1.00	626.1	non-LIQ	0.993	0.26	0.260	Above Water	0.13	23596	794.5	0.01	0.00	0.000	NA	NA	0.000
3.12	117.2	115.0	115.0	368.0	2.9	0.8	0	56	136	0.00	1.00	136	0.179	0.179	0.179	0.179	1.24	SAND	0.5	1.70	591.2	1.00	591.2	non-LIQ	0.993	0.26	0.260	Above Water	0.13	22816	797.2	0.01	0.00	0.000	NA	NA	0.000
3.28	117.0	115.0	115.0	342.5	2.6	0.8	0	52	124	0.00	1.00	124	0.189	0.189	0.189	0.189	1.25	SAND	0.5	1.70	550.3	1.00	550.3	non-LIQ	0.992	0.26	0.260	Above Water	0.13	22142	791.8	0.01	0.00	0.000	NA	NA	0.000
3.45	116.9	115.0	115.0	317.1	2.4	0.8	0	49	112	0.00	1.00	112	0.198	0.198	0.198	0.198	1.27	SAND	0.5	1.70	509.5	1.00	509.5	non-LIQ	0.992	0.26	0.260	Above Water	0.13	21480	786.4	0.01	0.00	0.000	NA	NA	0.000
3.61	116.7	115.0	115.0	292.2	2.4	0.8	1	46	103	0.00	1.00	103	0.208	0.208	0.208	0.208	1.32	SAND	0.5	1.70	469.5	1.00	469.5	non-LIQ	0.992	0.26	0.260	Above Water	0.13	20904	781.1	0.01	0.00	0.000	NA	NA	0.000
3.77	116.5	115.0	115.0	297.7	2.6	0.9	1	47	103	0.00	1.00	103	0.217	0.217	0.217	0.217	1.34	SAND	0.5	1.70	478.3	1.00	478.3	non-LIQ	0.991	0.26	0.260	Above Water	0.13	20367	799.4	0.01	0.00	0.000	NA	NA	0.000
3.94	116.4	115.0	115.0	315.3	2.8	0.9	1	50	107	0.00	1.00	107	0.227	0.227	0.227	0.227	1.34	SAND	0.5	1.70	506.6	1.00	506.6	non-LIQ	0.991	0.26	0.260	Above Water	0.13	19835	826.8	0.01	0.00	0.000	NA	NA	0.000
4.10	116.2	115.0	115.0	329.4	3.0	0.9	1	52	110	0.00	1.00	110	0.236	0.236	0.236	0.236	1.35	SAND	0.5	1.70	529.2	1.00	529.2	non-LIQ	0.990	0.26	0.260	Above Water	0.13	19367	850.5	0.01	0.00	0.000	NA	NA	0.000
4.27	116.0	115.0	115.0	353.4	3.2	0.9	1	55	115	0.00	1.00	115	0.246	0.246	0.246	0.246	1.33	SAND	0.5	1.70	567.8	1.00	567.8	non-LIQ	0.990	0.26	0.260	Above Water	0.13	18901	881.4	0.01	0.00	0.000	NA	NA	0.000
4.43	115.9	115.0	115.0	360.8	3.2	0.9	1	56	115	0.00	1.00	115	0.255	0.255	0.255	0.255	1.33	SAND	0.5	1.70	579.7	1.00	579.7	non-LIQ	0.990	0.26	0.260	Above Water	0.13	18488	897.7	0.01	0.00	0.000	NA	NA	0.000
4.59	115.7	115.0	115.0	358.7	3.2	0.9	1	56	112	0.00	1.00	112	0.264	0.264	0.264	0.264	1.33	SAND	0.5	1.70	576.3	1.00	576.3	non-LIQ	0.989	0.26	0.260	Above Water	0.13	18099	907.3	0.01	0.00	0.000	NA	NA	0.000
4.76	115.5	115.0	115.0	345.4	3.0	0.9	1	54	106	0.00	1.00	106	0.274	0.274	0.274	0.274	1.34	SAND	0.5	1.70	554.9	1.00	554.9	non-LIQ	0.989	0.26	0.260	Above Water	0.13	17708	907.0	0.01	0.00	0.000	NA	NA	0.000
4.92	115.4	115.0	115.0	325.1	2.3	0.7	0	50	97	0.00	1.00	97	0.283	0.283	0.283	0.283	1.28	SAND	0.5	1.70	522.3	1.00	522.3	non-LIQ	0.989	0.26	0.260	Above Water	0.13	17360	893.4	0.01	0.00	0.000	NA	NA	0.000
5.09	115.2	115.0	115.0	299.1	2.3	0.8	1	47	89	0.00	1.00	89	0.293	0.293	0.293	0.293	1.33	SAND	0.5	1.70	480.6	1.00	480.6	non-LIQ	0.988	0.26	0.260	Above Water	0.13	17010	883.7	0.01	0.00	0.000	NA	NA	0.000
5.25	115.1	115.0	115.0	263.3	2.1	0.8	1	42	78	0.00	1.00	78	0.302	0.302	0.302	0.302	1.36	SAND	0.5	1.70	423.0	1.00	423.0	non-LIQ	0.988	0.26	0.260	Above Water	0.13	16697	860.0	0.01	0.00	0.000	NA	NA	0.000
5.41	114.9	115.0	115.0	249.8	1.7	0.7	1	39	72	0.00	1.00	72	0.311	0.311	0.311	0.311	1.34	SAND	0.5	1.70	401.3	1.00	401.3	non-LIQ	0.987	0.26	0.260	Above Water	0.13	16399	850.2	0.01	0.00	0.000	NA	NA	0.000
5.58	114.7	115.0	115.0	231.4	1.6	0.7	1	37	67	0.00	1.00	67	0.321	0.321	0.321	0.321	1.37	SAND	0.5	1.70	371.8	1.00	371.8	non-LIQ	0.987	0.26	0.260	Above Water	0.13	16097	840.1	0.01	0.00	0.000	NA	NA	0.000
5.74	114.6	115.0	115.0	214.7	1.6	0.7	2	35	62	0.00	1.00	62	0.330	0.330	0.330	0.330	1.42	SAND	0.5	1.70	344.9	1.00	344.9	non-LIQ	0.987	0.26	0.260	Above Water	0.13	15827	831.4	0.02	0.00	0.000	NA	NA	0.000
5.91	114.4	115.0	115.0	203.5	1.8	0.9	3	34	59	0.00	1.00	59	0.340	0.340	0.340	0.340	1.50	SAND	0.5	1.70	327.0	1.00	327.0	non-LIQ	0.986	0.26	0.260	Above Water	0.13	15552	831.4	0.02	0.00	0.000	NA	NA	0.000
6.07	114.2	115.0	115.0	213.0	2.6	1.2	4	36	63	0.00	1.00	63	0.349	0.349	0.349	0.349	1.60	SAND	0.5	1.70	342.2	1.00	342.2	non-LIQ	0.986	0.26	0.260	Above Water	0.13	15305	861.3	0.02	0.00	0.000	NA	NA	0.000
6.23	114.1	115.0	115.0	262.9	3.6	1.4	4	45	77	0.00	1.00	77	0.358	0.358	0.358	0.358	1.60	SAND	0.5	1.70	422.4	1.00	422.4	non-LIQ	0.985	0.26	0.260	Above Water	0.13	15068	931.4	0.01	0.00	0.000	NA	NA	0.000
6.40	113.9	115.0	115.0	363.0	4.8	1.3	3	60	102	0.00	1.00	102	0.368	0.368	0.368	0.368	1.52	SAND	0.5	1.70	581.7	1.00	581.7	non-LIQ	0.985	0.26	0.260	Above Water	0.13	14826	1037.3	0.01	0.00	0.000	NA	NA	0.000
6.56	113.7	115.0	115.0	440.6	5.9	1.3	3	72	121	0.00	1.00	121	0.377	0.377	0.377	0.377	1.49	SAND	0.5	1.67	697.4	1.00	697.4	non-LIQ	0.985	0.26	0.260	Above Water	0.13	14608	1112.1	0.01	0.00	0.000	NA	NA	0.000
6.73	113.6	115.0	115.0	498.7	7.0	1.4	3	82	135	0.00	1.00	135	0.387	0.387	0.387	0.387	1.48	SAND	0.5	1.65	779.4	1.00	779.4	non-LIQ	0.984	0.26	0.260	Above Water	0.13	14386	1168.8	0.01	0.00	0.000	NA	NA	0.000
6.89	113.4	115.0	115.0	533.0	7.4	1.4	2	87	142	0.00	1.00	142	0.396	0.396	0.396	0.396	1.47	SAND	0.5	1.63	823.2	1.00	823.2	non-LIQ	0.984	0.26	0.260	Above Water	0.13	14184	1202.6	0.01	0.00	0.000	NA	NA	0.000
7.05	113.3	115.0	115.0	541.1	7.2	1.3	2	88	142	0.00	1.00	142	0.405	0.405	0.405	0.405	1.45	SAND	0.5	1.62	826.2	1.00	826.2	non-LIQ	0.984	0.26	0.260	Above Water	0.13	13990	1215.7	0.01	0.00	0.000	NA	NA	0.000
7.22	113.1	115.0	115.0	528.6	7.3	1.4	2	87	138	0.00	1.00	138	0.415	0.415	0.415	0.415	1.47	SAND	0.5	1.60	797.6	1.00	797.6	non-LIQ	0.983	0.26	0.260	Above Water	0.13	13792	1218.6	0.01	0.00	0.000	NA	NA	0.000
7.38	112.9	115.0	115.0	514.4	8.6	1.7	4	86	137	0.00	1.00	137	0.424	0.424	0.424	0.424	1.56	SAND	0.5	1.58	767.7	1.00	767.7	non-LIQ	0.983	0.26	0.260	Above Water	0.14	13611	1227.4	0.01	0.00	0.000	NA	NA	0.000
7.55	112.8	115.0	115.0	527.9	10.0	1.9	4	90	141	0.00	1.00	141	0.434	0.434	0.434	0.434	1.61	SAND	0.5	1.56	778.9	1.00	778.9	non-LIQ	0.982	0.26	0.260	Above Water	0.14	13427	1254.1	0.01	0.00	0.000	NA	NA	0.000
7.71	112.6	115.0	115.0	589.1	9.4	1.6	3	98	151	0.00	1.00	151	0.443	0.443	0.443	0.443	1.52	SAND	0.5	1.54	860.1	1.00	860.1	non-LIQ	0.982	0.26	0.260	Above Water	0.14	13259	1297.8	0.01	0.00	0.000	NA	NA	0.000
7.87	112.4	115.0	115.0	650.1	5.8	0.9	0	100	153	0.00	1.00	153	0.453	0.453	0.453	0.453	1.27	SAND	0.5	1.53	939.5	1.00	939.5	non-LIQ	0.982	0.26	0.260	Above Water	0.14	13096	1315.8	0.01	0.00	0.000	NA	NA	0.000
8.04	112.3	115.0	115.0	669.0	9.1	1.4	2	108	164	0.00	1.00	164	0.462	0.462	0.462	0.462	1.44	SAND	0.5	1.51	956.5	1.00	956.5	non-LIQ	0.981	0.26	0.260	Above Water	0.14	12929	1361.2	0.01	0.00	0.000	NA	NA	0.000
8.20	112.1	115.0	115.0	649.6	10.1	1.6	3	107	161	0.00	1.00	161	0.472	0.472	0.472	0.472	1.50	SAND	0.5	1.50	919.7	1.00	919.7	non-LIQ	0.981	0.26	0.260	Above Water	0.14	12776	1365.5	0.01	0.00	0.000	NA	NA	0.000
8.37	111.9	115.0	115.0	574.1	7.6	1.3	2	93	138	0.00	1.00	138	0.481	0.481	0.481	0.481	1.46	SAND	0.5	1.48	804.5	1.00	804.5	non-LIQ	0.980	0.26	0.260	Above Water	0.14	12621	1313.2	0.01	0.00	0.000	NA	NA	0.000
8.53	111.8	115.0	115.0	504.1	6.5	1.3	2	82	121	0.00	1.00	121	0.490	0.490	0.490	0.490	1.47	SAND	0.5	1.47	699.8	1.00	699.8	non-LIQ	0.980	0.26	0.260	Above Water	0.14	12479	1267.4	0.01	0.00	0.000	NA	NA	0.000

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ_v' (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ_v' (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_Q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
8.69	111.6	115.0	115.0	435.5	5.2	1.2	2	71	104	0.00	1.00	104	0.500	0.500	0.500	0.500	1.47	SAND	0.5	1.46	598.9	1.00	598.9	non-LIQ	0.980	0.26	0.260	Above Water	0.14	12340	1214.7	0.01	0.00	0.000	NA	NA	0.000
8.86	111.4	115.0	115.0	396.6	4.6	1.2	3	65	94	0.00	1.00	94	0.509	0.509	0.509	0.509	1.48	SAND	0.5	1.44	540.2	1.00	540.2	non-LIQ	0.979	0.26	0.260	Above Water	0.14	12198	1186.4	0.02	0.00	0.000	NA	NA	0.000
9.02	111.3	115.0	115.0	409.3	3.7	0.9	1	65	93	0.00	1.00	93	0.519	0.519	0.519	0.519	1.38	SAND	0.5	1.43	552.5	1.00	552.5	non-LIQ	0.979	0.26	0.260	Above Water	0.14	12067	1193.7	0.02	0.00	0.000	NA	NA	0.000
9.19	111.1	115.0	115.0	417.9	4.0	1.0	2	67	95	0.00	1.00	95	0.528	0.528	0.528	0.528	1.40	SAND	0.5	1.42	558.9	1.00	558.9	non-LIQ	0.979	0.26	0.260	Above Water	0.14	11933	1211.8	0.02	0.00	0.000	NA	NA	0.000
9.35	111.0	115.0	115.0	420.5	4.0	1.0	2	67	94	0.00	1.00	94	0.538	0.538	0.538	0.538	1.40	SAND	0.5	1.40	557.5	1.00	557.5	non-LIQ	0.978	0.26	0.260	Above Water	0.14	11810	1221.1	0.02	0.00	0.000	NA	NA	0.000
9.51	110.8	115.0	115.0	419.1	3.6	0.9	1	66	92	0.00	1.00	92	0.547	0.547	0.547	0.547	1.37	SAND	0.5	1.39	551.0	1.00	551.0	non-LIQ	0.978	0.26	0.260	Above Water	0.14	11690	1222.3	0.02	0.00	0.000	NA	NA	0.000
9.68	110.6	115.0	115.0	414.4	3.3	0.8	1	65	90	0.00	1.00	90	0.557	0.557	0.557	0.557	1.34	SAND	0.5	1.38	540.0	1.00	540.0	non-LIQ	0.977	0.26	0.260	Above Water	0.14	11567	1222.0	0.02	0.00	0.000	NA	NA	0.000
9.84	110.5	115.0	115.0	398.1	3.7	0.9	2	64	87	0.00	1.00	87	0.566	0.566	0.566	0.566	1.41	SAND	0.5	1.37	514.5	1.00	514.5	non-LIQ	0.977	0.26	0.260	Above Water	0.14	11453	1220.9	0.02	0.00	0.000	NA	NA	0.000
10.01	110.3	115.0	115.0	405.1	3.6	0.9	1	65	88	0.00	1.00	88	0.576	0.576	0.576	0.576	1.39	SAND	0.5	1.36	519.1	1.00	519.1	non-LIQ	0.977	0.26	0.260	Above Water	0.14	11336	1232.7	0.02	0.00	0.000	NA	NA	0.000
10.17	110.1	115.0	115.0	385.9	3.2	0.8	1	61	82	0.00	1.00	82	0.585	0.585	0.585	0.585	1.38	SAND	0.5	1.35	490.6	1.00	490.6	non-LIQ	0.976	0.26	0.260	Above Water	0.14	11229	1217.9	0.02	0.00	0.000	NA	NA	0.000
10.34	110.0	115.0	115.0	357.0	2.9	0.8	1	57	76	0.00	1.00	76	0.595	0.595	0.595	0.595	1.40	SAND	0.5	1.33	450.1	1.00	450.1	non-LIQ	0.976	0.26	0.260	Above Water	0.14	11118	1195.0	0.02	0.00	0.000	NA	NA	0.000
10.50	109.8	115.0	115.0	331.8	2.9	0.9	2	54	71	0.00	1.00	71	0.604	0.604	0.604	0.604	1.44	SAND	0.5	1.32	415.1	1.00	415.1	non-LIQ	0.976	0.26	0.260	Above Water	0.14	11016	1177.9	0.02	0.00	0.000	NA	NA	0.000
10.66	109.6	115.0	115.0	303.5	6.0	2.0	7	55	72	0.17	1.01	73	0.613	0.613	0.613	0.613	1.76	SAND	0.5	1.31	376.9	1.08	406.7	non-LIQ	0.975	0.26	0.260	Above Water	0.14	10916	1190.8	0.02	0.00	0.000	NA	NA	0.000
10.83	109.5	115.0	115.0	294.4	7.7	2.6	10	55	72	0.80	1.02	74	0.623	0.623	0.623	0.623	1.87	SAND	0.5	1.30	362.7	1.17	422.9	non-LIQ	0.975	0.26	0.260	Above Water	0.14	10813	1201.3	0.02	0.00	0.000	NA	NA	0.000
10.99	109.3	115.0	115.0	292.2	5.5	1.9	7	53	68	0.15	1.01	69	0.632	0.632	0.632	0.632	1.75	SAND	0.5	1.29	357.3	1.07	384.1	non-LIQ	0.974	0.26	0.260	Above Water	0.14	10719	1187.0	0.02	0.00	0.000	NA	NA	0.000
11.16	109.1	115.0	115.0	296.8	3.8	1.3	5	51	65	0.00	1.00	65	0.642	0.642	0.642	0.642	1.61	SAND	0.5	1.28	360.2	1.00	360.2	non-LIQ	0.974	0.26	0.260	Above Water	0.14	10620	1180.0	0.02	0.00	0.000	NA	NA	0.000
11.32	109.0	115.0	115.0	292.7	3.6	1.2	4	50	64	0.00	1.00	64	0.651	0.651	0.651	0.651	1.60	SAND	0.5	1.27	352.7	1.00	352.7	non-LIQ	0.974	0.26	0.260	Above Water	0.14	10530	1178.9	0.02	0.00	0.000	NA	NA	0.000
11.48	108.8	115.0	115.0	204.2	3.9	1.9	9	38	48	0.64	1.02	50	0.660	0.660	0.660	0.660	1.85	SAND	0.5	1.27	244.3	1.15	280.2	non-LIQ	0.973	0.26	0.260	Above Water	0.14	10442	1081.3	0.02	0.01	0.000	NA	NA	0.000
11.65	108.7	115.0	115.0	162.2	4.1	2.5	13	32	40	1.98	1.04	44	0.670	0.670	0.670	0.670	2.01	SAND	0.5	1.26	192.7	1.32	253.5	non-LIQ	0.973	0.26	0.260	Above Water	0.14	10350	1026.6	0.03	0.01	0.000	NA	NA	0.000
11.81	108.5	115.0	115.0	143.2	3.4	2.4	14	28	36	2.09	1.04	39	0.679	0.679	0.679	0.679	2.03	SAND	0.5	1.25	168.9	1.33	225.4	non-LIQ	0.972	0.26	0.260	Above Water	0.14	10266	991.0	0.03	0.01	0.001	NA	NA	0.000
11.98	108.3	115.0	115.0	106.5	3.6	3.4	20	23	28	3.61	1.08	34	0.689	0.689	0.689	0.689	2.23	SAND	0.5	1.24	124.7	1.74	216.8	non-LIQ	0.972	0.26	0.260	Above Water	0.14	10178	927.2	0.03	0.02	0.001	NA	NA	0.000
12.14	108.2	115.0	115.0	99.9	2.9	2.9	19	21	26	3.41	1.07	31	0.698	0.698	0.698	0.698	2.20	SAND	0.5	1.23	116.2	1.66	192.7	non-LIQ	0.972	0.26	0.260	Above Water	0.14	10097	907.6	0.04	0.03	0.001	NA	NA	0.000
12.30	108.0	115.0	115.0	64.3	3.3	5.1	31	16	19	4.79	1.16	27	0.707	0.707	0.707	0.707	2.51	SAND	0.5	1.22	74.3	2.84	210.8	non-LIQ	0.971	0.26	0.260	Above Water	0.14	10018	825.0	0.05	0.05	0.002	NA	NA	0.000
12.47	107.8	115.0	115.0	88.3	2.9	3.3	22	19	24	3.68	1.09	30	0.717	0.717	0.717	0.717	2.28	SAND	0.5	1.21	101.4	1.87	190.1	non-LIQ	0.971	0.26	0.260	Above Water	0.14	9936	888.8	0.04	0.03	0.001	NA	NA	0.000
12.63	107.7	115.0	115.0	105.4	3.7	3.5	21	23	28	3.74	1.08	34	0.726	0.726	0.726	0.726	2.25	SAND	0.5	1.21	120.2	1.80	216.6	non-LIQ	0.971	0.26	0.260	Above Water	0.14	9860	943.5	0.04	0.02	0.001	NA	NA	0.000
12.80	107.5	115.0	115.0	84.5	3.3	3.9	24	19	23	4.23	1.11	30	0.736	0.736	0.736	0.736	2.35	SAND	0.5	1.20	95.8	2.12	203.1	non-LIQ	0.970	0.26	0.260	Above Water	0.14	9782	893.1	0.04	0.03	0.001	NA	NA	0.000
12.96	107.3	115.0	115.0	77.6	2.7	3.5	24	18	21	4.17	1.11	27	0.745	0.745	0.745	0.745	2.34	SAND	0.5	1.19	87.4	2.08	181.5	non-LIQ	0.970	0.26	0.260	Above Water	0.14	9709	870.1	0.04	0.04	0.002	NA	NA	0.000
13.12	107.2	115.0	115.0	70.1	2.2	3.1	24	16	19	4.17	1.11	25	0.754	0.754	0.754	0.754	2.34	SAND	0.5	1.18	78.5	2.07	162.6	non-LIQ	0.969	0.26	0.260	Above Water	0.14	9638	844.4	0.05	0.05	0.002	NA	NA	0.000
13.29	107.0	115.0	115.0	116.5	1.5	1.3	10	22	26	1.04	1.02	28	0.764	0.764	0.764	0.764	1.90	SAND	0.5	1.18	129.6	1.19	154.6	0.42	0.969	0.26	0.260	Above Water	0.14	9564	947.7	0.04	0.03	0.001	NA	NA	0.000
13.45	106.9	115.0	115.0	139.4	1.3	0.9	7	25	29	0.14	1.01	30	0.773	0.773	0.773	0.773	1.75	SAND	0.5	1.17	154.1	1.07	165.4	non-LIQ	0.969	0.26	0.260	Above Water	0.14	9495	991.8	0.04	0.02	0.001	NA	NA	0.000
13.62	106.7	115.0	115.0	123.3	1.3	1.1	9	23	26	0.49	1.02	27	0.783	0.783	0.783	0.783	1.83	SAND	0.5	1.16	135.4	1.13	153.0	0.41	0.968	0.26	0.260	Above Water	0.14	9424	964.9	0.04	0.03	0.001	NA	NA	0.000
13.78	106.5	115.0	115.0	118.6	1.0	0.8	8	22	25	0.24	1.01	25	0.792	0.792	0.792	0.792	1.76	SAND	0.5	1.16	129.5	1.09	141.6	0.34	0.968	0.26	0.260	Above Water	0.14	9358	950.6	0.04	0.03	0.001	NA	NA	0.000
13.94	106.4	115.0	115.0	112.2	1.3	1.2	10	21	24	0.94	1.02	26	0.802	0.802	0.802	0.802	1.89	SAND	0.5	1.15	121.8	1.18	144.0	0.36	0.967	0.26	0.260	Above Water	0.14	9293	949.5	0.04	0.03	0.001	NA	NA	0.000
14.11	106.2	115.0	115.0	104.9	1.2	1.1	11	20	23	1.10	1.02	24	0.811	0.811	0.811	0.811	1.91	SAND	0.5	1.14	113.2	1.20	136.0	0.31	0.967	0.26	0.260	Above Water	0.15	9226	934.5	0.04	0.04	0.001	NA	NA	0.000
14.27	106.0	115.0	115.0	116.4	2.0	1.7	13	23	26	1.92	1.04	29	0.821	0.821	0.821	0.821	2.01	SAND	0.5	1.14	124.9	1.31	163.3	non-LIQ	0.967	0.26	0.260	Above Water	0.15	9164	982.5	0.04	0.03	0.001	NA	NA	0.000
14.44	105.9	115.0	115.0	117.2	2.9	2.5	17	24	27	2.89	1.06	32	0.830	0.830	0.830	0.830	2.12	SAND	0.5	1.13	125.0	1.50	187.3	non-LIQ	0.966	0.26	0.260	Above Water	0.15	9099	1004.1	0.04	0.03	0.001	NA	NA	0.000
14.60	105.7	115.0	115.0	81.8	3.2	3.9	26	19	21	4.35	1.12	28	0.839	0.839	0.839	0.839	2.38	SAND	0.5	1.12	86.8	2.23	193.5	non-LIQ	0.966	0.26	0.260	Above Water	0.15	9039	927.1	0.05	0.04	0.002	NA	NA	0.000
14.76	105.5	115.0	115.0	68.9	2.9	4.2	29	16	18	4.61	1.14	26	0.849	0.849	0.849	0.849	2.45	SAND	0.5	1.12	72.7	2.55	185.4	non-LIQ	0.966	0.26	0.260	Above Water	0.15	8980	888.9	0.05	0.06	0.002	NA	NA	0.000
14.93	105.4	115.0	115.0	65.1	2.7	4.1	29	16	17	4.66	1.15	25	0.858	0.858	0.858	0.858	2.47	SAND	0.5	1.11	68.3	2.61	178.5	non-LIQ	0.965	0.26	0.260	Above Water	0.15	8919	877.5	0.05	0.06	0.003	NA	NA	0.000
15.09	105.2	115.0	115.0	65.0	3.0	4.6	31	16	18	4.76	1.16	25	0.868	0.868	0.868	0.868	2.51	SAND	0.5	1.10	67.8	2.80	189.6	non-LIQ	0.965	0.26	0.260	Above Water	0.15	8862	885.3	0.05	0.06	0.002	NA	NA	0.000
15.26	105.0	115.0	115.0	72.2	3.6	5.0	31	18	19	4.76	1.16	27	0.877	0.877	0.877	0.877	2.50	SAND	0.5	1.10	74.9	2.78	208.2	non-LIQ	0.964	0.26	0.260	Above Water	0.15	8802	919.8	0.05	0.05	0.002	NA	NA	0.000
15.42	104.9	115.0	115.0	80.0	3.9	4.9	29	19	21	4.65	1.15	29	0.887	0.887	0.887	0.887	2.47	SAND	0.5	1.09	82.6	2.61	215.3	non-LIQ	0.964	0.26	0.260	Above Water	0.15	8747	949.8	0.05	0.04	0.002	NA	NA	0.000
15.58	104.7	115.0	115.0	68.4	3.8	5.6	33	17	19	4.90	1.18	27	0.896	0.896	0.896	0.896	2.56	SAND	0.5	1.09	70.3	3.07	215.8	non-LIQ	0.964	0.26	0.260	Above Water	0.15	8693	917.7	0.05	0.06	0.002	NA	NA	0.000
15.75	104.6	115.0	115.0	72.8	4.0	5.5	32	18	20	4.85	1.17	28	0.906	0.906	0.906	0.906	2.54	SAND	0.5	1.08	74.4	2.96	220.3	non-LIQ	0.963	0.26	0.260	Above Water	0.15	8637	937.3	0.05	0.05	0.002	NA	NA	0.000
15.91	104.4	115.0	115.0	76.6	3.8	5.0	30	19	20	4.72	1.16	28	0.915	0.915	0.915	0.915	2.49	SAND	0.5	1.08	77.9	2.72	211.5	non-LIQ	0.963	0.26	0.260	Above Water	0.15	8585	949.4	0.05	0.05	0.002	NA	NA	0.000
16.08	104.2	115.0	115.0	63.6	3.6	5.7	35	16	17	4.97	1.20	26	0.925	0.925	0.925	0.925	2.59	SAND	0.5	1.07	64.3	3.26	209.4	non-LIQ	0.963	0.26	0.260	Above Water	0.15	8530	909.9	0.06	0.07	0.003	NA	NA	0.000
16.24	104.1	115.0	115.0	59.1	3.3	5.6	35	15	16	5.00	1.20	24	0.934	0.934	0.934	0.934	2.60	SILT	0.7	1.09	61.0	3.32	202.7	non-LIQ	0.962	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.40	103.9	115.0	115.0	65.9	3.4	5.2	33	16	17	4.88	1.18	25	0.943	0.943	0.943	0.943	2.55	SAND	0.5	1.06	66.0	3.04	200.3	non-LIQ	0.962	0.26	0.260	Above Water	0.15	8430	921.0	0.06	0.07	0.003	NA	NA	0.000
16.57	103.7	115.0	115.0	68.2	3.6	5.3	33	17	18	4.86	1.18	26	0.953	0.953	0.953	0.953	2.55	SAND	0.5	1.05	67.9	3.03	205.9	non-LIQ	0.961	0.25	0.250	Above Water	0.15	8378	934.7	0.05	0.06	0.002	NA	NA	0.000
16.73	103.6	115.0	115.0	73.2	3.6	4.9	31	18	19	4.77	1.16	27	0.962	0.962	0.962	0.962	2.51	SAND	0.5	1.05	72.6	2.80	203.5	non-LIQ	0.961	0.25	0.250	Above Water	0.15	8330	953.6	0.05	0.05	0.002	NA	NA	0.000
16.90	103.4	115.0	115.0	72.6	3.6	5.0	31	18	19	4.79	1.17	26	0.972	0.972	0.972	0.972	2.51	SAND	0.5	1.04	71.6	2.84	203.2	non-LIQ	0.961	0.25	0.250	Above Water	0.15	8279	955.2	0.05	0.05	0.002	NA	NA	0.000
17.06	103.2	115.0	115.0	73.1	4.0	5.5	33	18	19	4.87	1.18	27	0.981	0.981	0.981	0.961	2.55	SAND	0.5	1.04	71.8	3.01	216.1	non-LIQ	0.960	0.25	0.250	Above Water	0.15	8233	965.4	0.05	0.05	0.002	NA	NA	0.000
17.23	103.1	115.0	115.0	77.4	3.8	4.9	30	19	19	4.74	1.16	27	0.991	0.991	0.991	0.991	2.49	SAND	0.5	1.03	75.6	2.74	207.3	non-LIQ	0.960	0.25	0.250	Above Water	0.15	8184	979.1	0.05	0.05	0.002	NA	NA	0.000
17.39	102.9	115.0	115.0	85.0	4.6	5.4	31	21	21	4.76	1.16	30	1.000	1.000	1.000	1.000	2.50	SAND	0.5	1.03	82.6	2.78	229.9	non-LIQ	0.959	0.25	0.250	Above Water	0.15	8139	1014.5	0.05	0.04	0.002	NA	NA	0.000
17.55	102.8	115.0	115.0	96.4	4.9	5.1	28	23	23	4.59	1.14	31	1.009	1.009	1.009	1.009	2.45	SAND	0.5	1.02	93.3	2.52	234.9	non-LIQ	0.959	0.25	0.250	Above Water	0.15	8094	1052.2	0.04	0.04	0.001	NA	NA	0.000
17.72	102.6	115.0	115.0	88.1	4.5	5.1	30	21	22	4.68	1.15	30	1.019	1.019	1.019	1.019	2.48	SAND	0.5	1.02	84.8	2.65	224.7	non-LIQ	0.959	0.25	0.250	Above Water	0.15	8047	1028.8	0.05	0.04	0.002	NA	NA	0.000
17.88	102.4	115.0	115.0	63.2	4.0	4.8	29	20	20	4.67	1.15	28	1.028	1.028	1.028	1.028	2.47	SAND	0.5	1.01	79.8	2.63	210.1	non-LIQ	0.958	0.25	0.250	Above Water	0.15	8004	1011.9	0.05	0.05	0.002	NA	NA	0.000
18.05	102.3	115.0	115.0	72.8	5.1	7.0	37	19	19	5.00	1.20	28	1.038	1.038	1.038	1.038	2.64	non-LIQ CLAY	1	1.02	NA	3.56	non-LIQ	non-LIQ	0.958	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
18.21	102.1	115.0	115.0	87.0	3.7	4.3	27	20	21	4.50	1.13	28	1.047	1.047	1.047	1.047	2.42	SAND	0.5	1.01	82.7	2.40	198.6	non-LIQ	0.958	0.25	0.250	Above Water	0.15	7917	1025.2	0.05	0.05	0.002	NA	NA	0.000
18.37	101.9	115.0	115.0	129.4	2.9	2.2	16	26	26	2.70	1.05	31	1.056	1.056	1.056	1.056	2.10	SAND	0.5	1.00	122.4	1.45	177.4	non-LIQ	0.957	0.25	0.250	Above Water	0.15	7875	1120.6	0.04	0.03	0.001	NA	NA	0.000
18.54	101.8	115.0	115.0	110.1	2.7	2.5	18	23	23	3.27	1.07	28	1.066	1.066	1.066	1.066	2.18	SAND	0.5	1.00	103.7	1.61	166.7	non-LIQ	0.957	0.25	0.250	Above Water	0.15	7832	1076.5	0.04	0.04	0.002	NA	NA	0.000
18.70	101.6	115.0	115.0	86.8	3.4	3.9	26	20	20	4.42	1.13	27	1.075	1.075	1.075	1.075	2.40	SAND	0.5	0.99	81.4	2.31	187.9	non-LIQ	0.956	0.25	0.250	Above Water	0.15	7792	1030.0	0.05	0.05	0.002	NA	NA	0.000
18.87	101.4	115.0	115.0	73.4	3.5	4.6	31	18	18	4.79	1.17	25	1.085	1.085	1.085	1.085	2.51	SAND	0.5	0.99	68.5	2.84	194.6	non-LIQ	0.956	0.25	0.250	Above Water	0.15	7749	994.6	0.05	0.06	0.003	NA	NA	0.000
19.03	101.3	115.0	115.0	80.7	3.8	4.7	30	20	19	4.70	1.15	27	1.094	1.094	1.094	1.094	2.48	SAND	0.5	0.98	75.0	2.69	201.5	non-LIQ	0.956	0.25	0.250	Above Water	0.15	7710	1024.5	0.05	0.05	0.002	NA	NA	0.000
19.19	101.1	115.0	115.0	87.1	3.6	4.1	27	20	20	4.50	1.13	27	1.103	1.103	1.103	1.103	2.42	SAND	0.5	0.98	80.6	2.39	193.0	non-LIQ	0.955	0.25	0.250	Above Water	0.15	7672	1043.4	0.05	0.05	0.002	NA	NA	0.000
19.36	100.9	115.0	115.0	75.9	3.1	4.1	29	18	18	4.62	1.14	25	1.113	1.113	1.113	1.113	2.46	SAND	0.5	0.97	69.9	2.56	179.2	non-LIQ	0.955	0.25	0.250	Above Water	0.15	7631	1005.4	0.05	0.06	0.003	NA	NA	0.000
19.52	100.8	115.0	115.0	65.6	2.6	4.0	30	16	15	4.73	1.16	23	1.122	1.122	1.122	1.122	2.49	SAND	0.5	0.97	60.2	2.73	164.6	non-LIQ	0.954	0.25	0.250	Above Water	0.15	7594	965.7	0.06	0.08	0.003	NA	NA	0.000
19.69	100.6	115.0	115.0	54.4	2.4	4.4	35	14	13	4.96	1.19	21	1.132	1.132	1.132	1.132	2.59	SAND	0.5	0.97	49.7	3.24	161.2	non-LIQ	0.954	0.25	0.250	Above Water	0.15	7554	923.7	0.07	0.11	0.005	NA	NA	0.000
19.85	100.5	115.0	115.0	47.0	2.0	4.3	37	12	12	5.00	1.20	19	1.141	1.141	1.141	1.141	2.63	non-LIQ CLAY	1	0.93	NA	3.54	non-LIQ	non-LIQ	0.954	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.01	100.3	115.0	115.0	42.6	1.9	4.5	40	11	11	5.00	1.20	18	1.151	1.151	1.151	1.151	2.68	non-LIQ CLAY	1	0.92	NA	3.68	non-LIQ	non-LIQ	0.953	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.18	100.1	115.0	115.0	38.2	1.8	4.7	43	10	10	5.00	1.20	17	1.160	1.160	1.160	1.160	2.74	non-LIQ CLAY	1	0.91	NA	4.29	non-LIQ	non-LIQ	0.953	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.34	100.0	115.0	115.0	33.7	1.5	4.5	44	9	9	5.00	1.20	16	1.170	1.170	1.170	1.170	2.77	non-LIQ CLAY	1	0.90	NA	4.50	non-LIQ	non-LIQ	0.953	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.51	99.8	115.0	115.0	28.5	1.3	4.6	48	8	8	5.00	1.20	14	1.179	1.179	1.179	1.179	2.83	non-LIQ CLAY	1	0.90	NA	5.08	non-LIQ	non-LIQ	0.952	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.67	99.6	115.0	115.0	30.3	1.3	4.3	46	9	8	5.00	1.20	15	1.189	1.189	1.189	1.189	2.80	non-LIQ CLAY	1	0.89	NA	4.76	non-LIQ	non-LIQ	0.952	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.83	99.5	115.0	115.0	34.1	1.3	3.8	42	9	9	5.00	1.20	15	1.198	1.198	1.198	1.198	2.73	non-LIQ CLAY	1	0.88	NA	4.18	non-LIQ	non-LIQ	0.951	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.00	99.3	115.0	115.0	33.7	1.3	3.9	42	9	9	5.00	1.20	15	1.208	1.208	1.208	1.208	2.74	non-LIQ CLAY	1	0.88	NA	4.26	non-LIQ	non-LIQ	0.951	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.16	99.1	115.0	115.0	33.3	1.3	3.9	43	9	9	5.00	1.20	15	1.217	1.217	1.217	1.217	2.75	non-LIQ CLAY	1	0.87	NA	4.34	non-LIQ	non-LIQ	0.951	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.33	99.0	115.0	115.0	31.9	1.2	3.8	43	9	8	5.00	1.20	15	1.226	1.226	1.226	1.226	2.75	non-LIQ CLAY	1	0.86	NA	4.40	non-LIQ	non-LIQ	0.950	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.49	98.8	115.0	115.0	31.4	1.3	4.1	45	9	8	5.00	1.20	15	1.236	1.236	1.236	1.236	2.79	non-LIQ CLAY	1	0.86	NA	4.69	non-LIQ	non-LIQ	0.950	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.65	98.7	115.0	115.0	29.6	1.4	4.7	49	9	8	5.00	1.20	15	1.245	1.245	1.245	1.245	2.85	non-LIQ CLAY	1	0.85	NA	5.23	non-LIQ	non-LIQ	0.950	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.82	98.5	115.0	115.0	28.4	1.6	5.6	53	9	8	5.00	1.20	15	1.255	1.255	1.255	1.255	2.92	non-LIQ CLAY	1	0.84	NA	5.88	non-LIQ	non-LIQ	0.949	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.98	98.3	115.0	115.0	35.1	1.8	5.1	47	10	9	5.00	1.20	16	1.264	1.264	1.264	1.264	2.82	non-LIQ CLAY	1	0.84	NA	4.96	non-LIQ	non-LIQ	0.949	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.15	98.2	115.0	115.0	44.6	1.9	4.3	40	12	11	5.00	1.20	18	1.274	1.274	1.274	1.274	2.69	non-LIQ CLAY	1	0.83	NA	3.91	non-LIQ	non-LIQ	0.948	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.31	98.0	115.0	115.0	43.2	2.0	4.6	42	12	11	5.00	1.20	18	1.283	1.283	1.283	1.283	2.73	non-LIQ CLAY	1	0.82	NA	4.19	non-LIQ	non-LIQ	0.948	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.47	97.8	115.0	115.0	38.9	1.8	4.6	44	11	10	5.00	1.20	17	1.292	1.292	1.292	1.292	2.76	non-LIQ CLAY	1	0.82	NA	4.48	non-LIQ	non-LIQ	0.948	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.64	97.7	115.0	115.0	43.6	1.9	4.4	41	12	11	5.00	1.20	18	1.302	1.302	1.302	1.302	2.71	non-LIQ CLAY	1	0.81	NA	4.06	non-LIQ	non-LIQ	0.947	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ_v' (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ_v' (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_q	q_{c1N}	Fines Correction Kc	Fines Correction $(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
22.80	97.5	115.0	115.0	42.7	2.0	4.7	43	12	11	5.00	1.20	16	1.311	1.311	1.311	1.311	2.74	non-LIQ CLAY	1	0.81	NA	4.30	non-LIQ	non-LIQ	0.947	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.97	97.3	115.0	115.0	41.8	2.0	4.8	44	12	10	5.00	1.20	17	1.321	1.321	1.321	1.321	2.76	non-LIQ CLAY	1	0.80	NA	4.42	non-LIQ	non-LIQ	0.946	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.13	97.2	115.0	115.0	44.3	1.8	4.1	40	12	11	5.00	1.20	16	1.330	1.330	1.330	1.330	2.69	non-LIQ CLAY	1	0.80	NA	3.93	non-LIQ	non-LIQ	0.946	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.30	97.0	115.0	115.0	37.9	1.7	4.5	45	11	9	5.00	1.20	16	1.340	1.340	1.340	1.340	2.77	non-LIQ CLAY	1	0.79	NA	4.57	non-LIQ	non-LIQ	0.946	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.46	96.8	115.0	115.0	32.6	1.7	5.2	50	10	9	5.00	1.20	15	1.349	1.349	1.349	1.349	2.87	non-LIQ CLAY	1	0.78	NA	5.44	non-LIQ	non-LIQ	0.945	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.62	96.7	115.0	115.0	33.0	1.7	5.2	50	10	9	5.00	1.20	15	1.358	1.358	1.358	1.358	2.87	non-LIQ CLAY	1	0.78	NA	5.39	non-LIQ	non-LIQ	0.945	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.79	96.5	115.0	115.0	41.9	1.8	4.3	42	11	10	5.00	1.20	17	1.368	1.368	1.368	1.368	2.74	non-LIQ CLAY	1	0.77	NA	4.26	non-LIQ	non-LIQ	0.945	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.95	96.4	115.0	115.0	41.1	1.8	4.4	43	11	10	5.00	1.20	17	1.377	1.377	1.377	1.377	2.75	non-LIQ CLAY	1	0.77	NA	4.37	non-LIQ	non-LIQ	0.944	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.12	96.2	115.0	115.0	39.2	1.8	4.6	45	11	10	5.00	1.20	17	1.387	1.387	1.387	1.387	2.78	non-LIQ CLAY	1	0.76	NA	4.63	non-LIQ	non-LIQ	0.944	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.28	96.0	115.0	115.0	37.3	2.0	5.4	49	11	9	5.00	1.20	16	1.396	1.396	1.396	1.396	2.85	non-LIQ CLAY	1	0.76	NA	5.20	non-LIQ	non-LIQ	0.943	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.44	95.9	115.0	115.0	47.5	1.9	4.0	39	13	11	5.00	1.20	18	1.405	1.405	1.405	1.405	2.68	non-LIQ CLAY	1	0.75	NA	3.86	non-LIQ	non-LIQ	0.943	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.61	95.7	115.0	115.0	41.6	2.0	4.8	45	12	10	5.00	1.20	17	1.415	1.415	1.415	1.415	2.76	non-LIQ CLAY	1	0.75	NA	4.64	non-LIQ	non-LIQ	0.943	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.77	95.5	115.0	115.0	36.6	1.8	4.9	48	11	9	5.00	1.20	16	1.424	1.424	1.424	1.424	2.83	non-LIQ CLAY	1	0.74	NA	5.09	non-LIQ	non-LIQ	0.942	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.94	95.4	115.0	115.0	33.2	1.7	5.1	51	10	8	5.00	1.20	15	1.434	1.434	1.434	1.434	2.88	non-LIQ CLAY	1	0.74	NA	5.53	non-LIQ	non-LIQ	0.942	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.10	95.2	115.0	115.0	30.3	1.7	5.6	55	9	8	5.00	1.20	15	1.443	1.443	1.443	1.443	2.94	non-LIQ CLAY	1	0.73	NA	6.14	non-LIQ	non-LIQ	0.941	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.26	95.0	115.0	115.0	37.8	1.7	4.5	46	11	9	5.00	1.20	16	1.452	1.452	1.452	1.452	2.80	non-LIQ CLAY	1	0.73	NA	4.82	non-LIQ	non-LIQ	0.941	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.43	94.9	115.0	115.0	37.7	1.7	4.5	46	11	9	5.00	1.20	16	1.462	1.462	1.462	1.462	2.81	non-LIQ CLAY	1	0.72	NA	4.85	non-LIQ	non-LIQ	0.941	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.59	94.7	115.0	115.0	36.1	1.7	4.7	48	10	9	5.00	1.20	16	1.471	1.471	1.471	1.471	2.84	non-LIQ CLAY	1	0.72	NA	5.12	non-LIQ	non-LIQ	0.940	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.76	94.5	115.0	115.0	37.3	1.7	4.6	47	11	9	5.00	1.20	16	1.481	1.481	1.481	1.481	2.82	non-LIQ CLAY	1	0.71	NA	4.95	non-LIQ	non-LIQ	0.940	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.92	94.4	115.0	115.0	34.9	1.8	5.2	51	10	9	5.00	1.20	15	1.490	1.490	1.490	1.490	2.88	non-LIQ CLAY	1	0.71	NA	5.51	non-LIQ	non-LIQ	0.940	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.08	94.2	115.0	115.0	33.8	1.8	5.3	52	10	9	5.00	1.20	15	1.500	1.500	1.500	1.500	2.90	non-LIQ CLAY	1	0.71	NA	5.73	non-LIQ	non-LIQ	0.939	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.25	94.1	115.0	115.0	39.2	1.9	4.8	48	11	9	5.00	1.20	16	1.509	1.509	1.509	1.509	2.83	non-LIQ CLAY	1	0.70	NA	5.02	non-LIQ	non-LIQ	0.939	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.41	93.9	115.0	115.0	49.0	1.9	3.9	40	13	11	5.00	1.20	18	1.519	1.519	1.519	1.519	2.69	non-LIQ CLAY	1	0.70	NA	3.90	non-LIQ	non-LIQ	0.938	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.58	93.7	115.0	115.0	41.0	1.9	4.6	46	12	10	5.00	1.20	17	1.528	1.528	1.528	1.528	2.80	non-LIQ CLAY	1	0.69	NA	4.81	non-LIQ	non-LIQ	0.938	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.74	93.6	115.0	115.0	40.0	1.7	4.3	45	11	9	5.00	1.20	16	1.538	1.538	1.538	1.538	2.79	non-LIQ CLAY	1	0.69	NA	4.68	non-LIQ	non-LIQ	0.938	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.90	93.4	115.0	115.0	40.3	1.8	4.5	46	11	9	5.00	1.20	16	1.547	1.547	1.547	1.547	2.80	non-LIQ CLAY	1	0.68	NA	4.80	non-LIQ	non-LIQ	0.937	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.07	93.2	115.0	115.0	31.6	1.8	5.7	56	10	8	5.00	1.20	15	1.557	1.557	1.557	1.557	2.96	non-LIQ CLAY	1	0.68	NA	6.31	non-LIQ	non-LIQ	0.937	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.23	93.1	115.0	115.0	24.2	1.4	5.8	63	8	7	5.00	1.20	13	1.566	1.566	1.566	1.566	3.06	non-LIQ CLAY	1	0.68	NA	7.47	non-LIQ	non-LIQ	0.937	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.40	92.9	115.0	115.0	25.4	1.5	5.9	62	8	7	5.00	1.20	13	1.576	1.576	1.576	1.576	3.05	non-LIQ CLAY	1	0.67	NA	7.36	non-LIQ	non-LIQ	0.936	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.56	92.7	115.0	115.0	23.7	1.5	6.3	66	6	7	5.00	1.20	13	1.585	1.585	1.585	1.585	3.10	non-LIQ CLAY	1	0.67	NA	7.94	non-LIQ	non-LIQ	0.936	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.72	92.6	115.0	115.0	25.3	1.6	6.3	64	9	7	5.00	1.20	13	1.594	1.594	1.594	1.594	3.08	non-LIQ CLAY	1	0.66	NA	7.66	non-LIQ	non-LIQ	0.935	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.89	92.4	115.0	115.0	28.9	1.6	5.5	58	9	7	5.00	1.20	14	1.604	1.604	1.604	1.604	2.99	non-LIQ CLAY	1	0.66	NA	6.68	non-LIQ	non-LIQ	0.935	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.05	92.3	115.0	115.0	30.6	1.6	5.2	56	10	8	5.00	1.20	14	1.613	1.613	1.613	1.613	2.96	non-LIQ CLAY	1	0.66	NA	6.30	non-LIQ	non-LIQ	0.935	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.22	92.1	115.0	115.0	25.9	1.6	6.2	63	9	7	5.00	1.20	13	1.623	1.623	1.623	1.623	3.07	non-LIQ CLAY	1	0.65	NA	7.56	non-LIQ	non-LIQ	0.934	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.38	91.9	115.0	115.0	25.9	1.5	5.8	62	9	7	5.00	1.20	13	1.632	1.632	1.632	1.632	3.05	non-LIQ CLAY	1	0.65	NA	7.36	non-LIQ	non-LIQ	0.934	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.54	91.8	115.0	115.0	33.1	1.7	5.1	54	10	8	5.00	1.20	15	1.641	1.641	1.641	1.641	2.93	non-LIQ CLAY	1	0.64	NA	6.02	non-LIQ	non-LIQ	0.933	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.71	91.6	115.0	115.0	32.3	1.8	5.6	56	10	8	5.00	1.20	15	1.651	1.651	1.651	1.651	2.97	non-LIQ CLAY	1	0.64	NA	6.38	non-LIQ	non-LIQ	0.933	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.87	91.4	115.0	115.0	35.8	1.8	5.0	52	11	9	5.00	1.20	15	1.660	1.660	1.660	1.660	2.90	non-LIQ CLAY	1	0.64	NA	5.72	non-LIQ	non-LIQ	0.933	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.04	91.3	115.0	115.0	35.1	1.9	5.4	54	11	9	5.00	1.20	15	1.670	1.670	1.670	1.670	2.93	non-LIQ CLAY	1	0.63	NA	6.03	non-LIQ	non-LIQ	0.932	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.20	91.1	115.0	115.0	36.9	1.9	5.1	52	11	9	5.00	1.20	16	1.679	1.679	1.679	1.679	2.90	non-LIQ CLAY	1	0.63	NA	5.72	non-LIQ	non-LIQ	0.932	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.36	90.9	115.0	115.0	36.7	1.8	4.9	52	11	9	5.00	1.20	15	1.688	1.688	1.688	1.688	2.89	non-LIQ CLAY	1	0.63	NA	5.62	non-LIQ	non-LIQ	0.932	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.53	90.8	115.0	115.0	41.2	1.9	4.6	48	12	9	5.00	1.20	16	1.698	1.698	1.698	1.698	2.84	non-LIQ CLAY	1	0.62	NA	5.10	non-LIQ	non-LIQ	0.931	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.69	90.6	115.0	115.0	35.5	2.0	5.6	55	11	9	5.00	1.20	15	1.707	1.707	1.707	1.707	2.95	non-LIQ CLAY	1	0.62	NA	6.19	non-LIQ	non-LIQ	0.931	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.86	90.4	115.0	115.0	31.4	1.9	6.1	59	10	8	5.00	1.20	15	1.717	1.717	1.717	1.717	3.01	non-LIQ CLAY	1	0.62	NA	6.91	non-LIQ	non-LIQ	0.930	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.02	90.3	115.0	115.0	36.4	2.0	5.5	54	11	9	5.00	1.20	16	1.726	1.726	1.726	1.726	2.94	non-LIQ CLAY	1	0.61	NA	6.06	non-LIQ	non-LIQ	0.930	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.19	90.1	115.0	115.0	46.8	2.2	4.7	46	13	10	5.00	1.20	17	1.736	1.736	1.736	1.736	2.81	non-LIQ CLAY	1	0.61	NA	4.83	non-LIQ	non-LIQ	0.928	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.35	90.0	115.0	115.0	57.5	2.3	4.0	40	15	12	5.00	1.20	19	1.745	1.745	1.745	1.745	2.69	non-LIQ CLAY	1	0.61	NA	3.92	non-LIQ	non-LIQ	0.927	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.51	89.8	115.0	115.0	50.7	2.3	4.5	44	14	11	5.00	1.20	18	1.754	1.754	1.754	1.754	2.77	non-LIQ CLAY	1	0.60	NA	4.54	non-LIQ	non-LIQ	0.926	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.68	89.6	115.0	115.0	43.4	2.1	4.8	49	13	10	5.00	1.20	17	1.764	1.764	1.764	1.764	2.85	non-LIQ CLAY	1	0.60	NA	5.18	non-LIQ	non-LIQ	0.924	0.25	0.250	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.84	89.5	115.0	115.0	41.7	1.9	4.6	49	12	9	5.00	1.20	16	1.773	1.773	1.773	1.773	2.84	non-LIQ CLAY	1	0.60	NA	5.16	non-LIQ	non-LIQ	0.923	0.24	0.240	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
31.01	89.3	115.0	115.0	37.7	1.8	4.8	52	11	9	5.00	1.20	15	1.783	1.783	1.783	1.783	2.89	non-LIQ CLAY	1	0.59	NA	5.64	non-LIQ	non-LIQ	0.922	0.24	0.240	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
31.17	89.1	115.0	115.0	35.0	1.8	5.1	54.8	10.8	8.3	5.0	1.2	15.0	1.79	1.79	1.79	1.79	2.94	non-LIQ CLAY	1	0.59	NA	6.14	non-LIQ	non-LIQ	0.920	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.33	89.0	115.0	115.0	31.9	1.8	5.6	58.9	10.2	7.8	5.0	1.2	14.0	1.80	1.80	1.80	1.80	3.01	non-LIQ CLAY	1	0.59	NA	6.81	non-LIQ	non-LIQ	0.919	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.50	88.8	115.0	115.0	35.8	1.9	5.3	55.1	11.1	8.5	5.0	1.2	15.0	1.81	1.81	1.81	1.81	2.95	non-LIQ CLAY	1	0.58	NA	6.19	non-LIQ	non-LIQ	0.918	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.66	88.6	115.0	115.0	41.8	1.9	4.5	49.0	12.2	9.3	5.0	1.2	16.0	1.82	1.82	1.82	1.82	2.85	non-LIQ CLAY	1	0.58	NA	5.23	non-LIQ	non-LIQ	0.916	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.83	88.5	115.0	115.0	45.2	2.1	4.6	47.9	13.1	9.9	5.0	1.2	17.0	1.83	1.83	1.83	1.83	2.83	non-LIQ CLAY	1	0.58	NA	5.06	non-LIQ	non-LIQ	0.915	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.99	88.3	115.0	115.0	43.6	2.1	4.8	49.3	12.8	9.7	5.0	1.2	17.0	1.84	1.84	1.84	1.84	2.86	non-LIQ CLAY	1	0.58	NA	5.29	non-LIQ	non-LIQ	0.914	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.15	88.2	115.0	115.0	40.8	2.1	5.1	52.1	12.3	9.3	5.0	1.2	16.0	1.85	1.85	1.85	1.85	2.90	non-LIQ CLAY	1	0.57	NA	5.71	non-LIQ	non-LIQ	0.912	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.32	88.0	115.0	115.0	43.5	2.1	4.8	49.6	12.8	9.7	5.0	1.2	17.0	1.86	1.86	1.86	1.86	2.86	non-LIQ CLAY	1	0.57	NA	5.33	non-LIQ	non-LIQ	0.911	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.48	87.8	115.0	115.0	46.0	2.2	4.8	48.4	13.4	10.1	5.0	1.2	17.0	1.87	1.87	1.87	1.87	2.84	non-LIQ CLAY	1	0.57	NA	5.15	non-LIQ	non-LIQ	0.910	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.65	87.7	115.0	115.0	44.8	2.3	5.1	50.3	13.3	10.0	5.0	1.2	17.0	1.88	1.88	1.88	1.88	2.87	non-LIQ CLAY	1	0.56	NA	5.44	non-LIQ	non-LIQ	0.908	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.81	87.5	115.0	115.0	44.4	2.3	5.2	50.8	13.2	9.9	5.0	1.2	17.0	1.89	1.89	1.89	1.89	2.88	non-LIQ CLAY	1	0.56	NA	5.51	non-LIQ	non-LIQ	0.907	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.97	87.3	115.0	115.0	41.0	2.4	5.9	54.9	12.7	9.5	5.0	1.2	16.0	1.90	1.90	1.90	1.90	2.95	non-LIQ CLAY	1	0.56	NA	6.16	non-LIQ	non-LIQ	0.906	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.14	87.2	115.0	115.0	44.4	2.3	5.2	51.0	13.2	9.9	5.0	1.2	17.0	1.91	1.91	1.91	1.91	2.88	non-LIQ CLAY	1	0.56	NA	5.54	non-LIQ	non-LIQ	0.904	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.30	87.0	115.0	115.0	47.7	2.2	4.6	47.6	13.8	10.2	5.0	1.2	17.0	1.91	1.91	1.91	1.91	2.83	non-LIQ CLAY	1	0.55	NA	5.02	non-LIQ	non-LIQ	0.903	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.47	86.8	115.0	115.0	40.1	2.2	5.5	54.5	12.4	9.2	5.0	1.2	16.0	1.92	1.92	1.92	1.92	2.94	non-LIQ CLAY	1	0.55	NA	6.10	non-LIQ	non-LIQ	0.902	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.63	86.7	115.0	115.0	37.2	2.0	5.4	56.0	11.6	8.6	5.0	1.2	15.0	1.93	1.93	1.93	1.93	2.96	non-LIQ CLAY	1	0.55	NA	6.33	non-LIQ	non-LIQ	0.900	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.79	86.5	115.0	115.0	36.1	1.9	5.3	56.4	11.3	8.4	5.0	1.2	15.0	1.94	1.94	1.94	1.94	2.97	non-LIQ CLAY	1	0.54	NA	6.40	non-LIQ	non-LIQ	0.899	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.96	86.3	115.0	115.0	33.7	1.9	5.6	59.5	10.9	8.0	5.0	1.2	15.0	1.95	1.95	1.95	1.95	3.02	non-LIQ CLAY	1	0.54	NA	6.91	non-LIQ	non-LIQ	0.898	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.12	86.2	115.0	115.0	36.4	1.9	5.2	56.3	11.4	8.4	5.0	1.2	15.0	1.96	1.96	1.96	1.96	2.97	non-LIQ CLAY	1	0.54	NA	6.38	non-LIQ	non-LIQ	0.896	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.29	86.0	115.0	115.0	41.7	2.0	4.8	51.7	12.5	9.2	5.0	1.2	16.0	1.97	1.97	1.97	1.97	2.90	non-LIQ CLAY	1	0.54	NA	5.65	non-LIQ	non-LIQ	0.895	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.45	85.9	115.0	115.0	40.1	2.0	5.0	53.4	12.2	8.9	5.0	1.2	16.0	1.98	1.98	1.98	1.98	2.92	non-LIQ CLAY	1	0.53	NA	5.92	non-LIQ	non-LIQ	0.894	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.61	85.7	115.0	115.0	39.0	1.9	4.9	53.7	11.9	8.7	5.0	1.2	15.0	1.99	1.99	1.99	1.99	2.93	non-LIQ CLAY	1	0.53	NA	5.97	non-LIQ	non-LIQ	0.892	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.78	85.5	115.0	115.0	36.9	2.0	5.4	57.1	11.6	8.5	5.0	1.2	15.0	2.00	2.00	2.00	2.00	2.98	non-LIQ CLAY	1	0.53	NA	6.52	non-LIQ	non-LIQ	0.891	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.94	85.4	115.0	115.0	37.1	2.1	5.7	57.9	11.8	8.6	5.0	1.2	15.0	2.01	2.01	2.01	2.01	2.99	non-LIQ CLAY	1	0.53	NA	6.65	non-LIQ	non-LIQ	0.890	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.11	85.2	115.0	115.0	49.8	2.4	4.8	48.5	14.5	10.5	5.0	1.2	18.0	2.02	2.02	2.02	2.02	2.84	non-LIQ CLAY	1	0.52	NA	5.16	non-LIQ	non-LIQ	0.888	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.27	85.0	115.0	115.0	54.7	2.5	4.6	45.8	15.5	11.2	5.0	1.2	18.0	2.03	2.03	2.03	2.03	2.80	non-LIQ CLAY	1	0.52	NA	4.76	non-LIQ	non-LIQ	0.887	0.240	0.240	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.43	84.9	115.0	115.0	51.9	2.4	4.6	47.1	14.9	10.7	5.0	1.2	18.0	2.04	2.04	2.04	2.04	2.82	non-LIQ CLAY	1	0.52	NA	4.95	non-LIQ	non-LIQ	0.886	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.60	84.7	115.0	115.0	47.1	2.8	5.9	53.8	14.4	10.4	5.0	1.2	17.0	2.05	2.05	2.05	2.05	2.93	non-LIQ CLAY	1	0.52	NA	5.99	non-LIQ	non-LIQ	0.884	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.76	84.5	115.0	115.0	59.7	3.0	5.0	46.0	17.0	12.2	5.0	1.2	20.0	2.06	2.06	2.06	2.06	2.80	non-LIQ CLAY	1	0.51	NA	4.78	non-LIQ	non-LIQ	0.883	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.93	84.4	115.0	115.0	76.3	3.3	4.3	39.1	20.3	14.5	5.0	1.2	22.0	2.07	2.07	2.07	2.07	2.67	non-LIQ CLAY	1	0.51	NA	3.82	non-LIQ	non-LIQ	0.882	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.09	84.2	115.0	115.0	60.6	3.0	5.0	45.6	17.2	12.3	5.0	1.2	20.0	2.08	2.08	2.08	2.08	2.79	non-LIQ CLAY	1	0.51	NA	4.73	non-LIQ	non-LIQ	0.880	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.26	84.0	115.0	115.0	50.6	2.6	5.1	50.0	14.9	10.6	5.0	1.2	18.0	2.08	2.08	2.08	2.08	2.87	non-LIQ CLAY	1	0.51	NA	5.39	non-LIQ	non-LIQ	0.879	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.42	83.9	115.0	115.0	50.3	2.6	5.2	50.3	14.9	10.6	5.0	1.2	18.0	2.09	2.09	2.09	2.09	2.87	non-LIQ CLAY	1	0.51	NA	5.44	non-LIQ	non-LIQ	0.878	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.58	83.7	115.0	115.0	58.8	2.7	4.6	45.2	16.6	11.8	5.0	1.2	19.0	2.10	2.10	2.10	2.10	2.79	non-LIQ CLAY	1	0.50	NA	4.66	non-LIQ	non-LIQ	0.876	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.75	83.6	115.0	115.0	53.8	2.9	5.4	49.9	15.9	11.2	5.0	1.2	18.0	2.11	2.11	2.11	2.11	2.87	non-LIQ CLAY	1	0.50	NA	5.37	non-LIQ	non-LIQ	0.875	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.91	83.4	115.0	115.0	45.5	2.2	4.8	51.6	13.6	9.6	5.0	1.2	17.0	2.12	2.12	2.12	2.12	2.89	non-LIQ CLAY	1	0.50	NA	5.63	non-LIQ	non-LIQ	0.874	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.08	83.2	115.0	115.0	40.0	2.2	5.5	57.0	12.6	8.9	5.0	1.2	16.0	2.13	2.13	2.13	2.13	2.98	non-LIQ CLAY	1	0.50	NA	6.50	non-LIQ	non-LIQ	0.872	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.24	83.1	115.0	115.0	45.0	2.4	5.3	53.8	13.8	9.7	5.0	1.2	17.0	2.14	2.14	2.14	2.14	2.93	non-LIQ CLAY	1	0.49	NA	5.98	non-LIQ	non-LIQ	0.871	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60CS}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ_v' (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ_v' (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_Q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60CS}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
37.40	82.9	115.0	115.0	42.6	2.4	5.6	56.2	13.3	9.4	5.0	1.2	16.0	2.15	2.15	2.15	2.15	2.97	non-LIQ CLAY	1	0.49	NA	6.37	non-LIQ	non-LIQ	0.870	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.57	82.7	115.0	115.0	41.0	2.2	5.4	56.3	12.8	9.0	5.0	1.2	16.0	2.16	2.16	2.16	2.16	2.97	non-LIQ CLAY	1	0.49	NA	6.38	non-LIQ	non-LIQ	0.868	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.73	82.6	115.0	115.0	37.0	2.0	5.4	59.0	11.9	8.3	5.0	1.2	15.0	2.17	2.17	2.17	2.17	3.01	non-LIQ CLAY	1	0.49	NA	6.83	non-LIQ	non-LIQ	0.867	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.90	82.4	115.0	115.0	33.5	1.8	5.4	61.5	11.0	7.7	5.0	1.2	14.0	2.18	2.18	2.18	2.18	3.04	non-LIQ CLAY	1	0.49	NA	7.25	non-LIQ	non-LIQ	0.866	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.06	82.2	115.0	115.0	29.3	1.7	5.8	66.8	10.1	7.0	5.0	1.2	13.0	2.19	2.19	2.19	2.19	3.12	non-LIQ CLAY	1	0.48	NA	6.15	non-LIQ	non-LIQ	0.864	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.22	82.1	115.0	115.0	25.7	1.6	6.2	72.2	9.3	6.5	5.0	1.2	13.0	2.20	2.20	2.20	2.20	3.19	non-LIQ CLAY	1	0.48	NA	9.10	non-LIQ	non-LIQ	0.863	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.39	81.9	115.0	115.0	25.2	1.9	7.5	77.2	9.6	6.6	5.0	1.2	13.0	2.21	2.21	2.21	2.21	3.25	non-LIQ CLAY	1	0.48	NA	10.01	non-LIQ	non-LIQ	0.862	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.55	81.8	115.0	115.0	28.4	2.4	8.5	76.3	10.7	7.4	5.0	1.2	14.0	2.22	2.22	2.22	2.22	3.24	non-LIQ CLAY	1	0.48	NA	9.85	non-LIQ	non-LIQ	0.860	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.72	81.6	115.0	115.0	60.3	2.8	4.6	46.0	17.1	11.8	5.0	1.2	19.0	2.23	2.23	2.23	2.23	2.80	non-LIQ CLAY	1	0.48	NA	4.78	non-LIQ	non-LIQ	0.859	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.88	81.4	115.0	115.0	59.6	3.1	5.2	48.3	17.3	11.9	5.0	1.2	19.0	2.24	2.24	2.24	2.24	2.84	non-LIQ CLAY	1	0.47	NA	5.13	non-LIQ	non-LIQ	0.858	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.04	81.3	115.0	115.0	47.0	2.4	5.1	53.1	14.3	9.8	5.0	1.2	17.0	2.24	2.24	2.24	2.24	2.92	non-LIQ CLAY	1	0.47	NA	5.87	non-LIQ	non-LIQ	0.856	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.21	81.1	115.0	115.0	41.3	2.2	5.3	57.0	13.0	8.9	5.0	1.2	16.0	2.25	2.25	2.25	2.25	2.98	non-LIQ CLAY	1	0.47	NA	6.49	non-LIQ	non-LIQ	0.855	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.37	80.9	115.0	115.0	39.8	2.2	5.5	58.7	12.7	8.7	5.0	1.2	15.0	2.26	2.26	2.26	2.26	3.00	non-LIQ CLAY	1	0.47	NA	6.77	non-LIQ	non-LIQ	0.854	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.54	80.8	115.0	115.0	45.8	2.4	5.2	54.4	14.1	9.6	5.0	1.2	17.0	2.27	2.27	2.27	2.27	2.94	non-LIQ CLAY	1	0.47	NA	6.08	non-LIQ	non-LIQ	0.852	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.70	80.6	115.0	115.0	52.1	2.7	5.2	51.5	15.6	10.6	5.0	1.2	18.0	2.28	2.28	2.28	2.28	2.89	non-LIQ CLAY	1	0.46	NA	5.61	non-LIQ	non-LIQ	0.851	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.86	80.4	115.0	115.0	60.8	2.7	4.4	45.6	17.2	11.7	5.0	1.2	19.0	2.29	2.29	2.29	2.29	2.79	non-LIQ CLAY	1	0.46	NA	4.73	non-LIQ	non-LIQ	0.850	0.230	0.230	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.03	80.3	115.0	115.0	57.0	2.7	4.7	48.1	16.5	11.2	5.0	1.2	18.0	2.30	2.30	2.30	2.30	2.84	non-LIQ CLAY	1	0.46	NA	5.10	non-LIQ	non-LIQ	0.848	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.19	80.1	115.0	115.0	50.3	2.3	4.6	50.2	14.9	10.1	5.0	1.2	17.0	2.31	2.31	2.31	2.31	2.87	non-LIQ CLAY	1	0.46	NA	5.43	non-LIQ	non-LIQ	0.847	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.36	79.9	115.0	115.0	42.7	2.0	4.7	54.5	13.1	8.9	5.0	1.2	16.0	2.32	2.32	2.32	2.32	2.94	non-LIQ CLAY	1	0.46	NA	6.09	non-LIQ	non-LIQ	0.846	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.52	79.8	115.0	115.0	39.0	1.9	4.9	57.5	12.3	8.3	5.0	1.2	15.0	2.33	2.33	2.33	2.33	2.98	non-LIQ CLAY	1	0.45	NA	6.58	non-LIQ	non-LIQ	0.844	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.68	79.6	115.0	115.0	36.2	2.0	5.5	61.9	11.9	8.0	5.0	1.2	15.0	2.34	2.34	2.34	2.34	3.05	non-LIQ CLAY	1	0.45	NA	7.31	non-LIQ	non-LIQ	0.843	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.85	79.5	115.0	115.0	38.6	2.2	5.7	60.9	12.6	8.5	5.0	1.2	15.0	2.35	2.35	2.35	2.35	3.04	non-LIQ CLAY	1	0.45	NA	7.15	non-LIQ	non-LIQ	0.842	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.01	79.3	115.0	115.0	49.2	2.6	5.3	53.8	15.1	10.1	5.0	1.2	17.0	2.36	2.36	2.36	2.36	2.93	non-LIQ CLAY	1	0.45	NA	5.98	non-LIQ	non-LIQ	0.840	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.18	79.1	115.0	115.0	56.9	2.9	5.1	50.1	16.8	11.2	5.0	1.2	18.0	2.37	2.37	2.37	2.37	2.87	non-LIQ CLAY	1	0.45	NA	5.40	non-LIQ	non-LIQ	0.839	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.34	79.0	115.0	115.0	65.3	3.1	4.7	46.1	18.6	12.4	5.0	1.2	20.0	2.38	2.38	2.38	2.38	2.80	non-LIQ CLAY	1	0.45	NA	4.80	non-LIQ	non-LIQ	0.838	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.50	78.8	115.0	115.0	55.6	2.9	5.2	51.1	16.6	11.0	5.0	1.2	18.0	2.39	2.39	2.39	2.39	2.89	non-LIQ CLAY	1	0.44	NA	5.56	non-LIQ	non-LIQ	0.836	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.67	78.6	115.0	115.0	46.7	2.5	5.4	55.6	14.5	9.7	5.0	1.2	17.0	2.40	2.40	2.40	2.40	2.96	non-LIQ CLAY	1	0.44	NA	6.27	non-LIQ	non-LIQ	0.835	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.83	78.5	115.0	115.0	50.9	2.4	4.7	51.4	15.2	10.1	5.0	1.2	17.0	2.41	2.41	2.41	2.41	2.89	non-LIQ CLAY	1	0.44	NA	5.61	non-LIQ	non-LIQ	0.834	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.00	78.3	115.0	115.0	49.7	2.3	4.6	51.7	14.9	9.9	5.0	1.2	17.0	2.42	2.42	2.42	2.42	2.90	non-LIQ CLAY	1	0.44	NA	5.65	non-LIQ	non-LIQ	0.832	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.16	78.1	115.0	115.0	45.0	2.1	4.7	54.2	13.8	9.1	5.0	1.2	16.0	2.42	2.42	2.42	2.42	2.93	non-LIQ CLAY	1	0.44	NA	6.05	non-LIQ	non-LIQ	0.831	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.32	78.0	115.0	115.0	39.0	1.9	4.9	58.5	12.5	8.2	5.0	1.2	15.0	2.43	2.43	2.43	2.43	3.00	non-LIQ CLAY	1	0.43	NA	6.75	non-LIQ	non-LIQ	0.830	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.49	77.8	115.0	115.0	33.6	2.0	6.0	66.5	11.6	7.6	5.0	1.2	14.0	2.44	2.44	2.44	2.44	3.11	non-LIQ CLAY	1	0.43	NA	8.11	non-LIQ	non-LIQ	0.828	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.65	77.7	115.0	115.0	35.6	2.0	5.6	63.9	12.0	7.9	5.0	1.2	14.0	2.45	2.45	2.45	2.45	3.08	non-LIQ CLAY	1	0.43	NA	7.65	non-LIQ	non-LIQ	0.827	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.82	77.5	115.0	115.0	41.4	2.1	5.1	58.1	13.2	8.6	5.0	1.2	15.0	2.46	2.46	2.46	2.46	2.99	non-LIQ CLAY	1	0.43	NA	6.68	non-LIQ	non-LIQ	0.826	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.98	77.3	115.0	115.0	47.2	2.3	4.9	54.3	14.5	9.5	5.0	1.2	16.0	2.47	2.47	2.47	2.47	2.94	non-LIQ CLAY	1	0.43	NA	6.07	non-LIQ	non-LIQ	0.824	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.15	77.2	115.0	115.0	48.5	2.6	5.4	55.6	15.1	9.9	5.0	1.2	17.0	2.48	2.48	2.48	2.48	2.96	non-LIQ CLAY	1	0.43	NA	6.26	non-LIQ	non-LIQ	0.823	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.31	77.0	115.0	115.0	50.2	2.8	5.6	55.6	15.6	10.2	5.0	1.2	17.0	2.49	2.49	2.49	2.49	2.96	non-LIQ CLAY	1	0.42	NA	6.27	non-LIQ	non-LIQ	0.822	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.47	76.8	115.0	115.0	54.9	2.7	4.9	51.3	16.4	10.7	5.0	1.2	18.0	2.50	2.50	2.50	2.50	2.89	non-LIQ CLAY	1	0.42	NA	5.60	non-LIQ	non-LIQ	0.820	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.64	76.7	115.0	115.0	53.0	2.7	5.1	52.6	16.1	10.4	5.0	1.2	18.0	2.51	2.51	2.51	2.51	2.91	non-LIQ CLAY	1	0.42	NA	5.63	non-LIQ	non-LIQ	0.819	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.80	76.5	115.0	115.0	45.7	2.7	5.9	59.2	14.7	9.5	5.0	1.2	16.0	2.52	2.52	2.52	2.52	3.01	non-LIQ CLAY	1	0.42	NA	6.86	non-LIQ	non-LIQ	0.818	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.97	76.3	115.0	115.0	52.0	2.8	5.4	54.5	16.0	10.4	5.0	1.2	17.0	2.53	2.53	2.53	2.53	2.94	non-LIQ CLAY	1	0.42	NA	6.09	non-LIQ	non-LIQ	0.816	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.13	76.2	115.0	115.0	62.1	3.0	4.8	46.7	18.1	11.7	5.0	1.2	19.0	2.54	2.54	2.54	2.54	2.85	non-LIQ CLAY	1	0.42	NA	5.19	non-LIQ	non-LIQ	0.815	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.29	76.0	115.0	115.0	62.7	3.1	4.9	49.0	18.3	11.8	5.0	1.2	19.0	2.55	2.55	2.55	2.55	2.85	non-LIQ CLAY	1	0.42	NA	5.24	non-LIQ	non-LIQ	0.814	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.46	75.8	115.0	115.0	62.8	3.1	4.9	49.0	18.4	11.8	5.0	1.2	19.0	2.56	2.56	2.56	2.56	2.85	non-LIQ CLAY	1	0.41	NA	5.24	non-LIQ	non-LIQ	0.812	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.62	75.7	115.0	115.0	66.9	3.1	4.6	46.7	19.1	12.3	5.0	1.2	20.0	2.57	2.57	2.57	2.57	2.81	non-LIQ CLAY	1	0.41	NA	4.89	non-LIQ	non-LIQ	0.811	0.220	0.220	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.79	75.5	115.0	115.0	62.7	3.2	5.1	49.8	18.5	11.8	5.0	1.2	19.0	2.58	2.58	2.58	2.58	2.86	non-LIQ CLAY	1	0.41	NA	5.36	non-LIQ	non-LIQ	0.809	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.95	75.4	115.0	115.0	60.2	2.9	4.8	49.7	17.7	11.3	5.0	1.2	19.0	2.58	2.58	2.58	2.58	2.86	non-LIQ CLAY	1	0.41	NA	5.34	non-LIQ	non-LIQ	0.808	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.11	75.2	115.0	115.0	60.9	2.9	4.8	49.3	17.9	11.4	5.0	1.2	19.0	2.59	2.59	2.59	2.59	2.86	non-LIQ CLAY	1	0.41	NA	5.29	non-LIQ	non-LIQ	0.807	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.28	75.0	115.0	115.0	63.4	2.8	4.4	47.3	18.2	11.6	5.0	1.2	19.0	2.60	2.60	2.60	2.60	2.82	non-LIQ CLAY	1	0.41	NA	4.97	non-LIQ	non-LIQ	0.806	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.44	74.9	115.0	115.0	60.2	2.7	4.5	48.7	17.6	11.2	5.0	1.2	18.0	2.61	2.61	2.61	2.61	2.85	non-LIQ CLAY	1	0.40	NA	5.19	non-LIQ	non-LIQ	0.804	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.61	74.7	115.0	115.0	52.7	2.3	4.4	51.2	15.7	10.0	5.0	1.2	17.0	2.62	2.62	2.62	2.62	2.89	non-LIQ CLAY	1	0.40	NA	5.57	non-LIQ	non-LIQ	0.803	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.77	74.5	115.0	115.0	48.0	2.1	4.4	53.4	14.6	9.3	5.0	1.2	16.0	2.63	2.63	2.63	2.63	2.92	non-LIQ CLAY	1	0.40	NA	5.93	non-LIQ	non-LIQ	0.802	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.93	74.4	115.0	115.0	44.6	1.9	4.3	54.8	13.8	8.7	5.0	1.2	15.0	2.64	2.64	2.64	2.64	2.94	non-LIQ CLAY	1	0.40	NA	6.14	non-LIQ	non-LIQ	0.800	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.10	74.2	115.0	115.0	48.0	2.3	4.8	55.3	14.9	9.4	5.0	1.2	16.0	2.65	2.65	2.65	2.65	2.95	non-LIQ CLAY	1	0.40	NA	6.22	non-LIQ	non-LIQ	0.799	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.26	74.0	115.0	115.0	58.3	2.8	4.8	51.0	17.4	11.0	5.0	1.2	18.0	2.66	2.66	2.66	2.66	2.88	non-LIQ CLAY	1	0.40	NA	5.54	non-LIQ	non-LIQ	0.798	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.43	73.9	115.0	115.0	67.4	3.6	5.3	49.9	19.9	12.5	5.0	1.2	20.0	2.67	2.67	2.67	2.67	2.87	non-LIQ CLAY	1	0.40	NA	5.37	non-LIQ	non-LIQ	0.796	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.59	73.7	115.0	115.0	70.8	3.6	5.1	48.1	20.5	12.9	5.0	1.2	20.0	2.68	2.68	2.68	2.68	2.84	non-LIQ CLAY	1	0.39	NA	5.09	non-LIQ	non-LIQ	0.795	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.75	73.6	115.0	115.0	89.6	3.5	3.9	39.3	23.8	15.0	5.0	1.2	23.0	2.69	2.69	2.69	2.69	2.66	non-LIQ CLAY	1	0.39	NA	3.84	non-LIQ	non-LIQ	0.794	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.92	73.4	115.0	115.0	86.7	2.2	2.5	27.0	20.3	12.7	4.5	1.1	19.0	2.70	2.70	2.70	2.70	2.41	SAND	0.5	0.63	51	2.37	122	0.248	0.792	0.210	0.210	Above Water	0.19	4486.62	1402.34	0.07	0.13	0.01	NA	NA	0.00
47.08	73.2	115.0	115.0	81.6	2.1	2.6	28.1	19.3	12.1	4.6	1.1	18.0	2.71	2.71	2.71	2.71	2.44	SAND	0.5	0.63	48	2.48	120	0.239	0.791	0.210	0.210	Above Water	0.19	4477.47	1381.21	0.08	0.14	0.01	NA	NA	0.00
47.25	73.1	115.0	115.0	56.9	2.1	3.7	47.4	16.4	10.2	5.0	1.2	17.0	2.72	2.72	2.72	2.72	2.82	non-LIQ CLAY	1	0.39	NA	5.00	non-LIQ	non-LIQ	0.789	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.41	72.9	115.0	115.0	55.6	2.3	4.1	49.9	16.4	10.2	5.0	1.2	17.0	2.73	2.73	2.73	2.73	2.87	non-LIQ CLAY	1	0.39	NA	5.38	non-LIQ	non-LIQ	0.788	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.57	72.7	115.0	115.0	55.5	2.5	4.5	51.5	16.6	10.3	5.0	1.2	17.0	2.74	2.74	2.74	2.74	2.89	non-LIQ CLAY	1	0.39	NA	5.62	non-LIQ	non-LIQ	0.787	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.74	72.6	115.0	115.0	61.2	2.6	4.2	48.5	17.8	11.1	5.0	1.2	18.0	2.75	2.75	2.75	2.75	2.84	non-LIQ CLAY	1	0.39	NA	5.15	non-LIQ	non-LIQ	0.785	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.90	72.4	115.0	115.0	70.7	2.9	4.1	45.0	19.9	12.3	5.0	1.2	20.0	2.75	2.75	2.75	2.75	2.78	non-LIQ CLAY	1	0.38	NA	4.64	non-LIQ	non-LIQ	0.784	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.07	72.2	115.0	115.0	60.9	2.7	4.4	49.4	17.9	11.1	5.0	1.2	18.0	2.76	2.76	2.76	2.76	2.86	non-LIQ CLAY	1	0.38	NA	5.30	non-LIQ	non-LIQ	0.783	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.23	72.1	115.0	115.0	51.3	2.2	4.3	52.8	15.5	9.6	5.0	1.2	17.0	2.77	2.77	2.77	2.77	2.91	non-LIQ CLAY	1	0.38	NA	5.82	non-LIQ	non-LIQ	0.781	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.39	71.9	115.0	115.0	46.9	1.8	3.8	53.0	14.2	8.8	5.0	1.2	16.0	2.78	2.78	2.78	2.78	2.92	non-LIQ CLAY	1	0.38	NA	5.86	non-LIQ	non-LIQ	0.780	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.56	71.7	115.0	115.0	43.4	1.6	3.7	54.3	13.3	8.2	5.0	1.2	15.0	2.79	2.79	2.79	2.79	2.94	non-LIQ CLAY	1	0.38	NA	6.06	non-LIQ	non-LIQ	0.779	0.210	0.210	Above Water	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.72	71.6	115.0	115.0	39.8	1.7	4.3	59.2	12.8	7.9	5.0	1.2	14.0	2.80	2.80	2.80	2.80	3.01	non-LIQ CLAY	1	0.38	NA	6.86	non-LIQ	non-LIQ	0.778	0.210	0.210	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.89	71.4	115.0	115.0	35.5	1.8	5.1	65.7	12.1	7.4	5.0	1.2	14.0	2.81	2.81	2.81	2.81	3.10	non-LIQ CLAY	1	0.38	NA	7.96	non-LIQ	non-LIQ	0.776	0.210	0.210	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.05	71.3	115.0	115.0	33.2	1.9	5.7	70.2	11.8	7.2	5.0	1.2	14.0	2.82	2.82	2.82	2.82	3.16	non-LIQ CLAY	1	0.38	NA	8.75	non-LIQ	non-LIQ	0.775	0.210	0.210	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.22	71.1	115.0	115.0	35.5	1.8	5.1	65.9	12.1	7.4	5.0	1.2	14.0	2.83	2.83	2.83	2.82	3.11	non-LIQ CLAY	1	0.37	NA	7.99	non-LIQ	non-LIQ	0.773	0.210	0.210	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.38	70.9	115.0	115.0	39.6	1.8	4.5	60.8	12.9	7.9	5.0	1.2	14.0	2.84	2.84	2.84	2.83	3.03	non-LIQ CLAY	1	0.37	NA	7.13	non-LIQ	non-LIQ	0.772	0.210	0.210	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.54	70.8	115.0	115.0	40.5	1.6	4.0	57.7	12.9	7.8	5.0	1.2	14.0	2.85	2.85	2.85	2.84	2.99	non-LIQ CLAY	1	0.37	NA	6.62	non-LIQ	non-LIQ	0.771	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.71	70.6	115.0	115.0	35.2	1.5	4.3	63.0	11.7	7.1	5.0	1.2	14.0	2.86	2.86	2.86	2.85	3.07	non-LIQ CLAY	1	0.37	NA	7.50	non-LIQ	non-LIQ	0.769	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.87	70.4	115.0	115.0	29.3	1.5	5.1	72.2	10.6	6.5	5.0	1.2	13.0	2.87	2.87	2.87	2.86	3.19	non-LIQ CLAY	1	0.37	NA	9.10	non-LIQ	non-LIQ	0.768	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.04	70.3	115.0	115.0	28.4	1.4	4.9	72.5	10.3	6.3	5.0	1.2	13.0	2.88	2.88	2.88	2.87	3.19	non-LIQ CLAY	1	0.37	NA	9.16	non-LIQ	non-LIQ	0.767	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.20	70.1	115.0	115.0	27.3	1.4	5.1	74.7	10.1	6.1	5.0	1.2	12.0	2.89	2.89	2.89	2.88	3.22	non-LIQ CLAY	1	0.37	NA	9.56	non-LIQ	non-LIQ	0.765	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.36	69.9	115.0	115.0	22.1	1.3	5.9	85.3	9.0	5.5	5.0	1.2	12.0	2.90	2.90	2.90	2.89	3.35	non-LIQ CLAY	1	0.37	NA	11.49	non-LIQ	non-LIQ	0.764	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.53	69.8	115.0	115.0	21.8	1.2	5.5	84.4	8.8	5.3	5.0	1.2	11.0	2.91	2.91	2.91	2.90	3.34	non-LIQ CLAY	1	0.36	NA	11.33	non-LIQ	non-LIQ	0.763	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.69	69.6	115.0	115.0	23.6	1.2	5.1	79.8	9.2	5.5	5.0	1.2	12.0	2.91	2.91	2.91	2.91	3.29	non-LIQ CLAY	1	0.36	NA	10.49	non-LIQ	non-LIQ	0.761	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.86	69.4	115.0	115.0	21.9	1.3	5.9	86.2	9.0	5.4	5.0	1.2	12.0	2.92	2.92	2.92	2.92	3.36	non-LIQ CLAY	1	0.36	NA	11.67	non-LIQ	non-LIQ	0.760	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.02	69.3	115.0	115.0	23.6	1.3	5.5	81.8	9.4	5.6	5.0	1.2	12.0	2.93	2.93	2.93	2.93	3.31	non-LIQ CLAY	1	0.36	NA	10.86	non-LIQ	non-LIQ	0.759	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.18	69.1	115.0	115.0	25.3	1.3	5.1	78.0	9.7	5.8	5.0	1.2	12.0	2.94	2.94	2.94	2.94	3.26	non-LIQ CLAY	1	0.36	NA	10.15	non-LIQ	non-LIQ	0.757	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.35	69.0	115.0	115.0	21.9	1.2	5.5	84.7	8.9	5.3	5.0	1.2	11.0	2.95	2.95	2.95	2.95	3.34	non-LIQ CLAY	1	0.36	NA	11.39	non-LIQ	non-LIQ	0.756	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.51	68.8	115.0	115.0	18.5	1.1	5.9	93.5	8.2	4.9	5.0	1.2	11.0	2.96	2.96	2.96	2.96	3.44	non-LIQ CLAY	1	0.36	NA	13.05	non-LIQ	non-LIQ	0.755	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.68	68.6	115.0	115.0	17.4	1.0	5.7	95.5	7.8	4.7	5.0	1.2	11.0	2.97	2.97	2.97	2.97	3.46	non-LIQ CLAY	1	0.36	NA	13.43	non-LIQ	non-LIQ	0.753	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.84	68.5	115.0	115.0	16.9	1.0	5.9	97.6	7.8	4.6	5.0	1.2	11.0	2.98	2.98	2.98	2.98	3.49	non-LIQ CLAY	1	0.35	NA	13.84	non-LIQ	non-LIQ	0.752	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'MOIST	Unit Weight (pcf) γ'SAT	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ_v' (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ_v' (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_Q	q_{c1N}	Fines Correction Kc	$(q_{c1n})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
52.00	68.3	115.0	115.0	16.4	1.0	6.1	99.9	7.7	4.6	5.0	1.2	10.0	2.99	2.99	2.99	2.99	3.51	non-LIQ CLAY	1	0.35	NA	14.27	non-LIQ	non-LIQ	0.751	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.17	68.1	115.0	115.0	17.5	1.0	5.7	95.5	7.9	4.7	5.0	1.2	11.0	3.00	3.00	3.00	2.99	3.46	non-LIQ CLAY	1	0.35	NA	13.43	non-LIQ	non-LIQ	0.749	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.33	68.0	115.0	115.0	17.3	1.2	6.9	101.0	8.2	4.9	5.0	1.2	11.0	3.01	3.01	3.01	3.00	3.52	non-LIQ CLAY	1	0.35	NA	14.48	non-LIQ	non-LIQ	0.748	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.50	67.8	115.0	115.0	17.0	1.3	7.6	104.5	8.3	4.9	5.0	1.2	11.0	3.02	3.02	3.02	3.01	3.56	non-LIQ CLAY	1	0.35	NA	15.16	non-LIQ	non-LIQ	0.747	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.66	67.6	115.0	115.0	29.9	1.3	4.3	69.9	10.6	6.3	5.0	1.2	13.0	3.03	3.03	3.03	3.02	3.16	non-LIQ CLAY	1	0.35	NA	8.71	non-LIQ	non-LIQ	0.745	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.82	67.5	115.0	115.0	32.6	1.6	4.9	69.8	11.6	6.8	5.0	1.2	13.0	3.04	3.04	3.04	3.03	3.16	non-LIQ CLAY	1	0.35	NA	8.68	non-LIQ	non-LIQ	0.744	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.99	67.3	115.0	115.0	29.0	1.6	5.5	76.1	10.9	6.4	5.0	1.2	13.0	3.05	3.05	3.05	3.04	3.24	non-LIQ CLAY	1	0.35	NA	9.80	non-LIQ	non-LIQ	0.743	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.15	67.2	115.0	115.0	23.0	1.4	6.1	86.6	9.5	5.6	5.0	1.2	12.0	3.06	3.06	3.06	3.05	3.36	non-LIQ CLAY	1	0.35	NA	11.74	non-LIQ	non-LIQ	0.741	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.32	67.0	115.0	115.0	17.1	1.0	5.8	98.1	7.9	4.6	5.0	1.2	11.0	3.07	3.07	3.07	3.06	3.49	non-LIQ CLAY	1	0.35	NA	13.93	non-LIQ	non-LIQ	0.740	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.48	66.8	115.0	115.0	12.4	0.8	6.5	117.4	6.9	4.1	5.0	1.2	10.0	3.08	3.08	3.08	3.07	3.68	non-LIQ CLAY	1	0.34	NA	17.69	non-LIQ	non-LIQ	0.739	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.64	66.7	115.0	115.0	11.5	0.8	7.0	124.3	6.9	4.0	5.0	1.2	10.0	3.08	3.08	3.08	3.08	3.75	non-LIQ CLAY	1	0.34	NA	19.05	non-LIQ	non-LIQ	0.737	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.81	66.5	115.0	115.0	10.4	0.8	7.7	134.2	6.9	4.1	5.0	1.2	10.0	3.09	3.09	3.09	3.09	3.83	non-LIQ CLAY	1	0.34	NA	21.01	non-LIQ	non-LIQ	0.736	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.97	66.3	115.0	115.0	12.2	1.0	8.2	125.7	7.4	4.3	5.0	1.2	10.0	3.10	3.10	3.10	3.10	3.76	non-LIQ CLAY	1	0.34	NA	19.33	non-LIQ	non-LIQ	0.735	0.200	0.200	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.14	66.2	115.0	115.0	12.6	1.1	8.7	125.8	7.7	4.5	5.0	1.2	10.0	3.11	3.11	3.11	3.11	3.76	non-LIQ CLAY	1	0.34	NA	19.34	non-LIQ	non-LIQ	0.733	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.30	66.0	115.0	115.0	17.9	1.2	6.7	100.2	8.4	4.9	5.0	1.2	11.0	3.12	3.12	3.12	3.12	3.51	non-LIQ CLAY	1	0.34	NA	14.34	non-LIQ	non-LIQ	0.732	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.46	65.8	115.0	115.0	17.0	1.2	7.1	104.1	8.3	4.8	5.0	1.2	11.0	3.13	3.13	3.13	3.13	3.55	non-LIQ CLAY	1	0.34	NA	15.09	non-LIQ	non-LIQ	0.731	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.63	65.7	115.0	115.0	16.5	1.2	7.3	106.5	8.3	4.8	5.0	1.2	11.0	3.14	3.14	3.14	3.14	3.58	non-LIQ CLAY	1	0.34	NA	15.55	non-LIQ	non-LIQ	0.729	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.79	65.5	115.0	115.0	16.5	1.1	6.7	104.3	8.1	4.7	5.0	1.2	11.0	3.15	3.15	3.15	3.15	3.56	non-LIQ CLAY	1	0.34	NA	15.13	non-LIQ	non-LIQ	0.728	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.96	65.3	115.0	115.0	14.1	1.0	7.1	114.3	7.6	4.4	5.0	1.2	10.0	3.16	3.16	3.16	3.15	3.65	non-LIQ CLAY	1	0.33	NA	17.07	non-LIQ	non-LIQ	0.727	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.12	65.2	115.0	115.0	12.3	1.0	8.1	126.3	7.5	4.3	5.0	1.2	10.0	3.17	3.17	3.17	3.16	3.76	non-LIQ CLAY	1	0.33	NA	19.44	non-LIQ	non-LIQ	0.725	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.28	65.0	115.0	115.0	12.4	1.1	8.9	128.6	7.8	4.5	5.0	1.2	10.0	3.18	3.18	3.18	3.17	3.78	non-LIQ CLAY	1	0.33	NA	19.88	non-LIQ	non-LIQ	0.724	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.45	64.9	115.0	115.0	22.8	1.5	6.6	90.4	9.8	5.6	5.0	1.2	12.0	3.19	3.19	3.19	3.18	3.41	non-LIQ CLAY	1	0.33	NA	12.46	non-LIQ	non-LIQ	0.723	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.61	64.7	115.0	115.0	28.4	1.8	6.3	81.5	11.2	6.5	5.0	1.2	13.0	3.20	3.20	3.20	3.19	3.31	non-LIQ CLAY	1	0.33	NA	10.79	non-LIQ	non-LIQ	0.721	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.78	64.5	115.0	115.0	23.5	1.5	6.4	88.7	9.9	5.7	5.0	1.2	12.0	3.21	3.21	3.21	3.20	3.39	non-LIQ CLAY	1	0.33	NA	12.14	non-LIQ	non-LIQ	0.720	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.94	64.4	115.0	115.0	19.2	1.1	5.7	94.6	8.6	4.9	5.0	1.2	11.0	3.22	3.22	3.22	3.21	3.45	non-LIQ CLAY	1	0.33	NA	13.25	non-LIQ	non-LIQ	0.719	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.11	64.2	115.0	115.0	16.9	1.1	6.5	103.7	8.2	4.7	5.0	1.2	11.0	3.23	3.23	3.23	3.22	3.55	non-LIQ CLAY	1	0.33	NA	15.01	non-LIQ	non-LIQ	0.717	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.27	64.0	115.0	115.0	18.6	1.1	5.9	97.0	8.5	4.9	5.0	1.2	11.0	3.24	3.24	3.24	3.23	3.48	non-LIQ CLAY	1	0.33	NA	13.72	non-LIQ	non-LIQ	0.716	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.43	63.9	115.0	115.0	16.2	1.3	8.0	111.7	8.5	4.9	5.0	1.2	11.0	3.24	3.24	3.24	3.24	3.63	non-LIQ CLAY	1	0.33	NA	16.56	non-LIQ	non-LIQ	0.715	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.60	63.7	115.0	115.0	20.1	1.4	7.0	97.9	9.3	5.3	5.0	1.2	11.0	3.25	3.25	3.25	3.25	3.49	non-LIQ CLAY	1	0.32	NA	13.89	non-LIQ	non-LIQ	0.713	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.76	63.5	115.0	115.0	27.6	1.6	5.8	81.2	10.9	6.2	5.0	1.2	12.0	3.26	3.26	3.26	3.26	3.30	non-LIQ CLAY	1	0.32	NA	10.74	non-LIQ	non-LIQ	0.712	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.93	63.4	115.0	115.0	29.8	1.6	5.4	77.0	11.3	6.4	5.0	1.2	13.0	3.27	3.27	3.27	3.27	3.25	non-LIQ CLAY	1	0.32	NA	9.96	non-LIQ	non-LIQ	0.711	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.09	63.2	115.0	115.0	33.4	1.6	4.8	71.0	12.0	6.8	5.0	1.2	13.0	3.28	3.28	3.28	3.28	3.17	non-LIQ CLAY	1	0.32	NA	8.89	non-LIQ	non-LIQ	0.709	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.25	63.1	115.0	115.0	23.2	1.4	6.0	88.9	9.6	5.6	5.0	1.2	12.0	3.29	3.29	3.29	3.29	3.39	non-LIQ CLAY	1	0.32	NA	12.18	non-LIQ	non-LIQ	0.708	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.42	62.9	115.0	115.0	16.5	1.1	6.7	106.7	8.3	4.7	5.0	1.2	11.0	3.30	3.30	3.30	3.30	3.58	non-LIQ CLAY	1	0.32	NA	15.58	non-LIQ	non-LIQ	0.707	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.58	62.7	115.0	115.0	13.7	1.0	7.3	119.3	7.8	4.4	5.0	1.2	10.0	3.31	3.31	3.31	3.31	3.70	non-LIQ CLAY	1	0.32	NA	18.06	non-LIQ	non-LIQ	0.705	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.75	62.6	115.0	115.0	13.4	1.0	7.5	121.4	7.8	4.4	5.0	1.2	10.0	3.32	3.32	3.32	3.32	3.72	non-LIQ CLAY	1	0.32	NA	18.48	non-LIQ	non-LIQ	0.704	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.91	62.4	115.0	115.0	14.9	1.0	6.7	112.6	7.9	4.5	5.0	1.2	10.0	3.33	3.33	3.33	3.32	3.64	non-LIQ CLAY	1	0.32	NA	16.74	non-LIQ	non-LIQ	0.703	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.07	62.2	115.0	115.0	16.7	1.0	6.0	103.9	8.1	4.6	5.0	1.2	11.0	3.34	3.34	3.34	3.33	3.55	non-LIQ CLAY	1	0.32	NA	15.04	non-LIQ	non-LIQ	0.701	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.24	62.1	115.0	115.0	15.4	1.1	7.1	112.8	8.2	4.6	5.0	1.2	11.0	3.35	3.35	3.35	3.34	3.64	non-LIQ CLAY	1	0.32	NA	16.78	non-LIQ	non-LIQ	0.700	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.40	61.9	115.0	115.0	15.9	1.1	6.9	110.4	8.3	4.6	5.0	1.2	11.0	3.36	3.36	3.36	3.35	3.62	non-LIQ CLAY	1	0.32	NA	16.31	non-LIQ	non-LIQ	0.699	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.57	61.7	115.0	115.0	15.0	1.1	7.3	115.3	8.2	4.6	5.0	1.2	11.0	3.37	3.37	3.37	3.36	3.66	non-LIQ CLAY	1	0.31	NA	17.27	non-LIQ	non-LIQ	0.697	0.190	0.190	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.73	61.6	115.0	115.0	14.2	1.1	7.7	120.1	8.1	4.6	5.0	1.2	10.0	3.38	3.38	3.38	3.37	3.71	non-LIQ CLAY	1	0.31	NA	18.21	non-LIQ	non-LIQ	0.696	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.89	61.4	115.0	115.0	12.9	1.1	8.5	128.9	8.1	4.5	5.0	1.2	10.0	3.39	3.39	3.39	3.38	3.79	non-LIQ CLAY	1	0.31	NA	19.95	non-LIQ	non-LIQ	0.695	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.06	61.2	115.0	115.0	16.2	1.1	6.8	109.5	8.3	4.7	5.0	1.2	11.0	3.40	3.40	3.40	3.39	3.61	non-LIQ CLAY	1	0.31	NA	16.14	non-LIQ	non-LIQ	0.693	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.22	61.1	115.0	115.0	18.5	1.1	5.9	99.7	8.7	4.8	5.0	1.2	11.0	3.41	3.41	3.41	3.40	3.51	non-LIQ CLAY	1	0.31	NA	14.24	non-LIQ	non-LIQ	0.692	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.39	60.9	115.0	115.0	21.5	1.2	5.6	91.7	9.3	5.2	5.0	1.2	11.0	3.41	3.41	3.41	3.41	3.42	non-LIQ CLAY	1	0.31	NA	12.70	non-LIQ	non-LIQ	0.691	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.55	60.8	115.0	115.0	15.7	1.1	7.0	112.4	8.3	4.6	5.0	1.2	11.0	3.42	3.42	3.42	3.42	3.64	non-LIQ CLAY	1	0.31	NA	16.71	non-LIQ	non-LIQ	0.689	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.71	60.6	115.0	115.0	15.8	1.0	6.3	109.6	8.1	4.5	5.0	1.2	10.0	3.43	3.43	3.43	3.43	3.61	non-LIQ CLAY	1	0.31	NA	16.15	non-LIQ	non-LIQ	0.688	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.88	60.4	115.0	115.0	14.8	1.0	6.8	115.0	8.1	4.5	5.0	1.2	10.0	3.44	3.44	3.44	3.44	3.66	non-LIQ CLAY	1	0.31	NA	17.22	non-LIQ	non-LIQ	0.687	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.04	60.3	115.0	115.0	13.3	0.9	6.8	121.5	7.7	4.3	5.0	1.2	10.0	3.45	3.45	3.45	3.45	3.72	non-LIQ CLAY	1	0.31	NA	18.49	non-LIQ	non-LIQ	0.685	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.21	60.1	115.0	115.0	11.2	0.8	7.1	134.8	7.5	4.2	5.0	1.2	10.0	3.46	3.46	3.46	3.46	3.84	non-LIQ CLAY	1	0.31	NA	21.12	non-LIQ	non-LIQ	0.684	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.37	59.9	115.0	115.0	12.5	0.8	6.4	124.2	7.5	4.1	5.0	1.2	10.0	3.47	3.47	3.47	3.47	3.75	non-LIQ CLAY	1	0.30	NA	19.03	non-LIQ	non-LIQ	0.683	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.53	59.8	115.0	115.0	11.4	0.9	7.9	136.9	7.8	4.3	5.0	1.2	10.0	3.48	3.48	3.48	3.48	3.86	non-LIQ CLAY	1	0.30	NA	21.53	non-LIQ	non-LIQ	0.681	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.70	59.6	115.0	115.0	11.7	0.9	7.7	134.4	7.8	4.3	5.0	1.2	10.0	3.49	3.49	3.49	3.48	3.84	non-LIQ CLAY	1	0.30	NA	21.05	non-LIQ	non-LIQ	0.680	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.86	59.4	115.0	115.0	13.3	1.0	7.5	125.3	8.1	4.4	5.0	1.2	10.0	3.50	3.50	3.50	3.49	3.76	non-LIQ CLAY	1	0.30	NA	19.25	non-LIQ	non-LIQ	0.679	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.03	59.3	115.0	115.0	15.3	1.3	8.5	120.6	8.8	4.8	5.0	1.2	11.0	3.51	3.51	3.51	3.50	3.71	non-LIQ CLAY	1	0.30	NA	18.32	non-LIQ	non-LIQ	0.677	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.19	59.1	115.0	115.0	20.1	1.6	8.0	104.9	9.9	5.4	5.0	1.2	12.0	3.52	3.52	3.52	3.51	3.56	non-LIQ CLAY	1	0.30	NA	15.23	non-LIQ	non-LIQ	0.676	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.35	59.0	115.0	115.0	32.6	1.8	5.5	77.1	12.4	6.8	5.0	1.2	13.0	3.53	3.53	3.53	3.52	3.25	non-LIQ CLAY	1	0.30	NA	9.98	non-LIQ	non-LIQ	0.675	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.52	58.8	115.0	115.0	30.9	1.9	6.1	81.4	12.2	6.7	5.0	1.2	13.0	3.54	3.54	3.54	3.53	3.30	non-LIQ CLAY	1	0.30	NA	10.77	non-LIQ	non-LIQ	0.673	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.68	58.6	115.0	115.0	34.0	1.7	5.0	73.7	12.5	6.8	5.0	1.2	13.0	3.55	3.55	3.55	3.54	3.21	non-LIQ CLAY	1	0.30	NA	9.38	non-LIQ	non-LIQ	0.672	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.85	58.5	115.0	115.0	35.0	1.8	5.1	73.5	12.8	7.0	5.0	1.2	13.0	3.56	3.56	3.56	3.55	3.21	non-LIQ CLAY	1	0.30	NA	9.34	non-LIQ	non-LIQ	0.671	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.01	58.3	115.0	115.0	32.4	1.8	5.6	77.8	12.4	6.7	5.0	1.2	13.0	3.57	3.57	3.57	3.56	3.26	non-LIQ CLAY	1	0.30	NA	10.11	non-LIQ	non-LIQ	0.669	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.17	58.1	115.0	115.0	34.1	2.0	5.9	77.3	13.0	7.1	5.0	1.2	13.0	3.57	3.57	3.57	3.57	3.25	non-LIQ CLAY	1	0.30	NA	10.03	non-LIQ	non-LIQ	0.668	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.34	58.0	115.0	115.0	42.0	2.2	5.2	68.5	14.7	8.0	5.0	1.2	15.0	3.58	3.58	3.58	3.58	3.14	non-LIQ CLAY	1	0.30	NA	8.45	non-LIQ	non-LIQ	0.667	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.50	57.8	115.0	115.0	42.1	2.3	5.5	69.4	14.9	8.1	5.0	1.2	15.0	3.59	3.59	3.59	3.59	3.15	non-LIQ CLAY	1	0.29	NA	8.60	non-LIQ	non-LIQ	0.665	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.67	57.6	115.0	115.0	40.7	2.2	5.4	70.2	14.5	7.9	5.0	1.2	14.0	3.60	3.60	3.60	3.60	3.16	non-LIQ CLAY	1	0.29	NA	8.76	non-LIQ	non-LIQ	0.664	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.83	57.5	115.0	115.0	40.5	2.2	5.4	70.6	14.5	7.8	5.0	1.2	14.0	3.61	3.61	3.61	3.61	3.17	non-LIQ CLAY	1	0.29	NA	8.82	non-LIQ	non-LIQ	0.663	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.00	57.3	115.0	115.0	38.7	2.2	5.7	73.0	14.1	7.6	5.0	1.2	14.0	3.62	3.62	3.62	3.62	3.20	non-LIQ CLAY	1	0.29	NA	9.25	non-LIQ	non-LIQ	0.661	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.16	57.1	115.0	115.0	38.2	2.1	5.5	72.8	13.9	7.5	5.0	1.2	14.0	3.63	3.63	3.63	3.63	3.20	non-LIQ CLAY	1	0.29	NA	9.21	non-LIQ	non-LIQ	0.660	0.180	0.180	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.32	57.0	115.0	115.0	37.3	2.0	5.4	73.1	13.6	7.4	5.0	1.2	14.0	3.64	3.64	3.64	3.64	3.20	non-LIQ CLAY	1	0.29	NA	9.26	non-LIQ	non-LIQ	0.659	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.49	56.8	115.0	115.0	35.1	1.8	5.1	74.2	13.0	7.0	5.0	1.2	13.0	3.65	3.65	3.65	3.65	3.21	non-LIQ CLAY	1	0.29	NA	9.46	non-LIQ	non-LIQ	0.657	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.65	56.7	115.0	115.0	33.4	1.7	5.1	75.7	12.5	6.7	5.0	1.2	13.0	3.66	3.66	3.66	3.65	3.23	non-LIQ CLAY	1	0.29	NA	9.74	non-LIQ	non-LIQ	0.656	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.82	56.5	115.0	115.0	31.3	1.6	5.1	78.1	12.0	6.4	5.0	1.2	13.0	3.67	3.67	3.67	3.66	3.26	non-LIQ CLAY	1	0.29	NA	10.18	non-LIQ	non-LIQ	0.655	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.98	56.3	115.0	115.0	28.2	1.5	5.3	82.8	11.3	6.0	5.0	1.2	12.0	3.68	3.68	3.68	3.67	3.32	non-LIQ CLAY	1	0.29	NA	11.04	non-LIQ	non-LIQ	0.653	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.14	56.2	115.0	115.0	24.7	1.3	5.3	87.8	10.3	5.5	5.0	1.2	12.0	3.69	3.69	3.69	3.68	3.38	non-LIQ CLAY	1	0.29	NA	11.97	non-LIQ	non-LIQ	0.652	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.31	56.0	115.0	115.0	20.3	1.1	5.4	97.0	9.3	5.0	5.0	1.2	11.0	3.70	3.70	3.70	3.69	3.48	non-LIQ CLAY	1	0.29	NA	13.71	non-LIQ	non-LIQ	0.651	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.47	55.8	115.0	115.0	17.3	1.1	6.4	108.9	8.9	4.7	5.0	1.2	11.0	3.71	3.71	3.71	3.70	3.60	non-LIQ CLAY	1	0.29	NA	16.03	non-LIQ	non-LIQ	0.649	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.64	55.7	115.0	115.0	16.9	1.0	5.9	108.4	8.6	4.6	5.0	1.2	11.0	3.72	3.72	3.72	3.71	3.60	non-LIQ CLAY	1	0.28	NA	15.93	non-LIQ	non-LIQ	0.648	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.80	55.5	115.0	115.0	20.0	1.0	5.0	96.1	9.1	4.8	5.0	1.2	11.0	3.73	3.73	3.73	3.72	3.47	non-LIQ CLAY	1	0.28	NA	13.55	non-LIQ	non-LIQ	0.647	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.96	55.3	115.0	115.0	15.9	1.0	6.3	113.6	8.5	4.5	5.0	1.2	10.0	3.74	3.74	3.74	3.73	3.65	non-LIQ CLAY	1	0.28	NA	16.95	non-LIQ	non-LIQ	0.645	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.13	55.2	115.0	115.0	15.6	1.0	6.4	115.4	8.5	4.5	5.0	1.2	10.0	3.74	3.74	3.74	3.74	3.66	non-LIQ CLAY	1	0.28	NA	17.29	non-LIQ	non-LIQ	0.644	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.29	55.0	115.0	115.0	16.1	1.1	6.8	115.4	8.8	4.7	5.0	1.2	11.0	3.75	3.75	3.75	3.75	3.66	non-LIQ CLAY	1	0.28	NA	17.30	non-LIQ	non-LIQ	0.643	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.46	54.8	115.0	115.0	17.1	1.1	6.4	110.7	8.9	4.7	5.0	1.2	11.0	3.76	3.76	3.76	3.76	3.62	non-LIQ CLAY	1	0.28	NA	16.36	non-LIQ	non-LIQ	0.641	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.62	54.7	115.0	115.0	18.2	1.1	6.0	105.9	9.1	4.8	5.0	1.2	11.0	3.77	3.77	3.77	3.77	3.57	non-LIQ CLAY	1	0.28	NA	15.44	non-LIQ	non-LIQ	0.640	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.78	54.5	115.0	115.0	18.4	1.0	5.4	102.8	8.9	4.7	5.0	1.2	11.0	3.78	3.78	3.78	3.78	3.54	non-LIQ CLAY	1	0.28	NA	14.84	non-LIQ	non-LIQ	0.639	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.95	54.4	115.0	115.0	17.6	1.1	6.3	108.8	9.0	4.8	5.0	1.2	11.0	3.79	3.79	3.79	3.79	3.60	non-LIQ CLAY	1	0.28	NA	16.00	non-LIQ	non-LIQ	0.637	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.11	54.2	115.0	115.0	16.3	1.0	6.1	112.6	8.7	4.6	5.0	1.2	10.0	3.80	3.80	3.80	3.80	3.64	non-LIQ CLAY	1	0.28	NA	16.74	non-LIQ	non-LIQ	0.636	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.28	54.0	115.0	115.0	15.8	1.0	6.3	115.3	8.6	4.5	5.0	1.2	10.0	3.81	3.81	3.81	3.81	3.66	non-LIQ CLAY	1	0.28	NA	17.27	non-LIQ	non-LIQ	0.635	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.44	53.9	115.0	115.0	14.9	1.0	6.7	120.5	8.6	4.5	5.0	1.2	10.0	3.82	3.82	3.82	3.82	3.71	non-LIQ CLAY	1	0.28	NA	18.30	non-LIQ	non-LIQ	0.633	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60CS}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60CS}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
66.60	53.7	115.0	115.0	14.9	1.0	6.7	120.7	8.6	4.5	5.0	1.2	10.0	3.83	3.83	3.83	3.82	3.71	non-LIQ CLAY	1	0.28	NA	18.33	non-LIQ	non-LIQ	0.632	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.77	53.5	115.0	115.0	15.6	1.1	7.1	119.4	8.9	4.7	5.0	1.2	11.0	3.84	3.84	3.84	3.83	3.70	non-LIQ CLAY	1	0.28	NA	18.08	non-LIQ	non-LIQ	0.631	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.93	53.4	115.0	115.0	15.8	1.0	6.3	115.9	8.7	4.5	5.0	1.2	10.0	3.85	3.85	3.85	3.84	3.67	non-LIQ CLAY	1	0.27	NA	17.39	non-LIQ	non-LIQ	0.629	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.10	53.2	115.0	115.0	16.1	1.0	6.2	114.4	8.7	4.6	5.0	1.2	10.0	3.86	3.86	3.86	3.85	3.65	non-LIQ CLAY	1	0.27	NA	17.10	non-LIQ	non-LIQ	0.628	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.26	53.0	115.0	115.0	15.8	1.1	7.0	118.8	8.9	4.7	5.0	1.2	11.0	3.87	3.87	3.87	3.86	3.70	non-LIQ CLAY	1	0.27	NA	17.95	non-LIQ	non-LIQ	0.627	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.42	52.9	115.0	115.0	15.5	1.1	7.1	120.6	8.9	4.7	5.0	1.2	11.0	3.88	3.88	3.88	3.87	3.71	non-LIQ CLAY	1	0.27	NA	18.31	non-LIQ	non-LIQ	0.625	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.59	52.7	115.0	115.0	17.5	1.2	6.9	112.8	9.3	4.9	5.0	1.2	11.0	3.89	3.89	3.89	3.88	3.64	non-LIQ CLAY	1	0.27	NA	16.79	non-LIQ	non-LIQ	0.624	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.75	52.6	115.0	115.0	21.3	1.3	6.1	100.1	10.0	5.2	5.0	1.2	11.0	3.90	3.90	3.90	3.89	3.51	non-LIQ CLAY	1	0.27	NA	14.31	non-LIQ	non-LIQ	0.623	0.170	0.170	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.92	52.4	115.0	115.0	24.0	1.3	5.4	92.0	10.5	5.4	5.0	1.2	12.0	3.91	3.91	3.91	3.90	3.43	non-LIQ CLAY	1	0.27	NA	12.76	non-LIQ	non-LIQ	0.621	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.08	52.2	115.0	115.0	24.8	1.3	5.2	90.0	10.6	5.5	5.0	1.2	12.0	3.91	3.91	3.91	3.91	3.40	non-LIQ CLAY	1	0.27	NA	12.38	non-LIQ	non-LIQ	0.620	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.24	52.1	115.0	115.0	23.2	1.2	5.2	92.6	10.2	5.3	5.0	1.2	11.0	3.92	3.92	3.92	3.92	3.43	non-LIQ CLAY	1	0.27	NA	12.87	non-LIQ	non-LIQ	0.619	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.41	51.9	115.0	115.0	22.1	1.2	5.4	96.0	10.0	5.2	5.0	1.2	11.0	3.93	3.93	3.93	3.93	3.47	non-LIQ CLAY	1	0.27	NA	13.52	non-LIQ	non-LIQ	0.617	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.57	51.7	115.0	115.0	19.9	1.3	6.5	105.6	9.9	5.1	5.0	1.2	11.0	3.94	3.94	3.94	3.94	3.57	non-LIQ CLAY	1	0.27	NA	15.39	non-LIQ	non-LIQ	0.616	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.74	51.6	115.0	115.0	18.9	1.2	6.3	107.6	9.6	4.9	5.0	1.2	11.0	3.95	3.95	3.95	3.95	3.59	non-LIQ CLAY	1	0.27	NA	15.77	non-LIQ	non-LIQ	0.615	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.90	51.4	115.0	115.0	21.3	1.2	5.6	98.9	9.9	5.1	5.0	1.2	11.0	3.96	3.96	3.96	3.96	3.50	non-LIQ CLAY	1	0.27	NA	14.08	non-LIQ	non-LIQ	0.613	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.07	51.2	115.0	115.0	21.1	1.2	5.7	99.7	9.9	5.1	5.0	1.2	11.0	3.97	3.97	3.97	3.97	3.51	non-LIQ CLAY	1	0.27	NA	14.23	non-LIQ	non-LIQ	0.612	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.23	51.1	115.0	115.0	21.4	1.3	6.1	100.7	10.1	5.2	5.0	1.2	11.0	3.98	3.98	3.98	3.98	3.52	non-LIQ CLAY	1	0.27	NA	14.44	non-LIQ	non-LIQ	0.611	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.39	50.9	115.0	115.0	21.5	1.3	6.0	100.5	10.2	5.2	5.0	1.2	11.0	3.99	3.99	3.99	3.98	3.52	non-LIQ CLAY	1	0.27	NA	14.39	non-LIQ	non-LIQ	0.609	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.56	50.7	115.0	115.0	22.9	1.4	6.1	98.0	10.6	5.4	5.0	1.2	12.0	4.00	4.00	4.00	3.99	3.49	non-LIQ CLAY	1	0.26	NA	13.91	non-LIQ	non-LIQ	0.608	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.72	50.6	115.0	115.0	25.8	1.6	6.2	93.3	11.4	5.8	5.0	1.2	12.0	4.01	4.01	4.01	4.00	3.44	non-LIQ CLAY	1	0.26	NA	13.00	non-LIQ	non-LIQ	0.607	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.89	50.4	115.0	115.0	27.5	1.7	6.2	90.7	11.8	6.1	5.0	1.2	12.0	4.02	4.02	4.02	4.01	3.41	non-LIQ CLAY	1	0.26	NA	12.51	non-LIQ	non-LIQ	0.605	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.05	50.3	115.0	115.0	33.6	1.8	5.4	79.9	13.1	6.7	5.0	1.2	13.0	4.03	4.03	4.03	4.02	3.29	non-LIQ CLAY	1	0.26	NA	10.51	non-LIQ	non-LIQ	0.604	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.21	50.1	115.0	115.0	35.4	1.9	5.4	78.2	13.6	6.9	5.0	1.2	13.0	4.04	4.04	4.04	4.03	3.27	non-LIQ CLAY	1	0.26	NA	10.19	non-LIQ	non-LIQ	0.603	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.38	49.9	115.0	115.0	35.8	1.7	4.7	75.3	13.4	6.8	5.0	1.2	13.0	4.05	4.05	4.05	4.04	3.23	non-LIQ CLAY	1	0.26	NA	9.67	non-LIQ	non-LIQ	0.601	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.54	49.8	115.0	115.0	31.6	1.6	5.1	81.1	12.4	6.4	5.0	1.2	13.0	4.06	4.06	4.06	4.05	3.30	non-LIQ CLAY	1	0.26	NA	10.73	non-LIQ	non-LIQ	0.600	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.71	49.6	115.0	115.0	28.6	1.6	5.6	87.2	11.9	6.1	5.0	1.2	12.0	4.07	4.07	4.07	4.06	3.37	non-LIQ CLAY	1	0.26	NA	11.86	non-LIQ	non-LIQ	0.599	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.87	49.4	115.0	115.0	29.5	1.6	5.4	85.4	12.1	6.2	5.0	1.2	12.0	4.08	4.08	4.08	4.07	3.35	non-LIQ CLAY	1	0.26	NA	11.52	non-LIQ	non-LIQ	0.597	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.03	49.3	115.0	115.0	28.8	1.5	5.2	85.5	11.8	6.0	5.0	1.2	12.0	4.08	4.08	4.08	4.08	3.35	non-LIQ CLAY	1	0.26	NA	11.54	non-LIQ	non-LIQ	0.596	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.20	49.1	115.0	115.0	27.2	1.5	5.5	89.2	11.5	5.9	5.0	1.2	12.0	4.09	4.09	4.09	4.09	3.39	non-LIQ CLAY	1	0.26	NA	12.23	non-LIQ	non-LIQ	0.595	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.36	48.9	115.0	115.0	26.7	1.5	5.6	90.5	11.5	5.8	5.0	1.2	12.0	4.10	4.10	4.10	4.10	3.41	non-LIQ CLAY	1	0.26	NA	12.47	non-LIQ	non-LIQ	0.593	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.53	48.8	115.0	115.0	26.4	1.5	5.7	91.3	11.4	5.8	5.0	1.2	12.0	4.11	4.11	4.11	4.11	3.42	non-LIQ CLAY	1	0.26	NA	12.63	non-LIQ	non-LIQ	0.592	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.69	48.6	115.0	115.0	24.7	1.4	5.7	94.2	11.0	5.6	5.0	1.2	12.0	4.12	4.12	4.12	4.12	3.45	non-LIQ CLAY	1	0.26	NA	13.17	non-LIQ	non-LIQ	0.591	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.85	48.5	115.0	115.0	22.1	1.3	5.9	100.2	10.4	5.3	5.0	1.2	11.0	4.13	4.13	4.13	4.13	3.51	non-LIQ CLAY	1	0.26	NA	14.33	non-LIQ	non-LIQ	0.589	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.02	48.3	115.0	115.0	19.3	1.1	5.7	106.2	9.6	4.9	5.0	1.2	11.0	4.14	4.14	4.14	4.14	3.57	non-LIQ CLAY	1	0.26	NA	15.49	non-LIQ	non-LIQ	0.588	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.18	48.1	115.0	115.0	16.1	1.0	6.2	118.7	9.1	4.6	5.0	1.2	11.0	4.15	4.15	4.15	4.15	3.70	non-LIQ CLAY	1	0.25	NA	17.95	non-LIQ	non-LIQ	0.587	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.35	48.0	115.0	115.0	15.5	1.0	6.5	122.3	9.1	4.6	5.0	1.2	11.0	4.16	4.16	4.16	4.15	3.73	non-LIQ CLAY	1	0.25	NA	18.64	non-LIQ	non-LIQ	0.585	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.51	47.8	115.0	115.0	14.5	1.0	6.9	128.7	9.1	4.6	5.0	1.2	11.0	4.17	4.17	4.17	4.16	3.79	non-LIQ CLAY	1	0.25	NA	19.91	non-LIQ	non-LIQ	0.584	0.160	0.160	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.67	47.6	115.0	115.0	15.0	1.0	6.7	125.6	9.1	4.6	5.0	1.2	11.0	4.18	4.18	4.18	4.17	3.76	non-LIQ CLAY	1	0.25	NA	19.30	non-LIQ	non-LIQ	0.583	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.84	47.5	115.0	115.0	15.5	1.1	7.1	125.4	9.4	4.7	5.0	1.2	11.0	4.19	4.19	4.19	4.18	3.76	non-LIQ CLAY	1	0.25	NA	19.26	non-LIQ	non-LIQ	0.581	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.00	47.3	115.0	115.0	14.9	1.0	6.7	126.5	9.1	4.6	5.0	1.2	11.0	4.20	4.20	4.20	4.19	3.77	non-LIQ CLAY	1	0.25	NA	19.48	non-LIQ	non-LIQ	0.580	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.17	47.1	115.0	115.0	14.9	1.0	6.7	126.7	9.2	4.6	5.0	1.2	11.0	4.21	4.21	4.21	4.20	3.77	non-LIQ CLAY	1	0.25	NA	19.51	non-LIQ	non-LIQ	0.579	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.33	47.0	115.0	115.0	14.4	1.0	6.9	130.1	9.2	4.6	5.0	1.2	11.0	4.22	4.22	4.22	4.21	3.80	non-LIQ CLAY	1	0.25	NA	20.19	non-LIQ	non-LIQ	0.577	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.49	46.8	115.0	115.0	13.8	1.0	7.2	134.5	9.2	4.6	5.0	1.2	11.0	4.23	4.23	4.23	4.22	3.84	non-LIQ CLAY	1	0.25	NA	21.07	non-LIQ	non-LIQ	0.576	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.66	46.6	115.0	115.0	11.6	0.9	7.8	150.8	9.4	4.7	5.0	1.2	11.0	4.24	4.24	4.24	4.23	3.97	non-LIQ CLAY	1	0.25	NA	24.28	non-LIQ	non-LIQ	0.575	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.82	46.5	115.0	115.0	11.8	0.9	7.6	148.9	9.3	4.7	5.0	1.2	11.0	4.24	4.24	4.24	4.24	3.95	non-LIQ CLAY	1	0.25	NA	23.91	non-LIQ	non-LIQ	0.573	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.99	46.3	115.0	115.0	12.8	1.0	7.8	143.1	9.5	4.7	5.0	1.2	11.0	4.25	4.25	4.25	4.25	3.91	non-LIQ CLAY	1	0.25	NA	22.76	non-LIQ	non-LIQ	0.572	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.15	46.2	115.0	115.0	14.4	1.0	6.9	130.9	9.3	4.6	5.0	1.2	11.0	4.26	4.26	4.26	4.26	3.80	non-LIQ CLAY	1	0.25	NA	20.35	non-LIQ	non-LIQ	0.571	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.31	46.0	115.0	115.0	15.3	1.0	6.5	125.2	9.3	4.6	5.0	1.2	11.0	4.27	4.27	4.27	4.27	3.75	non-LIQ CLAY	1	0.25	NA	19.22	non-LIQ	non-LIQ	0.569	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.48	45.8	115.0	115.0	15.2	1.0	6.6	126.0	9.3	4.6	5.0	1.2	11.0	4.28	4.28	4.28	4.28	3.76	non-LIQ CLAY	1	0.25	NA	19.37	non-LIQ	non-LIQ	0.568	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.64	45.7	115.0	115.0	15.6	1.0	6.4	123.7	9.3	4.6	5.0	1.2	11.0	4.29	4.29	4.29	4.29	3.74	non-LIQ CLAY	1	0.25	NA	18.92	non-LIQ	non-LIQ	0.567	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.81	45.5	115.0	115.0	17.0	1.1	6.5	116.7	9.6	4.8	5.0	1.2	11.0	4.30	4.30	4.30	4.30	3.70	non-LIQ CLAY	1	0.25	NA	17.94	non-LIQ	non-LIQ	0.565	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.97	45.3	115.0	115.0	17.8	1.1	6.2	114.9	9.7	4.8	5.0	1.2	11.0	4.31	4.31	4.31	4.31	3.66	non-LIQ CLAY	1	0.25	NA	17.19	non-LIQ	non-LIQ	0.564	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.13	45.2	115.0	115.0	18.1	1.1	6.1	113.6	9.7	4.8	5.0	1.2	11.0	4.32	4.32	4.32	4.31	3.65	non-LIQ CLAY	1	0.24	NA	16.94	non-LIQ	non-LIQ	0.563	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.30	45.0	115.0	115.0	17.4	1.1	6.3	117.1	9.7	4.8	5.0	1.2	11.0	4.33	4.33	4.33	4.32	3.68	non-LIQ CLAY	1	0.24	NA	17.62	non-LIQ	non-LIQ	0.561	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.46	44.8	115.0	115.0	16.7	1.1	6.6	120.8	9.6	4.8	5.0	1.2	11.0	4.34	4.34	4.34	4.33	3.71	non-LIQ CLAY	1	0.24	NA	18.36	non-LIQ	non-LIQ	0.560	0.150	0.150	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.63	44.7	115.0	115.0	16.7	1.0	6.0	118.4	9.4	4.6	5.0	1.2	11.0	4.35	4.35	4.35	4.34	3.69	non-LIQ CLAY	1	0.24	NA	17.87	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.79	44.5	115.0	115.0	20.6	1.5	7.3	111.9	10.9	5.4	5.0	1.2	11.0	4.36	4.36	4.36	4.35	3.63	non-LIQ CLAY	1	0.24	NA	16.60	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.96	44.3	115.0	115.0	31.2	1.6	5.1	84.7	12.7	6.2	5.0	1.2	12.0	4.37	4.37	4.37	4.36	3.34	non-LIQ CLAY	1	0.24	NA	11.38	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.12	44.2	115.0	115.0	41.3	2.2	5.3	75.6	15.5	7.6	5.0	1.2	14.0	4.38	4.38	4.38	4.37	3.23	non-LIQ CLAY	1	0.24	NA	9.72	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.28	44.0	115.0	115.0	32.8	2.8	8.5	95.1	14.7	7.2	5.0	1.2	14.0	4.39	4.39	4.39	4.38	3.46	non-LIQ CLAY	1	0.24	NA	13.36	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.45	43.9	115.0	115.0	77.0	2.7	3.5	50.6	22.9	11.2	5.0	1.2	18.0	4.40	4.40	4.40	4.39	2.88	non-LIQ CLAY	1	0.24	NA	5.48	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.61	43.7	115.0	115.0	120.4	2.4	2.0	23.3	27.0	13.2	4.1	1.1	19.0	4.41	4.41	4.41	4.40	2.32	SAND	0.5	0.49	56	2.02	112	0.212	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.78	43.5	115.0	115.0	116.8	3.0	2.6	37.4	30.5	14.9	5.0	1.2	23.0	4.41	4.41	4.41	4.41	2.64	non-LIQ CLAY	1	0.24	NA	3.58	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.94	43.4	115.0	115.0	87.8	3.2	3.6	48.4	25.5	12.5	5.0	1.2	20.0	4.42	4.42	4.42	4.42	2.84	non-LIQ CLAY	1	0.24	NA	5.14	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.10	43.2	115.0	115.0	71.3	3.8	5.3	60.2	23.2	11.3	5.0	1.2	19.0	4.43	4.43	4.43	4.43	3.02	non-LIQ CLAY	1	0.24	NA	7.03	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.27	43.0	115.0	115.0	64.8	3.7	5.7	64.1	21.8	10.6	5.0	1.2	18.0	4.44	4.44	4.44	4.44	3.08	non-LIQ CLAY	1	0.24	NA	7.69	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.43	42.9	115.0	115.0	44.3	3.7	8.4	84.1	17.9	8.7	5.0	1.2	15.0	4.45	4.45	4.45	4.45	3.34	non-LIQ CLAY	1	0.24	NA	11.28	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.60	42.7	115.0	115.0	47.2	4.5	9.5	85.3	19.3	9.4	5.0	1.2	16.0	4.46	4.46	4.46	4.46	3.35	non-LIQ CLAY	1	0.24	NA	11.50	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.76	42.5	115.0	115.0	75.3	4.7	6.2	62.2	24.9	12.1	5.0	1.2	20.0	4.47	4.47	4.47	4.47	3.05	non-LIQ CLAY	1	0.24	NA	7.36	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.92	42.4	115.0	115.0	163.0	5.7	3.5	36.2	42.0	20.4	5.0	1.2	30.0	4.48	4.48	4.48	4.48	2.62	non-LIQ CLAY	1	0.24	NA	3.43	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.09	42.2	115.0	115.0	164.1	6.1	3.7	37.0	42.7	20.7	5.0	1.2	30.0	4.49	4.49	4.49	4.48	2.63	non-LIQ CLAY	1	0.24	NA	3.53	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.25	42.1	115.0	115.0	185.5	4.8	2.6	21.1	40.5	19.7	3.8	1.1	25.0	4.50	4.50	4.50	4.49	2.26	SAND	0.5	0.48	85	1.83	155	0.428	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.42	41.9	115.0	115.0	229.0	4.2	1.8	15.4	46.6	22.6	2.6	1.1	26.0	4.51	4.51	4.51	4.50	2.09	SAND	0.5	0.48	105	1.43	150	0.394	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.58	41.7	115.0	115.0	242.7	4.4	1.8	14.8	49.0	23.7	2.4	1.0	27.0	4.52	4.52	4.52	4.51	2.06	SAND	0.5	0.48	111	1.39	155	0.425	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.74	41.6	115.0	115.0	263.9	4.7	1.8	13.9	52.6	25.4	2.2	1.0	29.0	4.53	4.53	4.53	4.52	2.03	SAND	0.5	0.48	121	1.35	162	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.91	41.4	115.0	115.0	280.7	4.3	1.5	12.1	54.5	26.3	1.6	1.0	29.0	4.54	4.54	4.54	4.53	1.97	SAND	0.5	0.48	128	1.26	161	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.07	41.2	115.0	115.0	283.2	4.4	1.6	12.1	55.1	26.6	1.6	1.0	29.0	4.55	4.55	4.55	4.54	1.97	SAND	0.5	0.48	129	1.26	163	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.24	41.1	115.0	115.0	268.7	4.2	1.6	12.6	52.6	25.4	1.8	1.0	28.0	4.56	4.56	4.56	4.55	1.99	SAND	0.5	0.48	122	1.28	157	0.441	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.40	40.9	115.0	115.0	248.9	4.1	1.6	13.7	49.5	23.8	2.1	1.0	27.0	4.57	4.57	4.57	4.56	2.03	SAND	0.5	0.48	113	1.34	152	0.404	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Camino Capistrano UC (55-0227) SP 11-137

LIQUEFACTION ANALYSIS; ACC. = 0.4 g 01-Mar-12

Liquefaction analysis is performed following Seed's Procedure, outlined by Seed et al (1985), Seed and Harder (1990), updated NCEER (1997)

Emean/E60 = Energy Ratio to correct to standard 60% Energy
Surcharge = Any surcharge on top of the ground (psf)
acc. max = maximum peak acceleration at the ground surface (g's)
^1C_N = square root of (100 kPa or 1.04427 tsf/effective overburden)
The induced cyclic stress ratio (CSR i) by a given peak ground acceleration (acc. max) is:

CSR i = 0.65 x acc max. x total normal stress x rd / (effective normal stress x g)

where: rd = stress reduction factor (Robertson and Wride (1996), Marcuson (USArmy Eng), per NCEER (1997))
g = acceleration of gravity

The resisting cyclic stress ratio (CSR r) is equal to:

CSR r = CSR x Cm x K sigma

where: Cm = Earthquake Magnitude Correction Factor (Blake, NCEER Table 3, Eq.4)
K sigma = Normalized resistance factor (Fig. 14 from NCEER Liquefaction workshop, Harder Boulanger)
CSR = Resisting Cyclic Stress Ratio. It is a function of the content of fines
(Figure 2, NCEER Workshop, after Seed et al 1985))

Factor of Safety, F sub L is:

F sub L = CSR r / CSR i

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Emean (%) 75 Sur.= psf 116.9 =top of ground el. Borehole Diamete 8 71.7 =water table El. acc. max = 0.41 g Earthq. M= 7.5
C_E 1.25 C_B 1.15 Cm= 1.00

ELEVATION TOP OF LAYER (ft.)	LAYER THICKNESS L (ft.)	TOTAL OVERBUR. PRESS. (tsf)	EFFEC. OVERBUR. PRESS. (tsf)	DEPTH BELOW SURFACE (ft)	C_N	C_R	C_S	C_{ST}	TOTAL UNIT WEIGHT (pcf)	SAMPLER TYPE 1=SPT 2=CA.MOD.	SAMPLER LINED 1=UNLINED 2=LINED	FIELD BLOW COUNT N	STRESS REDUC. COEFF. rd	INDUCED CYCLIC STRESS RATIO	CORRECT BLOW COUNT Nc	EST. PERCENT OF FINES (%)	(N1)60cs	K sigma	RESIST. CYCLIC STRESS RATIO M=7.5	RESIST. CYCLIC STRESS RATIO Overburd Cor Mag Corr	FACTOR OF SAFETY (F sub L)	WILL IT LIQUEFY?
111.9	5	0.29	0.29	5.00	1.91	0.75	1.20	1.00	115	1	1	16	0.99	0.26	40	30.0	51	1.00	high N	high N	LARGE	AboveWT
106.9	5	0.58	0.58	10.00	1.35	0.75	1.00	0.50	115	2	2	79	0.98	0.26	58	30.0	72	1.00	high N	high N	LARGE	AboveWT
101.9	5	0.86	0.86	15.00	1.10	0.85	1.20	1.00	115	1	1	13	0.97	0.26	21	51.0	31	1.00	high N	high N	LARGE	AboveWT
96.9	5	1.15	1.15	20.00	0.95	0.85	1.00	0.50	115	2	2	36	0.95	0.25	21	51.0	31	0.98	high N	high N	LARGE	AboveWT
91.9	5	1.44	1.44	25.00	0.85	0.95	1.20	1.00	115	1	1	11	0.94	0.25	16	51.0	25	0.94	0.29	0.27	1.10	AboveWT
86.9	5	1.73	1.73	30.00	0.78	0.95	1.00	0.50	115	2	2	40	0.93	0.25	22	51.0	32	0.90	high N	high N	LARGE	AboveWT
81.9	5	2.01	2.01	35.00	0.72	1.00	1.20	1.00	115	1	1	13	0.89	0.24	17	51.0	26	0.88	0.31	0.28	1.17	AboveWT
76.9	5	2.30	2.30	40.00	0.67	1.00	1.00	0.50	115	2	2	21	0.85	0.22	11	51.0	19	0.86	0.20	0.17	0.77	AboveWT
71.9	5	2.59	2.59	45.00	0.64	1.00	1.20	1.00	115	1	1	13	0.81	0.21	15	51.0	23	0.83	0.26	0.21	1.00	AboveWT
66.9	5	2.88	2.72	50.00	0.62	1.00	1.00	0.50	115	2	2	40	0.77	0.22	18	51.0	27	0.82	0.34	0.28	1.29	fines
61.9	5	3.16	2.85	55.00	0.61	1.00	1.20	1.00	115	1	1	18	0.73	0.21	19	51.0	28	0.81	0.37	0.30	1.40	fines
56.9	5	3.45	2.98	60.00	0.59	1.00	1.00	0.50	115	2	2	25	0.69	0.21	11	51.0	19	0.80	0.20	0.16	0.77	fines
51.9	5	3.74	3.11	65.00	0.58	1.00	1.20	1.00	115	1	1	13	0.64	0.21	13	51.0	21	0.77	0.23	0.18	0.86	fines
46.9	5	4.03	3.25	70.00	0.57	1.00	1.00	0.50	115	2	2	29	0.60	0.20	12	51.0	20	0.77	0.22	0.17	0.83	fines
41.9	5	4.31	3.38	75.00	0.56	1.00	1.20	1.00	115	1	1	10	0.56	0.19	10	51.0	17	0.76	0.18	0.14	0.72	fines
36.9	5	4.60	3.51	80.00	0.55	1.00	1.00	0.50	115	2	2	14	0.55	0.19	6	51.0	13	0.75	0.14	0.11	0.55	fines
31.9	5	4.89	3.64	85.00	0.54	1.00	1.20	1.00	115	1	1	31	0.54	0.19	29	51.0	40	0.74	high N	high N	LARGE	high N/fines

Camino Capistrano UC (55-0227)
LIQUEFACTION ANALYSIS; ACC. = 0.408 g

SP 11-137
01-Mar-12

Liquefaction analysis is performed following Seed's Procedure, outlined by Seed et al (1985), Seed and Harder (1990), updated NCEER (1997)

Emean/E60 = Energy Ratio to correct to standard 60% Energy
Surcharge = Any surcharge on top of the ground (psf)
acc. max = maximum peak acceleration at the ground surface (g's)
^1C_N = square root of (100 kPa or 1.04427 tsf/effective overburden)
The induced cyclic stress ratio (CSR i) by a given peak ground acceleration (acc. max) is:

CSR i = 0.65 x acc max. x total normal stress x rd / (effective normal stress x g)

where: rd = stress reduction factor (Robertson and Wride (1996), Marcuson (USArmy Eng), per NCEER (1997))
g = acceleration of gravity

The resisting cyclic stress ratio (CSR r) is equal to:

CSR r = CSR x Cm x K sigma

where: Cm = Earthquake Magnitude Correction Factor (Blake, NCEER Table 3, Eq.4)
K sigma = Normalized resistance factor (Fig. 14 from NCEER Liquefaction workshop, Harder Boulanger)
CSR = Resisting Cyclic Stress Ratio. It is a function of the content of fines
(Figure 2, NCEER Workshop, after Seed et al 1985))

Factor of Safety, F sub L is:

F sub L = CSR r / CSR i

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Emean (%)	75	Sur.=	psf	81.7	=top of ground el.	Borehole Diamete	8							71.7	=water table El.		acc. max =	0.41	g		Earthq. M=	7.5	
C_E	1.25					C_B	1.15														Cm=	1.00	

ELEVATION TOP OF LAYER (ft.)	LAYER THICKNESS L (ft.)	TOTAL OVERBUR. PRESS. (tsf)	EFFEC. OVERBUR. PRESS. (tsf)	DEPTH BELOW SURFACE (ft)	C_N	C_R	C_S	C_{ST}	TOTAL UNIT WEIGHT (pcf)	SAMPLER TYPE 1=SPT 2=CA.MOD.	SAMPLER LINED 1=UNLINED 2=LINED	FIELD BLOW COUNT N	STRESS REDUC. COEFF. rd	INDUCED CYCLIC STRESS RATIO	CORRECT BLOW COUNT Nc	EST. PERCENT OF FINES (%)	(N1)60cs	K sigma	RESIST. CYCLIC STRESS RATIO M=7.5	RESIST. CYCLIC STRESS RATIO Overburd Cor Mag Corr	FACTOR OF SAFETY (F sub L)	WILL IT LIQUEFY?
76.7	5	0.29	0.29	5.00	1.91	0.75	1.00	0.50	115	2	2	12	0.99	0.26	13	51.0	21	1.00	0.23	0.23	0.87	AboveWT
71.7	5	0.58	0.58	10.00	1.35	0.75	1.20	1.00	115	1	1	11	0.98	0.26	20	51.0	29	1.00	0.41	0.41	1.58	fines
66.7	5	0.86	0.71	15.00	1.22	0.85	1.00	0.50	115	2	2	23	0.97	0.31	18	51.0	27	1.00	0.34	0.34	1.08	fines
61.7	5	1.15	0.84	20.00	1.12	0.85	1.20	1.00	115	1	1	4	0.95	0.35	7	51.0	14	1.00	0.15	0.15	0.43	fines
56.7	5	1.44	0.97	25.00	1.04	0.95	1.00	0.50	115	2	2	8	0.94	0.37	6	51.0	13	1.00	0.14	0.14	0.38	fines
51.7	5	1.73	1.10	30.00	0.97	0.95	1.20	1.00	115	1	1	5	0.93	0.39	8	51.0	15	0.99	0.16	0.16	0.41	fines
46.7	5	2.01	1.23	35.00	0.92	1.00	1.00	0.50	115	2	2	16	0.89	0.39	11	51.0	19	0.97	0.20	0.20	0.51	fines
41.7	5	2.30	1.36	40.00	0.87	1.00	1.20	1.00	115	1	1	5	0.85	0.38	8	51.0	15	0.95	0.16	0.15	0.40	fines
36.7	5	2.59	1.50	45.00	0.84	1.00	1.00	0.50	115	2	2	25	0.81	0.37	16	51.0	25	0.93	0.29	0.27	0.73	fines
31.7	5	2.88	1.63	50.00	0.80	1.00	1.20	1.00	115	1	1	9	0.77	0.36	13	51.0	21	0.91	0.23	0.21	0.58	fines
26.7	5	3.16	1.76	55.00	0.77	1.00	1.00	0.50	115	2	2	25	0.73	0.35	14	51.0	22	0.89	0.24	0.22	0.62	fines
21.7	5	3.45	1.89	60.00	0.74	1.00	1.20	1.00	115	1	1	6	0.69	0.33	8	51.0	15	0.88	0.16	0.14	0.42	fines
16.7	5	3.74	2.02	65.00	0.72	1.00	1.00	0.50	115	2	2	36	0.64	0.32	19	51.0	28	0.88	0.37	0.32	1.03	fines
11.7	5	4.03	2.15	70.00	0.70	1.00	1.20	1.00	115	1	1	7	0.60	0.30	9	51.0	16	0.87	0.17	0.15	0.49	fines
6.7	5	4.31	2.28	75.00	0.68	1.00	1.00	0.50	115	2	2	31	0.56	0.28	16	51.0	25	0.86	0.29	0.25	0.89	fines
1.7	5	4.60	2.42	80.00	0.66	1.00	1.20	1.00	115	1	1	11	0.55	0.28	13	51.0	21	0.85	0.23	0.19	0.70	fines

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering
17800 Newhope Street
Suite B
Fountain Valley, CA 92708

CPT Number: CPT-11-349
Project Name: Retaining Wall 387
Project Number: 11-137
Location: Orange County
California

Computed by: SP
Checked by: LLL

Date: 04/12/12
Date: 4/16/12

Figure No.: _____

Reference:

1) Seed, R.B., et al, *Recent Advances in Soil Liquefaction Engineering: A Unified and Consistent Framework*, Keynote Presentation, 26th Annual ASCE Los Angeles Geotechnical Spring Seminar, April 30, 2003.
2) Youd, T.L. & Idriss, I.M., et al, *Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils*, ASCE Journal of Geotechnical and Geoenvironmental Engineering, Pp. 817-833, October 2001.
3) Pradel D., *Procedure to Evaluate Earthquake-induced Settlements in Dry Sandy Soils*, ASCE Journal of Geotechnical and Geoenvironmental Engineering, Pp. 364-368, April 1998.
4) Tokimatsu, K. & Seed, H.B., *Evaluation of Settlements in Sands due to Earthquake Shaking*, ASCE Journal of Geotechnical Engineering, Pp. 861-878, August 1987.
5) Jefferies, M.G. & Davies, M.P., *Use of CPT to Estimate Equivalent SPT N_{60}*, ASTM Geotechnical Testing Journal, Vol.17, No. 4, Pp. 458-567, 1993.
6) Robertson, P.K. et al, *Use of Piezometer Cone Data*, Proceedings of the ASCE Specialty Conference In Situ 86: Use of In Situ Tests in Geotechnical Engineering, Blacksburg, Pp. 1263-1280, 1986.

Surface Elevation = 81.7 ft MSL
Design Magnitude, M_w = 7.50
PGA, a_{max} = 0.408 g
Earthquake Scaling Factor, MSF = 1.000 for M_w = 7.5
Design Water Level = 71.7 ft MSL
Water Level at Investigation = 63.7 ft MSL
Req'd Factor of Safety = 1

Summary of Seismically Induced Settlement:

Dry Settlement (in)	0.024
Post-liquefaction Settlement (in)	0.077
Total Settlement (in)	0.101

Depth	Elev.	Unit Weight (pcf)		q_c	f_s	Frict. Ratio	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60CS}$	Stresses at Exploration Water Level		Stresses at Design Water Level		I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance			Fines Correction		$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max}	Cyclic Shear Strain γ	Norm. Vol. Strain ε_{vol}	Dry Settle. ΔS	Post-Liq. $(N_1)_{60CS}$	Post-Liq. Vol. Strain ε	Layer Post-Liq. Settle. ΔS
		γ^{*}_{MOIST}	γ^{*}_{SAT}										σ_v	σ_v'	σ_v	σ_v'			n	C_Q	q_{c1cs}	Kc	$(q_{c1n})_{cs}$														
(ft)	(ft, MSL)			(tsf)	(tsf)	(%)							(tsf)	(tsf)	(tsf)	(tsf)															(%)	(%)	(in)		(%)	(in)
0.33	81.4	115.0	115.0	3.7	0.0	0.0	37	1	7	5.00	1.20	14	0.019	0.019	0.019	0.019	2.63	non-LIQ CLAY	1	1.70	NA	3.50	non-LIQ	non-LIQ	0.999	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
0.49	81.2	115.0	115.0	7.8	0.0	0.0	50	2	14	5.00	1.20	22	0.028	0.028	0.028	0.028	2.86	non-LIQ CLAY	1	1.70	NA	5.34	non-LIQ	non-LIQ	0.999	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
0.66	81.0	115.0	115.0	13.7	0.0	0.0	62	5	24	5.00	1.20	34	0.038	0.038	0.038	0.038	3.06	non-LIQ CLAY	1	1.70	NA	7.38	non-LIQ	non-LIQ	0.998	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
0.82	80.9	115.0	115.0	13.6	0.0	0.0	64	5	22	5.00	1.20	31	0.047	0.047	0.047	0.047	3.08	non-LIQ CLAY	1	1.70	NA	7.71	non-LIQ	non-LIQ	0.998	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
0.98	80.7	115.0	115.0	12.8	0.0	0.0	65	4	19	5.00	1.20	28	0.056	0.056	0.056	0.056	3.09	non-LIQ CLAY	1	1.70	NA	7.84	non-LIQ	non-LIQ	0.998	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.15	80.6	115.0	115.0	12.6	0.0	0.0	67	4	17	5.00	1.20	26	0.066	0.066	0.066	0.066	3.12	non-LIQ CLAY	1	1.70	NA	8.12	non-LIQ	non-LIQ	0.997	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.31	80.4	115.0	115.0	15.5	0.0	0.0	72	6	21	5.00	1.20	30	0.075	0.075	0.075	0.075	3.19	non-LIQ CLAY	1	1.70	NA	9.06	non-LIQ	non-LIQ	0.997	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.48	80.2	115.0	115.0	16.9	0.0	0.0	75	6	22	5.00	1.20	32	0.085	0.085	0.085	0.085	3.23	non-LIQ CLAY	1	1.70	NA	9.63	non-LIQ	non-LIQ	0.997	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.64	80.1	115.0	115.0	18.4	0.2	1.1	16	4	13	2.88	1.06	16	0.094	0.094	0.094	0.094	2.12	SAND	0.5	1.70	29.6	1.49	44.2	0.09	0.996	0.26	0.260	Above Water	0.13	33560	262.2	0.03	0.06	0.002	NA	NA	0.000
1.80	79.9	115.0	115.0	29.4	3.1	10.5	36	8	24	5.00	1.20	34	0.104	0.104	0.104	0.104	2.60	SILT	0.7	1.70	47.2	3.35	158.4	0.45	0.996	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
1.97	79.7	115.0	115.0	82.3	8.7	10.6	31	20	61	4.74	1.16	76	0.113	0.113	0.113	0.113	2.50	SAND	0.5	1.70	132.2	2.76	364.3	non-LIQ	0.995	0.26	0.260	Above Water	0.13	30065	485.2	0.01	0.00	0.000	NA	NA	0.000
2.13	79.6	115.0	115.0	227.9	9.4	4.1	12	44	129	1.46	1.03	135	0.122	0.122	0.122	0.122	1.95	SAND	0.5	1.70	366.2	1.24	455.5	non-LIQ	0.995	0.26	0.260	Above Water	0.13	26688	647.8	0.01	0.00	0.000	NA	NA	0.000
2.30	79.4	115.0	115.0	296.3	7.9	2.7	7	53	150	0.11	1.01	151	0.132	0.132	0.132	0.132	1.74	SAND	0.5	1.70	476.1	1.07	507.7	non-LIQ	0.995	0.26	0.260	Above Water	0.13	27397	707.0	0.01	0.00	0.000	NA	NA	0.000
2.46	79.2	115.0	115.0	391.5	14.9	3.8	9	73	200	0.69	1.02	204	0.141	0.141	0.141	0.141	1.66	SAND	0.5	1.70	629.0	1.15	725.3	non-LIQ	0.994	0.26	0.260	Above Water	0.13	26313	804.5	0.01	0.00	0.000	NA	NA	0.000
2.62	79.1	115.0	115.0	424.2	18.4	4.3	11	81	214	1.08	1.02	220	0.151	0.151	0.151	0.151	1.91	SAND	0.5	1.70	681.5	1.20	816.6	non-LIQ	0.994	0.26	0.260	Above Water	0.13	25337	849.1	0.01	0.00	0.000	NA	NA	0.000
2.79	78.9	115.0	115.0	513.2	18.8	3.7	9	95	243	0.45	1.02	247	0.160	0.160	0.160	0.160	1.62	SAND	0.5	1.70	824.5	1.12	926.6	non-LIQ	0.993	0.26	0.260	Above Water	0.13	24399	914.2	0.01	0.00	0.000	NA	NA	0.000
2.95	78.8	115.0	115.0	508.9	18.6	3.7	9	94	234	0.46	1.02	238	0.170	0.170	0.170	0.170	1.63	SAND	0.5	1.70	817.6	1.13	920.3	non-LIQ	0.993	0.26	0.260	Above Water	0.13	23596	929.0	0.01	0.00	0.000	NA	NA	0.000
3.12	78.6	115.0	115.0	482.9	18.4	3.8	9	90	218	0.63	1.02	223	0.179	0.179	0.179	0.179	1.65	SAND	0.5	1.70	775.9	1.15	888.9	non-LIQ	0.993	0.26	0.260	Above Water	0.13	22816	932.9	0.01	0.00	0.000	NA	NA	0.000
3.28	78.4	115.0	115.0	400.8	16.2	4.0	10	76	180	0.99	1.02	185	0.189	0.189	0.189	0.189	1.90	SAND	0.5	1.70	643.9	1.19	764.7	non-LIQ	0.992	0.26	0.260	Above Water	0.13	22142	896.7	0.01	0.00	0.000	NA	NA	0.000
3.45	78.3	115.0	115.0	338.1	13.5	4.0	11	64	149	1.16	1.03	154	0.198	0.198	0.198	0.198	1.92	SAND	0.5	1.70	543.2	1.21	655.5	non-LIQ	0.992	0.26	0.260	Above Water	0.13	21480	863.8	0.01	0.00	0.000	NA	NA	0.000
3.61	78.1	115.0	115.0	287.6	9.6	3.3	10	54	122	0.78	1.02	125	0.208	0.208	0.208	0.208	1.87	SAND	0.5	1.70	462.1	1.16	537.9	non-LIQ	0.992	0.26	0.260	Above Water	0.13	20904	826.2	0.01	0.00	0.000	NA	NA	0.000
3.77	77.9	115.0	115.0	245.0	6.2	2.5	8	45	99	0.29	1.01	100	0.217	0.217	0.217	0.217	1.79	SAND	0.5	1.70	393.6	1.10	433.7	non-LIQ	0.991	0.26	0.260	Above Water	0.13	20367	787.1	0.01	0.00	0.000	NA	NA	0.000
3.94	77.8	115.0	115.0	214.0	3.9	1.8	6	38	82	0.03	1.00	82	0.227	0.227	0.227	0.227	1.70	SAND	0.5	1.70	343.8	1.04	356.3	non-LIQ	0.991	0.26	0.260	Above Water	0.13	19835	755.1	0.01	0.00	0.000	NA	NA	0.000
4.10	77.6	115.0	115.0	207.0	2.9	1.4	5	35	75	0.00	1.00	75	0.236	0.236	0.236	0.236	1.61	SAND	0.5	1.70	332.6	1.00	332.6	non-LIQ	0.990	0.26	0.260	Above Water	0.13	19367	749.3	0.01	0.00	0.000	NA	NA	0.000
4.27	77.4	115.0	115.0	145.8	2.1	1.4	6	26	54	0.05	1.01	54	0.246	0.246	0.246	0.246	1.71	SAND	0.5	1.70	234.3	1.05	245.0	non-LIQ	0.990	0.26	0.260	Above Water	0.13	18901	683.6	0.01	0.00	0.000	NA	NA	0.000
4.43	77.3	115.0	115.0	99.6	1.9	1.9	11	19	39	1.12	1.03	41	0.255	0.255	0.255	0.255	1.91	SAND	0.5	1.70	160.0	1.20	192.5	non-LIQ	0.990	0.26	0.260	Above Water	0.13	18488	624.4	0.02	0.01	0.000	NA	NA	0.000
4.59	77.1	115.0	115.0	66.7	1.9	2.2	13	17	34	1.91	1.04	37	0.264	0.264	0.264	0.264	2.00	SAND	0.5	1.70	139.3	1.31	181.9	non-LIQ	0.989	0.26	0.260	Above Water	0.13	18099	610.2	0.02	0.01	0.000	NA	NA	0.000
4.76	76.9	115.0	115.0	81.9	1.0	1.2	9	15	30	0.53	1.02	31	0.274	0.274	0.274	0.274	1.84	SAND	0.5	1.70	131.6	1.13	149.3	0.39	0.989	0.26	0.260	Above Water	0.13	17708	593.5	0.02	0.01	0.001	NA	NA	0.000
4.92	76.8	115.0	115.0	53.3	0.7	1.3	13	10	20	1.87	1.04	23	0.283	0.283	0.283	0.283	2.00	SAND	0.5	1.70	85.6	1.30	111.3	0.21	0.989	0.26	0.260	Above Water	0.13	17360	530.7	0.03	0.03	0.001	NA	NA	0.000
5.25	76.5	115.0	115.0	35.1	0.7	2.0	21	8	14	3.83	1.09	20	0.302	0.302	0.302	0.302	2.27	SAND	0.5	1.70	56.4	1.85	104.4	0.19	0.988	0.26	0.260	Above Water	0.13	16697	489.2	0.04	0.06	0.005	NA	NA	0.000
5.41	76.3	115.0	115.0	18.7	0.6	3.2	33	5	9	4.86	1.18	15	0.311	0.311	0.311	0.311	2.54	SILT	0.7	1.70	30.0	2.98	89.7	0.15	0.987	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
5.56	76.1	115.0	115.0	13.0	0.4	3.1	36	3	6	5.00	1.20	12	0.321	0.321	0.321	0.321	2.66	SILT	0.7	1.70	20.9	3.71	77.4	0.12	0.987	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
5.74	76.0	115.0	115.0	12.0	0.3	2.5	37	3	6	5.00	1.20	12	0.330	0.330	0.330	0.330	2.64	SILT	0.7	1.70	19.3	3.56	68.7	0.11	0.987	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
5.91	75.8	115.0	115.0	13.7	0.3	2.2	34	3	6	4.91	1.18	12	0.340	0.340	0.340	0.340	2.56	SILT	0.7	1.70	22.0	3.10	68.3	0.11	0.986	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
6.07	75.6	115.0	115.0	22.5	0.4	1.8	27	5	9	4.47	1.13	15	0.349	0.349	0.349	0.349	2.41	SAND	0.5	1.70	36.1	2.37	85.5	0.14	0.986	0.26	0.260	Above Water	0.13	15305	452.3	0.07	0.18	0.007	NA	NA	0.000
6.23	75.5	115.0	115.0	21.3	0.5	2.3	31	5	9	4.78	1.16	15	0.358	0.358	0.358	0.358	2.51	SAND	0.5	1.70	34.2	2.83	96.9	0.16	0.985	0.26	0.260	Above Water	0.13	15068	455.0	0.07	0.19	0.007	NA	NA	0.000
6.40	75.3	115.0	115.0	15.1	0.4	2.6	35	4	7	5.00	1.20	13	0.368	0.368	0.368	0.368	2.60	SILT	0.7	1.70	24.3	3.32	80.6	0.13	0.985	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
6.56	75.1	115.0	115.0	11.1	0.3	2.7	36	3	5	5.00	1.20	11	0.377	0.377	0.377	0.377	2.62	non-LIQ CLAY	1	1.70	NA	3.43	non-LIQ	non-LIQ	0.985	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
6.73	75.0	115.0	115.0	12.0	0.3	2.5	38	3	5	5.00	1.20	11	0.387	0.387	0.387	0.387	2.68	SILT	0.7	1.70	19.3	3.84	74.1	0.12	0.984	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
6.89	74.8	115.0	115.0	11.7	0.3	2.6	35	3	5	5.00	1.20	11	0.396	0.396	0.396	0.396	2.60	non-LIQ CLAY	1	1.70	NA	3.33	non-LIQ	non-LIQ	0.984	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
7.05	74.7	115.0	115.0	8.5	0.3	3.5	47	2	4	5.00	1.20	10	0.405	0.405	0.405	0.405	2.81	non-LIQ CLAY	1	1.70	NA	4.89	non-LIQ	non-LIQ	0.984	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
7.22	74.5	115.0	115.0	8.8	0.3	3.4	46	2	4	5.00	1.20	10	0.415	0.415	0.415	0.415	2.80	non-LIQ CLAY	1	1.70	NA	4.77	non-LIQ	non-LIQ	0.983	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
7.38	74.3	115.0	115.0	10.1	0.3	3.0	41	3	4	5.00	1.20	10	0.424	0.424	0.424	0.424	2.72	non-LIQ CLAY	1	1.70	NA	4.13	non-LIQ	non-LIQ	0.983	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
7.55	74.2	115.0	115.0	11.3	0.3	2.7	38	3	5	5.00	1.20	11	0.434	0.434	0.434	0.434	2.66	non-LIQ CLAY	1	1.70	NA	3.68	non-LIQ	non-LIQ	0.982	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
7.71	74.0	115.0	115.0	10.8	0.3	2.8	40	3	4	5.00	1.20	10	0.443	0.443	0.443	0.443	2.69	non-LIQ CLAY	1	1.70	NA	3.94	non-LIQ	non-LIQ	0.982	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
7.87	73.8	115.0	115.0	12.7	0.3	2.4	40	3	5	5.00	1.20	11	0.453	0.453	0.453	0.453	2.68	SILT	0.7	1.70	20.4	3.88	79.2	0.13	0.982	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
8.04	73.7	115.0	115.0	15.2	0.4	2.6	38	4	6	5.00	1.20	12	0.462	0.462	0.462	0.462	2.65	SILT	0.7	1.70	24.4	3.67	89.5	0.15	0.981	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
8.20	73.5	115.0	115.0	13.4	0.4	3.0	38	4	5	5.00	1.20	11	0.472	0.472	0.472	0.472	2.66	non-LIQ CLAY	1	1.70	NA	3.69	non-LIQ	non-LIQ	0.981	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
8.37	73.3	115.0	115.0	13.1	0.4	3.1	39	3	5	5.00	1.20	11	0.481	0.481	0.481	0.481	2.68	non-LIQ CLAY	1	1.70	NA	3.84	non-LIQ	non-LIQ	0.980	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
8.53	73.2	115.0	115.0	12.4	0.4	3.2	41	3	5	5.00	1.20	11	0.490	0.490	0.490	0.490	2.72	non-LIQ CLAY	1	1.70	NA	4.14	non-LIQ	non-LIQ	0.980	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
8.69	73.0	115.0	115.0	13.6	0.5	3.6	42	4	5	5.00	1.20	12	0.500	0.500	0.500	0.500	2.72	non-LIQ CLAY	1	1.70	NA	4.15	non-LIQ	non-LIQ	0.980	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ_v' (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ_v' (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{cv} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
8.86	72.8	115.0	115.0	14.4	0.5	3.5	40	4	6	5.00	1.20	12	0.509	0.509	0.509	0.509	2.70	non-LIQ CLAY	1	1.70	NA	4.00	non-LIQ	non-LIQ	0.979	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
9.02	72.7	115.0	115.0	15.9	0.5	3.1	38	4	6	5.00	1.20	12	0.519	0.519	0.519	0.519	2.64	non-LIQ CLAY	1	1.70	NA	3.61	non-LIQ	non-LIQ	0.979	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
9.19	72.5	115.0	115.0	15.2	0.5	3.3	39	4	6	5.00	1.20	12	0.528	0.528	0.528	0.528	2.68	non-LIQ CLAY	1	1.70	NA	3.85	non-LIQ	non-LIQ	0.979	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
9.35	72.4	115.0	115.0	15.2	0.5	3.3	40	4	6	5.00	1.20	12	0.538	0.538	0.538	0.538	2.69	non-LIQ CLAY	1	1.70	NA	3.89	non-LIQ	non-LIQ	0.978	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
9.51	72.2	115.0	115.0	14.6	0.5	3.4	41	4	6	5.00	1.20	12	0.547	0.547	0.547	0.547	2.72	non-LIQ CLAY	1	1.70	NA	4.12	non-LIQ	non-LIQ	0.978	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
9.68	72.0	115.0	115.0	15.3	0.6	3.9	43	4	6	5.00	1.20	12	0.557	0.557	0.557	0.557	2.75	non-LIQ CLAY	1	1.70	NA	4.34	non-LIQ	non-LIQ	0.977	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
9.84	71.9	115.0	115.0	16.5	0.6	3.6	41	4	6	5.00	1.20	12	0.566	0.566	0.566	0.566	2.70	non-LIQ CLAY	1	1.70	NA	4.02	non-LIQ	non-LIQ	0.977	0.26	0.260	Above Water	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
10.01	71.7	115.0	115.0	17.6	0.9	5.1	45	5	7	5.00	1.20	13	0.576	0.576	0.576	0.575	2.79	non-LIQ CLAY	1	1.70	NA	4.68	non-LIQ	non-LIQ	0.977	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
10.17	71.5	115.0	115.0	19.8	0.8	4.0	40	5	7	5.00	1.20	14	0.585	0.585	0.585	0.580	2.68	non-LIQ CLAY	1	1.70	NA	3.87	non-LIQ	non-LIQ	0.976	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
10.34	71.4	115.0	115.0	17.9	0.7	3.9	41	5	6	5.00	1.20	13	0.595	0.595	0.595	0.589	2.71	non-LIQ CLAY	1	1.70	NA	4.09	non-LIQ	non-LIQ	0.976	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
10.50	71.2	115.0	115.0	16.1	0.6	3.7	43	4	6	5.00	1.20	12	0.604	0.604	0.604	0.599	2.74	non-LIQ CLAY	1	1.70	NA	4.31	non-LIQ	non-LIQ	0.976	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
10.66	71.0	115.0	115.0	16.3	0.6	3.7	43	4	6	5.00	1.20	12	0.613	0.613	0.613	0.608	2.74	non-LIQ CLAY	1	1.70	NA	4.29	non-LIQ	non-LIQ	0.975	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
10.83	70.9	115.0	115.0	16.0	0.6	3.8	44	4	6	5.00	1.20	12	0.623	0.623	0.623	0.617	2.76	non-LIQ CLAY	1	1.70	NA	4.42	non-LIQ	non-LIQ	0.975	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
10.99	70.7	115.0	115.0	16.9	0.6	3.6	42	5	6	5.00	1.20	12	0.632	0.632	0.632	0.627	2.73	non-LIQ CLAY	1	1.67	NA	4.19	non-LIQ	non-LIQ	0.974	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
11.16	70.5	115.0	115.0	17.9	0.8	4.5	45	5	6	5.00	1.20	13	0.642	0.642	0.642	0.636	2.78	non-LIQ CLAY	1	1.65	NA	4.60	non-LIQ	non-LIQ	0.974	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
11.32	70.4	115.0	115.0	18.9	0.8	4.2	43	5	7	5.00	1.20	13	0.651	0.651	0.651	0.646	2.75	non-LIQ CLAY	1	1.63	NA	4.37	non-LIQ	non-LIQ	0.974	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
11.48	70.2	115.0	115.0	19.2	0.7	3.6	41	5	7	5.00	1.20	13	0.660	0.660	0.660	0.655	2.70	non-LIQ CLAY	1	1.60	NA	4.03	non-LIQ	non-LIQ	0.973	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
11.65	70.1	115.0	115.0	18.4	0.6	3.3	40	5	6	5.00	1.20	12	0.670	0.670	0.670	0.665	2.69	non-LIQ CLAY	1	1.58	NA	3.94	non-LIQ	non-LIQ	0.973	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
11.81	69.9	115.0	115.0	17.7	0.6	3.4	42	5	6	5.00	1.20	12	0.679	0.679	0.679	0.674	2.72	non-LIQ CLAY	1	1.56	NA	4.16	non-LIQ	non-LIQ	0.972	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
11.98	69.7	115.0	115.0	17.3	0.6	3.5	43	5	6	5.00	1.20	12	0.689	0.689	0.689	0.684	2.74	non-LIQ CLAY	1	1.54	NA	4.31	non-LIQ	non-LIQ	0.972	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.14	69.6	115.0	115.0	17.9	0.6	3.4	42	5	6	5.00	1.20	12	0.698	0.698	0.698	0.693	2.73	non-LIQ CLAY	1	1.52	NA	4.18	non-LIQ	non-LIQ	0.972	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.30	69.4	115.0	115.0	16.9	0.6	3.6	44	5	6	5.00	1.20	12	0.707	0.707	0.707	0.702	2.77	non-LIQ CLAY	1	1.50	NA	4.51	non-LIQ	non-LIQ	0.971	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.47	69.2	115.0	115.0	15.6	0.6	3.8	47	4	5	5.00	1.20	12	0.717	0.717	0.717	0.712	2.82	non-LIQ CLAY	1	1.48	NA	4.98	non-LIQ	non-LIQ	0.971	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.63	69.1	115.0	115.0	15.4	0.6	3.9	48	4	5	5.00	1.20	11	0.726	0.726	0.726	0.721	2.84	non-LIQ CLAY	1	1.46	NA	5.09	non-LIQ	non-LIQ	0.971	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.80	68.9	115.0	115.0	15.7	0.6	3.8	48	5	5	5.00	1.20	12	0.736	0.736	0.736	0.731	2.83	non-LIQ CLAY	1	1.44	NA	5.03	non-LIQ	non-LIQ	0.970	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
12.96	68.7	115.0	115.0	15.5	0.5	3.2	45	4	5	5.00	1.20	11	0.745	0.745	0.745	0.740	2.79	non-LIQ CLAY	1	1.42	NA	4.70	non-LIQ	non-LIQ	0.970	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.12	68.6	115.0	115.0	12.9	0.5	3.9	53	4	5	5.00	1.20	11	0.754	0.754	0.754	0.749	2.91	non-LIQ CLAY	1	1.40	NA	5.83	non-LIQ	non-LIQ	0.969	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.29	68.4	115.0	115.0	10.4	0.4	3.8	58	3	4	5.00	1.20	10	0.764	0.764	0.764	0.759	3.00	non-LIQ CLAY	1	1.38	NA	6.73	non-LIQ	non-LIQ	0.969	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.45	68.3	115.0	115.0	9.4	0.4	4.3	63	3	4	5.00	1.20	9	0.773	0.773	0.773	0.768	3.07	non-LIQ CLAY	1	1.37	NA	7.56	non-LIQ	non-LIQ	0.969	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.62	68.1	115.0	115.0	11.4	0.4	3.5	55	4	4	5.00	1.20	10	0.783	0.783	0.783	0.776	2.95	non-LIQ CLAY	1	1.35	NA	6.18	non-LIQ	non-LIQ	0.968	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.78	67.9	115.0	115.0	14.4	0.5	3.5	50	4	5	5.00	1.20	11	0.792	0.792	0.792	0.787	2.86	non-LIQ CLAY	1	1.34	NA	5.32	non-LIQ	non-LIQ	0.968	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
13.94	67.8	115.0	115.0	15.9	0.5	3.1	46	5	5	5.00	1.20	11	0.802	0.802	0.802	0.797	2.80	non-LIQ CLAY	1	1.32	NA	4.79	non-LIQ	non-LIQ	0.967	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
14.11	67.6	115.0	115.0	16.2	0.5	3.1	46	5	5	5.00	1.20	11	0.811	0.811	0.811	0.806	2.79	non-LIQ CLAY	1	1.30	NA	4.73	non-LIQ	non-LIQ	0.967	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
14.27	67.4	115.0	115.0	16.6	0.6	3.6	48	5	5	5.00	1.20	12	0.821	0.821	0.821	0.816	2.83	non-LIQ CLAY	1	1.29	NA	5.06	non-LIQ	non-LIQ	0.967	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
14.44	67.3	115.0	115.0	17.7	0.6	3.4	46	5	6	5.00	1.20	12	0.830	0.830	0.830	0.825	2.79	non-LIQ CLAY	1	1.27	NA	4.74	non-LIQ	non-LIQ	0.966	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
14.60	67.1	115.0	115.0	18.6	0.6	3.2	44	5	6	5.00	1.20	12	0.839	0.839	0.839	0.835	2.77	non-LIQ CLAY	1	1.26	NA	4.51	non-LIQ	non-LIQ	0.966	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
14.76	66.9	115.0	115.0	20.8	0.6	2.9	40	6	6	5.00	1.20	13	0.849	0.849	0.849	0.844	2.70	non-LIQ CLAY	1	1.25	NA	3.99	non-LIQ	non-LIQ	0.966	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
14.93	66.8	115.0	115.0	19.9	0.6	3.0	42	5	6	5.00	1.20	12	0.858	0.858	0.858	0.853	2.73	non-LIQ CLAY	1	1.23	NA	4.24	non-LIQ	non-LIQ	0.965	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
15.09	66.6	115.0	115.0	21.4	0.6	2.8	40	6	6	5.00	1.20	13	0.868	0.868	0.868	0.863	2.69	non-LIQ CLAY	1	1.22	NA	3.92	non-LIQ	non-LIQ	0.965	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
15.26	66.4	115.0	115.0	21.2	0.7	3.3	43	6	6	5.00	1.20	13	0.877	0.877	0.877	0.872	2.74	non-LIQ CLAY	1	1.21	NA	4.31	non-LIQ	non-LIQ	0.964	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
15.42	66.3	115.0	115.0	20.9	0.6	2.9	41	6	6	5.00	1.20	12	0.887	0.887	0.887	0.882	2.71	non-LIQ CLAY	1	1.19	NA	4.09	non-LIQ	non-LIQ	0.964	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
15.58	66.1	115.0	115.0	18.9	0.5	2.6	42	5	6	5.00	1.20	12	0.896	0.896	0.896	0.891	2.73	non-LIQ CLAY	1	1.18	NA	4.23	non-LIQ	non-LIQ	0.964	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
15.75	66.0	115.0	115.0	17.1	0.5	2.9	46	5	5	5.00	1.20	11	0.906	0.906	0.906	0.900	2.80	non-LIQ CLAY	1	1.17	NA	4.78	non-LIQ	non-LIQ	0.963	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
15.91	65.8	115.0	115.0	17.9	0.5	2.8	45	5	5	5.00	1.20	11	0.915	0.915	0.915	0.910	2.77	non-LIQ CLAY	1	1.16	NA	4.57	non-LIQ	non-LIQ	0.963	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.08	65.6	115.0	115.0	18.3	0.5	2.7	44	5	5	5.00	1.20	12	0.925	0.925	0.925	0.919	2.76	non-LIQ CLAY	1	1.14	NA	4.49	non-LIQ	non-LIQ	0.963	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.24	65.5	115.0	115.0	17.5	0.5	2.9	46	5	5	5.00	1.20	11	0.934	0.934	0.934	0.929	2.80	non-LIQ CLAY	1	1.13	NA	4.76	non-LIQ	non-LIQ	0.962	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.40	65.3	115.0	115.0	15.3	0.5	3.3	51	5	5	5.00	1.20	11	0.943	0.943	0.943	0.938	2.89	non-LIQ CLAY	1	1.12	NA	5.58	non-LIQ	non-LIQ	0.962	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.57	65.1	115.0	115.0	15.7	0.6	3.8	53	5	5	5.00	1.20	11	0.953	0.953	0.953	0.947	2.92	non-LIQ CLAY	1	1.11	NA	5.93	non-LIQ	non-LIQ	0.961	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.73	65.0	115.0	115.0	15.1	0.5	3.3	52	5	5	5.00	1.20	11	0.962	0.962	0.962	0.957	2.90	non-LIQ CLAY	1	1.10	NA	5.73	non-LIQ	non-LIQ	0.961	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
16.90	64.8	115.0	115.0	15.4	0.5	3.2	52	5	5	5.00	1.20	11	0.972	0.972	0.972	0.966	2.89	non-LIQ CLAY	1	1.09	NA	5.65	non-LIQ	non-LIQ	0.961	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.06	64.6	115.0	115.0	15.5	0.5	3.2	52	5	5	5.00	1.20	11	0.981	0.981	0.981	0.976	2.89	non-LIQ CLAY	1	1.08	NA	5.64	non-LIQ	non-LIQ	0.960	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.23	64.5	115.0	115.0	13.2	0.5	3.8	59	4	4	5.00	1.20	10	0.991	0.991	0.991	0.985	3.00	non-LIQ CLAY	1	1.07	NA	6.78	non-LIQ	non-LIQ	0.960	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.39	64.3	115.0	115.0	11.3	0.4	3.5	62	4	4	5.00	1.20	10	1.000	1.000	1.000	0.995	3.05	non-LIQ CLAY	1	1.06	NA	7.33	non-LIQ	non-LIQ	0.959	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.55	64.2	115.0	115.0	11.8	0.4	3.4	60	4	4	5.00	1.20	10	1.009	1.009	1.009	1.004	3.03	non-LIQ CLAY	1	1.05	NA	7.04	non-LIQ	non-LIQ	0.959	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.72	64.0	115.0	115.0	11.2	0.4	3.6	63	4	4	5.00	1.20	10	1.019	1.019	1.019	1.014	3.06	non-LIQ CLAY	1	1.04	NA	7.50	non-LIQ	non-LIQ	0.959	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
17.88	63.8	115.0	115.0	11.5	0.3	2.6	57	4	4	5.00	1.20	9	1.028	1.028	1.028	1.023	2.98	non-LIQ CLAY	1	1.03	NA	6.51	non-LIQ	non-LIQ	0.958	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
18.05	63.7	115.0	115.0	10.7	0.3	2.8	61	3	4	5.00	1.20	9	1.038	1.036	1.038	1.033	3.03	non-LIQ CLAY	1	1.02	NA	7.09	non-LIQ	non-LIQ	0.958	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
18.21	63.5	115.0	115.0	11.4	0.3	2.6	58	4	4	5.00	1.20	9	1.047	1.041	1.047	1.041	2.99	non-LIQ CLAY	1	1.02	NA	6.64	non-LIQ	non-LIQ	0.958	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
18.37	63.3	115.0	115.0	10.3	0.3	2.9	63	3	3	5.00	1.20	9	1.056	1.045	1.056	1.045	3.06	non-LIQ CLAY	1	1.01	NA	7.44	non-LIQ	non-LIQ	0.957	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
18.54	63.2	115.0	115.0	10.0	0.2	2.0	58	3	3	5.00	1.20	9	1.066	1.049	1.066	1.049	2.99	non-LIQ CLAY	1	1.01	NA	6.59	non-LIQ	non-LIQ	0.957	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
18.70	63.0	115.0	115.0	9.9	0.3	3.0	65	3	3	5.00	1.20	9	1.075	1.053	1.075	1.053	3.09	non-LIQ CLAY	1	1.00	NA	7.81	non-LIQ	non-LIQ	0.956	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
18.87	62.8	115.0	115.0	10.0	0.2	2.0	58	3	3	5.00	1.20	9	1.085	1.058	1.085	1.058	2.99	non-LIQ CLAY	1	1.00	NA	6.64	non-LIQ	non-LIQ	0.956	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
19.03	62.7	115.0	115.0	10.1	0.3	3.0	64	3	3	5.00	1.20	9	1.094	1.062	1.094	1.062	3.08	non-LIQ CLAY	1	1.00	NA	7.70	non-LIQ	non-LIQ	0.956	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
19.19	62.5	115.0	115.0	9.4	0.2	2.1	61	3	3	5.00	1.20	9	1.103	1.066	1.103	1.066	3.04	non-LIQ CLAY	1	0.99	NA	7.15	non-LIQ	non-LIQ	0.955	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
19.36	62.3	115.0	115.0	8.8	0.2	2.3	64	3	3	5.00	1.20	9	1.113	1.071	1.113	1.071	3.06	non-LIQ CLAY	1	0.99	NA	7.72	non-LIQ	non-LIQ	0.955	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
19.52	62.2	115.0	115.0	8.5	0.2	2.4	66	3	3	5.00	1.20	8	1.122	1.075	1.122	1.075	3.11	non-LIQ CLAY	1	0.98	NA	8.04	non-LIQ	non-LIQ	0.954	0.26	0.260	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
19.69	62.0	115.0	115.0	6.8	0.2	2.9	78	3	3	5.00	1.20	8	1.132	1.079	1.132	1.079	3.27	non-LIQ CLAY	1	0.98	NA	10.24	non-LIQ	non-LIQ	0.954	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
19.85	61.9	115.0	115.0	6.7	0.2	3.0	80	3	3	5.00	1.20	8	1.141	1.084	1.141	1.084	3.28	non-LIQ CLAY	1	0.98	NA	10.44	non-LIQ	non-LIQ	0.954	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.01	61.7	115.0	115.0	6.9	0.2	2.9	78	3	3	5.00	1.20	8	1.151	1.088	1.151	1.088	3.26	non-LIQ CLAY	1	0.97	NA	10.16	non-LIQ	non-LIQ	0.953	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.18	61.5	115.0	115.0	6.8	0.2	2.9	79	3	3	5.00	1.20	8	1.160	1.092	1.160	1.092	3.28	non-LIQ CLAY	1	0.97	NA	10.35	non-LIQ	non-LIQ	0.953	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.34	61.4	115.0	115.0	7.9	0.2	2.5	71	3	3	5.00	1.20	8	1.170	1.097	1.170	1.097	3.17	non-LIQ CLAY	1	0.96	NA	8.86	non-LIQ	non-LIQ	0.953	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.51	61.2	115.0	115.0	9.0	0.3	3.3	71	3	3	5.00	1.20	9	1.179	1.101	1.179	1.101	3.18	non-LIQ CLAY	1	0.96	NA	8.97	non-LIQ	non-LIQ	0.952	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.67	61.0	115.0	115.0	9.6	0.3	3.1	68	3	3	5.00	1.20	9	1.189	1.105	1.189	1.105	3.14	non-LIQ CLAY	1	0.96	NA	8.40	non-LIQ	non-LIQ	0.952	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
20.83	60.9	115.0	115.0	9.5	0.3	3.2	69	3	3	5.00	1.20	9	1.198	1.109	1.198	1.109	3.15	non-LIQ CLAY	1	0.95	NA	8.52	non-LIQ	non-LIQ	0.951	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.00	60.7	115.0	115.0	9.6	0.3	3.1	69	3	3	5.00	1.20	9	1.208	1.114	1.208	1.114	3.14	non-LIQ CLAY	1	0.95	NA	8.46	non-LIQ	non-LIQ	0.951	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.16	60.5	115.0	115.0	9.9	0.3	3.0	67	3	3	5.00	1.20	9	1.217	1.118	1.217	1.118	3.12	non-LIQ CLAY	1	0.95	NA	8.21	non-LIQ	non-LIQ	0.951	0.27	0.270	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.33	60.4	115.0	115.0	10.6	0.3	2.8	64	4	3	5.00	1.20	9	1.226	1.123	1.226	1.123	3.08	non-LIQ CLAY	1	0.94	NA	7.65	non-LIQ	non-LIQ	0.950	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.49	60.2	115.0	115.0	9.1	0.3	3.3	72	3	3	5.00	1.20	9	1.236	1.127	1.236	1.127	3.18	non-LIQ CLAY	1	0.94	NA	9.04	non-LIQ	non-LIQ	0.950	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.65	60.1	115.0	115.0	6.6	0.2	3.0	83	3	3	5.00	1.20	8	1.245	1.131	1.245	1.131	3.32	non-LIQ CLAY	1	0.93	NA	11.03	non-LIQ	non-LIQ	0.950	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.82	59.9	115.0	115.0	5.8	0.2	3.4	91	3	2	5.00	1.20	8	1.255	1.135	1.255	1.135	3.42	non-LIQ CLAY	1	0.93	NA	12.67	non-LIQ	non-LIQ	0.949	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
21.98	59.7	115.0	115.0	5.9	0.2	3.4	91	3	2	5.00	1.20	8	1.264	1.140	1.264	1.140	3.41	non-LIQ CLAY	1	0.93	NA	12.49	non-LIQ	non-LIQ	0.949	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.15	59.6	115.0	115.0	6.1	0.2	3.3	89	3	2	5.00	1.20	8	1.274	1.144	1.274	1.144	3.39	non-LIQ CLAY	1	0.92	NA	12.10	non-LIQ	non-LIQ	0.948	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.31	59.4	115.0	115.0	5.7	0.2	3.5	93	3	2	5.00	1.20	8	1.283	1.148	1.283	1.148	3.44	non-LIQ CLAY	1	0.92	NA	13.04	non-LIQ	non-LIQ	0.948	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.47	59.2	115.0	115.0	5.4	0.2	3.7	98	2	2	5.00	1.20	8	1.292	1.153	1.292	1.153	3.49	non-LIQ CLAY	1	0.92	NA	13.83	non-LIQ	non-LIQ	0.948	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.64	59.1	115.0	115.0	5.5	0.2	3.6	97	2	2	5.00	1.20	8	1.302	1.157	1.302	1.157	3.47	non-LIQ CLAY	1	0.91	NA	13.62	non-LIQ	non-LIQ	0.947	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
22.80	58.9	115.0	115.0	5.5	0.2	3.6	97	3	2	5.00	1.20	8	1.311	1.161	1.311	1.161	3.48	non-LIQ CLAY	1	0.91	NA	13.67	non-LIQ	non-LIQ	0.947	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60CS}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60CS}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
22.97	58.7	115.0	115.0	5.6	0.2	3.6	96	3	2	5.00	1.20	8	1.321	1.166	1.321	1.166	3.47	non-LIQ CLAY	1	0.91	NA	13.47	non-LIQ	non-LIQ	0.946	0.28	0.280	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.13	58.6	115.0	115.0	6.0	0.2	3.3	91	3	2	5.00	1.20	8	1.330	1.170	1.330	1.170	3.41	non-LIQ CLAY	1	0.90	NA	12.58	non-LIQ	non-LIQ	0.946	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.30	58.4	115.0	115.0	6.2	0.2	3.2	89	3	2	5.00	1.20	8	1.340	1.174	1.340	1.174	3.39	non-LIQ CLAY	1	0.90	NA	12.19	non-LIQ	non-LIQ	0.946	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.46	58.2	115.0	115.0	6.9	0.2	2.9	82	3	3	5.00	1.20	8	1.349	1.179	1.349	1.179	3.31	non-LIQ CLAY	1	0.90	NA	10.93	non-LIQ	non-LIQ	0.945	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.62	58.1	115.0	115.0	6.8	0.2	2.9	83	3	3	5.00	1.20	8	1.358	1.183	1.358	1.183	3.33	non-LIQ CLAY	1	0.89	NA	11.13	non-LIQ	non-LIQ	0.945	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.79	57.9	115.0	115.0	6.5	0.1	1.5	74	2	2	5.00	1.20	8	1.368	1.187	1.368	1.187	3.21	non-LIQ CLAY	1	0.89	NA	9.41	non-LIQ	non-LIQ	0.945	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
23.95	57.8	115.0	115.0	6.3	0.1	1.6	76	2	2	5.00	1.20	8	1.377	1.191	1.377	1.191	3.24	non-LIQ CLAY	1	0.89	NA	9.78	non-LIQ	non-LIQ	0.944	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.12	57.6	115.0	115.0	6.3	0.2	3.2	89	3	3	5.00	1.20	8	1.387	1.196	1.387	1.196	3.39	non-LIQ CLAY	1	0.88	NA	12.20	non-LIQ	non-LIQ	0.944	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.28	57.4	115.0	115.0	6.9	0.2	2.9	83	3	3	5.00	1.20	8	1.396	1.200	1.396	1.200	3.33	non-LIQ CLAY	1	0.88	NA	11.11	non-LIQ	non-LIQ	0.943	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.44	57.3	115.0	115.0	6.4	0.1	1.6	76	2	2	5.00	1.20	8	1.405	1.204	1.405	1.204	3.23	non-LIQ CLAY	1	0.88	NA	9.71	non-LIQ	non-LIQ	0.943	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.61	57.1	115.0	115.0	5.6	0.1	1.8	84	2	2	5.00	1.20	8	1.415	1.209	1.415	1.209	3.34	non-LIQ CLAY	1	0.88	NA	11.31	non-LIQ	non-LIQ	0.943	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.77	56.9	115.0	115.0	5.8	0.1	1.7	82	2	2	5.00	1.20	8	1.424	1.213	1.424	1.213	3.31	non-LIQ CLAY	1	0.87	NA	10.92	non-LIQ	non-LIQ	0.942	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
24.94	56.8	115.0	115.0	6.4	0.2	3.1	89	3	3	5.00	1.20	8	1.434	1.218	1.434	1.218	3.39	non-LIQ CLAY	1	0.87	NA	12.20	non-LIQ	non-LIQ	0.942	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.10	56.6	115.0	115.0	8.2	0.2	2.4	74	3	3	5.00	1.20	8	1.443	1.222	1.443	1.222	3.21	non-LIQ CLAY	1	0.87	NA	9.38	non-LIQ	non-LIQ	0.941	0.29	0.290	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.26	56.4	115.0	115.0	7.2	0.2	2.8	82	3	3	5.00	1.20	8	1.452	1.226	1.452	1.226	3.31	non-LIQ CLAY	1	0.86	NA	10.83	non-LIQ	non-LIQ	0.941	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.43	56.3	115.0	115.0	6.4	0.2	3.1	90	3	3	5.00	1.20	8	1.462	1.230	1.462	1.230	3.40	non-LIQ CLAY	1	0.86	NA	12.32	non-LIQ	non-LIQ	0.941	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.59	56.1	115.0	115.0	5.9	0.1	1.7	82	2	2	5.00	1.20	8	1.471	1.235	1.471	1.235	3.31	non-LIQ CLAY	1	0.86	NA	10.92	non-LIQ	non-LIQ	0.940	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.76	55.9	115.0	115.0	5.8	0.1	1.7	84	2	2	5.00	1.20	8	1.481	1.239	1.481	1.239	3.33	non-LIQ CLAY	1	0.85	NA	11.17	non-LIQ	non-LIQ	0.940	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
25.92	55.8	115.0	115.0	5.8	0.2	3.4	97	3	2	5.00	1.20	8	1.490	1.243	1.490	1.243	3.48	non-LIQ CLAY	1	0.85	NA	13.81	non-LIQ	non-LIQ	0.940	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.08	55.6	115.0	115.0	5.5	0.2	3.6	102	3	2	5.00	1.20	8	1.500	1.248	1.500	1.248	3.53	non-LIQ CLAY	1	0.85	NA	14.66	non-LIQ	non-LIQ	0.939	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.25	55.5	115.0	115.0	8.0	0.2	2.5	76	3	3	5.00	1.20	8	1.509	1.252	1.509	1.252	3.24	non-LIQ CLAY	1	0.85	NA	9.85	non-LIQ	non-LIQ	0.939	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.41	55.3	115.0	115.0	9.4	0.2	2.1	67	3	3	5.00	1.20	9	1.519	1.256	1.519	1.256	3.13	non-LIQ CLAY	1	0.84	NA	8.27	non-LIQ	non-LIQ	0.938	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.58	55.1	115.0	115.0	7.2	0.2	2.8	83	3	3	5.00	1.20	8	1.528	1.261	1.528	1.261	3.33	non-LIQ CLAY	1	0.84	NA	11.11	non-LIQ	non-LIQ	0.938	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.74	55.0	115.0	115.0	7.2	0.2	2.8	83	3	3	5.00	1.20	8	1.538	1.265	1.538	1.265	3.33	non-LIQ CLAY	1	0.84	NA	11.15	non-LIQ	non-LIQ	0.938	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
26.90	54.8	115.0	115.0	7.1	0.2	2.8	84	3	3	5.00	1.20	8	1.547	1.269	1.547	1.269	3.34	non-LIQ CLAY	1	0.83	NA	11.35	non-LIQ	non-LIQ	0.937	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.07	54.6	115.0	115.0	7.7	0.2	2.6	80	3	3	5.00	1.20	8	1.557	1.274	1.557	1.274	3.28	non-LIQ CLAY	1	0.83	NA	10.43	non-LIQ	non-LIQ	0.937	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.23	54.5	115.0	115.0	8.5	0.2	2.4	74	3	3	5.00	1.20	8	1.566	1.278	1.566	1.278	3.21	non-LIQ CLAY	1	0.83	NA	9.39	non-LIQ	non-LIQ	0.937	0.30	0.300	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.40	54.3	115.0	115.0	8.4	0.2	2.4	75	3	3	5.00	1.20	8	1.576	1.282	1.576	1.282	3.22	non-LIQ CLAY	1	0.83	NA	9.55	non-LIQ	non-LIQ	0.936	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.56	54.1	115.0	115.0	8.3	0.2	2.4	76	3	3	5.00	1.20	8	1.585	1.286	1.585	1.286	3.23	non-LIQ CLAY	1	0.82	NA	9.70	non-LIQ	non-LIQ	0.936	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.72	54.0	115.0	115.0	9.9	0.3	3.0	73	4	3	5.00	1.20	9	1.594	1.291	1.594	1.291	3.20	non-LIQ CLAY	1	0.82	NA	9.26	non-LIQ	non-LIQ	0.935	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
27.89	53.8	115.0	115.0	11.0	0.3	2.7	67	4	3	5.00	1.20	9	1.604	1.295	1.604	1.295	3.13	non-LIQ CLAY	1	0.82	NA	8.28	non-LIQ	non-LIQ	0.935	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.05	53.7	115.0	115.0	11.5	0.4	3.5	71	4	4	5.00	1.20	9	1.613	1.299	1.613	1.299	3.17	non-LIQ CLAY	1	0.81	NA	8.82	non-LIQ	non-LIQ	0.935	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.22	53.5	115.0	115.0	11.4	0.4	3.5	71	4	4	5.00	1.20	9	1.623	1.304	1.623	1.304	3.18	non-LIQ CLAY	1	0.81	NA	8.92	non-LIQ	non-LIQ	0.934	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.38	53.3	115.0	115.0	12.6	0.3	2.4	61	4	4	5.00	1.20	9	1.632	1.308	1.632	1.308	3.04	non-LIQ CLAY	1	0.81	NA	7.18	non-LIQ	non-LIQ	0.934	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.54	53.2	115.0	115.0	10.7	0.3	2.8	69	4	3	5.00	1.20	9	1.641	1.312	1.641	1.312	3.15	non-LIQ CLAY	1	0.81	NA	8.63	non-LIQ	non-LIQ	0.933	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.71	53.0	115.0	115.0	9.9	0.3	3.0	74	4	3	5.00	1.20	9	1.651	1.317	1.651	1.317	3.21	non-LIQ CLAY	1	0.80	NA	9.42	non-LIQ	non-LIQ	0.933	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
28.87	52.8	115.0	115.0	9.6	0.3	3.1	76	4	3	5.00	1.20	9	1.660	1.321	1.660	1.321	3.24	non-LIQ CLAY	1	0.80	NA	9.76	non-LIQ	non-LIQ	0.933	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.04	52.7	115.0	115.0	8.6	0.3	3.5	83	3	3	5.00	1.20	9	1.670	1.325	1.670	1.325	3.32	non-LIQ CLAY	1	0.80	NA	11.01	non-LIQ	non-LIQ	0.932	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.20	52.5	115.0	115.0	8.6	0.3	3.5	83	3	3	5.00	1.20	9	1.679	1.330	1.679	1.330	3.32	non-LIQ CLAY	1	0.80	NA	11.05	non-LIQ	non-LIQ	0.932	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.36	52.3	115.0	115.0	9.2	0.4	4.3	85	4	3	5.00	1.20	9	1.688	1.334	1.688	1.334	3.34	non-LIQ CLAY	1	0.79	NA	11.41	non-LIQ	non-LIQ	0.932	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.53	52.2	115.0	115.0	10.8	0.4	3.7	75	4	4	5.00	1.20	9	1.698	1.338	1.698	1.338	3.23	non-LIQ CLAY	1	0.79	NA	9.66	non-LIQ	non-LIQ	0.931	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.69	52.0	115.0	115.0	12.3	0.4	3.3	68	4	4	5.00	1.20	10	1.707	1.342	1.707	1.342	3.14	non-LIQ CLAY	1	0.79	NA	8.42	non-LIQ	non-LIQ	0.931	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
29.86	51.8	115.0	115.0	12.8	0.5	3.9	71	5	4	5.00	1.20	10	1.717	1.347	1.717	1.347	3.17	non-LIQ CLAY	1	0.79	NA	8.82	non-LIQ	non-LIQ	0.930	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.02	51.7	115.0	115.0	11.7	0.5	4.3	76	4	4	5.00	1.20	10	1.726	1.351	1.726	1.351	3.23	non-LIQ CLAY	1	0.78	NA	9.73	non-LIQ	non-LIQ	0.930	0.31	0.310	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.19	51.5	115.0	115.0	12.4	0.5	4.0	73	5	4	5.00	1.20	10	1.736	1.356	1.736	1.356	3.19	non-LIQ CLAY	1	0.78	NA	9.17	non-LIQ	non-LIQ	0.928	0.32	0.320	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.35	51.4	115.0	115.0	10.5	0.4	3.8	78	4	4	5.00	1.20	9	1.745	1.360	1.745	1.360	3.26	non-LIQ CLAY	1	0.78	NA	10.09	non-LIQ	non-LIQ	0.927	0.32	0.320	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.51	51.2	115.0	115.0	9.6	0.3	3.1	77	4	3	5.00	1.20	9	1.754	1.364	1.754	1.364	3.25	non-LIQ CLAY	1	0.78	NA	10.04	non-LIQ	non-LIQ	0.926	0.32	0.320	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.68	51.0	115.0	115.0	8.5	0.3	3.5	85	3	3	5.00	1.20	9	1.764	1.368	1.764	1.368	3.35	non-LIQ CLAY	1	0.77	NA	11.47	non-LIQ	non-LIQ	0.924	0.32	0.320	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
30.84	50.9	115.0	115.0	8.5	0.3	3.5	85	3	3	5.00	1.20	9	1.773	1.373	1.773	1.373	3.35	non-LIQ CLAY	1	0.77	NA	11.50	non-LIQ	non-LIQ	0.923	0.32	0.320	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
31.01	50.7	115.0	115.0	9.1	0.3	3.3	81	4	3	5.00	1.20	9	1.783	1.377	1.783	1.377	3.30	non-LIQ CLAY	1	0.77	NA	10.72	non-LIQ	non-LIQ	0.922	0.32	0.320	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
31.17	50.5	115.0	115.0	8.8	0.3	3.4	83	4	3	5.00	1.20	9	1.792	1.381	1.792	1.381	3.33	non-LIQ CLAY	1	0.77	NA	11.14	non-LIQ	non-LIQ	0.920	0.32	0.320	non-LIQ	NA	NA	NA	NA	NA	0.000	NA	NA	0.000
31.33	50.4	115.0	115.0	8.8	0.3	3.4	83.5	3.5	3.1	5.0	1.2	9.0	1.80	1.39	1.80	1.39	3.33	non-LIQ CLAY	1	0.76	NA	11.17	non-LIQ	non-LIQ	0.919	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.50	50.2	115.0	115.0	9.0	0.3	3.3	82.3	3.6	3.1	5.0	1.2	9.0	1.81	1.39	1.81	1.39	3.31	non-LIQ CLAY	1	0.76	NA	10.94	non-LIQ	non-LIQ	0.916	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.66	50.0	115.0	115.0	8.8	0.3	3.4	83.9	3.6	3.1	5.0	1.2	9.0	1.82	1.39	1.82	1.39	3.33	non-LIQ CLAY	1	0.76	NA	11.24	non-LIQ	non-LIQ	0.916	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.83	49.9	115.0	115.0	8.1	0.2	2.5	81.4	3.2	2.8	5.0	1.2	8.0	1.83	1.40	1.83	1.40	3.30	non-LIQ CLAY	1	0.76	NA	10.78	non-LIQ	non-LIQ	0.915	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
31.99	49.7	115.0	115.0	8.2	0.2	2.4	80.8	3.2	2.8	5.0	1.2	8.0	1.84	1.40	1.84	1.40	3.30	non-LIQ CLAY	1	0.75	NA	10.66	non-LIQ	non-LIQ	0.914	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.15	49.6	115.0	115.0	8.1	0.2	2.5	81.7	3.2	2.8	5.0	1.2	8.0	1.85	1.41	1.85	1.41	3.31	non-LIQ CLAY	1	0.75	NA	10.84	non-LIQ	non-LIQ	0.912	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.32	49.4	115.0	115.0	8.6	0.3	3.5	86.1	3.5	3.1	5.0	1.2	9.0	1.86	1.41	1.86	1.41	3.36	non-LIQ CLAY	1	0.75	NA	11.64	non-LIQ	non-LIQ	0.911	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.48	49.2	115.0	115.0	9.0	0.3	3.3	83.2	3.6	3.1	5.0	1.2	9.0	1.87	1.42	1.87	1.42	3.33	non-LIQ CLAY	1	0.75	NA	11.12	non-LIQ	non-LIQ	0.910	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.65	49.1	115.0	115.0	9.6	0.3	3.1	79.3	3.7	3.2	5.0	1.2	9.0	1.88	1.42	1.88	1.42	3.28	non-LIQ CLAY	1	0.74	NA	10.40	non-LIQ	non-LIQ	0.908	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.81	48.9	115.0	115.0	9.7	0.3	3.1	78.8	3.7	3.2	5.0	1.2	9.0	1.89	1.42	1.89	1.42	3.27	non-LIQ CLAY	1	0.74	NA	10.31	non-LIQ	non-LIQ	0.907	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
32.97	48.7	115.0	115.0	9.7	0.3	3.1	79.0	3.7	3.2	5.0	1.2	9.0	1.90	1.43	1.90	1.43	3.27	non-LIQ CLAY	1	0.74	NA	10.33	non-LIQ	non-LIQ	0.906	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.14	48.6	115.0	115.0	9.9	0.3	3.0	77.9	3.8	3.3	5.0	1.2	9.0	1.91	1.43	1.91	1.43	3.26	non-LIQ CLAY	1	0.74	NA	10.13	non-LIQ	non-LIQ	0.904	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.30	48.4	115.0	115.0	9.9	0.3	3.0	78.0	3.8	3.2	5.0	1.2	9.0	1.91	1.44	1.91	1.44	3.26	non-LIQ CLAY	1	0.74	NA	10.16	non-LIQ	non-LIQ	0.903	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.47	48.2	115.0	115.0	10.0	0.3	3.0	77.6	3.8	3.3	5.0	1.2	9.0	1.92	1.44	1.92	1.44	3.26	non-LIQ CLAY	1	0.73	NA	10.08	non-LIQ	non-LIQ	0.902	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.63	48.1	115.0	115.0	10.1	0.3	3.0	77.1	3.8	3.3	5.0	1.2	9.0	1.93	1.45	1.93	1.45	3.25	non-LIQ CLAY	1	0.73	NA	9.99	non-LIQ	non-LIQ	0.900	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.79	47.9	115.0	115.0	10.2	0.3	2.9	76.7	3.9	3.3	5.0	1.2	9.0	1.94	1.45	1.94	1.45	3.25	non-LIQ CLAY	1	0.73	NA	9.91	non-LIQ	non-LIQ	0.899	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
33.96	47.7	115.0	115.0	10.0	0.3	3.0	78.0	3.8	3.3	5.0	1.2	9.0	1.95	1.45	1.95	1.45	3.26	non-LIQ CLAY	1	0.73	NA	10.16	non-LIQ	non-LIQ	0.898	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.12	47.6	115.0	115.0	10.2	0.3	2.9	77.0	3.9	3.3	5.0	1.2	9.0	1.96	1.46	1.96	1.46	3.25	non-LIQ CLAY	1	0.73	NA	9.96	non-LIQ	non-LIQ	0.896	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.29	47.4	115.0	115.0	10.7	0.3	2.8	74.3	4.0	3.4	5.0	1.2	9.0	1.97	1.46	1.97	1.46	3.22	non-LIQ CLAY	1	0.72	NA	9.48	non-LIQ	non-LIQ	0.895	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.45	47.3	115.0	115.0	11.6	0.3	2.6	69.8	4.1	3.5	5.0	1.2	9.0	1.98	1.47	1.98	1.47	3.16	non-LIQ CLAY	1	0.72	NA	8.69	non-LIQ	non-LIQ	0.894	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.61	47.1	115.0	115.0	10.8	0.3	2.8	74.0	4.0	3.4	5.0	1.2	9.0	1.99	1.47	1.99	1.47	3.21	non-LIQ CLAY	1	0.72	NA	9.43	non-LIQ	non-LIQ	0.892	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.78	46.9	115.0	115.0	10.8	0.3	2.8	74.1	4.0	3.4	5.0	1.2	9.0	2.00	1.48	2.00	1.48	3.21	non-LIQ CLAY	1	0.72	NA	9.45	non-LIQ	non-LIQ	0.891	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
34.94	46.8	115.0	115.0	11.3	0.3	2.7	71.7	4.1	3.4	5.0	1.2	9.0	2.01	1.48	2.01	1.48	3.18	non-LIQ CLAY	1	0.71	NA	9.01	non-LIQ	non-LIQ	0.890	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.11	46.6	115.0	115.0	12.3	0.3	2.4	67.2	4.3	3.6	5.0	1.2	9.0	2.02	1.48	2.02	1.48	3.12	non-LIQ CLAY	1	0.71	NA	8.22	non-LIQ	non-LIQ	0.888	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.27	46.4	115.0	115.0	11.8	0.4	3.4	74.9	4.4	3.7	5.0	1.2	9.0	2.03	1.49	2.03	1.49	3.22	non-LIQ CLAY	1	0.71	NA	9.59	non-LIQ	non-LIQ	0.887	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.43	46.3	115.0	115.0	12.3	0.3	2.4	67.4	4.3	3.6	5.0	1.2	9.0	2.04	1.49	2.04	1.49	3.13	non-LIQ CLAY	1	0.71	NA	8.26	non-LIQ	non-LIQ	0.886	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.60	46.1	115.0	115.0	12.6	0.4	3.2	71.4	4.5	3.8	5.0	1.2	10.0	2.05	1.50	2.05	1.50	3.18	non-LIQ CLAY	1	0.71	NA	8.97	non-LIQ	non-LIQ	0.884	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.76	45.9	115.0	115.0	13.0	0.4	3.1	69.8	4.6	3.9	5.0	1.2	10.0	2.06	1.50	2.06	1.50	3.16	non-LIQ CLAY	1	0.70	NA	8.69	non-LIQ	non-LIQ	0.883	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
35.93	45.8	115.0	115.0	13.7	0.4	2.9	67.2	4.7	4.0	5.0	1.2	10.0	2.07	1.51	2.07	1.51	3.12	non-LIQ CLAY	1	0.70	NA	8.22	non-LIQ	non-LIQ	0.882	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.09	45.6	115.0	115.0	14.0	0.4	2.9	66.1	4.8	4.0	5.0	1.2	10.0	2.08	1.51	2.08	1.51	3.11	non-LIQ CLAY	1	0.70	NA	8.04	non-LIQ	non-LIQ	0.880	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.26	45.4	115.0	115.0	13.0	0.4	3.1	70.2	4.6	3.9	5.0	1.2	10.0	2.08	1.52	2.08	1.52	3.16	non-LIQ CLAY	1	0.70	NA	8.75	non-LIQ	non-LIQ	0.879	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.42	45.3	115.0	115.0	14.6	0.4	2.7	64.2	4.9	4.1	5.0	1.2	10.0	2.09	1.52	2.09	1.52	3.08	non-LIQ CLAY	1	0.70	NA	7.71	non-LIQ	non-LIQ	0.878	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.58	45.1	115.0	115.0	16.3	0.4	2.5	59.0	5.2	4.4	5.0	1.2	10.0	2.10	1.52	2.10	1.52	3.01	non-LIQ CLAY	1	0.69	NA	6.82	non-LIQ	non-LIQ	0.876	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.75	45.0	115.0	115.0	15.8	0.5	3.2	64.4	5.3	4.4	5.0	1.2	10.0	2.11	1.53	2.11	1.53	3.09	non-LIQ CLAY	1	0.69	NA	7.74	non-LIQ	non-LIQ	0.875	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
36.91	44.8	115.0	115.0	16.8	0.5	3.0	61.5	5.5	4.6	5.0	1.2	11.0	2.12	1.53	2.12	1.53	3.04	non-LIQ CLAY	1	0.69	NA	7.24	non-LIQ	non-LIQ	0.874	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.08	44.6	115.0	115.0	16.8	0.4	2.4	57.8	5.3	4.4	5.0	1.2	10.0	2.13	1.54	2.13	1.54	2.99	non-LIQ CLAY	1	0.69	NA	6.64	non-LIQ	non-LIQ	0.872	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.24	44.5	115.0	115.0	15.4	0.9	5.8	77.9	5.9	4.9	5.0	1.2	11.0	2.14	1.54	2.14	1.54	3.26	non-LIQ CLAY	1	0.69	NA	10.13	non-LIQ	non-LIQ	0.871	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.40	44.3	115.0	115.0	16.0	0.7	4.4	70.6	5.7	4.7	5.0	1.2	11.0	2.15	1.55	2.15	1.55	3.17	non-LIQ CLAY	1	0.68	NA	8.82	non-LIQ	non-LIQ	0.870	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'MOIST	Unit Weight (pcf) γ'SAT	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	n	C_Q	q_{c1N}	Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nc} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
37.57	44.1	115.0	115.0	16.9	0.7	4.1	67.8	5.9	4.9	5.0	1.2	11.0	2.16	1.55	2.16	1.55	3.13	non-LIQ CLAY	1	0.68	NA	8.33	non-LIQ	non-LIQ	0.868	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.73	44.0	115.0	115.0	16.1	0.4	2.5	60.2	5.2	4.3	5.0	1.2	10.0	2.17	1.55	2.17	1.55	3.03	non-LIQ CLAY	1	0.68	NA	7.03	non-LIQ	non-LIQ	0.867	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
37.90	43.8	115.0	115.0	14.8	0.4	2.7	64.5	5.0	4.1	5.0	1.2	10.0	2.18	1.56	2.18	1.56	3.09	non-LIQ CLAY	1	0.68	NA	7.75	non-LIQ	non-LIQ	0.866	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.06	43.6	115.0	115.0	15.2	0.4	2.6	63.2	5.1	4.2	5.0	1.2	10.0	2.19	1.56	2.19	1.56	3.07	non-LIQ CLAY	1	0.68	NA	7.54	non-LIQ	non-LIQ	0.864	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.22	43.5	115.0	115.0	15.4	0.4	2.6	62.7	5.1	4.2	5.0	1.2	10.0	2.20	1.57	2.20	1.57	3.06	non-LIQ CLAY	1	0.68	NA	7.45	non-LIQ	non-LIQ	0.863	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.39	43.3	115.0	115.0	15.5	0.4	2.6	62.5	5.1	4.2	5.0	1.2	10.0	2.21	1.57	2.21	1.57	3.06	non-LIQ CLAY	1	0.67	NA	7.41	non-LIQ	non-LIQ	0.862	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.55	43.2	115.0	115.0	14.9	0.4	2.7	64.5	5.0	4.1	5.0	1.2	10.0	2.22	1.58	2.22	1.58	3.09	non-LIQ CLAY	1	0.67	NA	7.76	non-LIQ	non-LIQ	0.860	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.72	43.0	115.0	115.0	15.1	0.5	3.3	68.0	5.3	4.3	5.0	1.2	10.0	2.23	1.58	2.23	1.58	3.13	non-LIQ CLAY	1	0.67	NA	8.36	non-LIQ	non-LIQ	0.859	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
38.88	42.8	115.0	115.0	17.1	0.6	3.5	65.0	5.8	4.7	5.0	1.2	11.0	2.24	1.58	2.24	1.58	3.09	non-LIQ CLAY	1	0.67	NA	7.85	non-LIQ	non-LIQ	0.858	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.04	42.7	115.0	115.0	29.6	0.6	2.0	41.8	8.1	6.6	5.0	1.2	13.0	2.24	1.59	2.24	1.59	2.73	non-LIQ CLAY	1	0.67	NA	4.18	non-LIQ	non-LIQ	0.856	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.21	42.5	115.0	115.0	30.9	0.9	2.9	46.2	8.8	7.2	5.0	1.2	14.0	2.25	1.59	2.25	1.59	2.80	non-LIQ CLAY	1	0.66	NA	4.81	non-LIQ	non-LIQ	0.855	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.37	42.3	115.0	115.0	23.1	0.7	3.0	54.0	7.1	5.8	5.0	1.2	12.0	2.26	1.60	2.26	1.60	2.93	non-LIQ CLAY	1	0.66	NA	6.01	non-LIQ	non-LIQ	0.854	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.54	42.2	115.0	115.0	18.0	0.4	2.2	56.1	5.6	4.6	5.0	1.2	10.0	2.27	1.60	2.27	1.60	2.96	non-LIQ CLAY	1	0.66	NA	6.35	non-LIQ	non-LIQ	0.852	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.70	42.0	115.0	115.0	13.3	0.3	2.3	66.2	4.6	3.7	5.0	1.2	9.0	2.28	1.61	2.28	1.61	3.11	non-LIQ CLAY	1	0.66	NA	8.06	non-LIQ	non-LIQ	0.851	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
39.86	41.8	115.0	115.0	12.7	0.4	3.1	74.1	4.7	3.8	5.0	1.2	10.0	2.29	1.61	2.29	1.61	3.21	non-LIQ CLAY	1	0.66	NA	9.45	non-LIQ	non-LIQ	0.850	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.03	41.7	115.0	115.0	12.3	0.4	3.3	76.1	4.6	3.7	5.0	1.2	9.0	2.30	1.61	2.30	1.61	3.24	non-LIQ CLAY	1	0.66	NA	9.81	non-LIQ	non-LIQ	0.848	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.19	41.5	115.0	115.0	14.7	0.3	2.0	61.4	4.8	3.9	5.0	1.2	10.0	2.31	1.62	2.31	1.62	3.04	non-LIQ CLAY	1	0.65	NA	7.24	non-LIQ	non-LIQ	0.847	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.36	41.3	115.0	115.0	12.6	0.4	3.2	74.9	4.7	3.8	5.0	1.2	10.0	2.32	1.62	2.32	1.62	3.22	non-LIQ CLAY	1	0.65	NA	9.59	non-LIQ	non-LIQ	0.846	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.52	41.2	115.0	115.0	15.2	0.6	3.9	72.3	5.5	4.4	5.0	1.2	10.0	2.33	1.63	2.33	1.63	3.19	non-LIQ CLAY	1	0.65	NA	9.12	non-LIQ	non-LIQ	0.844	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.68	41.0	115.0	115.0	22.3	0.6	2.7	53.6	6.8	5.5	5.0	1.2	12.0	2.34	1.63	2.34	1.63	2.93	non-LIQ CLAY	1	0.65	NA	5.95	non-LIQ	non-LIQ	0.843	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
40.85	40.9	115.0	115.0	20.6	0.7	3.4	59.9	6.7	5.4	5.0	1.2	11.0	2.35	1.64	2.35	1.64	3.02	non-LIQ CLAY	1	0.65	NA	6.97	non-LIQ	non-LIQ	0.842	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.01	40.7	115.0	115.0	18.9	0.6	3.2	61.3	6.2	5.0	5.0	1.2	11.0	2.36	1.64	2.36	1.64	3.04	non-LIQ CLAY	1	0.65	NA	7.22	non-LIQ	non-LIQ	0.840	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.18	40.5	115.0	115.0	15.0	0.4	2.7	65.8	5.1	4.1	5.0	1.2	10.0	2.37	1.64	2.37	1.64	3.10	non-LIQ CLAY	1	0.64	NA	7.99	non-LIQ	non-LIQ	0.839	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.34	40.4	115.0	115.0	14.4	0.3	2.1	63.2	4.8	3.9	5.0	1.2	10.0	2.38	1.65	2.38	1.65	3.07	non-LIQ CLAY	1	0.64	NA	7.53	non-LIQ	non-LIQ	0.838	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.50	40.2	115.0	115.0	14.1	0.3	2.1	64.4	4.8	3.8	5.0	1.2	10.0	2.39	1.65	2.39	1.65	3.08	non-LIQ CLAY	1	0.64	NA	7.73	non-LIQ	non-LIQ	0.836	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.67	40.0	115.0	115.0	12.6	0.3	2.4	70.5	4.5	3.6	5.0	1.2	9.0	2.40	1.66	2.40	1.66	3.17	non-LIQ CLAY	1	0.64	NA	8.81	non-LIQ	non-LIQ	0.835	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
41.83	39.9	115.0	115.0	11.9	0.2	1.7	67.0	4.1	3.3	5.0	1.2	9.0	2.41	1.66	2.41	1.66	3.12	non-LIQ CLAY	1	0.64	NA	8.20	non-LIQ	non-LIQ	0.834	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.00	39.7	115.0	115.0	12.3	0.4	3.3	77.6	4.7	3.7	5.0	1.2	9.0	2.42	1.67	2.42	1.67	3.26	non-LIQ CLAY	1	0.64	NA	10.07	non-LIQ	non-LIQ	0.832	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.16	39.5	115.0	115.0	15.6	0.5	3.2	68.4	5.5	4.3	5.0	1.2	10.0	2.42	1.67	2.42	1.67	3.14	non-LIQ CLAY	1	0.63	NA	8.43	non-LIQ	non-LIQ	0.831	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.32	39.4	115.0	115.0	21.5	0.6	2.8	56.0	6.7	5.3	5.0	1.2	11.0	2.43	1.67	2.43	1.67	2.96	non-LIQ CLAY	1	0.63	NA	6.34	non-LIQ	non-LIQ	0.830	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.49	39.2	115.0	115.0	22.1	0.7	3.2	57.4	7.0	5.6	5.0	1.2	12.0	2.44	1.68	2.44	1.68	2.98	non-LIQ CLAY	1	0.63	NA	6.57	non-LIQ	non-LIQ	0.828	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.65	39.1	115.0	115.0	21.9	0.7	3.2	57.9	7.0	5.5	5.0	1.2	12.0	2.45	1.68	2.45	1.68	2.99	non-LIQ CLAY	1	0.63	NA	6.65	non-LIQ	non-LIQ	0.827	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.82	38.9	115.0	115.0	19.0	0.5	2.6	58.9	6.1	4.8	5.0	1.2	11.0	2.46	1.69	2.46	1.69	3.01	non-LIQ CLAY	1	0.63	NA	6.81	non-LIQ	non-LIQ	0.826	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
42.98	38.7	115.0	115.0	18.7	0.5	2.7	59.7	6.0	4.8	5.0	1.2	11.0	2.47	1.69	2.47	1.69	3.02	non-LIQ CLAY	1	0.63	NA	6.95	non-LIQ	non-LIQ	0.824	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.15	38.6	115.0	115.0	15.2	0.4	2.6	66.4	5.2	4.1	5.0	1.2	10.0	2.48	1.70	2.48	1.70	3.11	non-LIQ CLAY	1	0.62	NA	8.08	non-LIQ	non-LIQ	0.823	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.31	38.4	115.0	115.0	15.3	0.5	3.3	70.2	5.4	4.3	5.0	1.2	10.0	2.49	1.70	2.49	1.70	3.16	non-LIQ CLAY	1	0.62	NA	8.74	non-LIQ	non-LIQ	0.822	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.47	38.2	115.0	115.0	17.7	0.7	4.0	68.9	6.2	4.9	5.0	1.2	11.0	2.50	1.70	2.50	1.70	3.15	non-LIQ CLAY	1	0.62	NA	8.51	non-LIQ	non-LIQ	0.820	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.64	38.1	115.0	115.0	22.2	0.9	4.1	62.3	7.4	5.8	5.0	1.2	12.0	2.51	1.71	2.51	1.71	3.06	non-LIQ CLAY	1	0.62	NA	7.38	non-LIQ	non-LIQ	0.819	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.80	37.9	115.0	115.0	24.5	0.9	3.7	57.8	7.8	6.1	5.0	1.2	12.0	2.52	1.71	2.52	1.71	2.99	non-LIQ CLAY	1	0.62	NA	6.62	non-LIQ	non-LIQ	0.818	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
43.97	37.7	115.0	115.0	21.7	0.9	4.1	63.6	7.3	5.7	5.0	1.2	12.0	2.53	1.72	2.53	1.72	3.07	non-LIQ CLAY	1	0.62	NA	7.60	non-LIQ	non-LIQ	0.816	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.13	37.6	115.0	115.0	22.5	1.0	4.4	63.9	7.6	5.9	5.0	1.2	12.0	2.54	1.72	2.54	1.72	3.08	non-LIQ CLAY	1	0.61	NA	7.65	non-LIQ	non-LIQ	0.815	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.29	37.4	115.0	115.0	22.2	1.0	4.5	64.6	7.5	5.9	5.0	1.2	12.0	2.55	1.73	2.55	1.73	3.09	non-LIQ CLAY	1	0.61	NA	7.76	non-LIQ	non-LIQ	0.814	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.46	37.2	115.0	115.0	22.9	0.8	3.5	59.1	7.4	5.8	5.0	1.2	12.0	2.56	1.73	2.56	1.73	3.01	non-LIQ CLAY	1	0.61	NA	6.84	non-LIQ	non-LIQ	0.812	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.62	37.1	115.0	115.0	20.4	0.8	3.9	64.7	6.9	5.4	5.0	1.2	11.0	2.57	1.74	2.57	1.74	3.09	non-LIQ CLAY	1	0.61	NA	7.80	non-LIQ	non-LIQ	0.811	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.79	36.9	115.0	115.0	20.5	1.1	5.4	70.9	7.3	5.7	5.0	1.2	12.0	2.58	1.74	2.58	1.74	3.17	non-LIQ CLAY	1	0.61	NA	8.86	non-LIQ	non-LIQ	0.809	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
44.95	36.8	115.0	115.0	20.9	1.2	5.7	71.8	7.6	5.9	5.0	1.2	12.0	2.58	1.74	2.58	1.74	3.18	non-LIQ CLAY	1	0.61	NA	9.04	non-LIQ	non-LIQ	0.808	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.11	36.6	115.0	115.0	29.3	1.1	3.8	54.0	9.0	7.0	5.0	1.2	13.0	2.59	1.75	2.59	1.75	2.93	non-LIQ CLAY	1	0.61	NA	6.01	non-LIQ	non-LIQ	0.807	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.28	36.4	115.0	115.0	25.9	1.0	3.9	57.8	8.2	6.4	5.0	1.2	13.0	2.60	1.75	2.60	1.75	2.99	non-LIQ CLAY	1	0.60	NA	6.63	non-LIQ	non-LIQ	0.806	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.44	36.3	115.0	115.0	24.0	0.8	3.3	57.4	7.6	5.9	5.0	1.2	12.0	2.61	1.76	2.61	1.76	2.98	non-LIQ CLAY	1	0.60	NA	6.56	non-LIQ	non-LIQ	0.804	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.61	36.1	115.0	115.0	22.4	0.8	3.6	60.7	7.3	5.7	5.0	1.2	12.0	2.62	1.76	2.62	1.76	3.03	non-LIQ CLAY	1	0.60	NA	7.11	non-LIQ	non-LIQ	0.803	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.77	35.9	115.0	115.0	22.8	0.8	3.5	59.9	7.4	5.7	5.0	1.2	12.0	2.63	1.77	2.63	1.77	3.02	non-LIQ CLAY	1	0.60	NA	6.98	non-LIQ	non-LIQ	0.802	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
45.93	35.8	115.0	115.0	24.6	0.9	3.7	58.5	7.9	6.1	5.0	1.2	12.0	2.64	1.77	2.64	1.77	3.00	non-LIQ CLAY	1	0.60	NA	6.75	non-LIQ	non-LIQ	0.800	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.10	35.6	115.0	115.0	26.6	1.0	3.8	56.9	8.4	6.5	5.0	1.2	13.0	2.65	1.77	2.65	1.77	2.98	non-LIQ CLAY	1	0.60	NA	6.49	non-LIQ	non-LIQ	0.799	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.26	35.4	115.0	115.0	27.1	1.0	3.7	56.2	8.5	6.5	5.0	1.2	13.0	2.66	1.78	2.66	1.78	2.97	non-LIQ CLAY	1	0.60	NA	6.37	non-LIQ	non-LIQ	0.798	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.43	35.3	115.0	115.0	27.8	1.0	3.6	55.1	8.6	6.6	5.0	1.2	13.0	2.67	1.78	2.67	1.78	2.95	non-LIQ CLAY	1	0.59	NA	6.20	non-LIQ	non-LIQ	0.796	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.59	35.1	115.0	115.0	28.4	1.0	3.5	54.3	8.7	6.7	5.0	1.2	13.0	2.68	1.79	2.68	1.79	2.94	non-LIQ CLAY	1	0.59	NA	6.06	non-LIQ	non-LIQ	0.795	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.75	35.0	115.0	115.0	28.6	0.8	2.8	50.4	8.5	6.5	5.0	1.2	13.0	2.69	1.79	2.69	1.79	2.87	non-LIQ CLAY	1	0.59	NA	5.44	non-LIQ	non-LIQ	0.794	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
46.92	34.8	115.0	115.0	26.1	0.7	2.7	52.1	7.9	6.0	5.0	1.2	12.0	2.70	1.80	2.70	1.80	2.90	non-LIQ CLAY	1	0.59	NA	5.72	non-LIQ	non-LIQ	0.792	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.08	34.6	115.0	115.0	21.4	0.5	2.3	55.5	6.7	5.1	5.0	1.2	11.0	2.71	1.80	2.71	1.80	2.96	non-LIQ CLAY	1	0.59	NA	6.26	non-LIQ	non-LIQ	0.791	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.25	34.5	115.0	115.0	18.1	0.6	3.3	66.9	6.3	4.8	5.0	1.2	11.0	2.72	1.80	2.72	1.80	3.12	non-LIQ CLAY	1	0.59	NA	8.17	non-LIQ	non-LIQ	0.789	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.41	34.3	115.0	115.0	21.5	0.8	3.7	63.5	7.2	5.5	5.0	1.2	12.0	2.73	1.81	2.73	1.81	3.07	non-LIQ CLAY	1	0.59	NA	7.59	non-LIQ	non-LIQ	0.788	0.320	0.320	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.57	34.1	115.0	115.0	30.1	1.0	3.3	52.2	9.1	6.9	5.0	1.2	13.0	2.74	1.81	2.74	1.81	2.90	non-LIQ CLAY	1	0.58	NA	5.73	non-LIQ	non-LIQ	0.787	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.74	34.0	115.0	115.0	30.7	1.3	4.2	56.0	9.6	7.3	5.0	1.2	14.0	2.75	1.82	2.75	1.82	2.96	non-LIQ CLAY	1	0.58	NA	6.33	non-LIQ	non-LIQ	0.785	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
47.90	33.8	115.0	115.0	31.7	1.9	6.0	61.9	10.5	8.0	5.0	1.2	15.0	2.75	1.82	2.75	1.82	3.05	non-LIQ CLAY	1	0.58	NA	7.31	non-LIQ	non-LIQ	0.784	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.07	33.6	115.0	115.0	60.2	2.7	3.4	29.2	19.2	14.6	4.6	1.1	21.0	2.76	1.83	2.76	1.83	2.47	SAND	0.5	0.76	58	2.60	150	0.394	0.783	0.310	0.310	1.27	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.23	33.5	115.0	115.0	96.5	3.3	3.4	26.9	22.6	17.1	4.5	1.1	24.0	2.77	1.83	2.77	1.83	2.41	SAND	0.5	0.76	69	2.36	164	non-LIQ	0.781	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.39	33.3	115.0	115.0	54.4	2.0	3.7	41.1	14.7	11.2	5.0	1.2	18.0	2.78	1.83	2.78	1.83	2.71	non-LIQ CLAY	1	0.58	NA	4.08	non-LIQ	non-LIQ	0.780	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.56	33.1	115.0	115.0	28.6	1.4	4.9	60.9	9.4	7.1	5.0	1.2	14.0	2.79	1.84	2.79	1.84	3.04	non-LIQ CLAY	1	0.56	NA	7.15	non-LIQ	non-LIQ	0.779	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.72	33.0	115.0	115.0	28.3	1.6	5.7	64.1	9.5	7.2	5.0	1.2	14.0	2.80	1.84	2.80	1.84	3.08	non-LIQ CLAY	1	0.57	NA	7.70	non-LIQ	non-LIQ	0.778	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
48.89	32.8	115.0	115.0	58.9	2.1	3.6	39.2	15.7	11.9	5.0	1.2	19.0	2.81	1.85	2.81	1.85	2.68	non-LIQ CLAY	1	0.57	NA	3.83	non-LIQ	non-LIQ	0.776	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.05	32.7	115.0	115.0	123.4	2.4	1.9	17.7	25.9	19.5	3.2	1.1	24.0	2.82	1.85	2.82	1.85	2.16	SAND	0.5	0.76	88	1.57	139	0.328	0.775	0.310	0.310	1.06	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.22	32.5	115.0	115.0	133.7	3.2	2.4	19.0	28.5	21.5	3.4	1.1	26.0	2.83	1.86	2.83	1.86	2.20	SAND	0.5	0.76	95	1.66	159	0.452	0.773	0.310	0.310	1.46	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.38	32.3	115.0	115.0	108.5	3.2	2.9	23.7	24.5	18.4	4.1	1.1	25.0	2.84	1.86	2.84	1.86	2.33	SAND	0.5	0.75	77	2.05	159	0.451	0.772	0.310	0.310	1.46	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.54	32.2	115.0	115.0	95.9	3.0	3.1	26.0	22.2	16.7	4.4	1.1	23.0	2.85	1.86	2.85	1.86	2.39	SAND	0.5	0.75	68	2.27	155	0.425	0.771	0.310	0.310	1.37	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.71	32.0	115.0	115.0	83.6	2.9	3.5	29.2	20.0	15.1	4.6	1.1	22.0	2.86	1.87	2.86	1.87	2.47	SAND	0.5	0.75	59	2.60	155	0.424	0.769	0.310	0.310	1.37	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
49.87	31.8	115.0	115.0	56.6	2.4	4.2	42.9	15.7	11.8	5.0	1.2	19.0	2.87	1.87	2.87	1.87	2.74	non-LIQ CLAY	1	0.56	NA	4.33	non-LIQ	non-LIQ	0.768	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.04	31.7	115.0	115.0	42.1	2.7	6.4	56.9	13.3	10.0	5.0	1.2	17.0	2.88	1.88	2.88	1.88	2.98	non-LIQ CLAY	1	0.56	NA	6.48	non-LIQ	non-LIQ	0.767	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.20	31.5	115.0	115.0	59.3	2.3	3.9	40.8	16.0	12.0	5.0	1.2	19.0	2.89	1.88	2.89	1.88	2.71	non-LIQ CLAY	1	0.56	NA	4.04	non-LIQ	non-LIQ	0.765	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.36	31.3	115.0	115.0	39.9	1.4	3.5	47.4	11.5	8.6	5.0	1.2	15.0	2.90	1.89	2.90	1.89	2.82	non-LIQ CLAY	1	0.56	NA	4.99	non-LIQ	non-LIQ	0.764	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.53	31.2	115.0	115.0	25.7	0.6	2.3	51.9	7.7	5.8	5.0	1.2	12.0	2.91	1.89	2.91	1.89	2.90	non-LIQ CLAY	1	0.56	NA	5.68	non-LIQ	non-LIQ	0.763	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.69	31.0	115.0	115.0	22.9	1.1	4.8	68.1	8.0	6.0	5.0	1.2	12.0	2.91	1.89	2.91	1.89	3.14	non-LIQ CLAY	1	0.56	NA	8.38	non-LIQ	non-LIQ	0.761	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
50.86	30.8	115.0	115.0	71.6	1.9	2.7	28.0	16.9	12.6	4.6	1.1	19.0	2.92	1.90	2.92	1.90	2.44	SAND	0.5	0.75	51	2.48	125	0.262	0.760	0.310	0.310	0.85	NA	NA	NA	NA	NA	0.00	15.00	1.91	0.04
51.02	30.7	115.0	115.0	87.8	2.7	3.1	27.0	20.6	15.3	4.5	1.1	22.0	2.93	1.90	2.93	1.90	2.42	SAND	0.5	0.75	62	2.38	147	0.376	0.759	0.310	0.310	1.21	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.18	30.5	115.0	115.0	92.4	3.1	3.4	27.5	21.7	16.2	4.5	1.1	23.0	2.94	1.91	2.94	1.91	2.43	SAND	0.5	0.74	65	2.42	158	0.445	0.757	0.310	0.310	1.43	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.35	30.4	115.0	115.0	84.8	3.2	3.8	30.3	20.6	15.3	4.7	1.2	22.0	2.95	1.91	2.95	1.91	2.49	SAND	0.5	0.74	60	2.73	163	non-LIQ	0.756	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.51	30.2	115.0	115.0	74.0	3.0	4.1	37.8	19.4	14.4	5.0	1.2	22.0	2.96	1.92	2.96	1.92	2.65	non-LIQ CLAY	1	0.55	NA	3.64	non-LIQ	non-LIQ	0.755	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.68	30.0	115.0	115.0	59.7	2.7	4.5	43.5	16.6	12.3	5.0	1.2	20.0	2.97	1.92	2.97	1.92	2.76	non-LIQ CLAY	1	0.55	NA	4.43	non-LIQ	non-LIQ	0.753	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
51.84	29.9	115.0	115.0	35.6	2.0	5.6	59.1	11.4	8.5	5.0	1.2	15.0	2.98	1.92	2.98	1.92	3.01	non-LIQ CLAY	1	0.55	NA	6.84	non-LIQ	non-LIQ	0.752	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.00	29.7	115.0	115.0	35.8	1.5	4.2	53.5	10.9	8.1	5.0	1.2	15.0	2.99	1.93	2.99	1.93	2.92	non-LIQ CLAY	1	0.55	NA	5.94	non-LIQ	non-LIQ	0.751	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60cs}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_Q	q_{c1N}	Fines Correction Kc	Fines Correction $(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_{eq}	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{vol} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60cs}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
52.17	29.5	115.0	115.0	37.8	1.9	5.0	55.5	11.8	6.7	5.0	1.2	15.0	3.00	1.93	3.00	1.93	2.96	non-LIQ CLAY	1	0.55	NA	6.26	non-LIQ	non-LIQ	0.749	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.33	29.4	115.0	115.0	58.6	2.0	3.4	39.6	15.6	11.6	5.0	1.2	19.0	3.01	1.94	3.01	1.94	2.68	non-LIQ CLAY	1	0.55	NA	3.88	non-LIQ	non-LIQ	0.748	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.50	29.2	115.0	115.0	58.8	2.2	3.7	41.0	15.9	11.7	5.0	1.2	19.0	3.02	1.94	3.02	1.94	2.71	non-LIQ CLAY	1	0.54	NA	4.07	non-LIQ	non-LIQ	0.747	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.66	29.0	115.0	115.0	69.0	1.8	2.6	28.6	16.4	12.1	4.6	1.1	18.0	3.03	1.95	3.03	1.95	2.45	SAND	0.5	0.74	48	2.53	122	0.248	0.745	0.310	0.310	0.80	NA	NA	NA	NA	NA	0.00	14.00	2.00	0.04
52.82	28.9	115.0	115.0	47.4	1.9	4.0	46.6	13.5	10.0	5.0	1.2	17.0	3.04	1.95	3.04	1.95	2.81	non-LIQ CLAY	1	0.54	NA	4.87	non-LIQ	non-LIQ	0.744	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
52.99	28.7	115.0	115.0	52.3	2.5	4.8	47.5	15.1	11.1	5.0	1.2	18.0	3.05	1.96	3.05	1.96	2.83	non-LIQ CLAY	1	0.54	NA	5.01	non-LIQ	non-LIQ	0.743	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.15	28.6	115.0	115.0	39.5	2.6	6.6	60.1	12.8	9.4	5.0	1.2	16.0	3.06	1.96	3.06	1.96	3.02	non-LIQ CLAY	1	0.54	NA	7.01	non-LIQ	non-LIQ	0.741	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.32	28.4	115.0	115.0	58.8	1.9	3.2	39.0	15.6	11.4	5.0	1.2	19.0	3.07	1.96	3.07	1.96	2.67	non-LIQ CLAY	1	0.54	NA	3.80	non-LIQ	non-LIQ	0.740	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.48	28.2	115.0	115.0	61.5	2.0	3.3	38.3	16.2	11.9	5.0	1.2	19.0	3.08	1.97	3.08	1.97	2.66	non-LIQ CLAY	1	0.54	NA	3.70	non-LIQ	non-LIQ	0.739	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.64	28.1	115.0	115.0	36.9	1.5	4.1	52.8	11.2	8.2	5.0	1.2	15.0	3.08	1.97	3.08	1.97	2.91	non-LIQ CLAY	1	0.54	NA	5.83	non-LIQ	non-LIQ	0.737	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.81	27.9	115.0	115.0	28.5	1.2	4.2	60.3	9.3	6.8	5.0	1.2	13.0	3.09	1.98	3.09	1.98	3.03	non-LIQ CLAY	1	0.54	NA	7.05	non-LIQ	non-LIQ	0.736	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
53.97	27.7	115.0	115.0	28.0	1.3	4.6	62.8	9.3	6.8	5.0	1.2	13.0	3.10	1.98	3.10	1.98	3.06	non-LIQ CLAY	1	0.53	NA	7.46	non-LIQ	non-LIQ	0.735	0.310	0.310	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.14	27.6	115.0	115.0	54.0	2.0	3.7	43.0	14.9	10.9	5.0	1.2	18.0	3.11	1.99	3.11	1.99	2.75	non-LIQ CLAY	1	0.53	NA	4.34	non-LIQ	non-LIQ	0.733	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.30	27.4	115.0	115.0	54.7	2.1	3.8	43.3	15.1	11.0	5.0	1.2	18.0	3.12	1.99	3.12	1.99	2.75	non-LIQ CLAY	1	0.53	NA	4.39	non-LIQ	non-LIQ	0.732	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.46	27.2	115.0	115.0	41.4	1.9	4.6	52.5	12.5	9.1	5.0	1.2	16.0	3.13	1.99	3.13	1.99	2.91	non-LIQ CLAY	1	0.53	NA	5.77	non-LIQ	non-LIQ	0.731	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.63	27.1	115.0	115.0	40.0	1.4	3.5	48.7	11.7	8.5	5.0	1.2	15.0	3.14	2.00	3.14	2.00	2.85	non-LIQ CLAY	1	0.53	NA	5.18	non-LIQ	non-LIQ	0.729	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.79	26.9	115.0	115.0	34.3	1.8	5.2	59.8	11.1	8.1	5.0	1.2	15.0	3.15	2.00	3.15	2.00	3.02	non-LIQ CLAY	1	0.53	NA	6.96	non-LIQ	non-LIQ	0.728	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
54.96	26.7	115.0	115.0	61.2	1.9	3.1	38.1	16.1	11.7	5.0	1.2	19.0	3.16	2.01	3.16	2.01	2.65	non-LIQ CLAY	1	0.53	NA	3.68	non-LIQ	non-LIQ	0.727	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.12	26.6	115.0	115.0	56.3	1.7	3.0	39.3	15.0	10.9	5.0	1.2	16.0	3.17	2.01	3.17	2.01	2.68	non-LIQ CLAY	1	0.53	NA	3.84	non-LIQ	non-LIQ	0.725	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.28	26.4	115.0	115.0	32.5	1.5	4.6	59.0	10.4	7.6	5.0	1.2	14.0	3.18	2.02	3.18	2.02	3.01	non-LIQ CLAY	1	0.52	NA	6.83	non-LIQ	non-LIQ	0.724	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.45	26.3	115.0	115.0	26.5	1.1	4.2	62.9	8.8	6.4	5.0	1.2	13.0	3.19	2.02	3.19	2.02	3.06	non-LIQ CLAY	1	0.52	NA	7.48	non-LIQ	non-LIQ	0.723	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.61	26.1	115.0	115.0	31.2	1.0	3.2	53.7	9.5	6.9	5.0	1.2	13.0	3.20	2.02	3.20	2.02	2.93	non-LIQ CLAY	1	0.52	NA	5.97	non-LIQ	non-LIQ	0.721	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.78	25.9	115.0	115.0	36.1	0.9	2.5	46.1	10.3	7.4	5.0	1.2	14.0	3.21	2.03	3.21	2.03	2.80	non-LIQ CLAY	1	0.52	NA	4.81	non-LIQ	non-LIQ	0.720	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
55.94	25.8	115.0	115.0	31.4	1.0	3.2	53.5	9.6	6.9	5.0	1.2	13.0	3.22	2.03	3.22	2.03	2.92	non-LIQ CLAY	1	0.52	NA	5.94	non-LIQ	non-LIQ	0.719	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.11	25.6	115.0	115.0	59.0	1.5	2.5	36.2	15.2	11.0	5.0	1.2	18.0	3.23	2.04	3.23	2.04	2.62	non-LIQ CLAY	1	0.52	NA	3.44	non-LIQ	non-LIQ	0.717	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.27	25.4	115.0	115.0	47.3	1.5	3.2	43.9	13.2	9.5	5.0	1.2	16.0	3.24	2.04	3.24	2.04	2.76	non-LIQ CLAY	1	0.52	NA	4.47	non-LIQ	non-LIQ	0.716	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.43	25.3	115.0	115.0	31.9	1.1	3.4	54.7	9.8	7.1	5.0	1.2	13.0	3.24	2.05	3.24	2.05	2.94	non-LIQ CLAY	1	0.52	NA	6.12	non-LIQ	non-LIQ	0.715	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.60	25.1	115.0	115.0	27.9	0.8	2.9	55.3	8.7	6.2	5.0	1.2	12.0	3.25	2.05	3.25	2.05	2.95	non-LIQ CLAY	1	0.52	NA	6.22	non-LIQ	non-LIQ	0.713	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.76	24.9	115.0	115.0	27.1	1.1	4.1	62.3	9.0	6.4	5.0	1.2	13.0	3.26	2.05	3.26	2.05	3.06	non-LIQ CLAY	1	0.52	NA	7.38	non-LIQ	non-LIQ	0.712	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
56.93	24.8	115.0	115.0	38.4	1.3	3.4	49.8	11.3	8.1	5.0	1.2	15.0	3.27	2.06	3.27	2.06	2.86	non-LIQ CLAY	1	0.51	NA	5.36	non-LIQ	non-LIQ	0.711	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.09	24.6	115.0	115.0	46.5	1.6	3.4	45.7	13.2	9.4	5.0	1.2	16.0	3.28	2.06	3.28	2.06	2.80	non-LIQ CLAY	1	0.51	NA	4.75	non-LIQ	non-LIQ	0.709	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.25	24.5	115.0	115.0	33.1	1.3	3.9	56.2	10.4	7.4	5.0	1.2	14.0	3.29	2.07	3.29	2.07	2.97	non-LIQ CLAY	1	0.51	NA	6.36	non-LIQ	non-LIQ	0.708	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.42	24.3	115.0	115.0	30.3	0.9	3.0	53.9	9.3	6.6	5.0	1.2	13.0	3.30	2.07	3.30	2.07	2.93	non-LIQ CLAY	1	0.51	NA	6.00	non-LIQ	non-LIQ	0.707	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.58	24.1	115.0	115.0	25.8	0.9	3.5	61.3	8.5	6.0	5.0	1.2	12.0	3.31	2.08	3.31	2.08	3.04	non-LIQ CLAY	1	0.51	NA	7.22	non-LIQ	non-LIQ	0.705	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.75	24.0	115.0	115.0	25.2	0.8	3.2	60.4	8.2	5.8	5.0	1.2	12.0	3.32	2.08	3.32	2.08	3.03	non-LIQ CLAY	1	0.51	NA	7.07	non-LIQ	non-LIQ	0.704	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
57.91	23.8	115.0	115.0	25.9	0.9	3.5	61.3	8.5	6.1	5.0	1.2	12.0	3.33	2.08	3.33	2.08	3.04	non-LIQ CLAY	1	0.51	NA	7.21	non-LIQ	non-LIQ	0.703	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.07	23.6	115.0	115.0	25.3	0.9	3.6	62.5	8.4	6.0	5.0	1.2	12.0	3.34	2.09	3.34	2.09	3.06	non-LIQ CLAY	1	0.51	NA	7.41	non-LIQ	non-LIQ	0.701	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.24	23.5	115.0	115.0	25.9	0.9	3.5	61.4	8.5	6.0	5.0	1.2	12.0	3.35	2.09	3.35	2.09	3.04	non-LIQ CLAY	1	0.51	NA	7.23	non-LIQ	non-LIQ	0.700	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.40	23.3	115.0	115.0	27.8	0.9	3.2	58.1	8.9	6.3	5.0	1.2	13.0	3.36	2.10	3.36	2.10	2.99	non-LIQ CLAY	1	0.50	NA	6.68	non-LIQ	non-LIQ	0.699	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.57	23.1	115.0	115.0	28.8	0.9	3.1	56.6	9.0	6.4	5.0	1.2	13.0	3.37	2.10	3.37	2.10	2.97	non-LIQ CLAY	1	0.50	NA	6.43	non-LIQ	non-LIQ	0.697	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.73	23.0	115.0	115.0	28.5	0.9	3.2	57.1	9.0	6.4	5.0	1.2	13.0	3.38	2.11	3.38	2.11	2.98	non-LIQ CLAY	1	0.50	NA	6.52	non-LIQ	non-LIQ	0.696	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
58.89	22.8	115.0	115.0	28.7	0.9	3.1	56.8	9.0	6.4	5.0	1.2	13.0	3.39	2.11	3.39	2.11	2.98	non-LIQ CLAY	1	0.50	NA	6.47	non-LIQ	non-LIQ	0.695	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.06	22.6	115.0	115.0	37.7	1.2	3.2	50.0	11.1	7.9	5.0	1.2	14.0	3.40	2.11	3.40	2.11	2.87	non-LIQ CLAY	1	0.50	NA	5.38	non-LIQ	non-LIQ	0.693	0.300	0.300	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.22	22.5	115.0	115.0	40.8	1.4	3.4	49.3	12.0	8.5	5.0	1.2	15.0	3.41	2.12	3.41	2.12	2.86	non-LIQ CLAY	1	0.50	NA	5.28	non-LIQ	non-LIQ	0.692	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.39	22.3	115.0	115.0	35.9	1.1	3.1	50.7	10.7	7.5	5.0	1.2	14.0	3.41	2.12	3.41	2.12	2.88	non-LIQ CLAY	1	0.50	NA	5.49	non-LIQ	non-LIQ	0.691	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.55	22.2	115.0	115.0	32.5	0.9	2.8	51.6	9.7	6.9	5.0	1.2	13.0	3.42	2.13	3.42	2.13	2.89	non-LIQ CLAY	1	0.50	NA	5.64	non-LIQ	non-LIQ	0.689	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.71	22.0	115.0	115.0	28.8	0.9	3.1	57.0	9.1	6.4	5.0	1.2	13.0	3.43	2.13	3.43	2.13	2.96	non-LIQ CLAY	1	0.50	NA	6.50	non-LIQ	non-LIQ	0.688	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
59.88	21.8	115.0	115.0	28.9	1.1	3.8	60.4	9.4	6.6	5.0	1.2	13.0	3.44	2.14	3.44	2.14	3.03	non-LIQ CLAY	1	0.50	NA	7.07	non-LIQ	non-LIQ	0.687	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.04	21.7	115.0	115.0	30.1	1.2	4.0	60.2	9.8	6.9	5.0	1.2	13.0	3.45	2.14	3.45	2.14	3.02	non-LIQ CLAY	1	0.49	NA	7.03	non-LIQ	non-LIQ	0.685	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.21	21.5	115.0	115.0	34.9	1.3	3.7	54.9	10.8	7.6	5.0	1.2	14.0	3.46	2.15	3.46	2.15	2.95	non-LIQ CLAY	1	0.49	NA	6.17	non-LIQ	non-LIQ	0.684	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.37	21.3	115.0	115.0	34.0	1.2	3.5	54.8	10.5	7.4	5.0	1.2	14.0	3.47	2.15	3.47	2.15	2.94	non-LIQ CLAY	1	0.49	NA	6.14	non-LIQ	non-LIQ	0.683	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.53	21.2	115.0	115.0	33.6	1.2	3.6	55.3	10.4	7.3	5.0	1.2	14.0	3.48	2.15	3.48	2.15	2.95	non-LIQ CLAY	1	0.49	NA	6.23	non-LIQ	non-LIQ	0.681	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.70	21.0	115.0	115.0	32.3	1.1	3.4	55.6	10.1	7.0	5.0	1.2	13.0	3.49	2.16	3.49	2.16	2.96	non-LIQ CLAY	1	0.49	NA	6.28	non-LIQ	non-LIQ	0.680	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
60.86	20.8	115.0	115.0	33.1	1.1	3.3	54.6	10.2	7.1	5.0	1.2	14.0	3.50	2.16	3.50	2.16	2.94	non-LIQ CLAY	1	0.49	NA	6.11	non-LIQ	non-LIQ	0.679	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.03	20.7	115.0	115.0	30.7	1.0	3.3	56.4	9.6	6.7	5.0	1.2	13.0	3.51	2.17	3.51	2.17	2.97	non-LIQ CLAY	1	0.49	NA	6.40	non-LIQ	non-LIQ	0.677	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.19	20.5	115.0	115.0	29.6	1.0	3.4	58.1	9.4	6.6	5.0	1.2	13.0	3.52	2.17	3.52	2.17	2.99	non-LIQ CLAY	1	0.49	NA	6.68	non-LIQ	non-LIQ	0.676	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.35	20.4	115.0	115.0	30.0	1.0	3.3	57.6	9.5	6.6	5.0	1.2	13.0	3.53	2.18	3.53	2.18	2.99	non-LIQ CLAY	1	0.49	NA	6.59	non-LIQ	non-LIQ	0.675	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.52	20.2	115.0	115.0	31.1	1.1	3.5	57.6	9.9	6.9	5.0	1.2	13.0	3.54	2.18	3.54	2.18	2.99	non-LIQ CLAY	1	0.49	NA	6.60	non-LIQ	non-LIQ	0.673	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.68	20.0	115.0	115.0	31.2	1.1	3.5	57.5	9.9	6.9	5.0	1.2	13.0	3.55	2.18	3.55	2.18	2.99	non-LIQ CLAY	1	0.48	NA	6.59	non-LIQ	non-LIQ	0.672	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
61.85	19.9	115.0	115.0	32.0	1.0	3.1	54.8	9.9	6.9	5.0	1.2	13.0	3.56	2.19	3.56	2.19	2.94	non-LIQ CLAY	1	0.48	NA	6.15	non-LIQ	non-LIQ	0.671	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.01	19.7	115.0	115.0	31.5	0.8	2.5	51.9	9.5	6.6	5.0	1.2	13.0	3.57	2.19	3.57	2.19	2.90	non-LIQ CLAY	1	0.48	NA	5.69	non-LIQ	non-LIQ	0.669	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.17	19.5	115.0	115.0	27.3	0.7	2.6	56.2	8.5	5.9	5.0	1.2	12.0	3.57	2.20	3.57	2.20	2.97	non-LIQ CLAY	1	0.48	NA	6.37	non-LIQ	non-LIQ	0.668	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.34	19.4	115.0	115.0	24.8	0.6	2.4	58.2	7.9	5.5	5.0	1.2	12.0	3.58	2.20	3.58	2.20	3.00	non-LIQ CLAY	1	0.48	NA	6.70	non-LIQ	non-LIQ	0.667	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.50	19.2	115.0	115.0	24.9	0.7	2.8	60.6	8.1	5.6	5.0	1.2	12.0	3.59	2.21	3.59	2.21	3.03	non-LIQ CLAY	1	0.48	NA	7.10	non-LIQ	non-LIQ	0.665	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.67	19.0	115.0	115.0	26.2	0.7	2.7	58.3	8.4	5.8	5.0	1.2	12.0	3.60	2.21	3.60	2.21	3.00	non-LIQ CLAY	1	0.48	NA	6.71	non-LIQ	non-LIQ	0.664	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
62.83	18.9	115.0	115.0	27.0	0.8	3.0	59.2	8.7	6.0	5.0	1.2	12.0	3.61	2.21	3.61	2.21	3.01	non-LIQ CLAY	1	0.48	NA	6.86	non-LIQ	non-LIQ	0.663	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.00	18.7	115.0	115.0	27.5	0.8	2.9	58.4	8.8	6.1	5.0	1.2	12.0	3.62	2.22	3.62	2.22	3.00	non-LIQ CLAY	1	0.48	NA	6.72	non-LIQ	non-LIQ	0.661	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.16	18.5	115.0	115.0	28.3	0.8	2.8	57.1	8.9	6.2	5.0	1.2	12.0	3.63	2.22	3.63	2.22	2.98	non-LIQ CLAY	1	0.48	NA	6.52	non-LIQ	non-LIQ	0.660	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.32	18.4	115.0	115.0	29.5	0.8	2.7	55.3	9.2	6.3	5.0	1.2	13.0	3.64	2.23	3.64	2.23	2.95	non-LIQ CLAY	1	0.48	NA	6.22	non-LIQ	non-LIQ	0.659	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.49	18.2	115.0	115.0	29.6	1.1	3.7	60.7	9.7	6.6	5.0	1.2	13.0	3.65	2.23	3.65	2.23	3.03	non-LIQ CLAY	1	0.47	NA	7.11	non-LIQ	non-LIQ	0.657	0.290	0.290	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.65	18.1	115.0	115.0	31.7	1.3	4.1	60.5	10.3	7.1	5.0	1.2	14.0	3.66	2.24	3.66	2.24	3.03	non-LIQ CLAY	1	0.47	NA	7.09	non-LIQ	non-LIQ	0.656	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.82	17.9	115.0	115.0	47.9	2.1	4.4	51.1	14.3	9.8	5.0	1.2	17.0	3.67	2.24	3.67	2.24	2.89	non-LIQ CLAY	1	0.47	NA	5.56	non-LIQ	non-LIQ	0.655	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
63.98	17.7	115.0	115.0	57.4	3.0	5.2	50.2	17.0	11.7	5.0	1.2	19.0	3.68	2.24	3.68	2.24	2.87	non-LIQ CLAY	1	0.47	NA	5.42	non-LIQ	non-LIQ	0.653	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.14	17.6	115.0	115.0	73.5	3.5	4.8	43.5	20.4	14.0	5.0	1.2	22.0	3.69	2.25	3.69	2.25	2.76	non-LIQ CLAY	1	0.47	NA	4.43	non-LIQ	non-LIQ	0.652	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.31	17.4	115.0	115.0	74.5	3.5	4.7	43.1	20.6	14.1	5.0	1.2	22.0	3.70	2.25	3.70	2.25	2.75	non-LIQ CLAY	1	0.47	NA	4.36	non-LIQ	non-LIQ	0.651	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.47	17.2	115.0	115.0	65.8	2.6	4.0	42.7	18.1	12.4	5.0	1.2	20.0	3.71	2.26	3.71	2.26	2.74	non-LIQ CLAY	1	0.47	NA	4.31	non-LIQ	non-LIQ	0.649	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.64	17.1	115.0	115.0	44.8	1.8	4.0	51.4	13.4	9.2	5.0	1.2	16.0	3.72	2.26	3.72	2.26	2.89	non-LIQ CLAY	1	0.47	NA	5.60	non-LIQ	non-LIQ	0.648	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.80	16.9	115.0	115.0	38.1	1.7	4.5	57.4	12.1	8.2	5.0	1.2	15.0	3.73	2.27	3.73	2.27	2.98	non-LIQ CLAY	1	0.47	NA	6.57	non-LIQ	non-LIQ	0.647	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
64.96	16.7	115.0	115.0	39.2	2.0	5.1	59.2	12.6	8.6	5.0	1.2	15.0	3.74	2.27	3.74	2.27	3.01	non-LIQ CLAY	1	0.47	NA	6.87	non-LIQ	non-LIQ	0.645	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.13	16.6	115.0	115.0	60.5	1.8	3.0	40.2	16.2	11.1	5.0	1.2	18.0	3.74	2.27	3.74	2.27	2.69	non-LIQ CLAY	1	0.47	NA	3.96	non-LIQ	non-LIQ	0.644	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.29	16.4	115.0	115.0	48.7	1.7	3.5	47.3	14.0	9.5	5.0	1.2	16.0	3.75	2.28	3.75	2.28	2.82	non-LIQ CLAY	1	0.46	NA	4.97	non-LIQ	non-LIQ	0.643	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.46	16.2	115.0	115.0	46.0	1.5	3.3	47.5	13.3	9.0	5.0	1.2	16.0	3.76	2.28	3.76	2.28	2.83	non-LIQ CLAY	1	0.46	NA	5.01	non-LIQ	non-LIQ	0.641	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.62	16.1	115.0	115.0	46.0	1.3	2.8	45.3	13.0	8.8	5.0	1.2	16.0	3.77	2.29	3.77	2.29	2.79	non-LIQ CLAY	1	0.46	NA	4.69	non-LIQ	non-LIQ	0.640	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.78	15.9	115.0	115.0	41.0	1.1	2.7	47.3	11.8	8.0	5.0	1.2	15.0	3.78	2.29	3.78	2.29	2.82	non-LIQ CLAY	1	0.46	NA	4.97	non-LIQ	non-LIQ	0.639	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
65.95	15.8	115.0	115.0	38.9	1.2	3.1	50.8	11.6	7.9	5.0	1.2	14.0	3.79	2.30	3.79	2.30	2.88	non-LIQ CLAY	1	0.46	NA	5.51	non-LIQ	non-LIQ	0.637	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.11	15.6	115.0	115.0	37.0	1.2	3.2	53.0	11.2	7.6	5.0	1.2	14.0	3.80	2.30	3.80	2.30	2.92	non-LIQ CLAY	1	0.46	NA	5.65	non-LIQ	non-LIQ	0.636	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.28	15.4	115.0	115.0	45.9	1.3	2.8	45.6	13.0	8.8	5.0	1.2	16.0	3.81	2.30	3.81	2.30	2.79	non-LIQ CLAY	1	0.46	NA	4.72	non-LIQ	non-LIQ	0.635	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.44	15.3	115.0	115.0	45.3	1.5	3.3	48.4	13.2	8.9	5.0	1.2	16.0	3.82	2.31	3.82	2.31	2.84	non-LIQ CLAY	1	0.46	NA	5.14	non-LIQ	non-LIQ	0.633	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.60	15.1	115.0	115.0	40.8	1.3	3.2	50.3	12.1	8.2	5.0	1.2	15.0	3.83	2.31	3.83	2.31	2.87	non-LIQ CLAY	1	0.46	NA	5.44	non-LIQ	non-LIQ	0.632	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Liquefaction Analysis with Cone Penetration Test (CPT) Data

Depth (ft)	Elev. (ft, MSL)	Unit Weight (pcf) γ'_{MOIST}	Unit Weight (pcf) γ'_{SAT}	q_c (tsf)	f_s (tsf)	Frict. Ratio (%)	% Fines	Equiv. N_{60}	Equiv. $(N_1)_{60}$	α	β	Equiv. $(N_1)_{60CS}$	Stresses at Exploration Water Level σ_v (tsf)	Stresses at Exploration Water Level σ'_v (tsf)	Stresses at Design Water Level σ_v (tsf)	Stresses at Design Water Level σ'_v (tsf)	I_c	Soil Type Character (SAND, SILT or non-LIQ CLAY)	Normalization of Tip Resistance n	C_Q	q_{c1N}	Fines Correction Kc	$(q_{c1N})_{cs}$	$CRR_{7.5}$	r_d	CSR_M	$CSR_{7.5}$	FS	a	b	Max Shear Modulus G_{max} (tsf)	Cyclic Shear Strain γ (%)	Norm. Vol. Strain ε_{Nr} (%)	Dry Settle. ΔS (in)	Post-Liq. $(N_1)_{60CS}$	Post-Liq. Vol. Strain ε (%)	Layer Post-Liq. Settle. ΔS (in)
66.77	14.9	115.0	115.0	34.6	1.1	3.2	54.6	10.7	7.2	5.0	1.2	14.0	3.84	2.32	3.84	2.32	2.94	non-LIQ CLAY	1	0.46	NA	6.12	non-LIQ	non-LIQ	0.631	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
66.93	14.8	115.0	115.0	33.1	1.0	3.0	55.1	10.2	6.9	5.0	1.2	13.0	3.85	2.32	3.85	2.32	2.95	non-LIQ CLAY	1	0.46	NA	6.18	non-LIQ	non-LIQ	0.629	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.10	14.6	115.0	115.0	32.6	1.1	3.4	57.4	10.3	7.0	5.0	1.2	13.0	3.86	2.33	3.86	2.33	2.98	non-LIQ CLAY	1	0.45	NA	6.57	non-LIQ	non-LIQ	0.628	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.26	14.4	115.0	115.0	33.0	1.1	3.3	56.9	10.4	7.0	5.0	1.2	13.0	3.87	2.33	3.87	2.33	2.98	non-LIQ CLAY	1	0.45	NA	6.49	non-LIQ	non-LIQ	0.627	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.42	14.3	115.0	115.0	34.4	1.2	3.5	56.6	10.8	7.3	5.0	1.2	14.0	3.88	2.33	3.88	2.33	2.97	non-LIQ CLAY	1	0.45	NA	6.44	non-LIQ	non-LIQ	0.625	0.280	0.280	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.59	14.1	115.0	115.0	34.3	1.2	3.5	56.8	10.8	7.3	5.0	1.2	14.0	3.89	2.34	3.89	2.34	2.97	non-LIQ CLAY	1	0.45	NA	6.47	non-LIQ	non-LIQ	0.624	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.75	14.0	115.0	115.0	34.9	1.0	2.9	53.0	10.6	7.1	5.0	1.2	14.0	3.90	2.34	3.90	2.34	2.92	non-LIQ CLAY	1	0.45	NA	5.86	non-LIQ	non-LIQ	0.623	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
67.92	13.8	115.0	115.0	35.2	1.0	2.8	52.7	10.7	7.2	5.0	1.2	14.0	3.91	2.35	3.91	2.35	2.91	non-LIQ CLAY	1	0.45	NA	5.81	non-LIQ	non-LIQ	0.621	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.08	13.6	115.0	115.0	33.3	1.0	3.0	55.2	10.3	6.9	5.0	1.2	13.0	3.91	2.35	3.91	2.35	2.95	non-LIQ CLAY	1	0.45	NA	6.20	non-LIQ	non-LIQ	0.620	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.24	13.5	115.0	115.0	34.6	1.1	3.2	55.1	10.7	7.2	5.0	1.2	14.0	3.92	2.36	3.92	2.36	2.95	non-LIQ CLAY	1	0.45	NA	6.20	non-LIQ	non-LIQ	0.619	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.41	13.3	115.0	115.0	33.4	1.1	3.3	56.8	10.5	7.0	5.0	1.2	13.0	3.93	2.36	3.93	2.36	2.97	non-LIQ CLAY	1	0.45	NA	6.46	non-LIQ	non-LIQ	0.617	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.57	13.1	115.0	115.0	32.6	1.1	3.4	57.9	10.4	6.9	5.0	1.2	13.0	3.94	2.36	3.94	2.36	2.99	non-LIQ CLAY	1	0.45	NA	6.65	non-LIQ	non-LIQ	0.616	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.74	13.0	115.0	115.0	32.6	1.0	3.1	56.3	10.2	6.8	5.0	1.2	13.0	3.95	2.37	3.95	2.37	2.97	non-LIQ CLAY	1	0.45	NA	6.39	non-LIQ	non-LIQ	0.615	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
68.90	12.8	115.0	115.0	32.2	1.0	3.1	57.0	10.1	6.8	5.0	1.2	13.0	3.96	2.37	3.96	2.37	2.98	non-LIQ CLAY	1	0.45	NA	6.49	non-LIQ	non-LIQ	0.613	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.07	12.6	115.0	115.0	31.3	1.0	3.2	58.3	10.0	6.7	5.0	1.2	13.0	3.97	2.38	3.97	2.38	3.00	non-LIQ CLAY	1	0.44	NA	6.72	non-LIQ	non-LIQ	0.612	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.23	12.5	115.0	115.0	32.3	1.1	3.4	58.6	10.3	6.9	5.0	1.2	13.0	3.98	2.38	3.98	2.38	3.00	non-LIQ CLAY	1	0.44	NA	6.76	non-LIQ	non-LIQ	0.611	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.39	12.3	115.0	115.0	33.7	1.1	3.3	56.7	10.6	7.1	5.0	1.2	13.0	3.99	2.39	3.99	2.39	2.97	non-LIQ CLAY	1	0.44	NA	6.45	non-LIQ	non-LIQ	0.609	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.56	12.1	115.0	115.0	33.3	1.0	3.0	55.7	10.4	6.9	5.0	1.2	13.0	4.00	2.39	4.00	2.39	2.96	non-LIQ CLAY	1	0.44	NA	6.28	non-LIQ	non-LIQ	0.608	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.72	12.0	115.0	115.0	33.4	1.0	3.0	55.6	10.4	6.9	5.0	1.2	13.0	4.01	2.40	4.01	2.40	2.96	non-LIQ CLAY	1	0.44	NA	6.27	non-LIQ	non-LIQ	0.607	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
69.89	11.8	115.0	115.0	33.7	1.2	3.6	58.4	10.8	7.1	5.0	1.2	14.0	4.02	2.40	4.02	2.40	3.00	non-LIQ CLAY	1	0.44	NA	6.73	non-LIQ	non-LIQ	0.605	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.05	11.7	115.0	115.0	32.1	1.1	3.4	59.2	10.3	6.9	5.0	1.2	13.0	4.03	2.40	4.03	2.40	3.01	non-LIQ CLAY	1	0.44	NA	6.86	non-LIQ	non-LIQ	0.604	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.21	11.5	115.0	115.0	31.2	1.0	3.2	58.9	10.0	6.6	5.0	1.2	13.0	4.04	2.41	4.04	2.41	3.01	non-LIQ CLAY	1	0.44	NA	6.81	non-LIQ	non-LIQ	0.603	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.38	11.3	115.0	115.0	30.0	0.9	3.0	59.0	9.6	6.4	5.0	1.2	13.0	4.05	2.41	4.05	2.41	3.01	non-LIQ CLAY	1	0.44	NA	6.82	non-LIQ	non-LIQ	0.601	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.54	11.2	115.0	115.0	29.6	1.0	3.4	61.5	9.7	6.4	5.0	1.2	13.0	4.06	2.42	4.06	2.42	3.04	non-LIQ CLAY	1	0.44	NA	7.25	non-LIQ	non-LIQ	0.600	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.71	11.0	115.0	115.0	30.9	1.0	3.2	59.5	10.0	6.6	5.0	1.2	13.0	4.07	2.42	4.07	2.42	3.02	non-LIQ CLAY	1	0.44	NA	6.91	non-LIQ	non-LIQ	0.599	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
70.87	10.8	115.0	115.0	30.0	0.9	3.0	59.1	9.6	6.4	5.0	1.2	13.0	4.08	2.43	4.08	2.43	3.01	non-LIQ CLAY	1	0.44	NA	6.85	non-LIQ	non-LIQ	0.597	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.03	10.7	115.0	115.0	28.7	0.8	2.8	59.3	9.2	6.1	5.0	1.2	12.0	4.08	2.43	4.08	2.43	3.01	non-LIQ CLAY	1	0.44	NA	6.88	non-LIQ	non-LIQ	0.596	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.20	10.5	115.0	115.0	28.6	0.8	2.8	59.5	9.2	6.1	5.0	1.2	12.0	4.09	2.43	4.09	2.43	3.02	non-LIQ CLAY	1	0.43	NA	6.92	non-LIQ	non-LIQ	0.595	0.270	0.270	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.36	10.3	115.0	115.0	28.0	0.9	3.2	62.7	9.3	6.1	5.0	1.2	12.0	4.10	2.44	4.10	2.44	3.06	non-LIQ CLAY	1	0.43	NA	7.45	non-LIQ	non-LIQ	0.593	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.53	10.2	115.0	115.0	28.8	0.9	3.1	61.4	9.5	6.2	5.0	1.2	12.0	4.11	2.44	4.11	2.44	3.04	non-LIQ CLAY	1	0.43	NA	7.22	non-LIQ	non-LIQ	0.592	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.69	10.0	115.0	115.0	29.1	1.0	3.4	62.8	9.7	6.4	5.0	1.2	13.0	4.12	2.45	4.12	2.45	3.06	non-LIQ CLAY	1	0.43	NA	7.47	non-LIQ	non-LIQ	0.591	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
71.85	9.9	115.0	115.0	29.2	1.0	3.4	62.7	9.7	6.4	5.0	1.2	13.0	4.13	2.45	4.13	2.45	3.06	non-LIQ CLAY	1	0.43	NA	7.45	non-LIQ	non-LIQ	0.589	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.02	9.7	115.0	115.0	29.0	1.0	3.4	63.1	9.7	6.3	5.0	1.2	13.0	4.14	2.46	4.14	2.46	3.07	non-LIQ CLAY	1	0.43	NA	7.52	non-LIQ	non-LIQ	0.588	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.18	9.5	115.0	115.0	29.6	1.0	3.4	62.1	9.8	6.4	5.0	1.2	13.0	4.15	2.46	4.15	2.46	3.05	non-LIQ CLAY	1	0.43	NA	7.35	non-LIQ	non-LIQ	0.587	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.35	9.4	115.0	115.0	30.0	0.9	3.0	59.7	9.7	6.4	5.0	1.2	13.0	4.16	2.46	4.16	2.46	3.02	non-LIQ CLAY	1	0.43	NA	6.94	non-LIQ	non-LIQ	0.585	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.51	9.2	115.0	115.0	29.6	0.9	3.0	60.4	9.6	6.3	5.0	1.2	13.0	4.17	2.47	4.17	2.47	3.03	non-LIQ CLAY	1	0.43	NA	7.06	non-LIQ	non-LIQ	0.584	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.67	9.0	115.0	115.0	28.7	0.9	3.1	61.9	9.5	6.2	5.0	1.2	12.0	4.18	2.47	4.18	2.47	3.05	non-LIQ CLAY	1	0.43	NA	7.32	non-LIQ	non-LIQ	0.583	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
72.84	8.9	115.0	115.0	28.1	0.9	3.2	63.1	9.4	6.1	5.0	1.2	12.0	4.19	2.48	4.19	2.48	3.07	non-LIQ CLAY	1	0.43	NA	7.51	non-LIQ	non-LIQ	0.581	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.00	8.7	115.0	115.0	28.3	0.9	3.2	62.8	9.4	6.1	5.0	1.2	12.0	4.20	2.48	4.20	2.48	3.06	non-LIQ CLAY	1	0.43	NA	7.46	non-LIQ	non-LIQ	0.580	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.17	8.5	115.0	115.0	28.5	0.9	3.2	62.5	9.5	6.2	5.0	1.2	12.0	4.21	2.49	4.21	2.49	3.06	non-LIQ CLAY	1	0.43	NA	7.41	non-LIQ	non-LIQ	0.579	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.33	8.4	115.0	115.0	28.4	0.9	3.2	62.7	9.4	6.2	5.0	1.2	12.0	4.22	2.49	4.22	2.49	3.06	non-LIQ CLAY	1	0.42	NA	7.45	non-LIQ	non-LIQ	0.577	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.49	8.2	115.0	115.0	29.0	1.0	3.4	63.6	9.7	6.3	5.0	1.2	13.0	4.23	2.49	4.23	2.49	3.07	non-LIQ CLAY	1	0.42	NA	7.61	non-LIQ	non-LIQ	0.576	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.66	8.0	115.0	115.0	29.8	0.8	2.7	58.4	9.5	6.2	5.0	1.2	12.0	4.24	2.50	4.24	2.50	3.00	non-LIQ CLAY	1	0.42	NA	6.73	non-LIQ	non-LIQ	0.575	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.82	7.9	115.0	115.0	30.2	1.0	3.3	61.7	9.9	6.5	5.0	1.2	13.0	4.24	2.50	4.24	2.50	3.05	non-LIQ CLAY	1	0.42	NA	7.28	non-LIQ	non-LIQ	0.573	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
73.99	7.7	115.0	115.0	23.2	1.0	4.3	76.1	8.7	5.7	5.0	1.2	12.0	4.25	2.51	4.25	2.51	3.24	non-LIQ CLAY	1	0.42	NA	9.80	non-LIQ	non-LIQ	0.572	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.15	7.6	115.0	115.0	29.6	1.0	3.4	62.8	9.8	6.4	5.0	1.2	13.0	4.26	2.51	4.26	2.51	3.06	non-LIQ CLAY	1	0.42	NA	7.47	non-LIQ	non-LIQ	0.571	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.31	7.4	115.0	115.0	29.6	1.0	3.4	62.9	9.9	6.4	5.0	1.2	13.0	4.27	2.52	4.27	2.52	3.06	non-LIQ CLAY	1	0.42	NA	7.48	non-LIQ	non-LIQ	0.569	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.48	7.2	115.0	115.0	30.2	1.2	4.0	65.3	10.3	6.7	5.0	1.2	13.0	4.28	2.52	4.28	2.52	3.10	non-LIQ CLAY	1	0.42	NA	7.90	non-LIQ	non-LIQ	0.568	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.64	7.1	115.0	115.0	35.4	1.5	4.2	61.7	11.7	7.5	5.0	1.2	14.0	4.29	2.52	4.29	2.52	3.05	non-LIQ CLAY	1	0.42	NA	7.28	non-LIQ	non-LIQ	0.567	0.260	0.260	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.81	6.9	115.0	115.0	48.2	1.3	2.7	46.0	13.7	8.9	5.0	1.2	16.0	4.30	2.53	4.30	2.53	2.80	non-LIQ CLAY	1	0.42	NA	4.78	non-LIQ	non-LIQ	0.565	0.250	0.250	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
74.97	6.7	115.0	115.0	39.2	1.2	3.1	53.2	11.9	7.7	5.0	1.2	14.0	4.31	2.53	4.31	2.53	2.92	non-LIQ CLAY	1	0.42	NA	5.88	non-LIQ	non-LIQ	0.564	0.250	0.250	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.13	6.6	115.0	115.0	29.7	1.0	3.4	63.0	9.9	6.4	5.0	1.2	13.0	4.32	2.54	4.32	2.54	3.07	non-LIQ CLAY	1	0.42	NA	7.50	non-LIQ	non-LIQ	0.563	0.250	0.250	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.30	6.4	115.0	115.0	26.9	0.8	3.0	64.1	9.1	5.8	5.0	1.2	12.0	4.33	2.54	4.33	2.54	3.08	non-LIQ CLAY	1	0.42	NA	7.69	non-LIQ	non-LIQ	0.561	0.250	0.250	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.46	6.2	115.0	115.0	27.4	0.7	2.6	60.9	9.0	5.8	5.0	1.2	12.0	4.34	2.55	4.34	2.55	3.04	non-LIQ CLAY	1	0.42	NA	7.15	non-LIQ	non-LIQ	0.560	0.250	0.250	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.63	6.1	115.0	115.0	25.7	0.7	2.7	64.2	8.7	5.6	5.0	1.2	12.0	4.35	2.55	4.35	2.55	3.08	non-LIQ CLAY	1	0.41	NA	7.71	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.79	5.9	115.0	115.0	25.2	0.8	3.2	67.7	8.8	5.6	5.0	1.2	12.0	4.36	2.55	4.36	2.55	3.13	non-LIQ CLAY	1	0.41	NA	8.32	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
75.96	5.7	115.0	115.0	25.9	0.8	3.1	66.3	8.9	5.7	5.0	1.2	12.0	4.37	2.56	4.37	2.56	3.11	non-LIQ CLAY	1	0.41	NA	8.07	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.12	5.6	115.0	115.0	26.8	0.8	3.0	64.6	9.1	5.8	5.0	1.2	12.0	4.38	2.56	4.38	2.56	3.09	non-LIQ CLAY	1	0.41	NA	7.77	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.28	5.4	115.0	115.0	27.0	0.9	3.3	66.4	9.3	6.0	5.0	1.2	12.0	4.39	2.57	4.39	2.57	3.11	non-LIQ CLAY	1	0.41	NA	8.09	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.45	5.3	115.0	115.0	29.1	0.8	2.7	60.5	9.5	6.1	5.0	1.2	12.0	4.40	2.57	4.40	2.57	3.03	non-LIQ CLAY	1	0.41	NA	7.09	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.61	5.1	115.0	115.0	28.4	1.0	3.5	65.8	9.7	6.2	5.0	1.2	12.0	4.41	2.58	4.41	2.58	3.10	non-LIQ CLAY	1	0.41	NA	7.99	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.78	4.9	115.0	115.0	27.9	1.0	3.6	66.8	9.6	6.2	5.0	1.2	12.0	4.41	2.58	4.41	2.58	3.12	non-LIQ CLAY	1	0.41	NA	8.16	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
76.94	4.8	115.0	115.0	41.0	1.4	3.4	54.4	12.6	8.1	5.0	1.2	15.0	4.42	2.59	4.42	2.59	2.94	non-LIQ CLAY	1	0.41	NA	6.08	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.10	4.6	115.0	115.0	42.8	1.4	3.3	52.6	12.9	8.3	5.0	1.2	15.0	4.43	2.59	4.43	2.59	2.91	non-LIQ CLAY	1	0.41	NA	5.79	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.27	4.4	115.0	115.0	36.5	1.5	4.1	61.1	11.9	7.6	5.0	1.2	14.0	4.44	2.59	4.44	2.59	3.04	non-LIQ CLAY	1	0.41	NA	7.17	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.43	4.3	115.0	115.0	34.3	1.2	3.5	60.0	11.1	7.1	5.0	1.2	14.0	4.45	2.60	4.45	2.60	3.02	non-LIQ CLAY	1	0.41	NA	7.00	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.60	4.1	115.0	115.0	30.8	1.0	3.2	62.0	10.2	6.5	5.0	1.2	13.0	4.46	2.60	4.46	2.60	3.05	non-LIQ CLAY	1	0.41	NA	7.34	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.76	3.9	115.0	115.0	28.3	0.9	3.2	64.5	9.6	6.1	5.0	1.2	12.0	4.47	2.61	4.47	2.61	3.09	non-LIQ CLAY	1	0.41	NA	7.76	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
77.92	3.8	115.0	115.0	29.7	0.8	2.7	60.0	9.6	6.1	5.0	1.2	12.0	4.48	2.61	4.48	2.61	3.02	non-LIQ CLAY	1	0.41	NA	7.00	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.09	3.6	115.0	115.0	26.4	0.8	3.0	66.1	9.1	5.8	5.0	1.2	12.0	4.49	2.62	4.49	2.62	3.11	non-LIQ CLAY	1	0.40	NA	8.04	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.25	3.5	115.0	115.0	25.8	0.7	2.7	65.0	8.8	5.6	5.0	1.2	12.0	4.50	2.62	4.50	2.62	3.09	non-LIQ CLAY	1	0.40	NA	7.84	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.42	3.3	115.0	115.0	26.5	0.7	2.6	63.7	8.9	5.6	5.0	1.2	12.0	4.51	2.62	4.51	2.62	3.07	non-LIQ CLAY	1	0.40	NA	7.61	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.58	3.1	115.0	115.0	26.5	0.8	3.0	66.1	9.1	5.8	5.0	1.2	12.0	4.52	2.63	4.52	2.63	3.11	non-LIQ CLAY	1	0.40	NA	8.03	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.74	3.0	115.0	115.0	27.0	0.8	3.0	65.2	9.2	5.8	5.0	1.2	12.0	4.53	2.63	4.53	2.63	3.10	non-LIQ CLAY	1	0.40	NA	7.87	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
78.91	2.8	115.0	115.0	27.5	0.8	2.9	64.3	9.3	5.9	5.0	1.2	12.0	4.54	2.64	4.54	2.64	3.08	non-LIQ CLAY	1	0.40	NA	7.72	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.07	2.6	115.0	115.0	26.9	0.8	3.0	65.5	9.2	5.8	5.0	1.2	12.0	4.55	2.64	4.55	2.64	3.10	non-LIQ CLAY	1	0.40	NA	7.93	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.24	2.5	115.0	115.0	27.6	0.8	2.9	64.2	9.3	5.9	5.0	1.2	12.0	4.56	2.65	4.56	2.65	3.08	non-LIQ CLAY	1	0.40	NA	7.71	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.40	2.3	115.0	115.0	26.9	0.8	3.0	65.6	9.2	5.8	5.0	1.2	12.0	4.57	2.65	4.57	2.65	3.10	non-LIQ CLAY	1	0.40	NA	7.95	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00
79.56	2.1	115.0	115.0	27.2	0.8	2.9	65.1	9.2	5.8	5.0	1.2	12.0	4.57	2.65	4.57	2.65	3.09	non-LIQ CLAY	1	0.40	NA	7.86	non-LIQ	non-LIQ	TOO DEEP	NA	NA	non-LIQ	NA	NA	NA	NA	NA	0.00	NA	NA	0.00

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

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Project I-5 HOV Segment 3 - Retaining Wall 387 **Project No.** 11-157

By SP **Date** 09/04/12 **Checked By** HCC **Date** 9/7/12 **Sheet** ____ **of** ____

consider wall between Sta 395+43 and End wall

12-inch Square concrete pile

perimeter = $4 \times \frac{12}{12} = 4$ feet

Area = $12 \times 12 = 144$ inch^2 = 1 ft^2

$I = \frac{12^4}{12} = 1728$ in^4

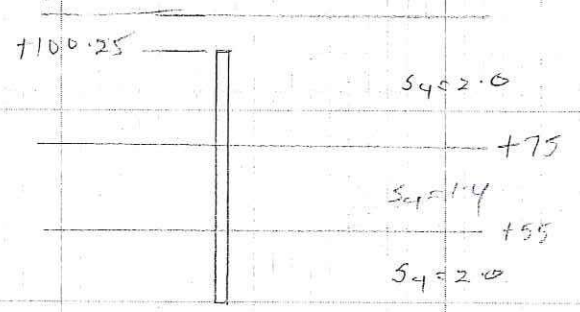
consider modified Caltrans Type 1SW8P Retaining wall

consider wall height = 16 feet

width = 10.75 feet ; pile cap = 10.75'x4'

Bottom of footing = +100.25 feet

Number of piles = 14



Nominal Resistance for compression per pile

strength limit state = 126/0.7 = 180 kips

Extreme event limit state = 129/1.0 = 129 kips

consider 130 kips

Nominal resistance for tension per pile

Extreme event limit state = 0 kips

Nominal resistance per support

strength limit state = 1204/0.7 = 1720 kips

Extreme event limit state = 916/1.0 = 916 kips

consider 920 kips

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Project I-5 HOV Segment 3 - Retaining Wall 387 **Project No.** 11-197

By SP **Date** 09/04/12 **Checked By** WCC **Date** 9/16/12 **Sheet** ____ **of** ____

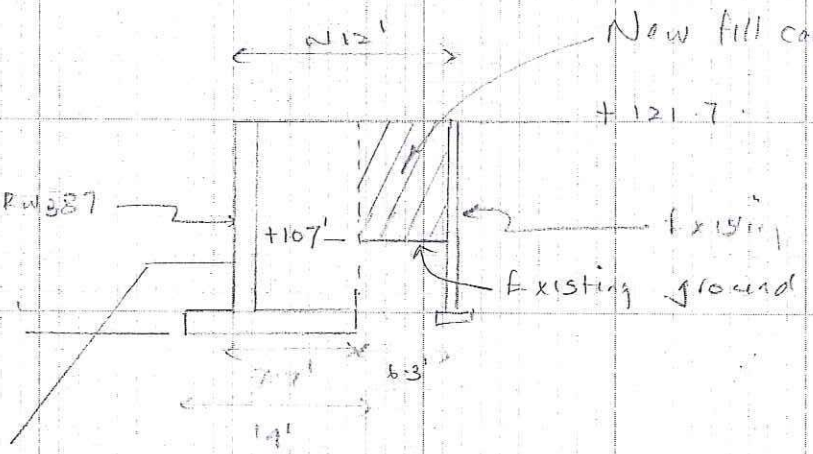
Downdrag

Due to the new fill between proposed wall and existing MSE wall, settlement will occur

Consider Station 394+00

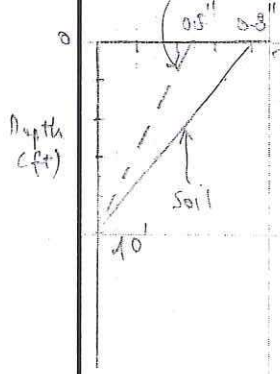
wall height = 24'

footing width = 14'



Dal to new fill $q = 15 \times 12.0 = 1.8$ ksf

σ_{vo}	$\Delta\sigma$	Settlement
$17 \times 120 = 2.0$	$1.8 \times 0.6 = 1.08$	$10 \times \frac{1}{40} \log\left(\frac{2.0+1.08}{2.0}\right) = 0.55$
$32 \times 120 = 3.84$	$1.8 \times 0.2 = 0.36$	$20 \times \frac{1}{40} \log\left(\frac{3.84+0.36}{3.84}\right) = 0.23$
$47 \times 120 = 5.64$	$1.8 \times 0.1 = 0.18$	$10 \times \frac{1}{40} \log\left(\frac{5.64+0.18}{5.64}\right) = 0$
		$0.78''$



The relative movement between pile and soil is anticipated to be less than 0.7 inches.

According to section 3.11.8 of AASHTO, Downdrag loads cannot be mobilized.

No downdrag is considered for analysis

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Project I-5 HOV segment 3 Retaining wall 287 **Project No.** 11-127

By SP **Date** 09/05/12 **Checked By** KC **Date** 9/7/12 **Sheet** ____ **of** ____

from analysis (from sta 395+43 to end wall)

strength limit state

at 53 feet pile capacity = 181 kips

pile tip elevation for compression = 100 - 53.
= +47 feet

available group nominal resistance at pile tip elevation at +47 feet = 14 x 0.9 x 181
= 2280 kips

required group nominal resistance = 1720 kips < 2280 kips

available group nominal resistance exceeds required group nominal resistance.

consider pile tip elevation for compression = +45 feet.

extreme event limit state

at 40 feet, pile capacity = 132 kips > 130 kips

pile tip elevation for compression = 100 - 40 = +60 feet

available group nominal resistance at pile tip elevation at +60 feet = 14 x 0.9 x 132 = 1663 kips

required group nominal resistance = 920 kips < 1663 kips

available group nominal resistance exceeds required group nominal resistance

pile tip elevation for compression = +60 feet

Similar calculations are performed for other wall types and wall heights to determine pile tip elevations for strength and extreme event limit states.

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Project I-5 Hov Segment 3 Retaining Wall 387 **Project No.** 11-137

By SP **Date** 04/13/12 **Checked By** HLC **Date** 4/16/12 **Sheet** ____ **of** ____

Wall Type	Wall Height	Cut-off elev.	Nominal Resistance (kips/ft) Strength Comp.	Strength Tens.	Extreme Comp.	Extreme Tens.	LRFD Factored Strength Comp.	LRFD Factored Strength Tens.	LRFD Factored Extreme Comp.	LRFD Factored Extreme Tens.
	10	+119.25	80	20	60	20	30	10	20	10
	10	+118.25	80	20	60	20	30	10	20	10
	12	+116.75	100	30	90	30	30	10	25	15
7SWBP modified	14	+114.75	100	50	90	60	30	15	25	20
	14	+112.75	100	50	90	60	30	15	25	20
	16	+110.75	110	60	90	70	35	20	25	25
	16	+109.75	110	60	90	70	35	20	25	25
	16	+107.75	110	60	90	70	35	20	25	25
	18	+105.75	110	10	90	20	35	10	25	10
	18	+105.75	140	0	110	20	40	—	30	10
	18	+103.75	140	0	110	20	40	—	30	10
	20	+100.75	150	10	120	30	45	10	35	10
15WBP modified	22	+98.25	160	0	90	30	45	—	25	10
	24	+96.75	140	40	110	80	40	15	30	30
	22	+95.75	120	30	90	50	40	10	30	20
	20	+97.75	170	10	130	20	55	10	40	10
	16	+100.75	180	0	130	0	55	—	40	—
	14	+102.25	170	0	120	0	55	—	40	—
15WBP	18	+98.75	150	0	110	10	50	—	35	10
	20	+95.25	180	0	140	20	55	—	45	10
	24	+91.75	160	20	130	60	50	10	40	25

I-5 HOV Segment 3 Retaining Wall 387 (Begin Wall to 395+43), 09/05/2012 SP
Class 90 Alt X (12-inch Square)

SOIL DATA

NUMBER OF SOIL UNITS = 1
DEPTH TO WATER TABLE = 100.00'
UNIT WEIGHT OF WATER = .0624 kcf

SOIL UNIT	DEPTH (ft)	UNIT WT. (kcf)	CLAY: c (ksf) SAND: PHI (deg)	Nc Nq	Cac Kht	Cat Kht	delta (deg)
1	.0 - 60.0	.120	CLAY 2.00	0.	.47	.38	

PILE DATA

	PILE TOP	PILE TIP
DEPTH =	.00	60.00'
CIRCUMFERENCE =	4.000	4.000'
CROSS-SECTIONAL AREA =	1.0000	1.0000 ft2

PILE STIFFNESS AE/L = 99999. kips/ft
DISPLACEMENT TO MOBILIZE FULL SKIN FRICTION = 1.670E-02' (= 2.004E-01")
DISPLACEMENT TO MOBILIZE FULL END BEARING = 6.700E-02' (= 8.040E-01")
DEPTH INCREMENT FOR CAPACITY CALCULATIONS = 1.00'
FACTOR OF SAFETY FOR SKIN FRICTION = 1.00
FACTOR OF SAFETY FOR END-BEARING = 1.00

SOIL UNIT -	DEPTH (ft)	EFF. STRESS (ksf)	UNIT SKIN FRICT COMPR. (ksf)	UPLIFT (ksf)	UNIT END BEARING (ksf)	CUM.FR. COMPR. (kips)	END BEARING (kips)	CAPACITY COMPRESS (kips)	UPLIFT (kips)
1	.00	.00	.95	.76	.0	.0	.0	.0	.0
1	1.00	.12	.95	.76	.0	3.8	.0	3.8	3.0
1	2.00	.24	.95	.76	.0	7.6	.0	7.6	6.1
1	3.00	.36	.95	.76	.0	11.4	.0	11.4	9.1
1	4.00	.48	.95	.76	.0	15.2	.0	15.2	12.2
1	5.00	.60	.95	.76	.0	19.0	.0	19.0	15.2
1	6.00	.72	.95	.76	.0	22.8	.0	22.8	18.2
1	7.00	.84	.95	.76	.0	26.6	.0	26.6	21.3
1	8.00	.96	.95	.76	.0	30.4	.0	30.4	24.3
1	9.00	1.08	.95	.76	.0	34.2	.0	34.2	27.4
1	10.00	1.20	.95	.76	.0	38.0	.0	38.0	30.4
1	11.00	1.32	.95	.76	.0	41.8	.0	41.8	33.4
1	12.00	1.44	.95	.76	.0	45.6	.0	45.6	36.5
1	13.00	1.56	.95	.76	.0	49.4	.0	49.4	39.5
1	14.00	1.68	.95	.76	.0	53.2	.0	53.2	42.6
1	15.00	1.80	.95	.76	.0	57.0	.0	57.0	45.6
1	16.00	1.92	.95	.76	.0	60.8	.0	60.8	48.6
1	17.00	2.04	.95	.76	.0	64.6	.0	64.6	51.7
1	18.00	2.16	.95	.76	.0	68.4	.0	68.4	54.7
1	19.00	2.28	.95	.76	.0	72.2	.0	72.2	57.8
1	20.00	2.40	.95	.76	.0	76.0	.0	76.0	60.8
1	21.00	2.52	.95	.76	.0	79.8	.0	79.8	63.8
1	22.00	2.64	.95	.76	.0	83.6	.0	83.6	66.9
1	23.00	2.76	.95	.76	.0	87.4	.0	87.4	69.9
1	24.00	2.88	.95	.76	.0	91.2	.0	91.2	73.0
1	25.00	3.00	.95	.76	.0	95.0	.0	95.0	76.0
1	26.00	3.12	.95	.76	.0	98.8	.0	98.8	79.0
1	27.00	3.24	.95	.76	.0	102.6	.0	102.6	82.1
1	28.00	3.36	.95	.76	.0	106.4	.0	106.4	85.1
1	29.00	3.48	.95	.76	.0	110.2	.0	110.2	88.2
1	30.00	3.60	.95	.76	.0	114.0	.0	114.0	91.2
1	31.00	3.72	.95	.76	.0	117.8	.0	117.8	94.2
1	32.00	3.84	.95	.76	.0	121.6	.0	121.6	97.3
1	33.00	3.96	.95	.76	.0	125.4	.0	125.4	100.3
1	34.00	4.08	.95	.76	.0	129.2	.0	129.2	103.4
1	35.00	4.20	.95	.76	.0	133.0	.0	133.0	106.4
1	36.00	4.32	.95	.76	.0	136.8	.0	136.8	109.4
1	37.00	4.44	.95	.76	.0	140.6	.0	140.6	112.5
1	38.00	4.56	.95	.76	.0	144.4	.0	144.4	115.5
1	39.00	4.68	.95	.76	.0	148.2	.0	148.2	118.6
1	40.00	4.80	.95	.76	.0	152.0	.0	152.0	121.6
1	41.00	4.92	.95	.76	.0	155.8	.0	155.8	124.6
1	42.00	5.04	.95	.76	.0	159.6	.0	159.6	127.7
1	43.00	5.16	.95	.76	.0	163.4	.0	163.4	130.7
1	44.00	5.28	.95	.76	.0	167.2	.0	167.2	133.8
1	45.00	5.40	.95	.76	.0	171.0	.0	171.0	136.8
1	46.00	5.52	.95	.76	.0	174.8	.0	174.8	139.8
1	47.00	5.64	.95	.76	.0	178.6	.0	178.6	142.9
1	48.00	5.76	.95	.76	.0	182.4	.0	182.4	145.9
1	49.00	5.88	.95	.76	.0	186.2	.0	186.2	149.0
1	50.00	6.00	.95	.76	.0	190.0	.0	190.0	152.0
1	51.00	6.12	.95	.76	.0	193.8	.0	193.8	155.0
1	52.00	6.24	.95	.76	.0	197.6	.0	197.6	158.1
1	53.00	6.36	.95	.76	.0	201.4	.0	201.4	161.1
1	54.00	6.48	.95	.76	.0	205.2	.0	205.2	164.2

1	55.00	6.60	.95	.76	.0	209.0	.0	209.0	167.2
1	56.00	6.72	.95	.76	.0	212.8	.0	212.8	170.2
1	57.00	6.84	.95	.76	.0	216.6	.0	216.6	173.3
1	58.00	6.96	.95	.76	.0	220.4	.0	220.4	176.3
1	59.00	7.08	.95	.76	.0	224.2	.0	224.2	179.4
1	60.00	7.20	.95	.76	.0	228.0	.0	228.0	182.4
0	60.00	7.20	.00	.00	.0	228.0	.0	228.0	182.4

I-5 HOV Segment 3 Retaining Wall 387 (395+43 to End Wall), 09/05/2012 SP
Class 90 Alt X (12-inch Square)

SOIL DATA

NUMBER OF SOIL UNITS = 3
DEPTH TO WATER TABLE = 100.00'
UNIT WEIGHT OF WATER = .0624 kcf

SOIL UNIT	DEPTH (ft)		UNIT WT. (kcf)	CLAY: SAND:	c (ksf) PHI (deg)	Nc Nq	Cac Khc	Cat Kht	delta (deg)
1	.0	16.0	.120	CLAY	2.00	0.	.47	.38	
2	16.0	36.0	.120	CLAY	1.40	0.	.50	.40	
3	36.0	60.0	.120	CLAY	2.00	0.	.47	.38	

PILE DATA	PILE TOP	PILE TIP
DEPTH	.00	60.00'
CIRCUMFERENCE	4.000	4.000'
CROSS-SECTIONAL AREA	1.0000	1.0000 ft2

PILE STIFFNESS AE/L = 99999. kips/ft
DISPLACEMENT TO MOBILIZE FULL SKIN FRICTION = 1.670E-02' (= 2.004E-01")
DISPLACEMENT TO MOBILIZE FULL END BEARING = 6.700E-02' (= 8.040E-01")
DEPTH INCREMENT FOR CAPACITY CALCULATIONS = 1.00'
FACTOR OF SAFETY FOR SKIN FRICTION = 1.00
FACTOR OF SAFETY FOR END-BEARING = 1.00

SOIL UNIT	DEPTH (ft)	EFF. STRESS (ksf)	UNIT SKIN FRICT COMPR. (ksf)	UPLIFT (ksf)	UNIT END BEARING (ksf)	CUM.FR. COMPR. (kips)	END BEARING (kips)	CAPACITY COMPRESS (kips)	UPLIFT (kips)
1	.00	.00	.95	.76	.0	.0	.0	.0	.0
1	1.00	.12	.95	.76	.0	3.8	.0	3.8	3.0
1	2.00	.24	.95	.76	.0	7.6	.0	7.6	6.1
1	3.00	.36	.95	.76	.0	11.4	.0	11.4	9.1
1	4.00	.48	.95	.76	.0	15.2	.0	15.2	12.2
1	5.00	.60	.95	.76	.0	19.0	.0	19.0	15.2
1	6.00	.72	.95	.76	.0	22.8	.0	22.8	18.2
1	7.00	.84	.95	.76	.0	26.6	.0	26.6	21.3
1	8.00	.96	.95	.76	.0	30.4	.0	30.4	24.3
1	9.00	1.08	.95	.76	.0	34.2	.0	34.2	27.4
1	10.00	1.20	.95	.76	.0	38.0	.0	38.0	30.4
1	11.00	1.32	.95	.76	.0	41.8	.0	41.8	33.4
1	12.00	1.44	.95	.76	.0	45.6	.0	45.6	36.5
1	13.00	1.56	.95	.76	.0	49.4	.0	49.4	39.5
1	14.00	1.68	.95	.76	.0	53.2	.0	53.2	42.6
1	15.00	1.80	.95	.76	.0	57.0	.0	57.0	45.6
1	16.00	1.92	.95	.76	.0	60.8	.0	60.8	48.6
2	16.00	1.92	.70	.56	.0	60.8	.0	60.8	48.6
2	17.00	2.04	.70	.56	.0	63.6	.0	63.6	50.9
2	18.00	2.16	.70	.56	.0	66.4	.0	66.4	53.1
2	19.00	2.28	.70	.56	.0	69.2	.0	69.2	55.4
2	20.00	2.40	.70	.56	.0	72.0	.0	72.0	57.6
2	21.00	2.52	.70	.56	.0	74.8	.0	74.8	59.8
2	22.00	2.64	.70	.56	.0	77.6	.0	77.6	62.1
2	23.00	2.76	.70	.56	.0	80.4	.0	80.4	64.3
2	24.00	2.88	.70	.56	.0	83.2	.0	83.2	66.6
2	25.00	3.00	.70	.56	.0	86.0	.0	86.0	68.8
2	26.00	3.12	.70	.56	.0	88.8	.0	88.8	71.0
2	27.00	3.24	.70	.56	.0	91.6	.0	91.6	73.3
2	28.00	3.36	.70	.56	.0	94.4	.0	94.4	75.5
2	29.00	3.48	.70	.56	.0	97.2	.0	97.2	77.8
2	30.00	3.60	.70	.56	.0	100.0	.0	100.0	80.0
2	31.00	3.72	.70	.56	.0	102.8	.0	102.8	82.2
2	32.00	3.84	.70	.56	.0	105.6	.0	105.6	84.5
2	33.00	3.96	.70	.56	.0	108.4	.0	108.4	86.7
2	34.00	4.08	.70	.56	.0	111.2	.0	111.2	89.0
2	35.00	4.20	.70	.56	.0	114.0	.0	114.0	91.2
2	36.00	4.32	.70	.56	.0	116.8	.0	116.8	93.4
3	36.00	4.32	.95	.76	.0	116.8	.0	116.8	93.4
3	37.00	4.44	.95	.76	.0	120.6	.0	120.6	96.5
3	38.00	4.56	.95	.76	.0	124.4	.0	124.4	99.5
3	39.00	4.68	.95	.76	.0	128.2	.0	128.2	102.6
3	40.00	4.80	.95	.76	.0	132.0	.0	132.0	105.6
3	41.00	4.92	.95	.76	.0	135.8	.0	135.8	108.6
3	42.00	5.04	.95	.76	.0	139.6	.0	139.6	111.7
3	43.00	5.16	.95	.76	.0	143.4	.0	143.4	114.7
3	44.00	5.28	.95	.76	.0	147.2	.0	147.2	117.8
3	45.00	5.40	.95	.76	.0	151.0	.0	151.0	120.8
3	46.00	5.52	.95	.76	.0	154.8	.0	154.8	123.8
3	47.00	5.64	.95	.76	.0	158.6	.0	158.6	126.9
3	48.00	5.76	.95	.76	.0	162.4	.0	162.4	129.9
3	49.00	5.88	.95	.76	.0	166.2	.0	166.2	133.0
3	50.00	6.00	.95	.76	.0	170.0	.0	170.0	136.0

3	51.00	6.12	.95	.76	.0	173.8	.0	173.8	139.0
3	52.00	6.24	.95	.76	.0	177.6	.0	177.6	142.1
3	53.00	6.36	.95	.76	.0	181.4	.0	181.4	145.1
3	54.00	6.48	.95	.76	.0	185.2	.0	185.2	148.2
3	55.00	6.60	.95	.76	.0	189.0	.0	189.0	151.2
3	56.00	6.72	.95	.76	.0	192.8	.0	192.8	154.2
3	57.00	6.84	.95	.76	.0	196.6	.0	196.6	157.3
3	58.00	6.96	.95	.76	.0	200.4	.0	200.4	160.3
3	59.00	7.08	.95	.76	.0	204.2	.0	204.2	163.4
3	60.00	7.20	.95	.76	.0	208.0	.0	208.0	166.4
0	60.00	7.20	.00	.00	.0	208.0	.0	208.0	166.4

LPile Plus for Windows, Version 6.0 (6.0.09)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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This program is licensed to:

Earth Mechanics, Inc.
Earth Mechanics, Inc.

Files Used for Analysis

Path to file locations: X:\Projects\2011\11-137 - TRC, I-5 HOV Widening - Segment 3\Reports\07 RW 387\Appendix C Analyses\Lateral Capacity\
Name of input data file: RW 387 12-inch PCC.lp6d
Name of output file: RW 387 12-inch PCC.lp6o
Name of plot output file: RW 387 12-inch PCC.lp6p
Name of runtime file: RW 387 12-inch PCC.lp6r

Date and Time of Analysis

Date: April 16, 2012 Time: 15:06:17

Problem Title

Project Name:

Job Number:

Client:

Engineer:

Description:

Program Options

Units Used - US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal Moment Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis uses p-y multipliers for group action
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output summary table of values for pile-head deflection, maximum bending moment, and shear force only
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:

- Number of pile increments	=	100	
- Maximum number of iterations allowed	=	100	
- Deflection tolerance for convergence	=	1.0000E-05	in
- Maximum allowable deflection	=	100.0000	in

Pile Response Output Options:
- Only summary tables of pile-head deflection, maximum bending moment, and maximum shear force are to be written to output report file.

Pile Structural Properties and Geometry

Total Number of Sections = 1

Total Pile Length = 30.00 ft

Depth of ground surface below top of pile = 0.00 ft

Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 2 points.
p-y curves are computed using values of pile diameter interpolated over
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	12.0000000
2	30.000000	12.0000000

Input Structural Properties:

Section No. 1:

Section Type	=	Elastic Pile
Cross-sectional Shape	=	Rectangular
Section Length	=	30.000 ft
Top Width	=	12.000 in
Bottom Width	=	12.000 in
Top Section Depth	=	12.000 in
Bottom Section Depth	=	12.000 in
Top Area	=	144.000000 Sq. in
Bottom Area	=	144.000000 Sq. in
Moment of Inertia at Top	=	1.728E+03 inA4
Moment of Inertia at Bottom	=	1.728E+03 inA4
Elastic Modulus	=	3200000.000 lbs/in

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 0.000 ft
Distance from top of pile to bottom of layer = 16.000 ft

Layer 2 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 16.000 ft
Distance from top of pile to bottom of layer = 36.000 ft

Layer 3 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 36.000 ft
Distance from top of pile to bottom of layer = 60.000 ft

(Depth of lowest layer extends 30.00 ft below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 6 points

Point No.	Depth X ft	Eff. Unit Weight pcf
1	0.00	120.00000
2	16.00	120.00000
3	16.00	120.00000

4	36.00	120.00000
5	36.00	120.00000
6	60.00	120.00000

Summary of Soil Properties

Layer Num.	Soil Type (p-y Curve Criteria)	Depth ft	Eff. Unit Wt., pcf	Cohesion psf	Friction Ang., deg.	qu psi	RQD percent	Epsilon 50	kpy pci	Rock Emass psi	krm	Test Type	Test Prop.	Elas. Subgr. pci
1	Soft Clay	0.00	120.000	2000.000	--	--	--	0.00700	--	--	--	--	--	--
		16.000	120.000	2000.000	--	--	--	0.00700	--	--	--	--	--	--
2	Soft Clay	16.000	120.000	1400.000	--	--	--	0.00700	--	--	--	--	--	--
		36.000	120.000	1400.000	--	--	--	0.00700	--	--	--	--	--	--
3	Soft Clay	36.000	120.000	2000.000	--	--	--	0.00700	--	--	--	--	--	--
		60.000	120.000	2000.000	--	--	--	0.00700	--	--	--	--	--	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 2 points

Point No.	Depth X ft	p-mult	y-mult
1	0.000	0.8500	1.0000
2	45.000	0.8500	1.0000

Loading Type

p-y criteria for static loading was used for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 5

Load No.	Load Type	Condition 1		Condition 2		Axial Thrust Force, lbs
1	4	y =	0.250 in	M =	0.000 in-lbs	150000.000
2	4	y =	0.500 in	M =	0.000 in-lbs	150000.000
3	4	y =	1.000 in	M =	0.000 in-lbs	150000.000
4	4	y =	2.000 in	M =	0.000 in-lbs	150000.000
5	4	y =	5.000 in	M =	0.000 in-lbs	150000.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust values were determined from pile-head loading conditions

Number of Sections = 1

Section No. 1:

Moment-Curvature properties derived from elastic section properties

Summary of Pile Response(s)

Definitions of Pile-Head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

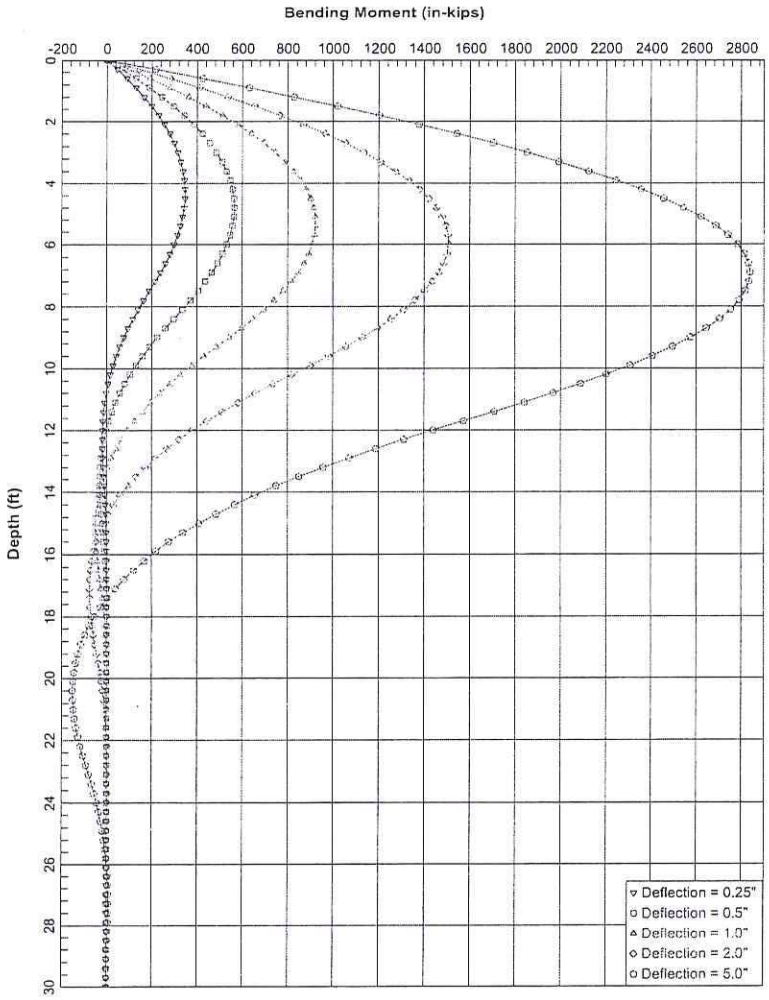
Load Case No.	Load Type No.	Condition 1 V(lbs) or y(inches)	Condition 2 in-lb, rad., or in-lb/rad.	Axial Load lbs	Pile-Head Deflection inches	Maximum Moment in-lbs	Maximum Shear lbs	Pile-Head Rotation radians
1	4	y = 0.2500	M = 0.000	150000.	0.25000000	347733.	12534.	0.00000000
2	4	y = 0.5000	M = 0.000	150000.	0.50000000	566159.	17945.	0.00000000
3	4	y = 1.0000	M = 0.000	150000.	1.00000000	923130.	25673.	0.00000000
4	4	y = 2.0000	M = 0.000	150000.	2.00000000	1506884.	36494.	0.00000000
5	4	y = 5.0000	M = 0.000	150000.	5.00000000	2838889.	52041.	0.00000000

Summary of Warning Messages

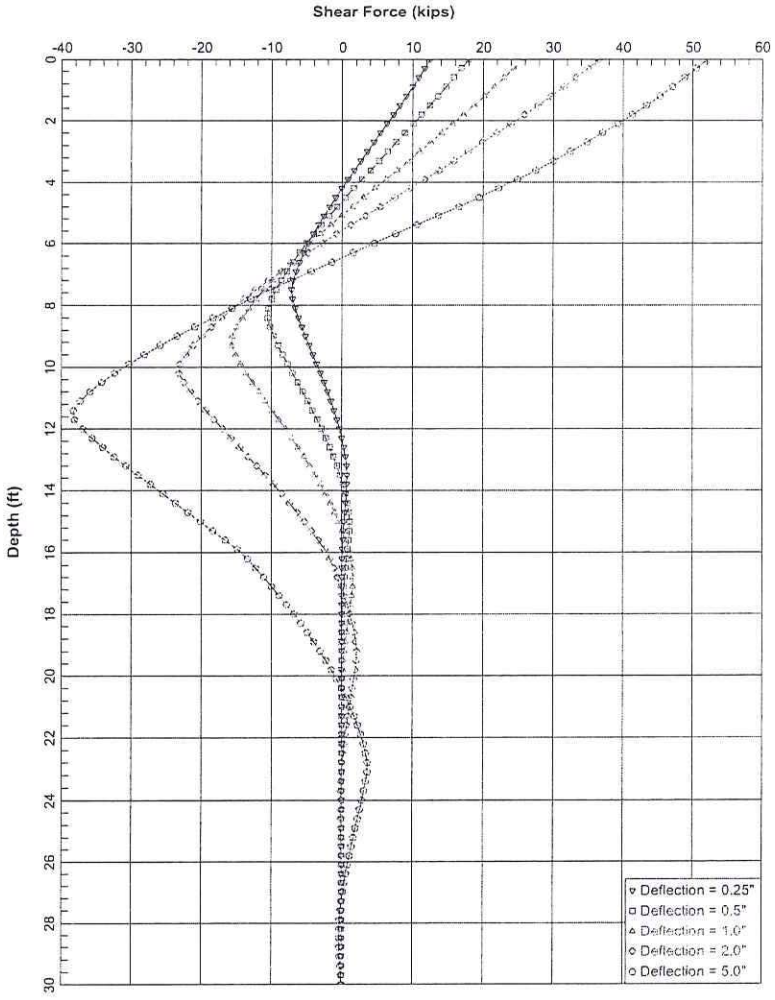
The following warning was reported 1717 times

**** Warning ****

An unreasonable input value for shear strength has been specified for a soil defined using the soft clay criteria. The input value is greater than 8.68 psi (1,250 psf). You should check your input data for correctness.



Retaining Wall 387 - Caltrans Standard Class 90 (Alternative X) 12-inch Square Concrete Piles



Retaining Wall 387 - Caltrans Standard Class 90 (Alternative X) 12-inch Square Concrete Piles

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

Project I-5 HOV segment 3 Retaining wall 387 **Project No.** 11-137

By SF **Date** 09/05/12 **Checked By** LCC **Date** 9/7/12 **Sheet** ____ **of** ____

settlement

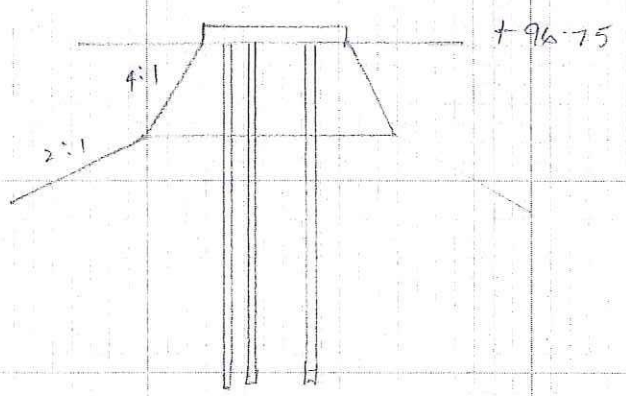
consider caltrans Type 1SWBP (modified) wall

wall height = 24'

pile cap = 14' x 96'

Total load = 3076 kips

bottom of footing = +96.75'



consider pile length = 21 feet

$2D/3$ = 14 feet

Equivalent footing = $(14 + \frac{14}{4} \times 2)(96 + \frac{14}{4} \times 2)$

= 21' x 103'

$q = \frac{3076}{21 \times 103} = 1.42$ kips

σ_{vo}	$\Delta\sigma$	settlement
$19 \times 120 = 2.28$	$\frac{3076}{(21+5)(103+5)} = 1.1$	$10 \times \frac{1}{40} \log\left(\frac{2.28+1.1}{2.28}\right) = 0.51$
$34 \times 120 = 4.08$	$\frac{3076}{(21+20)(103+20)} = 0.61$	$20 \times \frac{1}{40} \log\left(\frac{4.08+0.61}{4.08}\right) = 0.36$
$54 \times 120 = 6.48$	$\frac{3076}{(21+40)(103+40)} = 0.35$	$20 \times \frac{1}{40} \log\left(\frac{6.48+0.35}{6.48}\right) = 0.14$
		1.01

pile tip elevation for settlement = 96 - 21

= +75 feet

Similar calculations have been performed for other wall types and wall heights.

Earth Mechanics, Inc.
Geotechnical and Earthquake Engineering

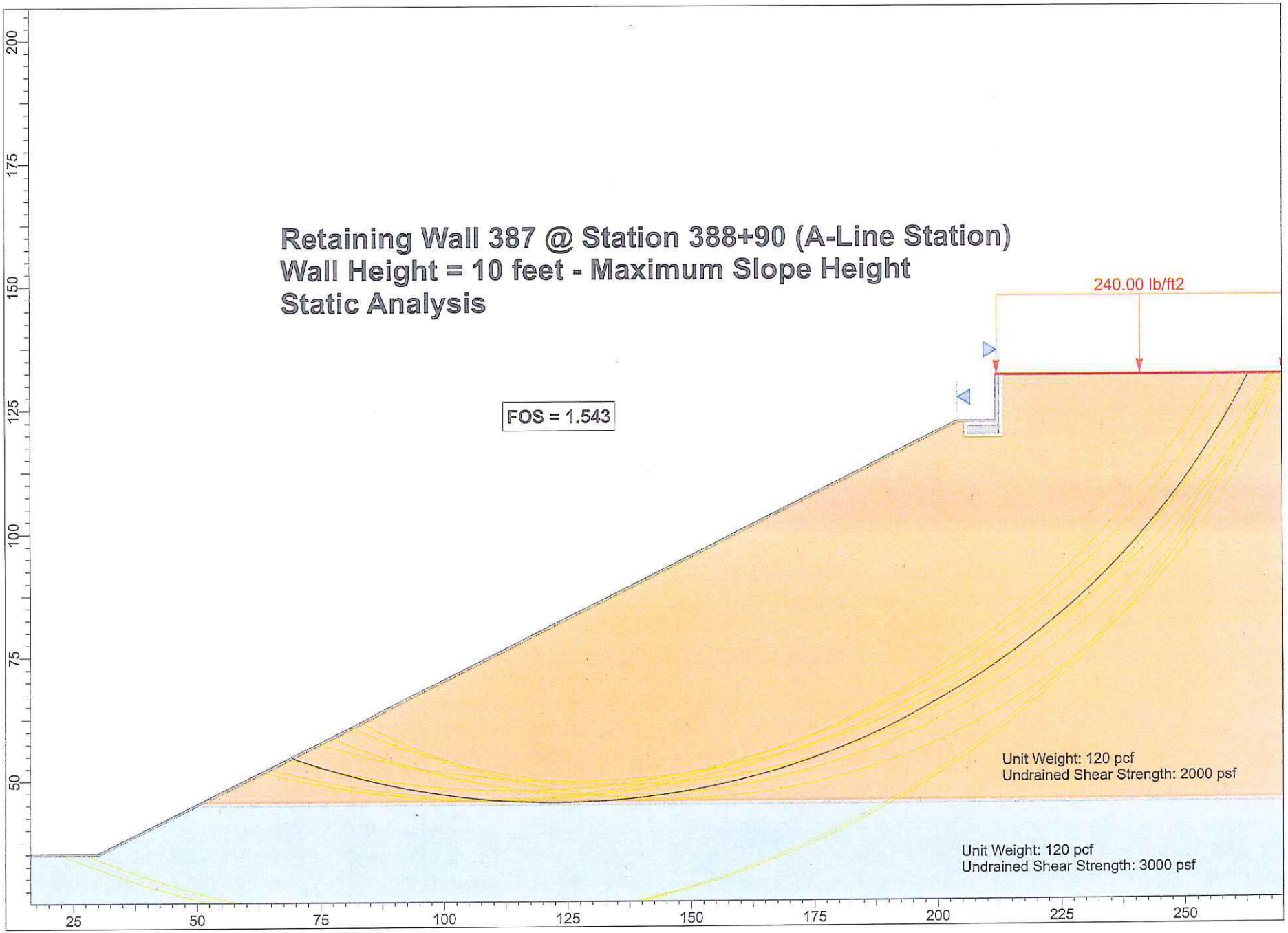
17800 Newhope Street, Suite B, Fountain Valley, CA 92708
(714) 751-3826, Fax (714) 751-3928

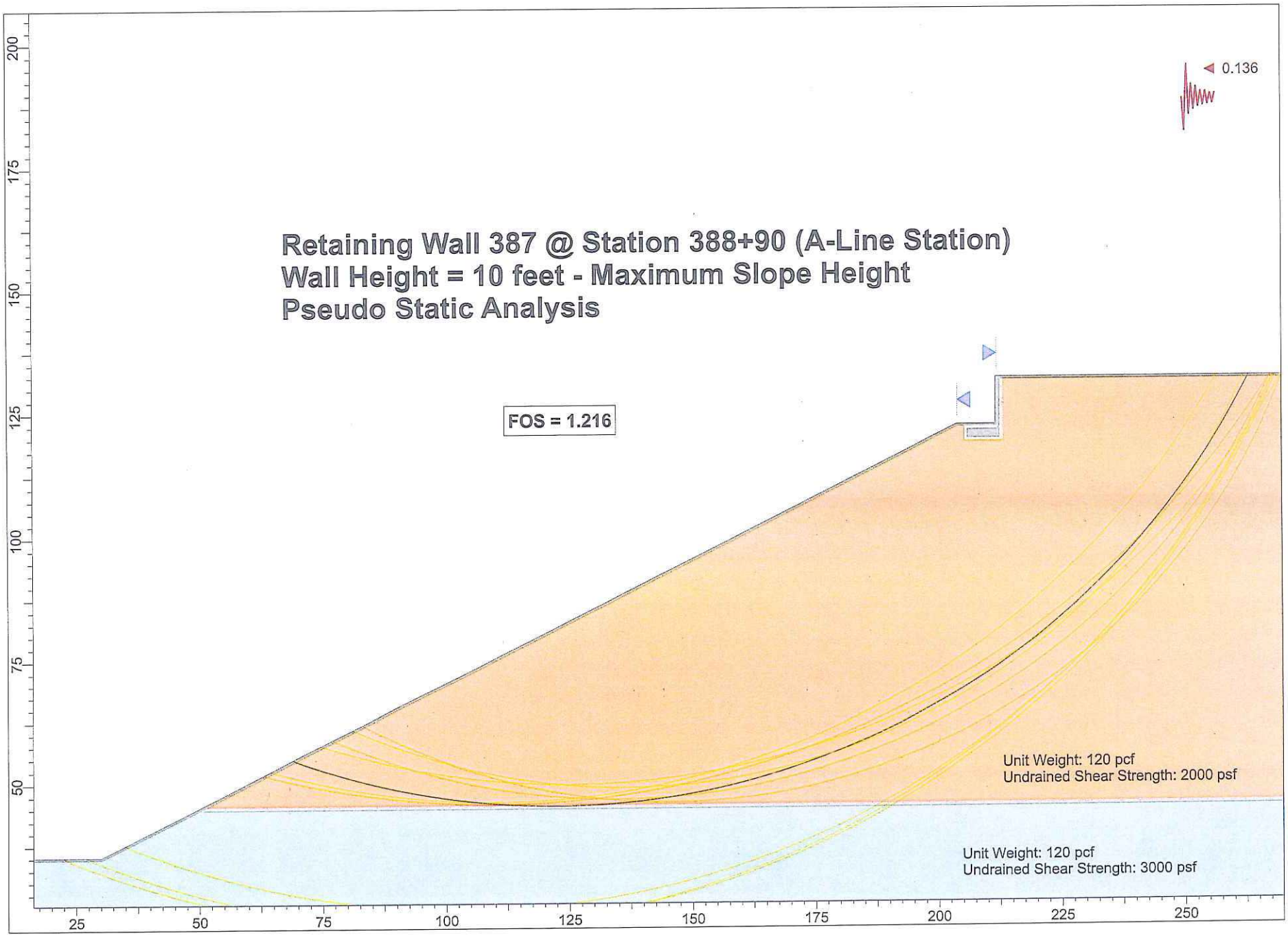
Project I-5 HOV Segment 3 Retaining Wall 987 **Project No.** 11-187

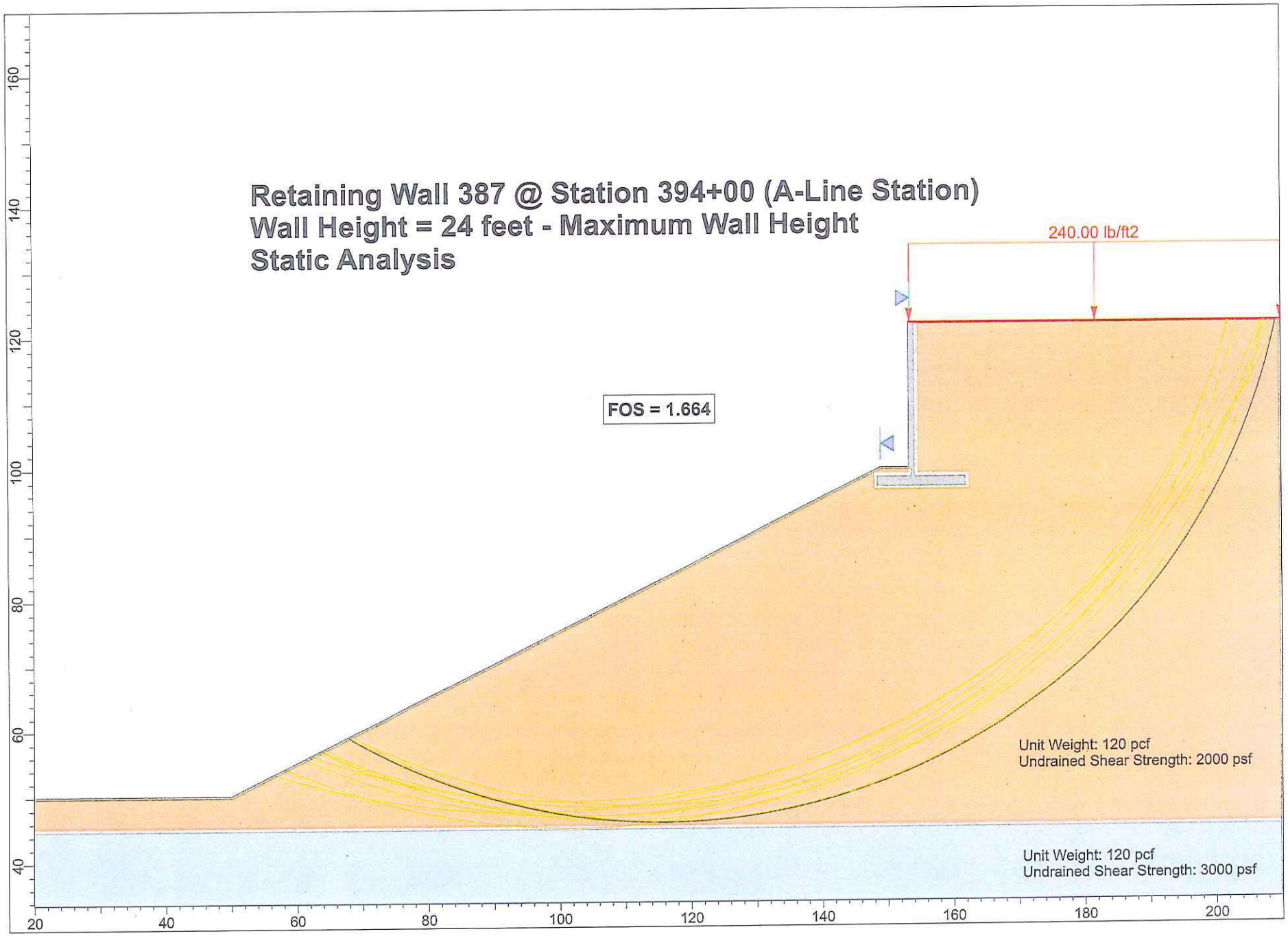
By SP **Date** 09/05/12 **Checked By** HSC **Date** 9/7/12 **Sheet** ____ **of** ____

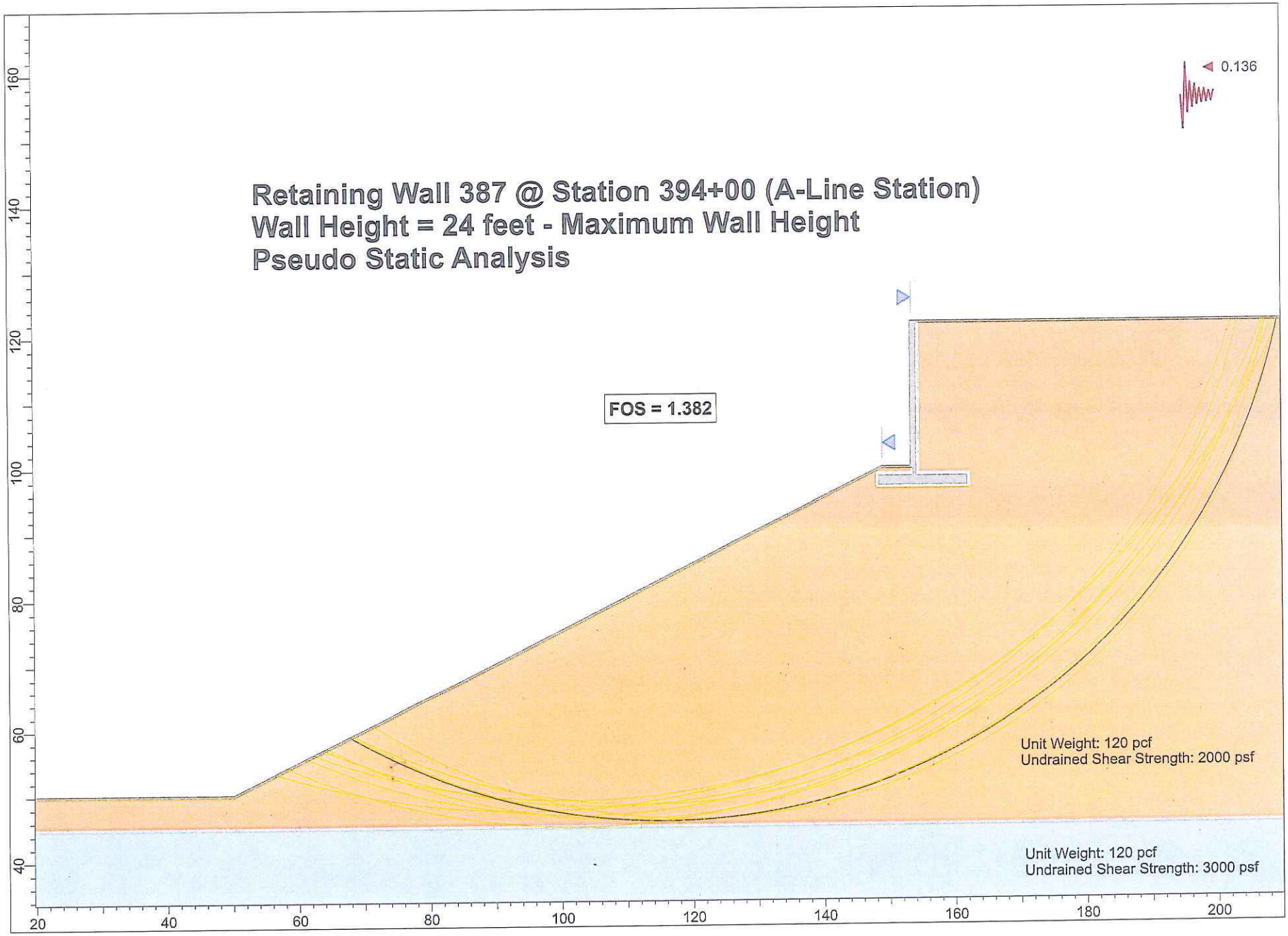
wall type	wall height (feet)	Salvica-I limit state total load (kips)	cut-off Elevation (feet)	pile cap (feet): B	pile cap (feet): L	pile length for settlement (feet)
	10	85	+119.25	7.25	12.0	<12
	10	85	+118.25	7.25	12.0	<12
	12	196	+116.75	7.75	24.0	<12
7SW BP modified	14	211	+114.75	8.00	24.0	<12
	14	211	+112.75	8.00	24.0	<12
	16	482	+110.75	9.00	48.0	<12
	16	482	+109.75	9.00	48.0	<12
	16	482	+107.75	9.00	48.0	<12
	18	758	+105.75	11.00	48.0	<12
	18	896	+105.75	11.00	48.0	<12
	18	896	+103.75	11.00	48.0	<12
16SW BP modified	20	1256	+100.75	11.59	48.0	15
	22	1590	+98.25	14.00	48.0	17
	24	2917	+96.75	14.00	96.0	21
	22	2218	+95.75	13.59	96.0	15
	20	1087	+97.75	11.50	48.0	13
	16	993	+100.25	10.75	48.0	<12
	14	1060	+102.25	10.00	63.0	<12
14SW BP	18	804	+98.75	11.25	14.0	<12
	20	964	+95.25	12.00	14.0	<12
	24	904	+91.75	14.25	14.0	12

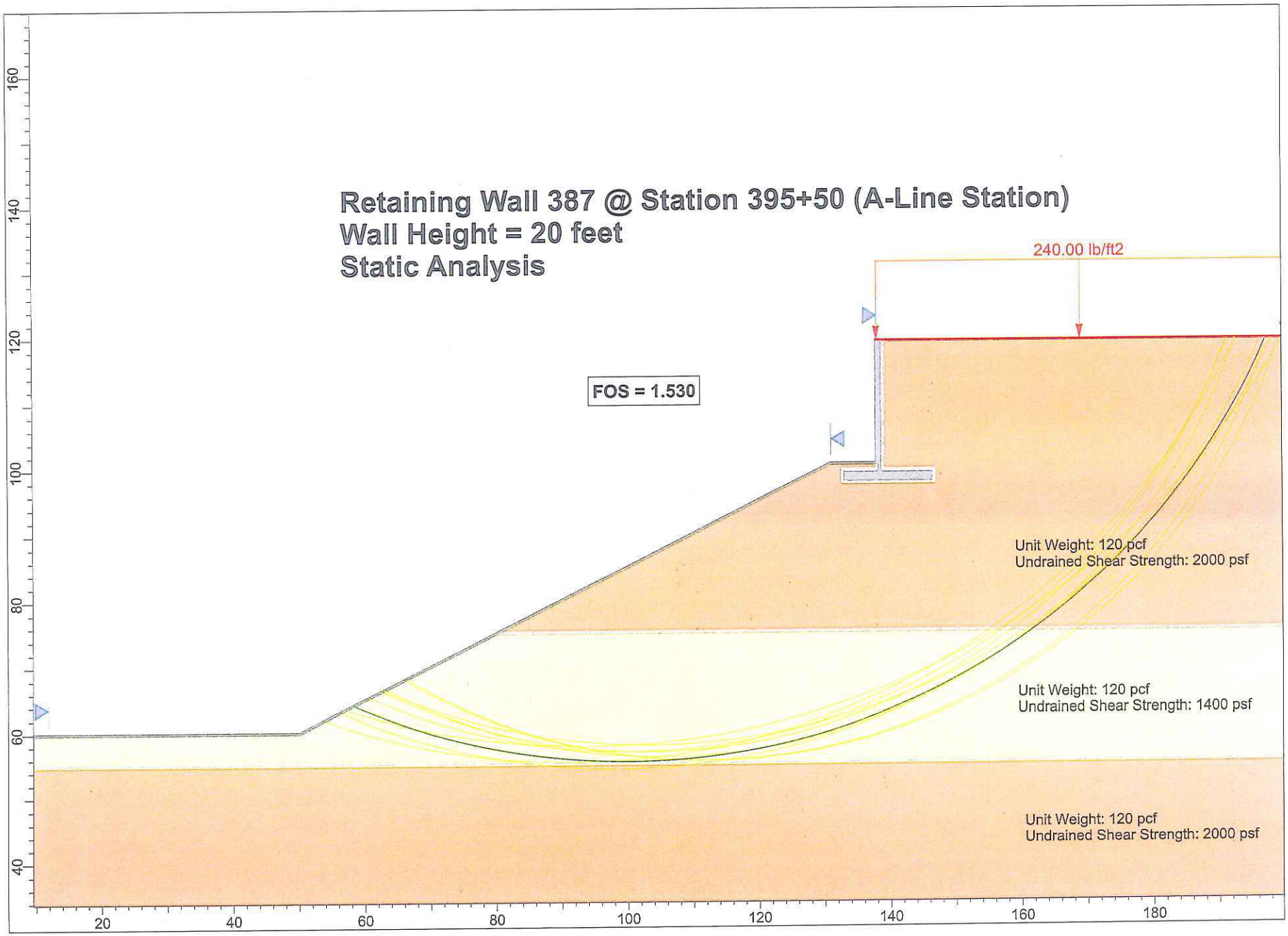
where pile length is less than 12 feet, the total settlement is less than 1-inch. Therefore, no pile tip for settlement.

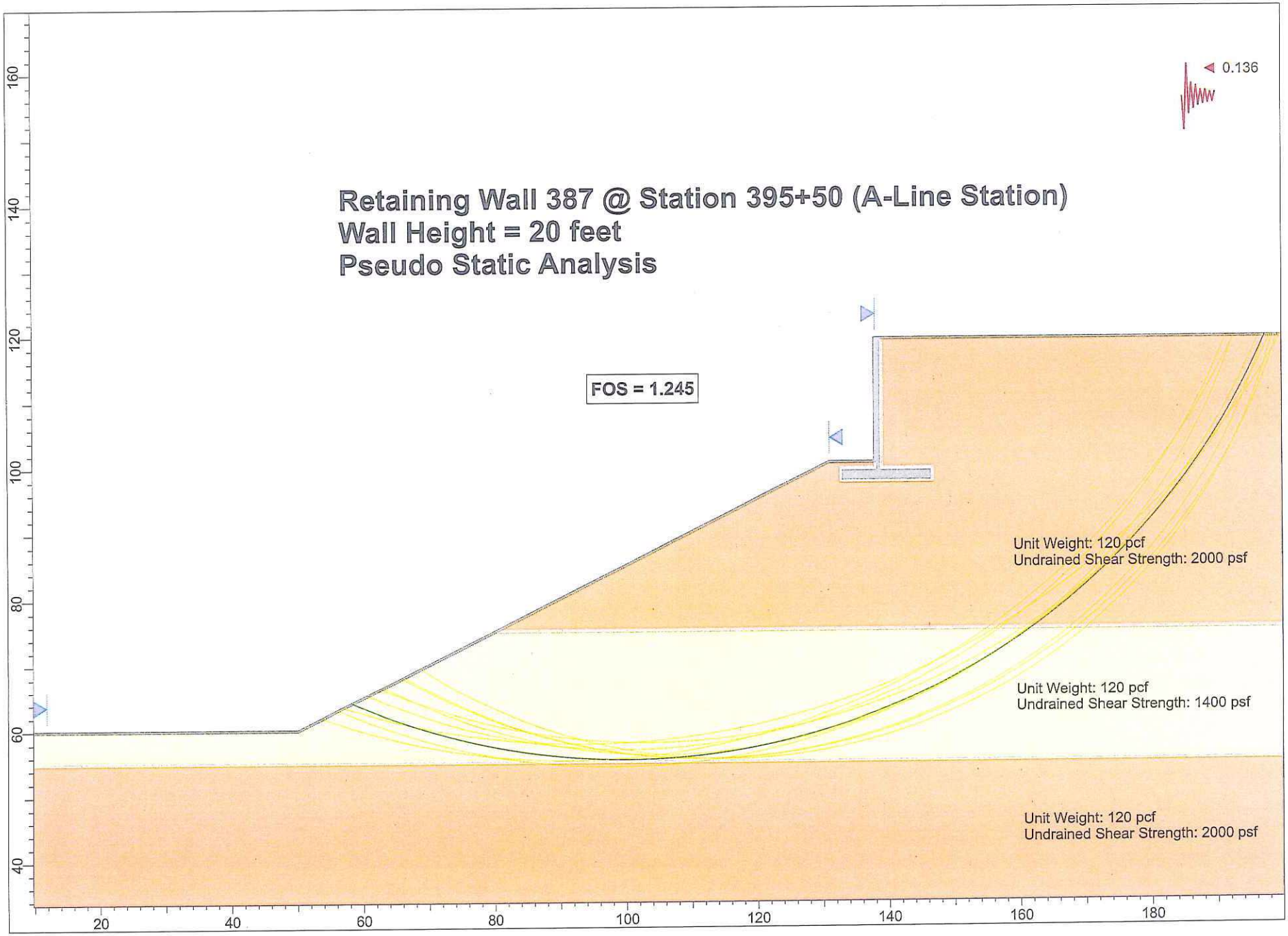

Retaining Wall 387 @ Station 388+90 (A-Line Station)
Wall Height = 10 feet - Maximum Slope Height
Static Analysis
240.00 lb/ft2
FOS = 1.543
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 3000 psf
200
175
150
125
100
75
50
25
50
75
100
125
150
175
200
225
250

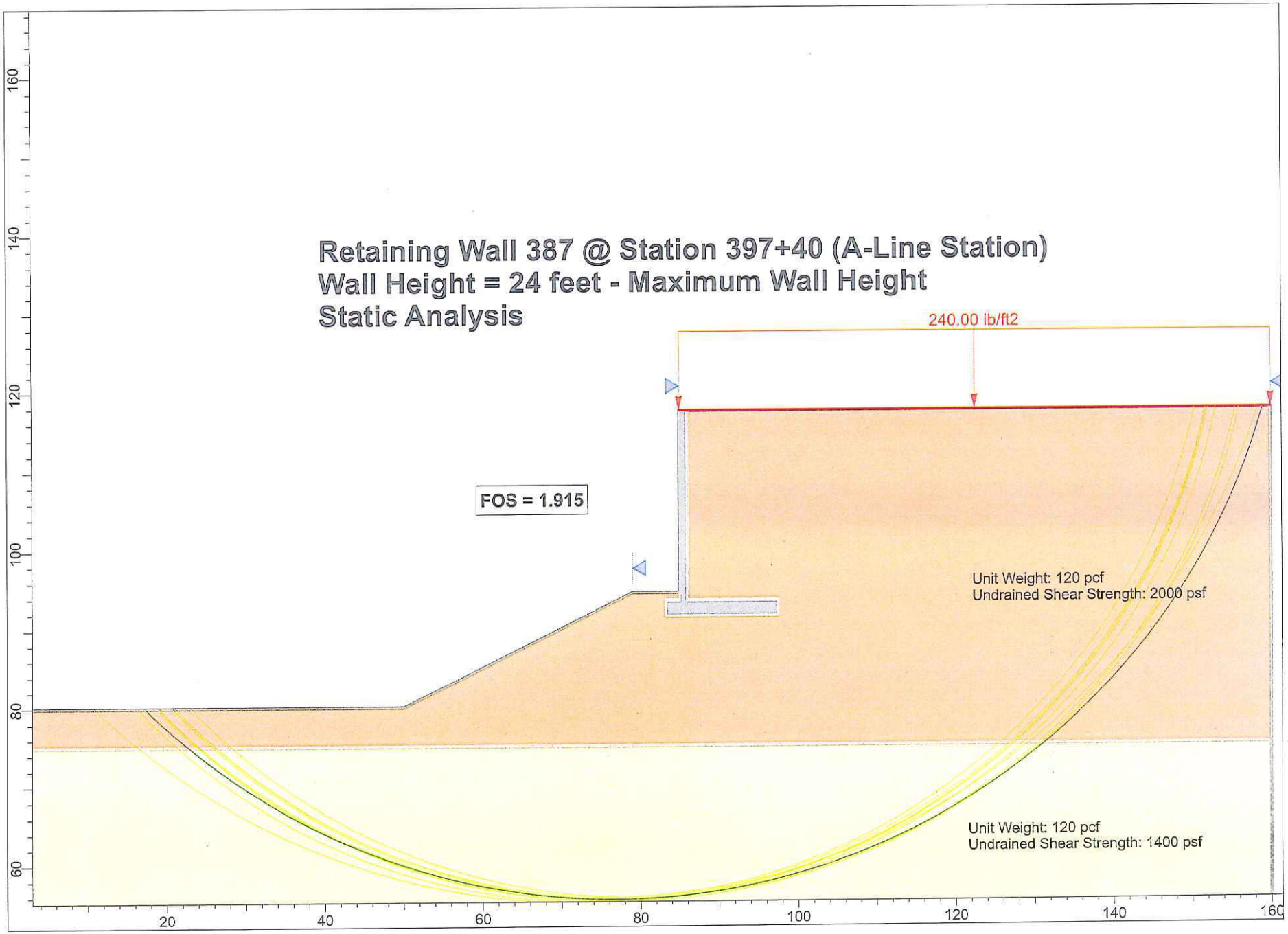

0.136
Retaining Wall 387 @ Station 388+90 (A-Line Station)
Wall Height = 10 feet - Maximum Slope Height
Pseudo Static Analysis
FOS = 1.216
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 3000 psf
200
175
150
125
100
75
50
25
50
75
100
125
150
175
200
225
250

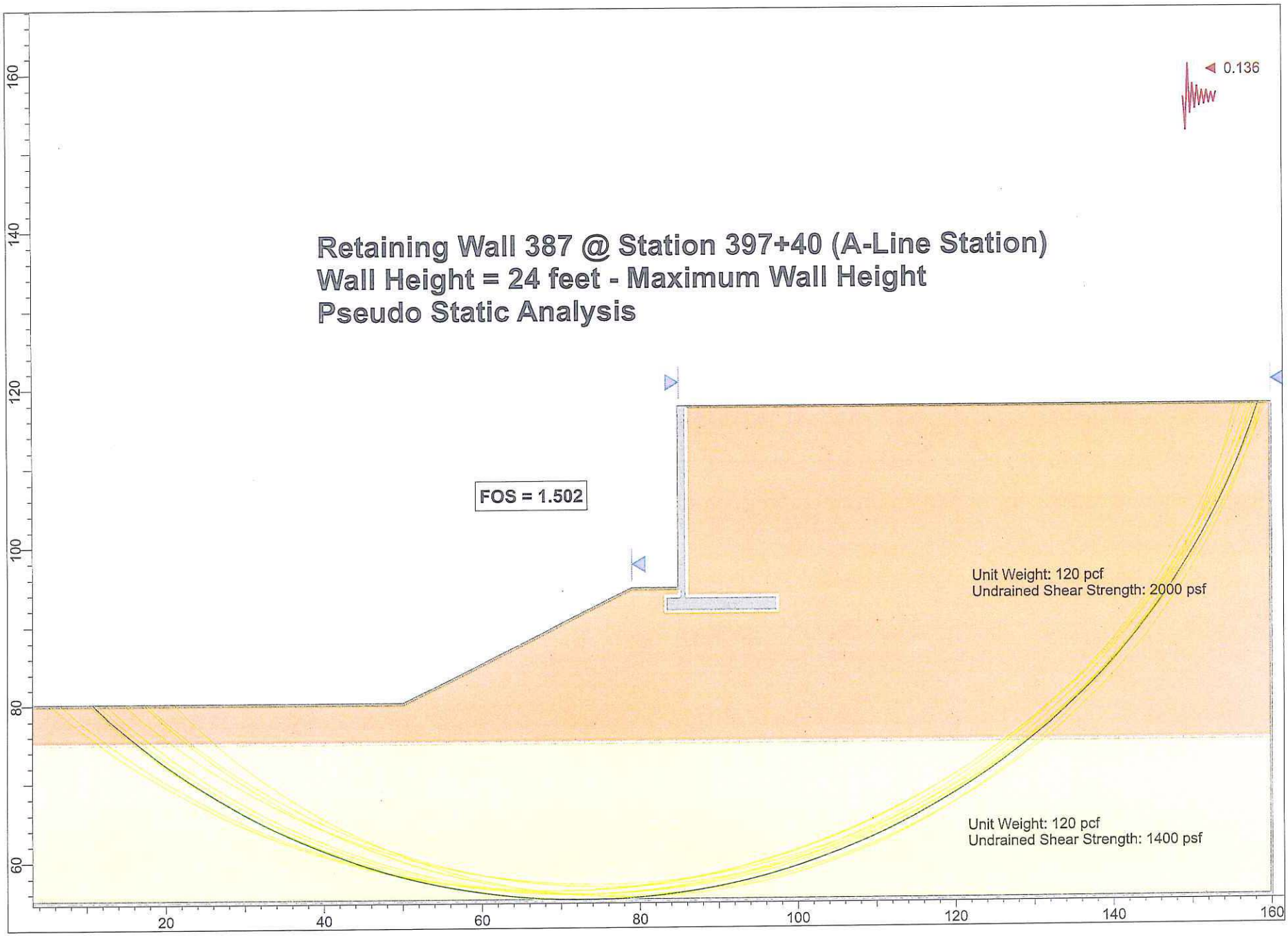

Retaining Wall 387 @ Station 394+00 (A-Line Station)
Wall Height = 24 feet - Maximum Wall Height
Static Analysis
240.00 lb/ft2
FOS = 1.664
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 3000 psf
160
140
120
100
80
60
40
20
40
60
80
100
120
140
160
180
200


0.136
Retaining Wall 387 @ Station 394+00 (A-Line Station)
Wall Height = 24 feet - Maximum Wall Height
Pseudo Static Analysis
FOS = 1.382
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 3000 psf
160
140
120
100
80
60
40
20
40
60
80
100
120
140
160
180
200


Retaining Wall 387 @ Station 395+50 (A-Line Station)
Wall Height = 20 feet
Static Analysis
240.00 lb/ft2
FOS = 1.530
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 1400 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
160
140
120
100
80
60
40
20
40
60
80
100
120
140
160
180


0.136
Retaining Wall 387 @ Station 395+50 (A-Line Station)
Wall Height = 20 feet
Pseudo Static Analysis
FOS = 1.245
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 1400 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
160
140
120
100
80
60
40
20
40
60
80
100
120
140
160
180


Retaining Wall 387 @ Station 397+40 (A-Line Station)
Wall Height = 24 feet - Maximum Wall Height
Static Analysis
240.00 lb/ft2
FOS = 1.915
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 1400 psf
160
140
120
100
80
60
20
40
60
80
100
120
140
160


0.136
Retaining Wall 387 @ Station 397+40 (A-Line Station)
Wall Height = 24 feet - Maximum Wall Height
Pseudo Static Analysis
FOS = 1.502
Unit Weight: 120 pcf
Undrained Shear Strength: 2000 psf
Unit Weight: 120 pcf
Undrained Shear Strength: 1400 psf
160
140
120
100
80
60
20
40
60
80
100
120
140
160

Appendix D

CALTRANS REVIEW COMMENTS AND EMI RESPONSES

EXTERNAL SUBMITTAL REVIEW

PROJECT: INTERSTATE 5 HOV IMPROVEMENT
PROJECT No. 1200020279

EA No.: 12-0F96E	
Agency: CalTrans	
Submittal No.	Title: FR for RW 387 (I-5 HOV, Segment 3), 4/23/2012

Lead:	Date: 7/26/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submitta

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING		
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)
1	Page 12, Table 4-1	H.Liu	1	Based on converted shear parameters from CPT readings and UU test result, the undrained shear strength for the clayey soils from Elev. +65' to +40' should be less than 1400 psf. Please revise the strength parameter for the soils at the above depth from STA 395+43 to the end of the proposed wall.	RI	A	Since Boring A-11-349 and CPT-11-349 are located more than 100 feet away from the end of the wall, more emphasis was on Boring A-11-348 to derive Shear Strength parameters for the wall segement "From A-Line Station 395+43 to End Wall". The UU test results obtained from boring A-11-348 were compared with CPT correlations from all CPTs for the same soil layer. Results of these comparision shows the 1400 psf is conservative. Table 4-1 will be revised to show only boring A-11-348 for "From A-Line Station 395+43 to End Wall".			
2	Page 15, Table 5-2	H.Liu	2	Please include soundwall information (heights and limits etc.) into this table.	RI	C	As presented in Section 5.4, Retaining Wall 387 is proposed to be a combination of Caltrans modified Type 1SWBP, modified Type 7SWBP and Type 1SWBP cantilevered retaining walls without the soundwall on top.			

EA No.: 12-0F96E	
Agency: CalTrans	
Submittal No.	Title: FR for RW 387 (I-5 HOV, Segment 3), 4/23/2012

Lead:	Date: 7/26/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only
CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submitta

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING		
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)
3	Page 17, Section 5.4.2	H.Liu	3	Please eliminate the last paragraph, as it appears to be redundant and is not applicable for axial case in these types of foundation soils.	RI	A	We will comply.			
4	PP. 17-21 Tables 5-5 and 5-6	H.Liu	4	Based on Section 5.4.2, GEF of 0.9 was considered in pile design. This requires that nominal driving resistance be 11% more than nominal resistance. Since there is no group effect during pile installation, additional resistance needs to be developed during individual pile driving, to account for stress increase (stress over-lap) for foundation soils under future group-loaded condition. Please increase the required nominal driving resistance while GEF is considered.	RI	A	We will comply.			
5	Appendix A LOTBS	H.Liu	5	The retaining wall symbol on LOTBS shown that the earth will be retained away from the highway, which is contrary to the project plan. Please revise it.	RI	A	We will comply.			
6	Appendix A LOTBS	H.Liu	6	Boring# A-11-349: from El +16.5' to El +11.5', plasticity of fines in soils should be defined as non to low, in order to be classified as ML, based on 14.7.3 of ASTM D-2488 and "Soil and Rock Logging Manual (2010)". Please redefine either the soil plasticity or soil classification/group name.	RI	A	We will comply.			

EA No.: 12-0F96E	
Agency: CalTrans	
Submittal No.	Title: FR for RW 387 (I-5 HOV, Segment 3), 4/23/2012

Lead:	Date: 7/26/2012
Technical Discipline: Geotechnical	

ACTION (30, 60, 85%): RL = Revise in Later Submittal RI = Revise Immediately & OTS Review

30, 60, 85% SUBMITTAL DISPOSITION (check one): ( )Approved, ( ) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only
CODE: A - Accept/will comply, B - Agency Action, C - Clarify/Discuss, D - Delete Comment, E - Different Submitta

FINAL SUBMITTAL (100%) DISPOSITION (check one): ( ) Approved, (X) Approved as Noted for Correction, ( ) Rejected, Revise & Resubmit, ( ) Record Only

FILLED OUT BY REVIEWER						FILLED OUT BY RESPONDER		FILLED OUT AT RESOLUTION MEETING		
No.	Plan/SSP/ Page No.	Reviewer	Reviewer Comment No.	Comments	Action	Initial Code	Response	Final Code	Verify (1)	Verify (2)
7	Appendix A LOTBS	H.Liu	7	During sampling, MCD sampler should be pushed-in by the rig, instead of driven-in by the hammer, to minimiz the sample disturbance.	RI	C	We agree that the MCD samplers should be pushed-in to minimize the sample disturbance. Soil strengths were obtained from UU test results, correlations with CPT and correlations with SPT blowcounts. However, blowcount correlations are not reliable for fine-grained soils. CPT correlations are more reliable. Soil strengths obtained from the laboratory tests are observed to be less than the parameters obtained from CPT correlations. Therefore, the shear strength parameters are obtained from average lower bound of the CPT correlations. Therefore, in our opinion, the effect of sample disturbance is not a major factor in determining the soil strength parameters.			
8	Appendix C Calculations	H.Liu	8	In axial capacity analyses. the uplifting capacity of piles should be taken as a fraction of the compression capacity of piles, please reflect such a consideration in the calculation output.	RI	A	We will comply.			