APPENDIX C

Preliminary Geologic Hazards
&
Geotechnical Engineering Report

LUSD STOCKON – LAKEVIEW SCHOOL
Stockton, California
MPE No. 04434-01

MID PACIFIC ENGINEERING, INC.

August 15, 2019

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LUSD STOCKTON-LAKEVIEW SCHOOL

Regatta Lane and Cosumnes Drive

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INTRODUCTION

We have completed a Preliminary Geologic Hazards and Geotechnical Engineering investigation for the site of the proposed Lodi Unified School District educational facility to be located south of the intersection of Regatta Lane and Cosumnes Drive in Stockton, California. The purposes of our study have been to investigate the site, soil, geologic and groundwater conditions of the school site, and to prepare Geologic and preliminary Geotechnical Engineering conclusions and recommendations regarding development of the property with a new school. Our work has been performed in general accordance with the conditions of our proposal to the Lodi Unified School District (c/o Petralogix Engineering, Inc.), dated April 10, 2019. This report presents the results of our work.

SCOPE OF SERVICES

Our scope of work included the following:

1. Site reconnaissance;
2. Review of available historic aerial photographs, topographic maps and groundwater information of the area;
3. Review of geologic maps and fault maps;
4. Review of historic seismicity within 100 kilometers of the site;
5. Subsurface exploration, including the following:
   A. Excavating and sampling of eight exploratory test pits to maximum depths of approximately eight feet below the existing ground surface;
   B. Drilling and sampling of four test borings to maximum depths of approximately 26½ feet below the existing ground surface; and,

C. The completion of two Cone Penetration Test (CPT) soundings to a maximum depth of approximately 50 feet below existing site grades.

6. Collection of bulk samples of near-surface soils;
7. Laboratory testing of selected soil samples;
8. Engineering analyses; and,
9. Preparation of this report.

FIGURES AND ATTACHMENTS

Figure	Title	Figure	Title
1	Topographic Map	11	Unified Soil Classification System
2	Regional Geologic Map	12	Regional Fault Map
3	Site Investigation Map	13	Earthquake Epicenter Map
4-7	Logs of Soil Borings	14	FEMA Flood Map
8-10	Logs of Test Pits		

Appended to this report are:

- Appendix A – General information regarding project concepts; exploratory methods used during our field investigation; and, laboratory test results not included on the boring logs.
- Appendix B – Output files from the EQFAULT/EQSEARCH programs.
- Appendix C – The results of the CPT soundings and the CLiq Liquefaction Analyses.
- Appendix D – A list of references cited.

PROPOSED DEVELOPMENT

Based on discussions with Petralogix Engineering, Inc., we understand the Lodi Unified School District (LUSD) is in their due-diligence period on purchasing the property located south of the intersection of Regatta Lane and Cosumnes Drive in Stockton, California. It is our understanding the LUSD is considering purchasing the land for the construction of a new school. The number of buildings, their sizes and locations, as well as site grading concepts, have not been developed yet.

SITE HISTORY

We reviewed historical aerial photographs of the site from Google Earth, taken in May 1993 through August 2018. In May 1993, the site appeared to be used for agricultural farming. Sometime between August 1998 and May 2002, the site had been stripped of vegetation. From May 2002 to December 2005 the site was left as fallow undeveloped land. Sometime between December 2005 and July 2006, a new subdivision was observed to the east and the site appeared to be used as a stockpile storage location. A detention basin was observed near the southwest corner of the site. Between February 2007 and February 2008, it appears a water line was installed on the eastern side of the site. From February 2008 to August 2018, the site has remained relatively unchanged.

FINDINGS

SITE DESCRIPTION

The proposed improvements encompass a total area of approximately 11 acres and is located at the corner of Regatta Lane and Cosumnes Drive in Stockton, California. The center of the proposed improvements is located at approximately latitude 38.0469° north and longitude 121.3920° west. The site is bounded to the north by fallow undeveloped land; to the east by a residential subdivision; to the west by agricultural fields; and, to the south by a large canal. Topography across the property is relatively flat with the exception of the stockpiles. Topography across the property is relatively flat with an average surface elevation of approximately -3 feet relative to mean sea level (msl), based on the review of the 1997 *United States Geological Survey (USGS) 7.5-Minute Series Topographic Map Terminous Quadrangle, California-San Joaquin Co.* (See Figure 1).

At the time of our investigation on May 2, 3 and 16, 2019, the site supported tall grasses and weeds. A major portion of the site contained soil stockpiles that ranged from 3 to 6 feet in vertical height. Precast concrete pipes were observed at the southern and western ends of site and a detention pond was observed near the southwest corner of the site.

Geologic Structure

The project site is located within the Great Valley Geomorphic Province of California (Great Valley), a ~100 million year old sedimentary basin that formed as a low lying region between a subducting oceanic plate to the west and the Sierra Nevada mountain range to the east. The province is approximately 450 miles long and 50 miles wide and is comprised of two northwest to southeast-trending sub-basins: the Sacramento Valley to the northwest and the San Joaquin Valley to the southeast (CEC, *Geologic Hazards and Resources*). Each of these basins is filled by a thick sequence of Mesozoic to Quaternary sediment, whose terrigenous and subaerial depositional sources have been traced to the Sierra Nevada and Coast Range Geomorphic Provinces to the east and west, respectively (Anderson, 1943).

The Great Valley and the Sierra Nevada Geomorphic Province form the Sierran Block, a relatively stable crustal block comprised of a Mesozoic basement (CEC, *Geologic Hazards and Resources).* The western boundary of the Great Valley is characterized by strike-ridges and valleys associated with the Upper Mesozoic strata of the Coast Ranges Geomorphic Province. These Mesozoic strata dip beneath the alluvium of the Great Valley (California Geological Survey [CGS], Note 36).

Surface elevations within the Great Valley range from several feet below mean sea level (msl) to elevations greater than 1000 feet above msl. Most notably, the Sutter Buttes (a volcanic remnant) rises to an elevation of approximately 1980 feet above the surrounding Sacramento Valley floor.

Regional Geology

Review of the *Preliminary Geologic Map of the Lodi 30'x60' Quadrangle, California* (CGS, 2009) indicates that the school site is underlain by late Pleistocene-aged alluvium (Map Symbol: Q_{m1}) of the Modesto Formation. These deposits primarily consist of arkosic sands with minor silts and gravels that form terraces, floodplains and alluvial fans along the Mokelumne and Cosumnes Rivers (Dawson, 2009; See Figure 2).

The soil conditions encountered in our borings were generally consistent with the soils typically mapped as the Modesto Formation.

SUBSURFACE SOIL CONDITIONS

The soil stockpiles located at the site were approximately three to six feet in height. The stockpile soils explored in our eight test pits were variable and consisted of clayey sand, clayey silt/silty clay and silty sands. In general, the stockpile soils were generally free of debris, with the exception of TP4 that encountered brick and PVC pipes.

The native surface and near-surface soil conditions encountered by our four test borings, and below the stockpile soils in our eight test pits generally consisted of medium dense clayey sand and very stiff silty clay to approximate depths of 2½ to nine feet below existing grades. The near-surface soils were underlain by medium dense to dense silty and clayey sand, medium dense cohesionless sand, very stiff to hard silty clay and very stiff clayey silt. Loose poorly graded sand was initially encountered in one of our borings (D3) at approximately 23 feet below existing grades.

To supplement our soil borings, two Cone Penetration Test (CPT) soundings were performed to maximum depths of approximately 50 feet below existing site grades. The soil conditions encountered at the CPT locations were generally consistent with those encountered in the soil borings.

For more detail regarding the soil conditions at a specific location, please refer to the Logs of Soil Borings on Figures 4 through 7 and Logs of Test Pits on Figures 8 through 10. The results of the CPT soundings are presented in Appendix C.

Please note that subsurface conditions within the borings are representative of the soil conditions at the time of exploration and at the specific location. It should be expected that soil conditions across the site can and will vary laterally and vertically from the soils encountered during our investigation.

GROUNDWATER

Groundwater was encountered at depths ranging from 7½ to 10 feet below existing site grades within our soil borings and CPT soundings performed on May 3 and 16, 2019, to a maximum depth explored of approximately 26½ and 50 feet below existing grades.

To supplement our groundwater information, we reviewed groundwater elevation data obtained from one nearby California Department of Water Resources (DWR) groundwater monitoring well #380571N1213745W001, located approximately 1½ miles northeast of the subject property. Surface elevation at the well is indicated to be approximately +7 feet above msl. The DWR has periodically measured groundwater elevations in this well from at least March 20, 1989 to March 3, 2004. During this time period, the groundwater elevations have ranged from approximately +1 feet above to -12 feet below msl (about 5 to 19 feet below grade at the well).

Recent measurements taken over the past 20 years by the DWR indicates the groundwater elevation in this area has varied between approximately 5 to 10 feet below existing site grades.

FAULTING

Review of the *Envision Stockton 2040 General Plan Update, Hazard Protection* (adopted December 4, 2018) indicates that the project site is not located within the mapped trace of any known fault. There were no indications of surface rupture or fault-related surface disturbance at the site during our review of aerial photographs, site reconnaissance, or geotechnical investigation.

The project site is not located within a state designated *Alquist-Priolo* Earthquake Hazard Fault Zone (CGS, 2019; Hart and Bryant, 2007). The closest Earthquake Fault Zones is the Greenville fault zone located approximately 26.5 miles/42.6 kilometers, southwest of the project site. The nearest identified fault trace, the Stockton fault, is not considered to be an active fault. A Regional Fault Map (Figure 12) is included with this report.

Using the USGS Earthquake Hazards Program, 2008 National Seismic Hazard Maps-Source Parameters (https://earthquake.usgs.gov/cfusion/hazfaults_2008_search/query_results.cfm) we have prepared Table 1, which contains CGS Class A and B faults and fault systems within 62 miles (100 km) of the site. The identified faults are considered to be capable of producing earthquakes with moment magnitudes (M_W) of 6.4 or greater. The closest active faults to the site are the Great Valley -Segment 7 Fault (22.7 miles/36.6 kilometers), Great Valley - Segment 5/Pittsburg Kirby Hills Fault (24.8 miles/40.0 kilometers), and the Greenville Connected Fault (26.5 miles/42.6 kilometers). The Great Valley - Segment 7 Fault is a 28 mile (45 kilometer) long, northwest to southeast-striking thrust fault, and the Great Valley -

Segment 5, Pittsburg Kirby Hills Fault is a 20 mile (32 kilometer) long, northwest to southeast-striking reverse fault. Both faults are located to the northwest of the project site. The Greenville Connected Fault is a northwest to southeast-trending, strike slip fault that is located to the west of the project site.

Table 1 - Faults Influential to the Site "I" School, Stockton, CA

Fault Name	Maximum Magnitude (M_W)	Distance to Site Miles (km)
Great Valley Fault System (Segment 7)	6.90	22.7 (36.6)
Great Valley Fault System (Segment 5)	6.70	24.8 (40.0)
Greenville Connected	7.00	26.5 (42.6)
Mount Diablo Thrust	6.70	32.2 (51.8)
Green Valley Connected	6.80	34.2 (55.1)
Great Valley Fault System (Segment 4b)	6.80	34.5 (55.5)
Calaveras CN	6.87	37.2 (59.9)
Calaveras CN+CC+CS	7.03	37.2 (59.9)
Calaveras CN+CC	7.00	37.2 (59.9)
Great Valley Fault System (Segment 8)	6.80	44.1 (77.0)
Hayward – Rodgers Creek Fault HN+HS	7.00	45.4 (73.1)
Hayward – Rodgers Creek Fault HS	6.78	45.4 (73.1)
Hayward – Rodgers Creek Fault RC+HN+HS	7.33	45.4 (73.1)
Great Valley Fault System (Segment 4a)	6.60	47.0 (75.7)
West Napa	6.70	47.2 (76.0)
Calaveras CC	6.39	47.3 (76.2)
Calaveras CC+CS	6.50	47.3 (76.2)
Hayward – Rodgers Creek Fault RC+HN	7.19	47.4 (76.3)
Hayward – Rodgers Creek Fault HN	6.60	47.4 (76.3)
Hunting Creek – Berryessa	7.10	52.0 (83.8)
Ortigalita	7.10	53.9 (86.7)
Great Valley Fault System (Segment 3)	7.10	57.0 (91.7)
Hayward – Rodgers Creek Fault RC	7.07	57.0 (91.7)

Review of the *Earthquake Outlook for the San Francisco Bay Region 2014–2043* (https://pubs.usgs.gov/fs/2016/3020/fs20163020.pdf), indicates the Hayward-Rodgers Creek Fault System has the highest probability (33 percent) of producing a magnitude 6.7 or greater earthquake in the next 30 years. The Greenville Fault, Mt. Diablo Thrust Fault, and the Green Valley Fault were assigned a 16 percent probability of producing a magnitude 6.7 or greater earthquake in the next 30 years. Based on supplementary review of USGS fault parameters and EQFault data files, it is our opinion that the Great Valley Fault System should also be considered a potential causative fault system.

HISTORIC SEISMICITY

Seismological data regarding significant historical earthquakes affecting the site was obtained using the commercially available software program EQSEARCH (Blake, 2000; database updated 2019). The EQSEARCH database was developed by extracting records of events equal to or greater than magnitude 5.0 from the DMG Comprehensive Computerized Earthquake Catalog, and supplemented by records from the USGS; University of California, Berkeley; and the California Institute of Technology. A search radius of 62 miles (100 km) was specified for this analysis. A historic earthquake epicenter map showing earthquakes (magnitude 5 or greater) within a 62 mile (100 km) radius of the project site is presented as Figure 14.

A review of the historical earthquake data indicates that the most significant earthquake shaking experienced at the project site occurred during the M_R 6.8 earthquake of October 21, 1868, with an epicenter located approximately 45.4 miles (73.1 kilometers) southwest of the project site. An examination of the tabulated EQSEARCH data suggests that the project site has not experienced a ground shaking equivalent to Modified Mercalli Intensity (MMI) X[1]. The closest earthquake to the site was 27.0 miles (43.5 kilometers) southwest, which measured a MMI of VI.

The largest earthquake to occur within the EQSEARCH radius of 62 miles (100 km) was measured at Mw 6.8, and the largest acceleration experienced at the site was estimated to be 0.091 g. The number of earthquakes greater than Mw 5.5 within a 62 mile (100 km) radius of the site is presented in the following table.

[1] Most masonry and frame structure and their foundations destroyed. Ground badly cracked. Landslides. Wholesale destruction.

TABLE OF MAGNITUDES AND EXCEEDANCES	
Earthquake Magnitude	Number of Times Exceeded
5.5	26
6.0	11
6.5	3
7.0	N/A
7.5	N/A
8.0	N/A

Output files from the EQFAULT/EQSEARCH programs are included in Appendix B.

COSEISMIC GROUND DEFORMATION

The California State Legislature passed the Seismic Hazards Mapping Act (SHMA) in 1990 as a result of earthquake damage caused by the 1987 Whittier Narrows and 1989 Loma Prieta earthquakes. The SHMA was enacted to protect public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes (CGS, Special Publication [SP] 117).

There are currently no State designated Seismic Hazard Zone maps or Earthquake Fault Zone maps for the City of Stockton or San Joaquin County. For both Earthquake Fault Zones and Seismic Hazard Zones, San Joaquin County is currently listed as "not affected", therefore no maps are available. The project site is not located within a designated Seismic Hazard Zone.

PRELIMINARY CONCLUSIONS

CALIFORNIA GEOLOGIC SURVEY REVIEW

It is our understanding the Lodi Unified School District is in their Due Diligence period of purchasing the subject property, and that once purchased, the development of a new school is being considered. Site plans were not provided during our fieldwork activities and as a result, it is unknown if the number and locations of our drilled borings meet the requirements called out in the Note 48 document prepared by the California Geologic Survey (CGS).

Once the site has been purchased and a final site plan is provided, additional borings at the site may be needed to meet CGS requirements for review of a final *Geologic Hazards and Geotechnical Engineering Report* for the development of a new school.

SEISMIC HAZARDS

No active or potentially active faults are shown to cross the project site, as indicated on the published geologic maps and aerial photographs reviewed for this report. The project site is not located within an Earthquake Fault Zone or a designated seismic hazard zone. Therefore, a site-specific ground motion analysis is not warranted.

The project site is located within a region of seismic activity. However, building structure designs in conformance with the 2016 edition of the California Building Code (Title 24 of the California Code of Regulations, Chapter 16A) should be sufficient to prevent significant damage from ground shaking during seismic events induced the by movement of any fault or fault system discussed in this report.

SHEAR WAVE SEISMIC VELOCITY AND SEISMIC SITE CLASS

Shear wave velocity data was obtained from our seismic CPTs and utilized to determine the average shear wave velocity (ASCE 7-10, Equation 20.4-1). Based on the calculated average shear wave velocity from both CPT's, this area would fall within the range of Site Class D (ASCE 7-10, Table 20.3-1).

Based on the information provided above, it is our opinion that the soils at this site should be designated as Site Class D in determining seismic design forces for this project in accordance with Table 1613A.3.2 of the 2016 CBC.

SEISMIC CODE PARAMETERS

Section 1613 of the 2016 edition of the CBC references ASCE Standard 7-10 for seismic design. The following seismic parameters were determined based on the site latitude and longitude using the web interface (https://seismicmaps.org/) provided by the Structural Engineers

Association of California (SEAOC) in association with the California Office of Statewide Health Planning and Development (OSHPD) that uses the USGS web services to retrieve pertinent seismic design data. The seismic design parameters summarized in the following table may be used for seismic design of the proposed improvements.

2016 CBC/ASCE 7-10 Seismic Design Parameters				
Latitude: 38.0469° N Longitude: 121.3920° W	ASCE 7-10 Table/Figure	2016 CBC Table/Figure	Factor/ Coefficient	Value
Short-Period MCE at 0.2s	Figure 22-1	Figure 1613.3.1(1)	S_S	0.918 g
1.0s Period MCE	Figure 22-2	Figure 1613.3.1(2)	S_1	0.341 g
Soil Class	Table 20.3-1	Section 1613.3.2	Site Class	D
Site Coefficient	Table 11.4-1	Table 1613.3.3(1)	F_a	1.133
Site Coefficient	Table 11.4-2	Table 1613.3.3(2)	F_v	1.717
Adjusted MCE Spectral Response Parameters	Equation 11.4-1	Equation 16-37	S_{MS}	1.040 g
	Equation 11.4-2	Equation 16-38	S_{M1}	0.586 g
Design Spectral Acceleration Parameters	Equation 11.4-3	Equation 16-39	S_{DS}	0.693 g
	Equation 11.4-4	Equation 16-40	S_{D1}	0.391 g
Seismic Design Category	Table 11.6-1	Section 1613.3.5(1)	Risk Category I to IV	D
	Table 11.6-2	Section 1613.3.5(2)	Risk Category I to IV	D

MCE – Maximum Considered Earthquake
g – Acceleration due to gravity

The PGA_M (Equation 11.8-1, ASCE 7-10) for the site is 0.381 g.

SEISMIC SOURCES

Several active and potentially active faults were identified as potential seismic sources within 62 miles (100 km) of the project site. These faults and fault systems include the Great Valley Fault System, the Greenville Connected Fault, the Green Valley Connected Fault, the Mount Diablo Thrust Fault, the Calaveras Fault System, and the Hayward-Rodgers Creek Fault, among others. The closest active faults are Segments 7 and 5 of the Great Valley Fault System located approximately 22.7 miles/36.6 kilometers and 24.8 miles/40 kilometers, respectively, west of the project site located. Maximum Moment Magnitude Earthquakes (M_W) for faults within 62 miles (100 km) of the project site are listed in the Table 1 within the FAULTING section of this report.

The Great Valley Fault System extends from the southern San Joaquin Valley in Kern County northward into Tehama County, and serves as the boundary between the Coast Range and the Great Valley Geomorphic Provinces of California. It is characterized by a zone of low-angle, or blind thrust, and reverse faults that do not rupture the ground surface during sizable earthquake events. Although not exposed at the surface, regional studies have suggested that the Great Valley Fault System may be comprised of 18 to 25 segments that range in length from 7 to 35 miles (11.2 to 56.3 kilometers) – with most segment lengths measuring between 12 and 19 miles (19.3 to 30.6 kilometers). Several notable earthquake events have occurred along segments of the Great Valley Fault System, including: the 1892 M_W 6.4 and 6.2 Winters-Vacaville earthquakes, 1983 M_W 6.5 Coalinga earthquake, and the 1985 M_W 6.1 Kettleman Hills earthquake.

The Greenville Fault is an active dextral strike slip fault situated within the Diablo Range of California. It, along with the Green Valley Fault, defines the easternmost extent of the San Andreas Fault System in the San Francisco Bay region. Recent studies of the Greenville Fault have determined a long-term creep rate of approximately 2 mm/year along the northern third of the fault system, with diminished aseismic releases in the two southern segments. A lack of large fault surface expressions (greater than 1 kilometer) and significant locking along the southern two-thirds of the Greenville Fault supplement seismic evidence for historic rupture events during the late Holocene. Estimations by Lienkaemper et al. (2013) imply that the resulting strain accumulation along the fault system is sufficient enough to generate a M_W 6.9 earthquake with a mean recurrence of approximately 600 years.

The Central Valley and the Sierra Nevada margin are defined in the region by the Foothills Fault System. This fault zone is less active than the Central Coast area's strike-slip faults and the CRCV boundary located along the west side of the Sacramento and San Joaquin Valley. The Foothills Fault System is regarded as an aerial earthquake source that is based on poorly constrained Quaternary slip rates across the Bear Mountain and Melones Fault Zones (CDMG, 1996; Woodward-Clyde Consultants, 1978). Wakabayashi and Smith (1994) describe the Foothills Fault Zone as lacking evidence of active crustal shorting and note that deformation along the eastside of the Central Valley is extensional or transtensional.

The Green Valley Fault is an active Holocene dextral strike slip fault. It is characterized by aseismic creep, and has been monitored by Galehouse (1992, 1999) since 1984. Detailed reconnaissance level mapping exists for most of the fault, based on geologic and geomorphic data (Weaver, 1949; Dooley 1973; Sims, and others 1973; Frizzell and Brown, 1976; and Bryant 1982, 1992). Several site-specific studies in compliance with the *Alquist-Priolo Act* (Hart and Bryant, 1997) have documented the location and approximate age of most recent faulting. Preliminary data from the Lopes Ranch paleoseismic project site indicates the Green Valley Fault has produced multiple surface-rupturing events in the last 2700 years, and has a minimum late Holocene dextral slip rate of 3.8 mm/yr to 4.8 mm/yr based on 1.2 – 1.5 meters (3.9 – 4.9 feet) dextral offsets within a 310 year old paleochannel (Baldwin and Lienkaemper, 1999). Geomorphic expressions of the Green Valley Fault include closed depressions, ponded alluvium, dextrally offset drainages, linear troughs, sidehill benches, and scarps in young alluvium (Dooley, 1973; Frizzell and Brown, 1976; Bryant, 1982, 1992). Extensive landslides locally conceal fault traces along the northern extent of the fault in Wooden Valley, and locally obscure fault traces between Suisun Bay and Highway 80. Bryant (1982, 1991) estimated a long-term Quaternary slip rate of 3 mm/yr, based on unconstrained dextral separation of Pliocene Sonoma Volcanics mapped by Sims, et al (1973).

The Hayward-Rodgers Creek fault system is a significant seismic source located in the northern San Francisco Bay area. The Working Group on California Earthquake Probabilities (WGCEP, 2003) defined the Hayward-Rodgers Creek Fault System as having the greatest probability in the San Francisco Bay region of generating an earthquake of M_W 6.7 or greater. Most investigators interpreted the Rodgers Creek Fault as a single fault system capable of generating a M_W 7.1 earthquake, or if it ruptures simultaneously with the northern Hayward Fault, a M_W 7.3 earthquake (WGCEP, 2003). The roughly 37-mile (60 kilometers) long Rodgers Creek Fault, located between San Pablo Bay and Santa Rosa, strikes approximately N35°W, and is characterized by a late Holocene right-lateral slip rate of 6.4 to 10.4 mm/yr (Budding et. al, 1991; Schwartz et. al, 1992). The Rodgers Creek Fault is one fault in a series of right-stepping en echelon faults that include the Hayward fault to the south, and the Healdsburg and Maacama Faults to the north. The surface expression of the Rodgers Creek Fault, as mapped by Randolph and Caskey (2001) and Hart (1992), includes classic fault-related geomorphic features such as offset drainages, side hill benches, tonal lineaments, sag ponds, and springs.

SURFACE FAULT RUPTURE

No known faults are mapped crossing the immediate vicinity of the site. The site does not lie within an Alquist-Priolo Earthquake Fault Zone as currently designated by the State of California, and no evidence of surface faulting was observed during our historical aerial photography review, site reconnaissance, or geotechnical investigation. It is our opinion that the potential of fault-related surface rupture at the site is low.

SEISMIC RISK

Based on review of the peak site accelerations obtained from EQFAULT analysis, the primary seismic site risks are from earthquakes along the Great Valley Fault System Segment 5. The fault system lies within approximately 19.5 miles (31.4 km) of the project site and is capable of producing large earthquakes. Results of the EQFAULT analysis indicate an Mw 6.5 earthquake on the Great Valley Fault System Segment 5 would result in a site acceleration of 0.148 g, based on the Boore et al (1997) Soil (250) attenuation relation.

LIQUEFACTION

Liquefaction is a soil strength and stiffness loss phenomenon that typically occurs in loose, saturated, cohesionless soils as a result of strong ground shaking during earthquakes. The potential for liquefaction at a site is usually determined based on the results of a subsurface geotechnical investigation and the groundwater conditions beneath the site. Hazards to buildings associated with liquefaction include bearing capacity failure, lateral spreading, and differential settlement of soils below foundations, which can contribute to structural damage or collapse.

We performed our liquefaction analysis for the CPT soundings CPT-1 and CPT-2 using the commercially available software program CLiq (Version 2.0) developed by Geologismiki. The analysis was performed using the Robertson (2009) methodology. Input earthquake ground motion for the liquefaction analysis was 0.38g (*PGA_M, 2016 CBC Section 1803A.5.11 for Site Classification D*); M6.9 earthquake (*USGS Interactive Deaggregations webpage*); and, an in-situ depth to groundwater of about 5 feet determined based on historical groundwater measurements for wells monitored by DRW located approximately 1½-mile northeast of the site. As required by Note 48, a factor of safety (FS) of 1.3 against liquefaction was used in the analysis. Appendix C of this report includes the output files of our liquefaction analysis. Based on the results of our analyses using the CLiq software program, the upper approximately 50 feet contain soils that may be potentially liquefiable and susceptible to seismic settlements. Analysis using the CLiq software program and the current subsurface data indicates estimated maximum total seismic settlements due to liquefaction could be on the order of approximately 2.5 to 2.7 inches. We estimate differential seismic settlements to be about half of the total seismic settlement. The Liquefaction Potential Index (LPI) value estimate from the analysis ranged from 5.58 to 8.06 for both CPT soundings. LPI values range from zero to 100. Iwasaki et al. (1982) suggested that liquefaction effects are low for 0 < LPI < 5; moderate for 5 < LPI < 15; and, major for LPI > 15. LPI combines depth, thickness, and factor of safety of liquefiable material inferred from a CPT sounding into a single parameter. The estimated LPI values fall into the moderate risk range. Based on the observed soils profile and the depths at which liquefaction settlement is estimated to occur, we consider the above estimated settlements to be a worst case scenario.

CYCLIC SOFTENING

The soils encountered in our borings generally consisted of medium dense clayey sand and very stiff silty clay underlain by medium dense to dense silty and clayey sand, medium dense cohesionless sand, very stiff to hard silty clay and very stiff clayey silt. Low strength clays were not encountered; therefore, it is our opinion the potential for cyclic softening occurring beneath the site is low.

DRY SAND SEISMIC SETTLEMENT

Dry sand seismic settlement can be evaluated using the methodology developed by Robertson and Shao (2010) based on the earlier work by Pradel (1998). The on-site soils above the groundwater surface generally consisted of medium dense clayey sand and very still silty clay. Based on our analyses using the CLiq software program (utilizing Robertson and Shao), the surface sands encountered in CPT-01 and CPT-02 are not susceptible to post-earthquake settlement of dry sands.

VOLCANIC HAZARDS

Review of the USGS Map of Potential Hazards from Future Volcanic Eruptions in California (Miller, 2011), shows there are six volcanic hazard zones in California. The project site does not lie within any of these six recognized volcanic hazard areas. The closest known volcanic center is the Clear Lake area, approximately 62 miles (100 km) northwest of the site. The most recent volcanic eruption from the Clear Lake area occurred approximately 10,000 years ago. Based on the above information, the volcanic hazard potential is low.

LANDSLIDES

Based on site observations and a review of the most recent topographic maps, the site has relatively flat topography. According to the 1997 *United States Geological Survey (USGS) 7.5-Minute Series Topographic Map Terminous Quadrangle, California-San Joaquin Co.,* the average surface elevation across the site is approximately -3 feet mean sea level (msl). There are no slopes in the immediate or general area. Due to the relatively flat topography of the site and general area, potential for landslides is not considered applicable to the site.

SLOPE STABILITY

The project is located on a relatively flat site. The proposed improvements to the site do not incorporate the formation of new slopes. Based on the current and anticipated final site conditions, slope stability is not considered a risk factor in site development.

NATURALLY OCCURRING ASBESTOS (NOA)

Asbestos is the generic term for the naturally occurring fibrous (asbestiform) varieties of six silicate minerals (croicidolite, tremolite, actinolite, anthophyllite, amosite, and chrysotile). These asbestiform minerals are naturally occurring in igneous ultramafic rock formations such as dunite, pyroxenite, peridotite, and hornblendite which form below the Earth's surface at high temperatures and then exposed by uplift and erosion. Chrysotile, the most common asbestos mineral in California, forms fibrous crystals in small veins in the altered metamorphic rock serpentinite. According to the USGS Open-File Report 2011-1188, *Reported Historic Asbestos Mines, Historic Asbestos Prospects, and Other Natural Occurrences of Asbestos in California* (Van Gosen and Clinkenbeard, 2011), the project site does not lie within an area mapped as containing Naturally Occurring Asbestos (NOA).

RADON GAS

Radon is a naturally occurring, colorless and tasteless gas produced in soil or rock by the decay of uranium and radium; radon is a known cause of lung cancer in the United States. Sections 307 and 309 of the Indoor Radon Abatement Act of 1988 (IRAA) directed EPA to list and identify areas of the U.S. with the potential for elevated indoor radon levels. EPA's Map of Radon Zones assigns each of the 3,141 counties in the U.S. to one of three zones based on radon potential. San Joaquin County and the project site are located in Zone 3 for radon potential. Zone 3 counties have a predicted average indoor radon screening level less than 2 pCi/L and are anticipated to have a low potential for radon.

FLOOD HAZARDS

The site is not located within a Special Flood Hazard Area (SFHA) as designated by the Federal Emergency Management Agency (FEMA). According to the Flood Insurance Rate Map (FIRM) Panel 295, Map Number 06077C0295F, published by the Federal Emergency Management Agency (FEMA), with an effective date of October 16, 2009, the proposed school campus is within a segment of Zone X that is defined as areas of 0.2 percent annual chance flood; areas of one-percent annual-chance flood with averaged depths of less than one foot or with drainage areas less than one square mile; and areas protected by levees from one percent annual chance flood. It is noted by FEMA however, that an overtopping or failure of any levee system is possible.

According to the *City of Stockton General Plan, 2040* (Adopted December 4, 2018), since 1998, flood risks have been reduced significantly through the Locally Constructed Flood Control Project by the San Joaquin Area Flood Control Agency, which includes flood protection facilities on Bear Creek and Pixley Slough located just south of the site. The risk of flooding at the site is considered low to moderate.

DAM INUNDATION

Based on review of the *City of Stockton General Plan, 2040* (adopted December 4, 2018), the school site is located just north of potential dam inundation areas from New Melones Dam and New Hogan Dam. Therefore, the potential of dam inundation at the site is considered low.

Tsunamis and Seiches

The project site is adjacent to Pixley Slough to the south with Bishop Cut approximately 1.3 miles west of the site. A tsunami by definition is a large ocean wave caused by an underwater earthquake. Based on the distance of the site from a large body of water, the potential for a tsunami hazard at the site is not applicable.

A seiche is a wave that oscillates in a lake, bay, or gulf as a result of seismic disturbance. The adjacent slough and nearby cut are likely too small and shallow to produce significant seiches, therefore, it is our opinion that the potential for seiches influencing the site is very low.

Subsidence and Hydrocollapse

Regional subsidence occurs when large areas of land sink in response to withdrawal of groundwater, petroleum, or natural gas. The site is within the San Joaquin Valley, a region historically subject to subsidence from over pumping of groundwater, petroleum or natural gas withdrawal and peat oxidation. According to a review of the *Areas of Land Subsidence in California Map* (California Water Science Center), the site is not currently located within an area of land subsidence from groundwater pumping, peat loss, or oil extraction, although the site is less than five miles east of an area mapped as subsiding due to peat loss.

According to the *State of California Public Utilities Commission – Lodi Gas Storage Project Area and Map*, the site is located approximately 14 miles (22.5 kms) southwest of the Lodi Gas Field. In our opinion, the site is not located in an area subject to high subsidence, due to the absence of factors and conditions needed to cause subsidence (excessive withdrawal of groundwater, petroleum, or natural gas). In addition, due to the age and composition of the native soils and geologic materials encountered during our field exploration, it is our opinion that subsidence of the on-site soils as the result of groundwater withdrawal is unlikely.

Due to the age and composition of the native soils and geologic materials encountered during our field exploration, it is our opinion that hydrocollapse of the on-site soils as the result of rain or irrigation water percolation is unlikely.

Bearing Capacity And Foundation Support

Site clearing operations to remove existing stockpiles, vegetation, utilities, rubble, and other deleterious debris will disturb the surface and near-surface soils, creating loose and variable soil conditions. Disturbed areas will require additional processing and recompaction as engineered fill to provide uniform support of the planned improvements. The existing stockpiles of soil will require complete removal to expose undisturbed native soils, and recompaction as engineered fill for support of improvements.

In our opinion, the undisturbed native soils are capable of supporting proposed structures and pavements provided the further recommendations regarding site preparation and soils compaction are followed. Our work also indicates that engineered fill, properly placed and compacted in accordance with the recommendations of this report, will be capable of supporting the proposed improvements.

Specific recommendations for processing and recompaction are presented in the Site Preparation section of this report.

Provided the native soils and soils disturbed during site clearing are processed and recompacted, and foundations are constructed, as recommended, we estimate total settlements (*seismic and static*) will be approximately 3 inches with differential settlements to be about half of the total estimated settlement between adjacent footings, or over the shortest span of the building footprint (subject to change once final plans are developed).

Expansive Soils

Laboratory testing on the stockpile soils and near-surface native clays indicates these soils possess a low to high expansion potential, when tested in accordance with ASTM D4829 (See Figures A1 and A2). In our opinion, these near-surface clays are capable of exerting moderate to high expansion pressures on foundations, interior floor slabs and exterior flatwork, if exposed at or near final subgrades. Therefore, we will recommend that imported non-expansive soils be used to construct the upper 12 inches of subgrades supporting buildings and exterior flatwork. Specific recommendations to mitigate the effects of potentially expansive soils are provided in later sections of this report.

As an alternate to 12 inches of granular, non-expansive soils for building pads and flatwork subgrades, lime-treatment may be considered as it can be an effective method of reducing the expansion potential of clay soils and can be used to reduce the moisture content of near-saturated soils to facilitate grading operations.

EXCAVATION CONDITIONS

Based on our field investigation, the native soils on the site should be readily excavatable with conventional earthmoving and trenching equipment typically used in the area. Based on the shallow depth to groundwater, deeper excavations in granular soils likely will be subject to sloughing or caving during excavation, especially if left open for an extended period of time. Excavations entered by workers must conform to current OSHA requirements (i.e., sloped or braced shoring). Based on available groundwater depth information, excavations deeper that about 5 to 7 feet may encounter groundwater requiring dewatering methods to complete construction

GROUNDWATER AND SEASONAL WATER

Based on the relatively shallow depth to groundwater, we conclude that groundwater may be a factor in design and construction of the structures and underground improvements at this site. Dewatering, if needed, should be performed by a qualified and knowledgeable contractor with experience in the area.

During the wet season, infiltrating surface runoff water can create saturated subsurface conditions where drainage is inhibited. Grading operations attempted following the onset of winter rains and prior to prolonged drying periods will be hampered by high soil moisture content. Such soils, intended for use as engineered fill, will require considerable aeration and drying, or chemical-treatment, to reach moisture contents that will permit the soils to be properly compacted.

Perched water may exist seasonally over the top of less permeable soils, especially during or shortly after periods of rainfall. Seepage also may be present within more permeable soil layers at the site.

Seasonal moisture and landscape irrigation will result in high soil moisture contents below interior floor slabs throughout their lifetime. Moisture vapor penetration resistance should be a significant consideration in design and construction of interior floor slabs.

Fill Material Suitability

The stockpile and on-site native soils are considered suitable for use as engineered fill provided the materials are free of roots, asphalt and concrete rubble, organic materials, other deleterious debris and are at a suitable moisture content to achieve the desired degree of compaction. Removal of the roots, rubble and debris from on-site soils may require laborers handpicking the fill materials. Clay soils will not be suitable for use within the upper 12 inches of building pad or flatwork subgrades, unless they are lime treated.

Pavement Subgrade Quality & Support

Laboratory test results indicate the near-surface native clays and stockpile soils are poor to moderate quality materials for the support of asphalt concrete pavements with Resistance ("R") values of 5 and 36, when tested in accordance with California Test (CT) 301 (see Figures A3 and A4). Based on the expansive clays at the site, it is our opinion an R-value of 5 is considered appropriate for design of pavements at this site.

In addition, laboratory test results (see Figures A5 and A6) indicate that lime treatment of the clayey and stockpile soils can result in a substantial improvement to the support characteristics of these soils, and reduce the required thickness of the base materials. Chemical treatment also can be used to reduce the moisture content of near-saturated soils to facilitate grading operations.

It will be important that the subgrade soils be tested and evaluated after initial grading to determine the most appropriate treatment options based on the exposed soil conditions. An experienced soil stabilization contractor should be retained to help facilitate selecting the most appropriate products for treatment.

The performance of chemically stabilized soils is very dependent on an adequate and uniform mixing of the selected products into the subgrade soils, and providing a proper curing period following compaction. An experienced soil stabilization contractor combined with a comprehensive quality control program is essential to achieve the best results with chemically treated subgrades.

Preliminary recommendations for chemical-treatment are presented in the LIME-TREATMENT ALTERNATIVE section of this report. Additional laboratory testing to further evaluate the feasibility of chemical-treatment is needed prior to final design.

SOIL CORROSION POTENTIAL

Two representative sample of the native soils and one sample of the stockpile soils (total of three samples) were submitted to Sunland Analytical to determine soil pH, minimum resistivity, chloride and sulfate concentrations to help evaluate potential for corrosive attack upon reinforced concrete and exposed buried metal. The results of the corrosivity testing are summarized in the table on the following page.

Soil Corrosivity Testing

Analyte	Test Method	Sample Identification		
		TP4 (1-2')	D2-3II (8')	D4-2II (3½')
pH	CA DOT Test #643 Modified (Sm. Cell)	7.03	7.33	7.59
Minimum Resistivity		2,410 Ω-cm	1,980 Ω-cm	1,210 Ω-cm
Chloride	CA DOT 417	2.0 ppm	8.4 ppm	10.4 ppm
Sulfate	CA DOT 422	38.7 ppm	23.6 ppm	52.3 ppm

Ω-cm = Ohm-centimeters ppm = Parts per million

The California Department of Transportation Corrosion Technology Section, Office of Materials and Foundations, Corrosion Guidelines Version 3.0, March 2018, considers a site to be corrosive to foundation elements if one or more of the following conditions exists for the representative soil and/or water samples taken: has a chloride concentration greater than or equal to 500 ppm, sulfate concentration greater than or equal to 1500 ppm, or the pH is 5.5 or less. Based on this criterion, the on-site soils are not considered corrosive to steel reinforcement properly embedded within Portland cement concrete for the samples tested.

Table 19.3.1.1 – *Exposure Categories and Classes*, American Concrete Institute (ACI) 318-14, Section 19.3, as referenced in Section 1904.1 of the 2016 CBC, indicates the severity of sulfate exposure for the samples tested is "not a concern". Ordinary Type I-II Portland cement is considered suitable for use on this project, assuming a minimum concrete cover is maintained over the reinforcement.

Mid Pacific Engineering, Inc. are not corrosion engineers. Therefore, to further define the soil corrosion potential at the site, or to determine the need or design parameters for cathodic protection or grounding systems, a corrosion engineer should be consulted.

Import fills, if used for construction, should be sampled and tested to verify the materials have corrosion characteristics within acceptable limits and generally should be similar to the tested on-site soils.

PRELIMINARY RECOMMENDATIONS

The recommendations contained here are preliminary in nature and are subject to revision. Our recommendations are based on the assumption that this site will be developed for support of a new school.

A major portion of the site contained soil stockpiles that ranged from 3 to 6 feet in vertical height. These materials will require complete removal to expose undisturbed native soils prior to further earthwork operations. Specific recommendations for removal of these piles as well as additional processing and recompaction of the near-surface soils, and those disturbed by site clearing operations, are presented below to promote more uniform support for the planned structures.

Based on the results of our subsurface exploration, the soils within the proposed structural areas may likely consist of clays which we anticipate could exert moderate expansion pressures on building foundations and interior and exterior concrete slabs-on-grade. Therefore, to reduce the potentially adverse effects of expansive clays within subgrades supporting buildings and slabs-on-grade, we recommend that the upper 12 inches of building pads and subgrades supporting exterior flatwork be constructed with non-expansive, granular soils (or aggregate base). Alternatively, consideration also may be given to lime-treating the upper 12 inches of the subgrades.

The recommendations presented below are appropriate for typical construction in the late spring through fall months. The on-site soils likely will be saturated by rainfall in the winter and spring months, and will not be compactable without drying by aeration or the addition of lime (or a similar product) to dry the soils. Should the construction schedule require work to continue during the wet months, additional recommendations should be provided by the Geotechnical Engineer retained to provide services during construction.

Site Clearing

Initially the site should be cleared of vegetation, rubble, debris, and other deleterious materials to expose undisturbed native soil as identified by our on-site representative. Our review of available literature and historical photographs provide a limited site history. Therefore, unknown buried structures (foundations, septic tanks, utility lines, etc.) may be present on-site and may be encountered during construction. If encountered, these structures should be removed and the resulting cavities or holes should be backfilled with properly moisture conditioned and compacted engineered fill as described in this report.

If the detention pond observed to the southwest of the site is located within the limits of the proposed improvements, the bottom of the pond should be stripped of all vegetation, and cleaned out to a depth where firm, undisturbed soils, as identified by our representative, are exposed.

A majority of the site contains soil stockpiles that ranged from 3 to 6 feet in vertical height. The existing soil stockpiles, as well as other identified fills, should be completely removed to expose firm, undisturbed native soils, as identified by our representative. If rubble, refuse, debris, or organics are exposed during the removal of the stockpiles, those items should be removed prior to being used as engineered fill.

The test pits outside of the stockpiles were backfilled with the native soils to the extent possible using the excavator bucket; however, the soils were not compacted to engineered fill specifications. The test pits should be identified and located in the field, and the backfill removed and re-compacted as engineered fill.

Where practical, the clearing should extend a minimum of five feet beyond the limits of the proposed structural areas of the site. Existing underground utilities, if encountered, located within the proposed building pad should be completely removed and/or rerouted as necessary. Utilities located outside the building area should be properly abandoned (i.e., fully grouted provided the abandoned utility is situated at least 2½ feet below the final subgrade level to reduce the potential for localized "hard spots"). All trees/large brush designated for removal should include the rootballs and roots ½ inch or larger in size.

Remaining areas should be stripped of surface vegetation and organically contaminated topsoil; strippings may be stockpiled for later use or disposed of off-site. *If used, on-site strippings may be placed in landscaped areas, provided they are kept at least five feet from the building pad, moisture conditioned and compacted. Strippings should not be used in landscaped berms that will support either retaining walls or concrete flatwork.*

All depressions resulting from the removal of such items, as well as all loose, disturbed or saturated soils in areas of clearing operations or tree removal, should be cleaned out to firm, undisturbed soil, as determined by our representative and should be restored to grade with engineered fill compacted in accordance with the recommendations of this report. It is considered essential that our office be notified prior to site clearing operations to schedule periodic site visits. If clearing is not performed under our direct observation, it is important that excavations resulting from clearing operations be left as shallow dish-shaped depressions for proper location and to allow proper access with compaction equipment during grading operations. If this is not the case, deeper sub-excavations will be required.

SUBEXCAVATION

Some sub-excavation and recompaction could be needed for foundation support based on the final building types and loading, and results of any additional investigation.

DIFFERENTIAL FILL DEPTHS

Buildings should not be supported upon differential fill depths greater than five feet. This is especially important in areas where new construction will span onto or across the backfill of the pond or sub-excavated areas. Our office should review the final grading plans after the site has been cleared to identify any lots that may require additional sub-excavation.

Site Preparation

All structural subgrade areas designated to receive fill, remain at-grade, or achieved by excavation, including areas that may be sub excavated, should be scarified to a depth of at least 12 inches, thoroughly moisture conditioned to at least two percent above the optimum moisture content, and uniformly compacted to not less than 90 percent of the ASTM D1557 maximum dry density.

Compaction operations should be undertaken with a heavy, self-propelled, compactor and should be performed in the presence of our representative who will evaluate the performance of the subgrade under compactive load and identify loose or unstable soils that could require additional excavation and/or compaction. Loose, soft, or unstable soils, as identified by our representative in the field, should be cleaned out to firm, undisturbed and stable soils, as determined by our representative, and should be restored to grade with engineered fill compacted in accordance with the recommendations of this report. Difficulty in achieving subgrade compaction or unusual soil instability may be indications of loose fill associated with past site usages or subsurface items. Should these conditions exist, the materials should be excavated to check for subsurface structures and the excavations backfilled with engineered fill. We recommend construction bid documents contain a unit price (price per cubic yard) for all excess excavation due to loose, soft, or unstable materials and replacement with engineered fill.

Engineered Fill Construction

Engineered fill should be placed in horizontal lifts not exceeding six inches in compacted thickness. Each lift should be thoroughly moisture conditioned to at least two percent above the optimum moisture content and uniformly compacted to at least 90 percent of the ASTM D1557 maximum dry density. Engineered fill at depths greater than five feet should be compacted to 95 percent of the maximum dry density, as defined above. Each lift of engineered fill should be property benched into adjacent side slopes to remove loose soils and promote uniformity.

Engineered fill should be properly benched into the existing slopes of the detention pond to remove loose surficial soils. Each bench should consist of a level terrace excavated at least 12 inches into the slope. For every three feet of vertical height of fill, a larger bench should be constructed, extending at least five feet into the existing slope. Taller slopes will require a wider bench placed at mid-slope height. Our representative should observe the benching of the slopes to evaluate the need for additional or larger benches into the hillside, based on exposed conditions.

The native and stockpiled on-site soils will be suitable for use as engineered fill if the materials are at a workable moisture content and free of rubbish, rubble, debris, roots and concentrations of organics, and have a maximum particle size of three inches or less. Removal of roots, organics, rubble and debris from the on-site soils may require laborers handpicking the fill materials to properly clean the soils prior to allowing their use as engineered fill.

Imported fill material, if required, should consist of granular soils or well graded aggregates with a Plasticity Index of 15 or less, an Expansion Index of 20 or less, and should have no particles greater than three inches in maximum dimension. Clean, open graded gravels (such as crushed rock or pea gravel) and other such materials are *not* acceptable for fill construction. The contractor also should supply appropriate documentation for imported fill materials indicating the materials are free of known contamination and have corrosion characteristics within acceptable limits. The imported materials should be sampled, tested, and approved well in advance (at least one week) of being transported to the project site.

The upper 12 inches of final building pad and exterior flatwork subgrades should consist of properly compacted imported non-expansive, granular soils or aggregate base. Clays should not be used within the upper 12 inches of building pad or exterior flatwork fills, unless they are chemically treated with lime.

Buildings should not be supported upon differential fill depths greater than five feet. This is especially important in areas where new construction will span onto or across the backfill of over-excavated areas.

The upper six inches of pavement subgrades and exterior slab subgrades supporting vehicle loadings should be scarified, moisture conditioned to at least the optimum moisture content, processed, and uniformly compacted to at least 95 percent of the maximum dry density, regardless of whether final grade is completed by excavation, filling, or left at existing grade. Final pavement subgrade preparation and compaction should be performed just prior to placement of aggregate base, after construction of underground utilities is complete. The completed pavement subgrades must be stable under construction traffic prior to placement of aggregate base.

Permanent excavation and fill slopes should be constructed no steeper than two horizontal to one vertical (2:1) and should be vegetated as soon as practical following grading to minimize erosion. As a minimum, erosion control measures including placement of straw bale sediment barriers or construction of silt filter fences in areas where surface run-off may be concentrated would be prudent. Slopes should be over-built and cutback to design grades and inclinations.

Site preparation should be accomplished in accordance with the recommendations of this section. It is essential that a representative of the Geotechnical Engineer be present on a nearly full-time basis during site clearing and preparation and all grading operations to identify unstable soil deposits, observe the earthwork construction, perform compaction testing and verify compliance with our recommendations and the job specifications.

Preliminary Stabilization Recommendations

The subgrades soils located adjacent to landscaped areas, and soils removed from excavations, may be in an over optimum or wet moisture condition, and too wet or unstable to properly compact. If such conditions are exposed, alternate stabilization recommendations will be needed to allow pavement subgrade construction to proceed. The following are preliminary options to help facilitate pavement construction. Final recommendations can be provided at the time of grading based on the actual field conditions exposed at the time. Soils removed from utility trench excavations and proposed for use as trench backfill may be too wet to compact, depending on exposed conditions, and may require drying methods prior to use as backfill.

Aeration

The first option would be to aerate the wet soils to dry them back to a compactable moisture content. This would involve near continuous scarification and aeration of the upper 12 inches of soils and exposure to the sun and wind for an extended period of time, to provide a better opportunity for drying. Factors influencing the usefulness and applicability of aeration include the depth of saturation and instability, and construction schedule constraints.

Removal and Replacement

Another acceptable alternative would be to completely remove the saturated/unstable soils to expose a firm, stable base and replace them to design soil subgrade elevation with dry, on-site or imported granular soils or Class 2 aggregate base (AB) (or on-site pavement grindings, where applicable) placed and properly compacted as engineered fill. The actual lateral extent and depth of excavation needed for stabilization will depend upon the observed soil conditions at the time of excavation and should be anticipated to be variable.

Mechanical Stabilization (Geogrid)

An alternative to complete removal of the unstable soils within pavement areas would be to excavate, as a minimum, an additional 12 to 18 inches of soils below the soil subgrade elevation, place a geogrid soil reinforcement (Tensar BX1100 or better) over the exposed soils and backfill to the design AB grades with Class 2 aggregate base. During excavation it is essential that our representative be present to help identify isolated areas of obviously deeper deposits of wet and very unstable soils that may require deeper sub-excavation, prior to placing geogrid.

Aggregate base used for stabilization should be compacted in thin lifts to at least 95 percent of the ASTM D1557 maximum dry density at a uniform moisture content near the optimum.

Chemical Stabilization

In our opinion, the native clay soils are likely to react favorably with the addition of quicklime (either dolomitic or high-calcium), which can be an effective method for enhancing the subgrade support quality of the native clays and to reduce the moisture content of near-saturated or unstable soils to facilitate grading operations.

The following sections of this report contain preliminary lime-treatment recommendations for spread rates and mixing depths, based on experience.

LIME-TREATMENT ALTERNATIVE

It will be important that the subgrade soils be observed and evaluated after site clearing to determine the most appropriate treatment options based on the exposed soil conditions.

The following are *preliminary* recommendations for clay soil subgrades. Revised recommendations will be needed if sands and silts are exposed at pavement subgrade elevations.

If lime-treatment is selected for pavement subgrades and/or building pad/flatwork subgrades, site preparation should be performed in accordance with the following recommendations. Following the site preparation, as recommended above, the upper 12 inches of the building pad, exterior flatwork grades and/or pavement subgrades should be treated with at least four percent high-calcium or dolomitic quicklime, as measured by dry unit weight of the untreated soil.

A large self-propelled rotary mixer should be used for mixing and remixing. Lime should be thoroughly mixed and remixed, as necessary, to a minimum depth of 12 inches at a minimum spread rate of at least 4½ pounds of lime per square foot based on a 12-inch mixing depth. This spread rate is provided for preliminary estimation purposes only as the actual amount of product can only be determined at the time of construction based upon the prevailing site, soil and moisture conditions. The contractor should include an add/deduct unit price for lime to account for variations in the quantities of product used.

It is emphasized that higher spread rates and/or deeper mixing depths with proportionately higher spread rates will needed for areas exposing the wet and/or unstable soils.

Initial mixing of lime should be followed by remixing the next day. Additional remix passes should be performed to provide a uniform soil-lime mixture. Lime stabilized soils should be compacted to at least 95 percent of the ASTM D1557 maximum dry density at a moisture content of at least two percent above the optimum moisture content. The moisture content of the treated soils should be maintained in the soil until the treated soil is covered by aggregate base or slabs. Compaction operations should be undertaken with a heavy, self-propelled, compactor and should be performed in the presence of our representative who will evaluate the performance of the subgrade under compactive load. No equipment or vehicle traffic should be allowed on the lime-treated materials during the first three days after treatment is completed.

If the lime-treatment alternate is selected, we recommend that additional laboratory testing be performed to further define the amount of lime required to produce the desired results.

A contractor experienced in such work should perform lime-treatment as specified in Chapter 24 of the Caltrans Standard Specifications.

UTILITY TRENCH BACKFILL

Utility trench backfill within structural areas should be mechanically compacted as engineered fill in accordance with the following recommendations. We recommend that native soil be used as trench backfill within the perimeter of the building foundations to help minimize soil moisture variations beneath the structures. The native soil backfill should extend at least three feet horizontally beyond perimeter foundation lines. Utility trench backfill should be placed in maximum six-inch lifts, moisture conditioned to at least two percent above the optimum moisture content, and mechanically compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557.

The upper 12 inches of backfill material for trenches within the building pad should match the materials used in the pad. If granular soils or AB were utilized, the upper 12 inches should be imported granular soils or AB. If the building pad was lime-treated, the upper 12 inches of materials should be either newly lime-treated materials, or imported Class 2 aggregate base. The upper 12 inches of trench backfill in lime-treated pavement areas should consist of aggregate base compacted to at least 95 percent of the maximum dry density.

We recommend that underground utility trenches that are aligned nearly parallel with foundations be at least three feet laterally from the outer edge of foundations, wherever possible. As a general rule, trenches should not encroach into the zone extending outward at a 1:1 inclination below the bottom of the foundations. Additionally, trenches parallel to foundations should not remain open longer than 72 hours. The intent of these recommendations is to prevent loss of both lateral and vertical support of foundations, resulting in possible settlement.

The soils removed from trench excavations, may be in an over optimum or wet moisture condition, and too wet or unstable to properly compact. If such conditions are exposed, additional stabilization recommendations may be needed to allow trench backfill to proceed. Such recommendations could include aeration and/or lime-treatment of spoils.

FOUNDATION DESIGN

We are providing design soil values for the analysis of the foundations, and suggested minimums for dimensions, but only from a Geotechnical Engineering perspective. The project Structural Engineer should determine final foundation width and depth dimensions, and concrete strength and reinforcement requirements, based on their specific structural design which should include an appropriate factor of safety applied to the overall design.

We estimate total settlements (*seismic and static*) will be approximately 3 inches with differential settlements to be about half of the total estimated settlement between adjacent footings, or over the shortest span of the building footprint (subject to change once final plans are developed).

It is essential that our office review the plans and project information, when available, to verify the applicability of the following recommendations.

Conventional Foundations (Subject to change once final plans are developed)

We anticipate that smaller, light-weight single- story classroom buildings can be supported on conventional shallow foundations extending *at least* 18 inches below building pad soil subgrade, or lowest adjacent soils grade, whichever is deeper. We anticipate larger, heavier auditorium or gymnasium buildings can be supported on conventional shallow foundations extending at least 24 inches deep into the pad. For this project, the building pad soil subgrade shall be defined as the surface on which the capillary break gravel is placed. Continuous foundations should be at least 18 inches wide and isolated spread foundations should be at least 24 inches wide.

Foundations so established may be sized for a maximum allowable soil bearing pressures of 2000 pounds per square foot (psf) for dead plus live load, with a 1/3 increase to include wind or seismic forces. The weight of foundation concrete extending below adjacent grade may be disregarded in sizing computations.

Foundations must be continuous around the perimeter of the building to help minimize moisture migration beneath the structures.

We recommend that all foundations be adequately reinforced to provide structural continuity, mitigate cracking and permit spanning of local soil irregularities. The structural engineer should determine final foundation reinforcing requirements. However, *as a minimum,* we recommend that continuous foundations be reinforced with four No. 4 steel reinforcing bars, placed two each near the top and bottom of the foundations. As a minimum, continuous foundations also should be provided with No. 4 slab tie reinforcing bars, positioned at least every 54 inches and penetrating at least two feet horizontally into the floor slab. The project engineer should evaluate the need for additional reinforcement.

Resistance to lateral displacement of shallow foundations may be computed using an allowable friction factor of 0.25 multiplied by the effective vertical load on each foundation. Additional lateral resistance may be achieved using an allowable passive earth pressure against the vertical projection of the foundation equal to an equivalent fluid pressure of 250 psf per foot of depth. These two modes of resistance should not be added unless the frictional component is reduced by 50 percent since mobilization of the passive resistance requires some horizontal movement, effectively reducing the frictional resistance.

Uplift resistance of the foundations can be provided by weight of the concrete extending below soil grade (150 pcf) and a friction value of 200 psf applied to the sides of the foundations in contact with the soils below lowest adjacent grade.

Post-Tensioned Slab Foundations (Subject to change once final plans are developed)

It is our opinion that post-tensioned (PT) foundations could be utilized as an option, depending on building types, sizes and structural loadings. Once final plans are completed, if PT foundations are considered, additional laboratory testing would need to be completed.

INTERIOR FLOOR SLAB SUPPORT (CONVENTIONAL FOUNDATIONS OPTION ONLY)

Interior concrete slab-on-grade floors should be supported upon subgrades consisting of at least 12 inches of uniformly moisture conditioned and properly compacted imported non-expansive soil, or Class 2 aggregate base, maintained at or near optimum conditions. Clays should be removed and replaced with nonexpansive engineered fill where present at or near subgrade elevation, or the clay subgrades should be lime-treated.

Interior concrete slab-on-grade floors should be at least four inches thick and, as a minimum, should be reinforced with chaired No. 3 reinforcing bars on 18-inch center-to-center spacing, located at mid-slab depth. This slab thickness and reinforcement is suggested as a guide "minimum" only; final concrete slab thickness, compressive strength, reinforcement and joint spacing should be determined by the Architect or Structural Engineer based on anticipated slab loading.

It is emphasized that thicker slabs with greater reinforcing will be needed in areas supporting higher loads or where increased performance is desired. *The Architect or Structural Engineer should determine the final thickness, strength, reinforcement, and joint spacing of slab-on-grade concrete based on anticipated slab loadings, proposed uses and desired performance.* Temporary loads exerted during construction should be considered in the design of the slab-on-grade floors. Proper and consistent location of the reinforcement at mid-slab is essential to its performance. The risk of uncontrolled shrinkage cracking is increased if the reinforcement is not properly located within the slab.

Floor slabs that will receive moisture sensitive floor covering may be underlain by a layer of free-draining crushed rock, serving as a deterrent to migration of capillary moisture. The crushed rock layer should be at least four inches thick and graded such that 100 percent passes a one-inch sieve and none passes a No. 4 sieve. Additional moisture protection may be provided by placing a plastic water vapor retarder (at least 10-mils thick) directly over the crushed rock. The plastic water vapor retarder should meet or exceed the minimum specifications as outlined in ASTM E1745. Consideration should be given to using a thicker, higher quality membrane for additional moisture protection such as a 15-mil thick Stego vapor barrier or other product. The membrane should be installed so that there are no holes or uncovered areas. All seams should overlap and be sealed with manufacturer-approved tape, continuous at the laps to create vapor tight conditions. All perimeter edges of the membrane, such as pipe penetrations, interior and exterior footings, joints, etc., should be sealed or caulked per manufacturer's recommendations. An optional, thin layer of clean sand above the membrane is acceptable, as an aid to curing of the slab concrete.

Floor slab construction over the past 25 years or more has included placement of a thin layer of sand over the vapor retarder membrane. The intent of the sand is to aid in the proper curing of the slab concrete. However, recent debate over excessive moisture vapor emissions from floor slabs includes concern for water trapped within the sand. As a consequence, we consider the use of the sand layer as optional. The concrete curing benefits should be weighed against efforts to reduce slab moisture vapor transmission.

The recommendations presented above are intended to mitigate any significant soils-related cracking of the slab-on-grade floors. More important to the performance and appearance of a Portland cement concrete slab is the quality of the concrete, the workmanship of the concrete contractor, the curing techniques utilized and the spacing of control joints.

FLOOR SLAB MOISTURE PENETRATION RESISTANCE

It is considered likely that floor slab subgrade soils will become wet to near-saturated at some time during the life of the structures. This is a certainty when slabs are constructed during the wet seasons or when constantly wet ground or poor drainage conditions exist adjacent to structures. For this reason, it should be assumed that all slabs in occupied areas, as well as those intended for moisture-sensitive floor coverings or materials, require protection against moisture or moisture vapor penetration. Standard practice includes the gravel and water vapor retarder as suggested above. However, the gravel and plastic membrane offer only a limited, first-line of defense against soil-related moisture. Recommendations contained in this report concerning foundation and floor slab design are presented as *minimum* requirements, only from the Geotechnical Engineering standpoint.

It is emphasized that the use of sub-slab crushed rock and water vapor retarder will not "moisture proof" the slab, nor does it assure that slab moisture transmission levels will be low enough to prevent damage to floor coverings or other building components. If increased protection against moisture vapor penetration of slabs is desired, a concrete moisture protection specialist should be consulted. The architect and design team should consider all available measures for slab moisture protection. It is commonly accepted that maintaining the lowest practical water-cement ratio in the slab concrete is an effective way to help reduce future moisture vapor penetration of the completed slabs.

EXTERIOR FLATWORK (NON-PAVEMENT AREAS)

Subgrades to receive exterior concrete flatwork should consist of 12 inches of imported, non-expansive soils, or Class 2 AB, moisture conditioned to at least the optimum moisture content and uniformly compacted to not less than 90 percent relative compaction, prior to the placement of the concrete. In lieu of 12 inches of granular fill, subgrades may be lime-treated. Expansion joints should be provided to allow for minor seasonal vertical movements of the flatwork.

The Architect or Structural Engineer should determine the final thickness, strength, reinforcement, and joint spacing of exterior slab-on-grade concrete; however, we offer the following suggested minimum guidelines. Exterior flatwork should be at least four inches thick and be constructed independent of perimeter building foundations and isolated column foundations by the placement of a layer of felt material between the flatwork and the foundation. Reinforcement should consist of at least heavy duty welded wire fabric (flat sheets), or equivalent steel reinforcing bars, placed mid-depth of the slab.

Slabs receiving wheeled traffic should be designed as pavements and be appropriately reinforced. For increased support and performance, the exterior slabs may be underlain by a minimum four inches of Class 2 aggregate compacted to 95 percent relative compaction.

Consideration should be given to thickening the outer edges of sidewalks to at least twice the slab thickness. Grades adjacent to flatwork must not be allowed to remain fallow due to the shrink/swell potential of the on-site native soils.

Proper and thorough moisture conditioning of subgrade soils is important to reduce the risk of non-uniform moisture withdrawal from the concrete and the possibility of plastic shrinkage cracks. Practices recommended by the Portland Cement Association (PCA) and the American Concrete Institute (ACI) for proper placement and curing of concrete, as well as for joint spacing and construction, should be followed during exterior concrete slab construction.

Site Drainage

Site drainage should be accomplished to provide positive drainage of surface water away from the building and prevent ponding of water adjacent to structures. The grade adjacent to the structure should be sloped away from foundations at a minimum two percent. Proper control of surface water drainage is essential to the performance of foundations, slabs-on-grade and pavements. We recommend using full-roof gutters, with downspouts from roof drains connected to rigid non-perforated piping directed to an appropriate drainage point away from the structures, or discharging onto paved surfaces leading away from the structures and foundations. Concentrated storm water discharge collected from roof downspouts or surface drains should not be allowed to drain on unprotected slopes adjacent to structures. Finished grades should be graded to drain positively away from all pavement and building structures. Ponding of surface water should be avoided near foundations and pavements. Landscape berms, if planned, should be constructed in such a manner as to promote drainage away from the buildings. All excavations should be protected from concentrated storm water run-off to minimize potential erosion. Ponding of surface water or allowing sheet flow of water over any open excavation must be avoided.

Pavement Design

Based on the anticipated traffic loads, we are providing pavement designs for Traffic Indices (TI's) of 4.5, 6.0 and 7.0. The following pavement sections presented in the table on the following page have been calculated based on an R-value of 5 for untreated subgrades and 50 for lime treated subgrade, the assumed TI's, and the procedures contained within Chapters 600 to 670 of the 6th Edition of the California Highway Design Manual. The project civil engineer should determine the appropriate traffic index based on anticipated traffic conditions. Additional pavement sections can be provided upon request.

ASPHALT CONCRETE PAVEMENT DESIGN ALTERNATIVES

Traffic Index (TI)	Traffic Condition	Untreated Pavement Subgrade R-value = 5		Lime-treated Pavement Subgrade R-value = 50 (a)	
		Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
4.5	Automobile Parking Only	2½*	10	2½*	4
6.0	Driveways / Fire Lanes	2½	15	2½	6
		3½*	13	3½*	4
7.0	Bus Lanes	3	18	3	7
		4*	16	4*	5

* = Asphalt concrete thickness includes the Caltrans Safety Factor.
(a) = Lime-treated subgrade should be at least 12 inches thick and possess a minimum R-value of 50 when testing in accordance with CTM 301 and minimum of 300 psi compressive strength (CT373)

We emphasize that the performance of pavements is critically dependent upon adequate and uniform compaction of the subgrade soils, including utility trench backfill within the limits of the pavements. It has been our experience that pavement failures may occur where a non-uniform or disturbed subgrade soil condition is created. Subgrade disturbances can result if pavement subgrade preparation is performed prior to underground utility construction and/or if a significant time period passes between subgrade preparation and placement of aggregate base. Therefore, we recommend that pavement subgrade preparation, i.e. scarification, moisture conditioning and compaction, be performed just prior to aggregate base placement.

The upper six inches of untreated or upper 12 inches of lime-treated final pavement subgrades should be uniformly moisture conditioned to at least two percent above the optimum moisture content and compacted to at least 95 percent relative compaction. Pavement subgrades should be proof-rolled with a loaded water truck and must be stable under construction traffic prior to placement of aggregate base. All aggregate base (AB) should be compacted to at least 95 percent of the maximum dry density. The AB should be proof rolled with a loaded water truck. Any areas of observed instability should be stabilized and recompacted as necessary to achieve the compaction requirements above. Earthwork construction within the limits of the pavements should be performed in accordance with the recommendation contained within this report. Material quality and construction of the structural section should conform to the applicable provisions of the Caltrans Standard Specifications, latest editions.

In the summer heat, high axle loads coupled with shear stresses induced by sharply turning tire movements can lead to failure in asphalt concrete pavements. Therefore, we recommend that consideration be given to using a Portland cement concrete (PCC) section in areas subjected to concentrated heavy wheel loading, such as entry driveways, truck or bus maneuvering areas, and in front of trash enclosures. At the time this report was prepared, the need for, and locations of, PCC pavements had not yet been determined. Therefore, when more information is available regarding uses, loading and potential subgrade conditions, we should review the information and provide specific thicknesses as applicable.

For preliminary purposes, it may be assumed that Portland cement concrete slabs in areas of entry driveways, truck maneuvering areas, and in front of trash enclosures should be at least 6 inches thick and be underlain by at least 6 inches of 95 percent compacted Class 2 aggregate base. Thicker slabs will be needed in areas of frequent bus traffic, in heavy duty areas, or areas subjected to high traffic frequencies by heavy trucks or equipment. In these areas, Portland cement concrete slabs with a minimum thickness of 7 inches and underlain by at least 6 inches of 95 percent compacted Class 2 aggregate base may be needed. These sections are preliminary and subject to revision based on review of additional information regarding loadings and traffic frequencies.

We suggest the concrete slabs be constructed with thickened edges in accordance with American Concrete Institute (ACI) design standards. Reinforcing for crack control, if desired, should consist of No. 4 reinforcing bars placed on maximum 24-inch centers each way throughout the slab. Reinforcement must be located at mid-slab depth to be effective. Construction of Portland cement concrete pavements should be performed in accordance with applicable American Concrete Institute (ACI) or PCA standards. Portland cement concrete utilized in pavements should attain a compressive strength of at least 3500 psi at 28 days.

Pavement Drainage

Efficient drainage of all surface water to avoid infiltration and saturation of the supporting aggregate base and subgrade soils is important to pavement performance. Consideration should be given to using full-depth curbs between landscaped areas and pavements to serve as a cut off for water that could migrate into the pavement base materials or subgrade soils. Geotextile water barriers also could be used to prevent migration of water into pavement base materials, if extruded curbs are used. Proprietary geotextile moisture barriers and curb details should be reviewed and approved by our office prior to construction. Weep holes are recommended in parking lot drop inlets to allow accumulating water moving through the aggregate base to drain from beneath the pavements.

Earthwork construction within the limits of the pavements should be performed in accordance with the recommendation contained within this report.

EARTHWORK TESTING AND OBSERVATION

Site preparation should be accomplished in accordance with the recommendations of this report. Representatives of Mid Pacific Engineering, Inc. must be present during site preparation and all grading operations to observe and test the fills to verify compliance with our recommendations and the job specifications. In the event that MPE is not retained to provide geotechnical engineering observation and testing services during construction, the Geotechnical Engineer retained to provide this service should indicate in writing that they agree with the recommendations of this report, and prepare supplemental recommendations as necessary.

A final report by the "Geotechnical Engineer" should be prepared upon completion of the project indicating compliance with or deviations from this report and the project plans and specifications. Please be aware that the title Geotechnical Engineer is restricted in the State of California to a Civil Engineer authorized by the State of California to use the title "Geotechnical Engineer."

FUTURE SERVICES

We recommend that our firm be given the opportunity to review the final plans and specifications to verify that the intent of our recommendations has been implemented in those documents. Testing and approval of proposed import sources is an essential requirement to qualify the proposed soils for use as engineered fill for this project. This sampling and testing should be completed well in advance of the proposed start of construction.

LIMITATIONS

Our recommendations are preliminary in nature and subject to revision based on additional investigation and analyses. We are providing preliminary conclusions and recommendations based upon the information provided regarding the proposed construction, combined with our analysis of site conditions revealed by the field exploration and laboratory testing programs. Additional subsurface exploration testing and analyses is a needed to prepare a final design-level report. We have used our best engineering judgment based upon the information provided and the data generated from our investigation. This report has been prepared in accordance with generally accepted standards of practice existing in northern California at the time of the report. No warranty, either express or implied, is provided.

If the proposed construction is modified or re-sited; or, if it is found during construction that subsurface conditions differ from those we encountered at the boring locations, we should be afforded the opportunity to review the new information or changed conditions to determine if our conclusions and recommendations must be modified. Mid Pacific Engineering, Inc., should be retained to review the final plans and specifications to verify that the intent of our recommendations has been implemented in those documents.

We emphasize that this report is applicable only to the proposed construction and the investigated site and should not be utilized for construction on any other site. The conclusions and recommendations of this report are considered valid for a period of two years. If design is not completed and construction has not started within two years of the date of this report, the report must be reviewed and updated, as necessary.

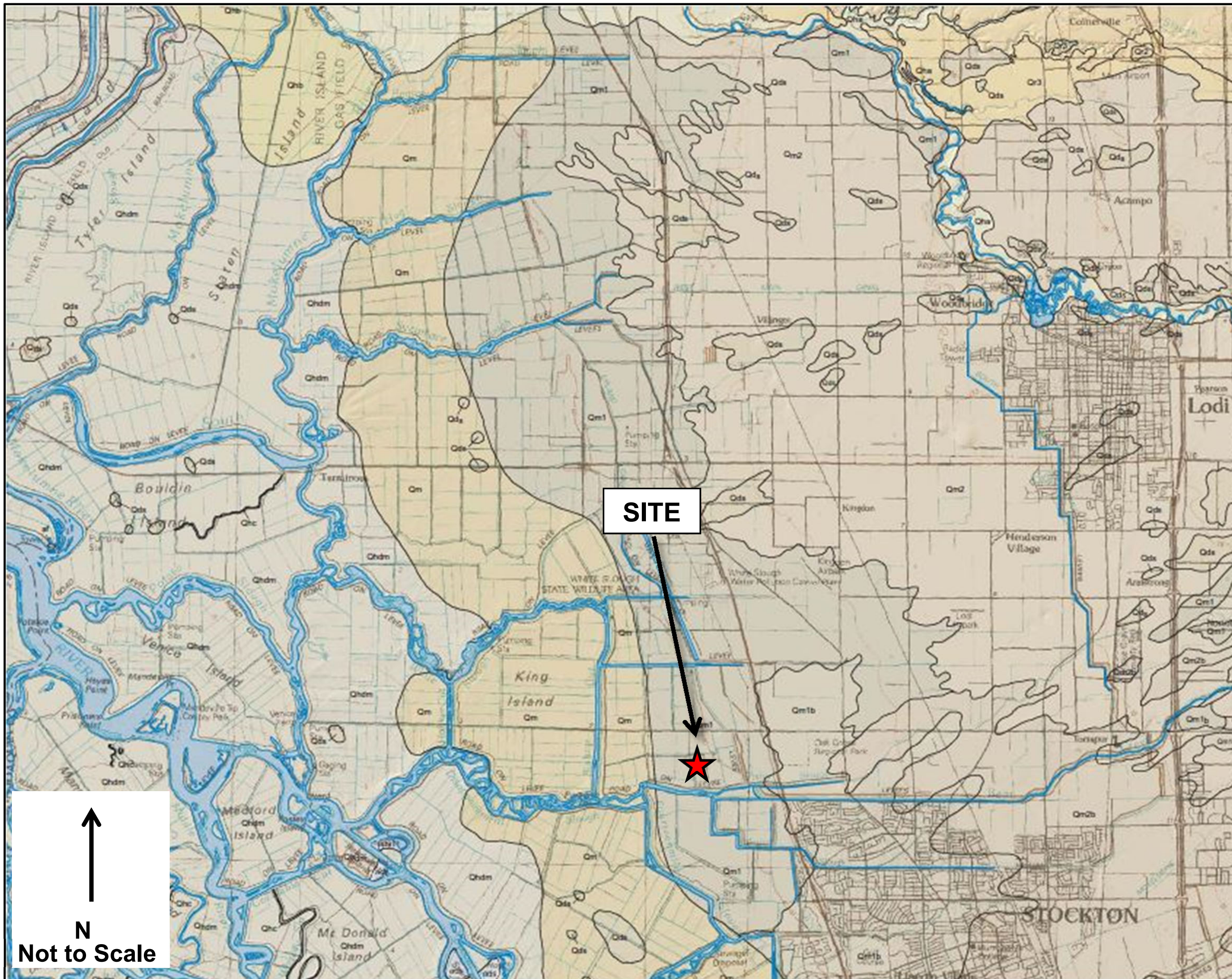
Mid Pacific Engineering, Inc.

Martin S. Osier, PE
Project Engineer

Daniel E. Kramer, CEG
Engineering Geologist

Daniel C. Smith, GE
Principal Engineer

FIGURES



EXPLANATION

Surficial Deposits

af -	Artificial fill
Qhc -	Stream channel deposits
Qhbm -	Estuarine deposits
Qha -	Holocene Alluvium, undivided
Qa -	Alluvium
Qhf-	Alluvial fan deposits
Qls -	Landslide deposits

Modesto Formation

Qm -	Undivided
Qm2 -	Upper member, undivided alluvium
Qm2b –	Upper member, fine-grained
Qm1 –	Lower member, undivided alluvium
Qm1b -	Lower member, fine-grained

Riverbank Formation

Qr -	Undivided
Qr3 -	Upper unit
Qr2 -	Middle unit
Qr1 -	Lower unit

GEOLOGIC MAP SYMBOLS

Geologic contact

Fault

Adapted from the *Preliminary Geologic Map of the Lodi 30 x 60 Minute Quadrangle, California* (Timothy E. Dawson, CGS, 2009).

MPE
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REGIONAL GEOLOGIC MAP

LUSD STOCKTON – LAKEVIEW SCHOOL

Regatta Lane and Cosumnes Drive
Stockton, California

FIGURE 2

Date: 08/19

MPE No. 04434-01

NOTES: Adapted from *Google Earth, dated 08/31/2018*

MPE
MID PACIFIC ENGINEERING, INC.

SITE INVESTIGATION MAP

LUSD STOCKTON-LAKEVIEW SCHOOL

Regatta Lane and Cosumnes Drive
Stockton, California

FIGURE 2

Date: 08/19

MPE No. 04434-01

Project: LUSD Stockton-Lakeview School	LOG OF SOIL BORING D1
Project Location: Regatta Land & Cosumnes Drive, Stockton, CA	
MPE Number: 04434-01	Sheet 1 of 1

Date(s) Drilled: 5/3/2019	Logged By: PJP	Checked By: MSO
Drilling Method: Solid Flight Auger	Drilling Contractor: V&W Drilling	Total Depth of Drill Hole, feet: 26½ Feet
Drill Rig Type: CME-75	Diameter(s) of Hole, inches: 6 Inches	Approx. Surface Elevation, ft MSL: - 3 Feet
Groundwater Depth [Elevation], feet: 7½ Feet	Sampling Method(s): 140 Lb Hammer/30" Drop	Drill Hole Backfill: Neat Cement
Remarks		

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown with gray and orange, moist, medium dense, clayey fine sand (SC)						
				■	D1-1	28	11.0	110	
-8	5		Brown, moist, medium dense, silty fine sand (SM)	■	D1-2	16	18.1	110	
			▽ (groundwater)						
			Brown, wet, medium dense, clayey fine sand (SC)						
-13	10			■	D1-3	33			
-18	15			■	D1-4	31			
			Light brown, wet, very stiff, silty clay (CL)						
			hard drilling						
			Brown, wet, dense, silty fine to medium sand (SM)						
-23	20			■	D1-5	50/6"			%-200 19.9
			Brown/Black, wet, medium dense, poorly graded fine to medium sand with silt (SP-SM)						
-28	25			■	D1-6	37	21.9	101	%-200 7.7

MPE *Mid Pacific Engineering, Inc .* **FIGURE 4**

Project: LUSD Stockton-Lakeview School	LOG OF SOIL BORING D2
Project Location: Regatta Land & Cosumnes Drive, Stockton, CA	
MPE Number: 04434-01	Sheet 1 of 1

Date(s) Drilled	5/3/2019	Logged By	PJP	Checked By	MSO
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	24½ Feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	- 3 Feet
Groundwater Depth [Elevation], feet	8 Feet	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Light brown, slightly moist, very stiff, fine sandy clay (CL/CH)		D2-1	21	7.6	102	
			Dark brown, slightly moist, very stiff, silty clay (CL)		D2-2	23			
-8	5		Brown, slightly moist, medium dense, clayey fine sand (SC)						
			▽ brown/orange/light brown, wet		D2-3	32	15.0	118	%-200 39.2
-13	10								
					D2-4	19	18.8	112	UCC 1.4 tsf
-18	15		Light brown, wet, very stiff, silty clay (CL)						
			Brown, wet, medium dense, silty fine sand (SM)		D2-5	25			
-23	20		Light brown with orange mottling, wet, very stiff, silty clay (CL)						
			Light brown, wet, very stiff, clayey silt (ML)		D2-6	22			
-28	25								

Project: LUSD Stockton-Lakeview School	LOG OF SOIL BORING D3
Project Location: Regatta Land & Cosumnes Drive, Stockton, CA	
MPE Number: 04434-01	Sheet 1 of 1

Date(s) Drilled	5/3/2019	Logged By	PJP	Checked By	MSO
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	26½ Feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	- 3 Feet
Groundwater Depth [Elevation], feet	10 Feet	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE NUMBER	BLOWS PER FOOT	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0–2½	Dark brown, slightly moist, very stiff, silty clay (CL/CH)					UCC 2.3 tsf
	2½–8½	Light brown, moist, medium dense, clayey fine sand (SC)	D3-1	19	14.8	110	TRIAX Φ=26 C=50
-8	5	less clayey	D3-2	20			
	8½–13½	Brown, wet, very stiff, silty clay (CL)					
-13	10	∇ (groundwater)	D3-3	28	17.2	112	UCC 2.2 tsf
	13½–16	Gray, wet, medium dense, clayey fine sand (SC)					
-18	15		D3-4	27			
	16–23	Gray, wet, very stiff, silty clay (CL)					
-23	20	gray/brown, with black and orange mottling, hard slightly sandy	D3-5	45			
	23–26½	Brown, wet, loose, poorly graded fine sand (SP)					
-28	25		D3-6	7	17.0	99	%-200 4.5

MPE Mid Pacific Engineering, Inc .

FIGURE 6

Project: LUSD Stockton-Lakeview School		LOG OF SOIL BORING D4	
Project Location: Regatta Land & Cosumnes Drive, Stockton, CA			
MPE Number: 04434-01		Sheet 1 of 1	

Date(s) Drilled	5/3/2019	Logged By	PJP	Checked By	MSO
Drilling Method	Solid Flight Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole, feet	24½ Feet
Drill Rig Type	CME-75	Diameter(s) of Hole, inches	6 Inches	Approx. Surface Elevation, ft MSL	- 3 Feet
Groundwater Depth [Elevation], feet	8 Feet	Sampling Method(s)	140 Lb Hammer/30" Drop	Drill Hole Backfill	Neat Cement
Remarks					

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	BLOWS PER FOOT	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Dark brown, slightly moist, very stiff, silty clay (CL/CH)						
			light brown	▥	D4-1	19	11.9	110	UCC 2.9 tsf
			less clayey	▥	D4-2	22	27.3	93	UCC 1.8 tsf
-8	5								
			▽ wet	▥					
			Brown, wet, medium dense, silty fine sand (SM)		D4-3	21			
			Light brown, wet, very stiff, silty clay (CL)						
-13	10								
			hard	▥	D4-4	48			
			Brown, wet, dense, silty fine sand (SM)						
-18	15								
			fine to medium sand	▥	D4-5	59	24.3	101	%-200 18.2
-23	20								
			Brown, wet, dense, clayey fine sand (SC)						
			Light brown/Gray, wet, hard, silty clay (CL)	▥	D4-6	50/5"			
			Brown, wet, dense, clayey fine sand (SC)						
-28	25								

LOGS OF TEST PITS

Excavated on: May 2, 2019
Kubota U27 with an 18-inch bucket
Logged by: P. Porata

Test Pit 1

	Stockpile
0' – 1'	Light brown, slightly moist, clayey silt/silty clay (ML/CL-FILL)
1' – 5'	Brown, slightly moist, silty fine sand (SM-FILL)
	slightly clayey with depth
	Native Soil
5' – 5½'	Black/Dark brown, moist, silty clay (CL/CH)

Bottom of Test Pit at 5½ feet.

Test Pit 2

	Stockpile
0' – 1'	Light brown, slightly moist, clayey silt/silty clay (CL/ML-FILL)
1' – 4'	Brown, slightly moist, silty fine sand (SM-FILL)
	Native Soil
4' – 4½'	Black/Dark Brown, moist, silty clay (CL/CH)

Bottom of Test Pit at 4½ feet.

Test Pit 3

	Stockpile
0' – ½'	Light brown, slightly moist, clayey silt/silty clay (ML/CL-FILL)
½' – 4'	Brown, moist, silty fine sand (SM-FILL)
	Native Soil
4' – 6'	Black/Dark brown, moist, silty clay (CL/CH)
6' – 8'	Grayish brown, moist, clayey fine sand (SC)

Bottom of Test Pit at 8 feet.

LOGS OF TEST PITS

Excavated on: May 2, 2019
Kubota U27 with an 18-inch bucket
Logged by: P. Porata

Test Pit 4

	Stockpile
0' – 4½'	Light brown, slightly moist, clayey fine sand (SC-FILL) bricks and PVC pipe encountered
	Native Soil
4½' – 5'	Black/Dark brown, moist, silty clay (CL/CH)
	Bottom of Test Pit at 5 feet.

Test Pit 5

	Stockpile
0' – 6'	Light brown, slightly moist, clayey silt/silty clay (CL/ML-FILL)
	Native Soil
6' – 6½'	Black/Dark brown, moist, silty clay (CL)
	Bottom of Test Pit at 6½ feet.

Test Pit 6

	Stockpile
0' – 1'	Dark brown, slightly moist, clayey silt (ML-FILL)
1' – 5'	Light brown, slightly moist, silty fine sand (SM-FILL)
	Native Soil
5' – 5½'	Black/Dark brown, moist, silty clay (CL/CH)
	Bottom of Test Pit at 5½ feet.

LOGS OF TEST PITS

Excavated on: May 2, 2019
Kubota U27 with an 18-inch bucket
Logged by: P. Porata

Test Pit 7

	Stockpile
0' – 1½'	Light brown, slightly moist, silty fine sand (SM-FILL)
	Native Soil
1½' – 3'	Black/Dark brown, moist, silty clay (CL)
3' – 4'	Brown, moist, silty fine sand (SM)

Bottom of Test Pit at 4 feet.

Test Pit 8

	Stockpile
0' – 5½'	Light brown, slightly moist, clayey fine sand (SC-FILL)
	Native Soil
5½' – 6'	Black/Dark brown, moist, silty clay (CL/CH)

Bottom of Test Pit at 6 feet.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	CODE	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of soil > no. 200 sieve size)	GRAVELS (More than 50% of coarse fraction > no. 4 sieve size)	GW		Well graded gravels or gravel - sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel - sand mixtures, little or no fines
		GM		Silty gravels, gravel - sand - silt mixtures
		GC		Clayey gravels, gravel - sand - silt mixtures
	SANDS (50% or more of coarse fraction < no. 4 sieve size)	SW		Well graded sands or gravelly sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand - silt mixtures
		SC		Clayey sands, sand clay mixtures
FINE GRAINED SOILS (More than 50% of soil < no. 200 sieve size)	SILTS & CLAYS LL< 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL		Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays
		OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL ≥ 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils
ROCK		RX		Rocks, weathered to fresh
FILL		FILL		Artificially placed fill material

OTHER SYMBOLS

= Drive Sample: 2-1/2" O.D. Modified California sampler

= Hand Driven Sample

=SPT Sampler

= Initial Water Level

= Final Water Level

= Estimated or gradational material change line

= Observed material change line

Laboratory Tests

- PI = Plasticity Index
- EI =Expansive Index
- UCC = Unconfined Compression Test
- TR = Triaxial Compression Test
- GR = Gradation Analysis (Sieve)
- K = Permeability Test

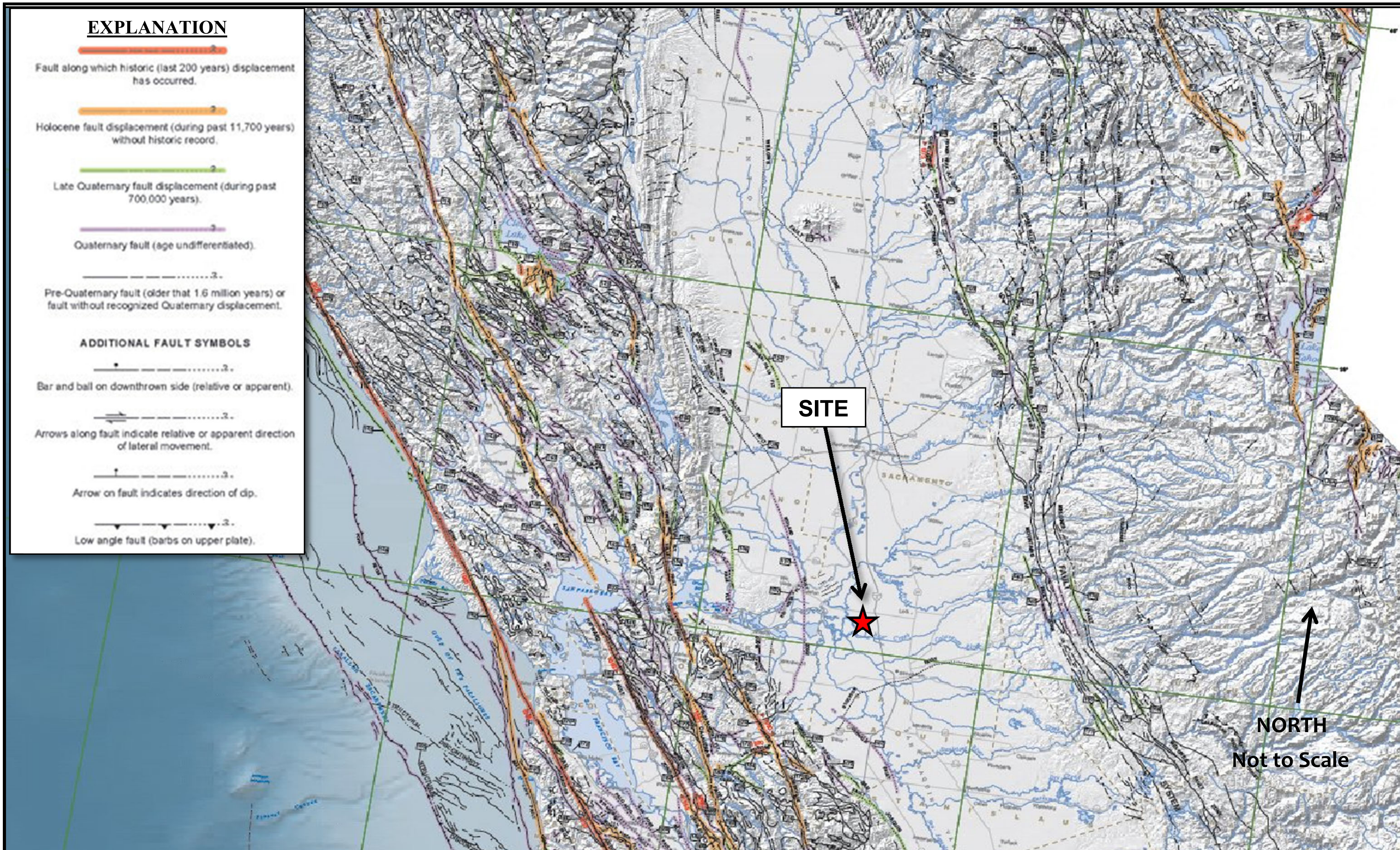
GRAIN SIZE CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse (c) fine (f)	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse (c) Medium (m) fine (f)	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

Mid Pacific Engineering, Inc.

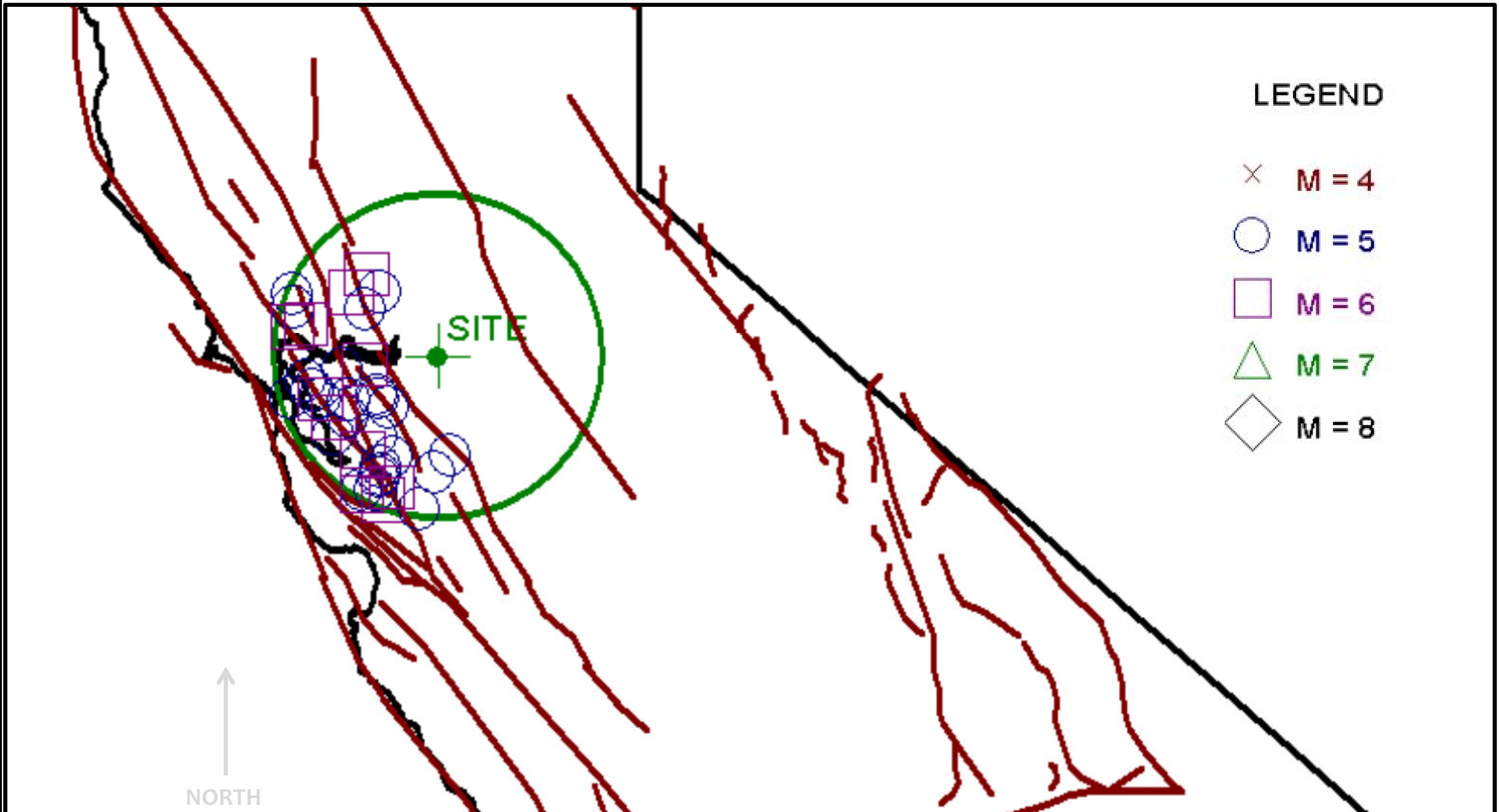
UNIFIED SOIL CLASSIFICATION SYSTEM
LUSD STOCKTON-LAKEVIEW SHCOOL
Regatta Lane and Cosumnes Drive
Stockton, California

FIGURE 11
Date: 08/19
MPE No. 04434-01



Adapted from: *Fault Activity Map of California 2010.* California Geological Survey, Geologic Data Map No. 6. Compilation and Interpretation by C.W. Jennings and W.A. Bryant

MPE MID PACIFIC ENGINEERING, INC.	**REGIONAL FAULT MAP** **LUSD STOCKTON – LAKEVIEW SCHOOL** Regatta Lane and Cosumnes Drive Stockton, California	**FIGURE 13** Date: 08/19 MPE No. 04434-01



NOTES:

1. Epicenter map presents earthquake magnitudes 5 and greater within 100 km radius.

MPE
MID PACIFIC ENGINEERING, INC.

EARTHQUAKE EPICENTER MAP

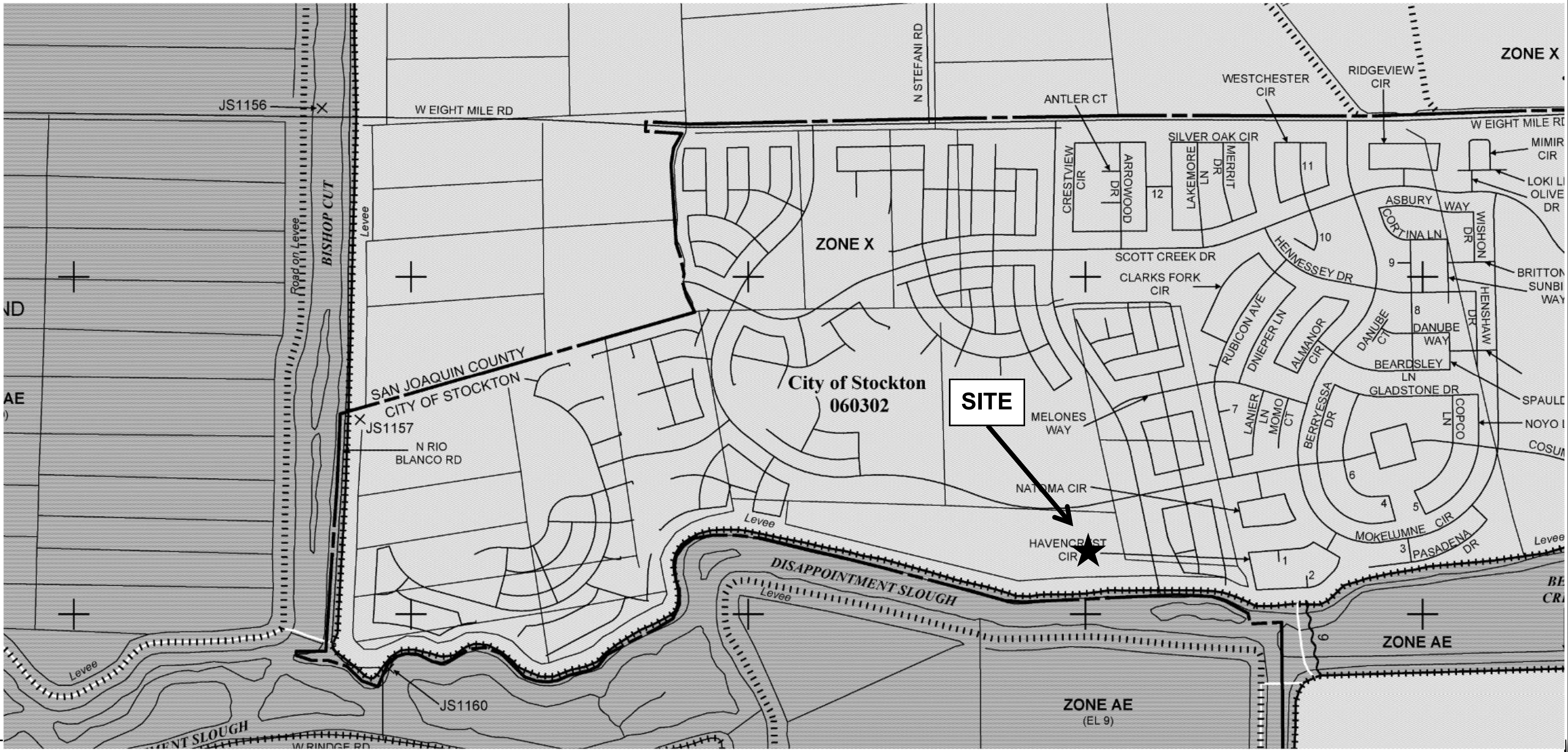
LUSD STOCKTON – LAKEVIEW SCHOOL

Regatta Lane and Cosumnes Drive
Stockton, California

FIGURE 14

Date: 08/19

MPE No. 04434-01



FLOOD HAZARDS

ZONE X – Site shown as being protected from the 1-percent chance flood hazard by a levee system.
Overtopping or failure of any levee system is possible.

ZONE AE – Base Flood Elevations Determined

N

Not to Scale

Adapted from: Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM), Map Number 06077C0295F, dated October 16, 2009

MPE
MID PACIFIC ENGINEERING, INC.

FEMA FLOOD MAP

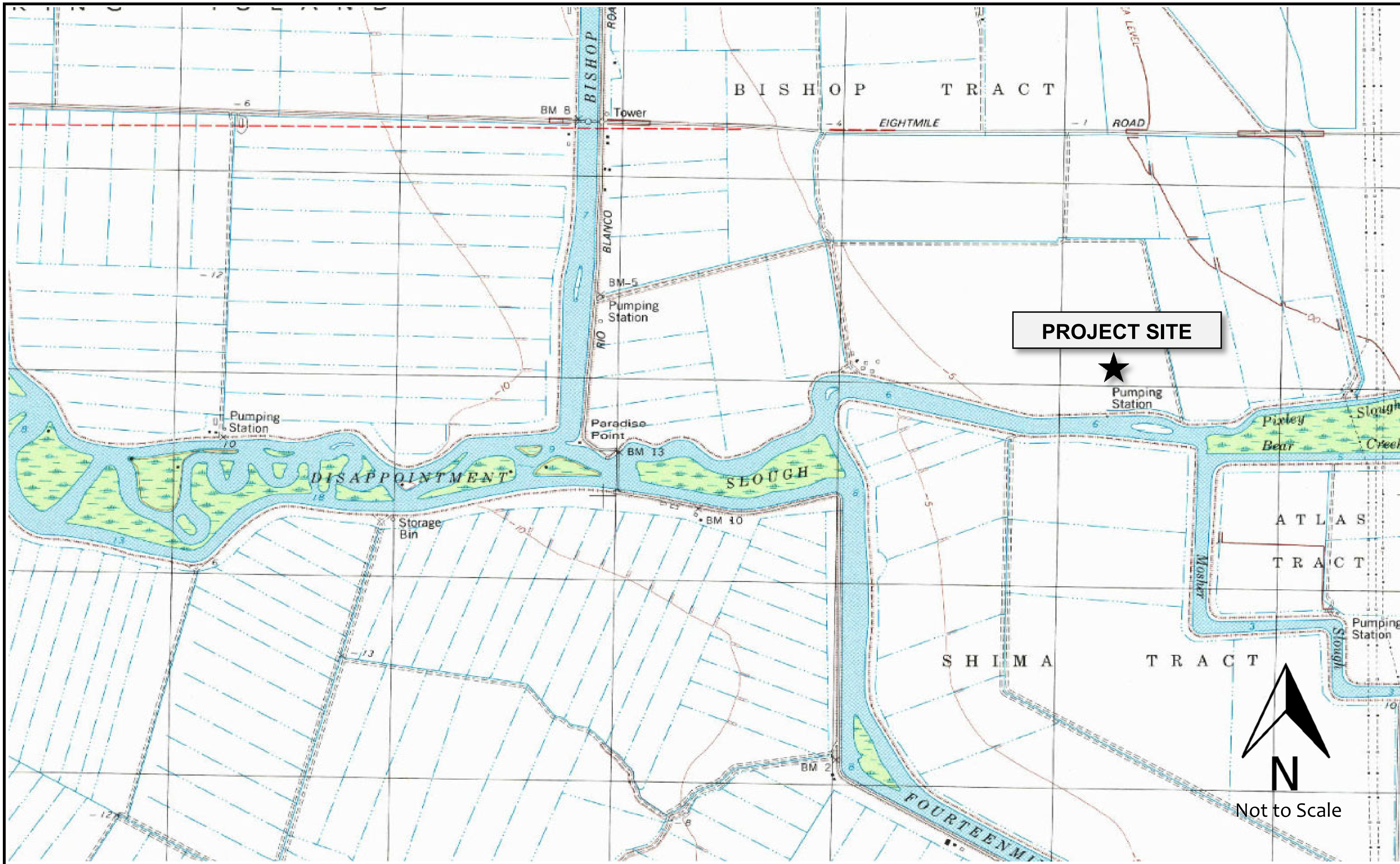
LUSD STOCKTON – LAKEVIEW SCHOOL

Regatta Lane and Cosumnes Drive
Stockton, California

FIGURE 15

Date: 08/19

MPE No. 04434-01



NOTES: Adapted from USGS National Topographic Map, *Terminous Quadrangle, California – San Joaquin County,* 7.5-Minute Series, 1997.

MPE
MID PACIFIC ENGINEERING, INC.

VICINITY MAP

LUSD STOCKTON-LAKEVIEW SCHOOL

Regatta Lane and Cosumnes Drive

Stockton, California

FIGURE 1

Date: 08/19

MPE No. 04434-01

APPENDICES

APPENDIX A

APPENDIX A

A. GENERAL INFORMATION

The performance of a Preliminary Geologic Hazards and Geotechnical Engineering Investigation for the proposed improvements at the site located southwest of the intersection of Regatta Lane and Cosumnes Drive in Stockton, California, was authorized by the Vickie Brum with the Lodi Unified School District. Authorization was for an investigation as described in our proposal letter of April 10, 2019, sent to our client, Lodi Unified School District (c/o Petralogix Engineering, Inc.), whose mailing address is 26675 Bruella Road, Galt, California 95687; telephone (209) 331-7223.

B. FIELD EXPLORATION

A total of four soil borings and eight test pits were drilled/excavated at the approximate locations indicated on Figure 3.

The drilled soil borings utilized a CME-55 truck-mounted drill rig equipped with eight-inch diameter, hollow-stem helical flight augers. The borings were drilled to maximum depths of approximately 14 to 25 feet below existing site grades. Exploratory test pits were excavated to a maximum depth of approximately 8 feet below existing site grades using a Kubota U27 Mini-Excavator equipped with a 18-inch wide bucket

In addition, two Cone Penetration Test (CPT) soundings were performed at the approximate locations indicated on Figure 3, utilizing a 25-ton truck-mounted CPT rig to a maximum depth of approximately 50 feet below existing site grades.

At various intervals, relatively undisturbed soil samples were recovered from the drilled soil borings with a 2½-inch O.D., 2-inch I.D. Modified California sampler (ASTM D3550) driven by an automatic 140-pound hammer freely falling 30 inches. The number of blows of the hammer required to drive the 18-inch long sampler each 6-inch interval was recorded with the sum of the blows required to drive the sampler the lower 12-inch interval being designated the penetration resistance or "blow count" for that particular drive.

The samples obtained with the modified California sampler were retained in 2-inch diameter by 6-inch long, thin-walled brass tubes contained within the sampler. Immediately after recovery, the field engineer visually classified the soil in the tubes and the ends of the tubes were sealed to preserve the natural moisture contents. Disturbed bulk samples of the surface materials also were obtained at various locations and depths. At various elevations, bulk samples of the near-surface soils and geologic materials were collected from our excavations. Soil samples were taken to our laboratory for additional classification (ASTM D2488) and selection of samples for testing.

The Logs of Soil Borings and Test Pits, Figures 4 through 10, contain descriptions of the soils encountered in each boring and excavation. A Legend explaining the Unified Soil Classification System and the symbols used on the logs is contained on Figure 11. The results of the CPT soundings are attached in Appendix C.

C. LABORATORY TESTING

Selected undisturbed samples of the soils were tested to determine dry unit weight (ASTM D2937), natural moisture content (ASTM D2216), direct shear testing (ASTM D3080) and percent passing the 200 sieve (ASTM D1140). The results of these tests are included on the boring logs at the depth each sample was obtained.

Two bulk samples of the near-surface and stockpile soils were subjected to Expansion Index testing (ASTM D4829). The results of this testing are presented on Figure A1 and A2.

Four bulk samples of the anticipated native pavement subgrade soils and existing stockpile soils were subjected to Resistance ("R-") value testing, which were used in the pavement design, are presented on Figures A3 through A6.

Three samples of near-surface soils were submitted to Sunland Analytical in Rancho Cordova, California, for corrosivity testing in accordance with No. 643 (Modified Small Cell), CT 532, CT 422, and CT 417. The analytical results are presented in the text of the report.

/

EXPANSION INDEX TEST RESULTS

(ASTM D4829)
(UBC 18-2)

Material Description: Black/Dark brown, silty clay (CL/CH)
Location: TP3 @ 4'

Sample Number	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
TP3 @ 4'	11.6	28.5	100	106

CLASSIFICATION OF EXPANSIVE SOIL

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

MPE	**EXPANSION INDEX TEST RESULTS** **LUSD STOCKTON-LAKEVIEW SHCOOL** Regatta Lane and Cosumnes Drive Stockton, California	**FIGURE A1** Date: 05/19 MPE No. 04434-01

EXPANSION INDEX TEST RESULTS
(ASTM D4829)
(UBC 18-2)

Material Description: Light brown, clayey fine sand (SC)
Location: TP4 @ 1'-2'

Sample Number	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
TP4 @ 1'-2'	9.3	18.2	112	32

CLASSIFICATION OF EXPANSIVE SOIL

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

MPE

EXPANSION INDEX TEST RESULTS
LUSD STOCKTON-LAKEVIEW SHCOOL
Regatta Lane and Cosumnes Drive
Stockton, California

FIGURE A2
Date: 08/19
MPE No. 04434-01

RESISTANCE VALUE TEST RESULTS
(California Test 301)

Material Description: Light brown, clayey fine sand (SC)

Location: Stockpile: TP4 (1' – 2')

Specimen No.	Dry Unit Weight (pcf)	Moisture at Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (psf)	R-Value
1	121.9	12.5	761	173	56
2	114.0	15.4	222	48	26
3	117.4	13.5	206	65	31
4	119.5	13.0	406	78	46

R-value at 300 psi exudation pressure = 36

RESISTANCE VALUE TEST RESULTS
(California Test 301)

Material Description: Black/Dark brown, silty clay (CL/CH)

Location: Native: TP3 @ 4'

Specimen No.	Dry Unit Weight (pcf)	Moisture at Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (psf)	R-Value
1		22.6	421		

Sample Extruded During Test, R-Value = 5

MPE	RESISTANCE VALUE TEST RESULTS **LUSD STOCKTON-LAKEVIEW SCHOOL** Regatta Lane and Cosumnes Drive Stockton, California	FIGURE A4 Date: 08/19 MPE No. 04434-01

RESISTANCE VALUE TEST RESULTS
(California Test 301)

Material Description: Light Brown, silty fine sand (SM), with 4% lime by dry weight

Location: Stockpile: TP6 (1' - 2')

Specimen No.	Dry Unit Weight (pcf)	Moisture at Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (psf)	R-Value
1	111.2	14.9	443	9	90
2	108.7	17.8	189	17	68
3	110.8	16.6	263	9	80
4	110.8	16.3	245	22	83

R-value at 300 psi exudation pressure = 82

MPE

RESISTANCE VALUE TEST RESULTS

LUSD STOCKTON-LAKEVIEW SCHOOL

Regatta Lane and Cosumnes Drive
Stockton, California

FIGURE A5

Date: 08/19

MPE No. 04434-01

APPENDIX B

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*    E Q F A U L T   *
*                    *
*    Version 3.00    *
*                    *
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DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 04434-01

DATE: 06-19-2019

JOB NAME: LUSD-STOCKTON

CALCULATION NAME: NEHRP D

FAULT-DATA-FILE NAME: C:\Program Files\EQFAULT1\CGSFLTE.DAT

SITE COORDINATES:
   SITE LATITUDE: 38.0467
   SITE LONGITUDE: 121.3919

SEARCH RADIUS: 62 mi

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   DISTANCE MEASURE: cd_2drp
   SCOND: 0
   Basement Depth: 2.00 km   Campbell SSR: Campbell SHR:
   COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: C:\Program Files\EQFAULT1\CGSFLTE.DAT

MINIMUM DEPTH VALUE (km): 0.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

Page 1

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
GREAT VALLEY 5	19.5(31.4)	6.5	0.148	VIII
GREAT VALLEY 7	22.7(36.6)	6.7	0.147	VIII
MOUNT DIABLO (MTD)	25.7(41.4)	6.7	0.130	VIII
GREENVILLE (GN)	26.3(42.4)	6.7	0.106	VII
GREENVILLE (GS+GN)	29.0(46.7)	6.9	0.114	VII
GREENVILLE (GS)	29.0(46.7)	6.6	0.095	VII
GREENVILLE (FLOATING)	29.0(46.7)	6.2	0.077	VII
FOOTHILLS FAULT SYSTEM 1	31.4(50.5)	6.5	0.103	VII
GREAT VALLEY 4	32.2(51.9)	6.6	0.106	VII
CONCORD/GV (CON+GVS)	34.1(54.8)	6.6	0.083	VII
CONCORD/GV (FLOATING)	34.1(54.8)	6.2	0.068	VI
CONCORD/GV (CON+GVS+GVN)	34.1(54.8)	6.7	0.089	VII

CONCORD/GV (CON)	34.1(54.8)	6.3	0.070	VI
CALAVERAS (CS+CC+CN)	37.1(59.7)	6.9	0.094	VII
CALAVERAS (FLOATING)	37.1(59.7)	6.2	0.064	VI
CALAVERAS (CN)	37.1(59.7)	6.8	0.086	VII
CALAVERAS (CC+CN)	37.1(59.7)	6.2	0.065	VI
CONCORD/GV (GVS)	37.3(60.0)	6.2	0.065	VI
CONCORD/GV (GVS+GVN)	37.3(60.0)	6.5	0.073	VII
FOOTHILLS FAULT SYSTEM 2	40.0(64.4)	6.5	0.086	VII
CONCORD/GV (GVN)	43.6(70.1)	6.0	0.051	VI
GREAT VALLEY 8	44.2(71.1)	6.6	0.084	VII
FOOTHILLS FAULT SYSTEM 3	44.5(71.6)	6.5	0.079	VII
HAYWARD (FLOATING)	45.3(72.9)	6.9	0.079	VII
HAYWARD (HS+HN+RC)	45.3(72.9)	7.3	0.095	VII
HAYWARD (HS)	45.3(72.9)	6.7	0.070	VI
HAYWARD (HS+HN)	45.3(72.9)	6.9	0.079	VII
WEST NAPA	47.1(75.8)	6.5	0.062	VI
HAYWARD (HN+RC)	47.2(75.9)	7.1	0.085	VII
HAYWARD (HN)	47.2(75.9)	6.5	0.062	VI
CALAVERAS (CS+CC)	47.3(76.1)	6.4	0.057	VI
CALAVERAS (CC)	47.3(76.1)	6.2	0.054	VI
CALAVERAS (CS+CC FLOATING)	47.3(76.1)	6.2	0.053	VI
HUNTING CREEK - BERRYESSA	52.0(83.7)	7.1	0.079	VII
ORTIGALITA	54.0(86.9)	7.1	0.077	VII
GREAT VALLEY 3	54.6(87.8)	6.9	0.083	VII
HAYWARD (RC)	56.8(91.4)	7.0	0.070	VI

****

-END OF SEARCH- 37 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE GREAT VALLEY 5 FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 19.5 MILES (31.4 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.1482 g

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*    E Q S E A R C H    *
*                       *
*     Version 3.00      *
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 04434-01

DATE: 06-19-2019

JOB NAME: LUSD-STOCKTON

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:
MINIMUM MAGNITUDE: 5.00
MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:
SITE LATITUDE: 38.0467
SITE LONGITUDE: 121.3919

SEARCH DATES:
START DATE: 1800
END DATE: 2018

SEARCH RADIUS:
62.0 mi
99.8 km

ATTENUATION RELATION: 3) Boore et al. (1997) Horiz. - NEHRP D (250)
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
ASSUMED SOURCE TYPE: BT [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
SCOND: 0 Depth Source: A
Basement Depth: 2.00 km Campbell SSR: Campbell SHR:
COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 0.0

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
BRK	37.7600	121.7300	01/27/1980	23336.0	0.0	5.40	0.065	VI	27.0(43.5)
BRK	37.8100	121.7900	01/24/1980	19 1 2.0	0.0	5.10	0.055	VI	27.1(43.7)
BRK	37.8300	121.8100	01/24/1980	19 0 9.0	0.0	5.80	0.080	VII	27.2(43.8)
DMG	38.0000	121.9000	05/19/1889	1110 0.0	0.0	6.00	0.087	VII	27.8(44.8)
DMG	38.3000	121.9000	05/19/1902	1831 0.0	0.0	5.50	0.059	VI	32.7(52.5)
DMG	38.4000	121.8000	04/30/1892	0 9 0.0	0.0	5.50	0.059	VI	32.9(53.0)
DMG	37.9700	122.0500	10/24/1955	41044.0	0.0	5.40	0.052	VI	36.2(58.2)
DMG	37.8000	122.0000	07/04/1861	011 0.0	0.0	5.60	0.056	VI	37.2(59.9)
DMG	37.6000	121.8000	06/11/1903	1312 0.0	0.0	5.50	0.053	VI	38.0(61.2)
DMG	37.5000	121.3000	07/15/1866	630 0.0	0.0	5.80	0.061	VI	38.1(61.3)
DMG	37.7000	122.0000	03/05/1864	1649 0.0	0.0	5.70	0.055	VI	40.9(65.8)
DMG	38.4000	122.0000	04/19/1892	1050 0.0	0.0	6.40	0.080	VII	41.0(66.0)
DMG	38.5000	121.9000	04/21/1892	1743 0.0	0.0	6.20	0.071	VI	41.7(67.1)

GSB	37.4830	121.6900	03/31/1986	115540.0	8.0	5.70	0.054	VI	42.2(67.9)
DMG	37.4000	121.4000	04/10/1881	10 0 0.0	0.0	5.90	0.057	VI	44.6(71.9)
DMG	37.7000	122.1000	10/21/1868	1553 0.0	0.0	6.80	0.091	VII	45.4(73.1)
DMG	37.5000	121.9000	11/26/1858	835 0.0	0.0	6.10	0.061	VI	46.8(75.4)
GSB	37.4340	121.7740	10/31/2007	030454.8	10.0	5.50	0.044	VI	47.2(75.9)
DMG	37.8000	122.2000	07/31/1889	1247 0.0	0.0	5.20	0.038	V	47.2(75.9)
DMG	37.8000	122.2000	06/10/1836	1530 0.0	0.0	6.80	0.088	VII	47.2(75.9)
MGI	37.8500	122.2500	09/10/1935	2355 0.0	0.0	5.00	0.033	V	48.7(78.3)
DMG	37.6000	122.1000	05/21/1864	2 1 0.0	0.0	5.30	0.039	V	49.4(79.5)
GSB	37.3850	121.7720	06/13/1988	014536.8	7.0	5.40	0.040	V	50.2(80.8)
DMG	37.9000	122.3000	04/02/1870	1948 0.0	0.0	5.30	0.038	V	50.4(81.2)
DMG	37.3700	121.7800	09/05/1955	2 118.0	0.0	5.50	0.042	VI	51.3(82.6)
GSB	38.2152	122.3123	08/24/2014	102044.1	11.1	6.02	0.055	VI	51.3(82.6)
GSB	37.3200	121.6980	04/24/1984	211519.0	8.0	6.20	0.059	VI	52.9(85.1)
DMG	38.2000	122.4000	03/31/1898	743 0.0	0.0	6.20	0.056	VI	55.8(89.7)
DMG	37.3000	121.8000	01/02/1891	20 0 0.0	0.0	5.50	0.039	V	56.2(90.4)
DMG	37.3000	121.8000	08/03/1903	649 0.0	0.0	5.50	0.039	V	56.2(90.4)
DMG	38.3000	122.4000	10/12/1891	628 0.0	0.0	5.50	0.038	V	57.4(92.4)
MGI	37.8000	122.4000	05/15/1851	1610 0.0	0.0	5.00	0.029	V	57.5(92.5)
MGI	37.8000	122.4000	10/05/1859	2016 0.0	0.0	5.00	0.029	V	57.5(92.5)
DMG	37.2500	121.7500	07/01/1911	22 0 0.0	0.0	6.60	0.067	VI	58.4(94.0)
DMG	37.3000	121.9000	10/08/1865	2046 0.0	0.0	6.30	0.057	VI	58.6(94.2)
MGI	37.3000	121.9000	05/28/1927	1739 0.0	0.0	5.00	0.029	V	58.6(94.2)
DMG	37.2000	121.5000	07/06/1899	2010 0.0	0.0	5.80	0.044	VI	58.8(94.6)
GSB	38.3790	122.4130	09/03/2000	083630.1	10.0	5.00	0.028	V	60.0(96.5)

****

-END OF SEARCH- 38 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2018

LENGTH OF SEARCH TIME: 219 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 27.0 MILES (43.5 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 6.8

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.091 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
  a-value= 0.340
  b-value= 0.248
  beta-value= 0.572

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	38	0.17352
4.5	38	0.17352
5.0	38	0.17352
5.5	26	0.11872
6.0	11	0.05023
6.5	3	0.01370

APPENDIX C

T A B L E O F C O N T E N T S

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

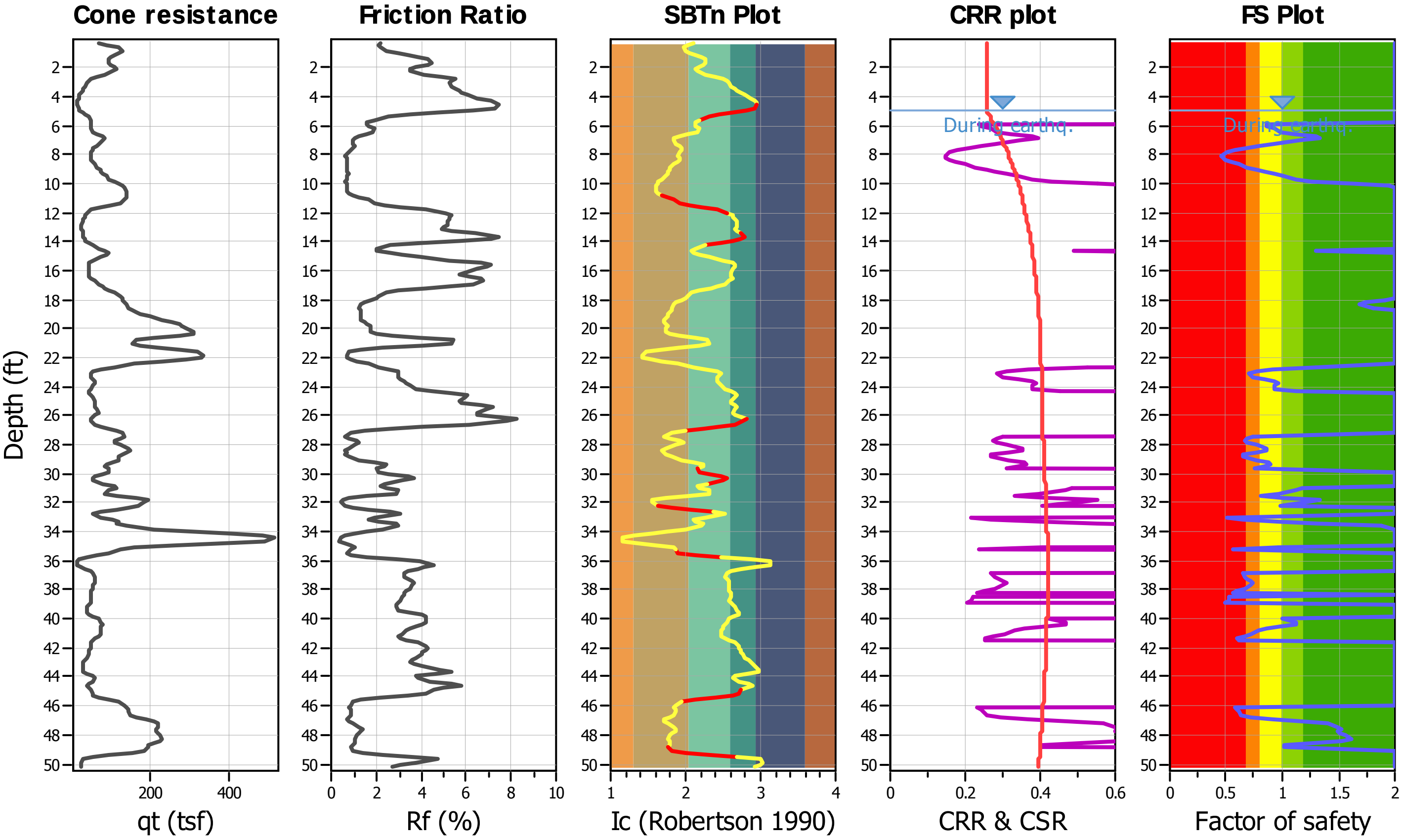
LIQUEFACTION ANALYSIS REPORT

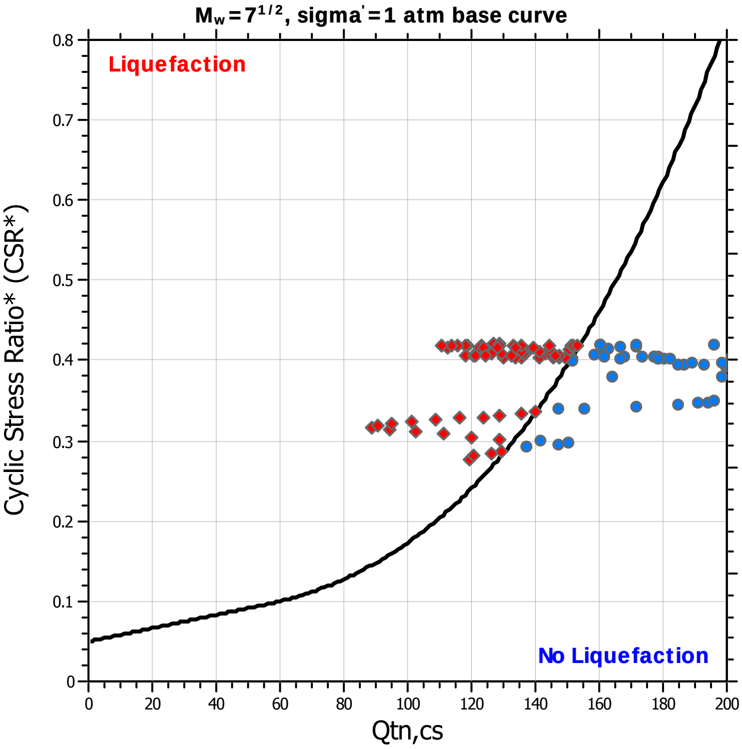
Project title : **Location :**

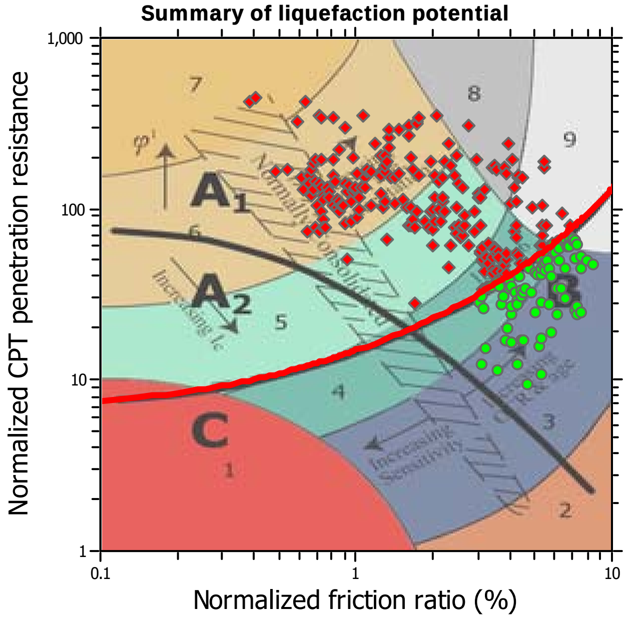
CPT file : CPT-01

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	5.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.38	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

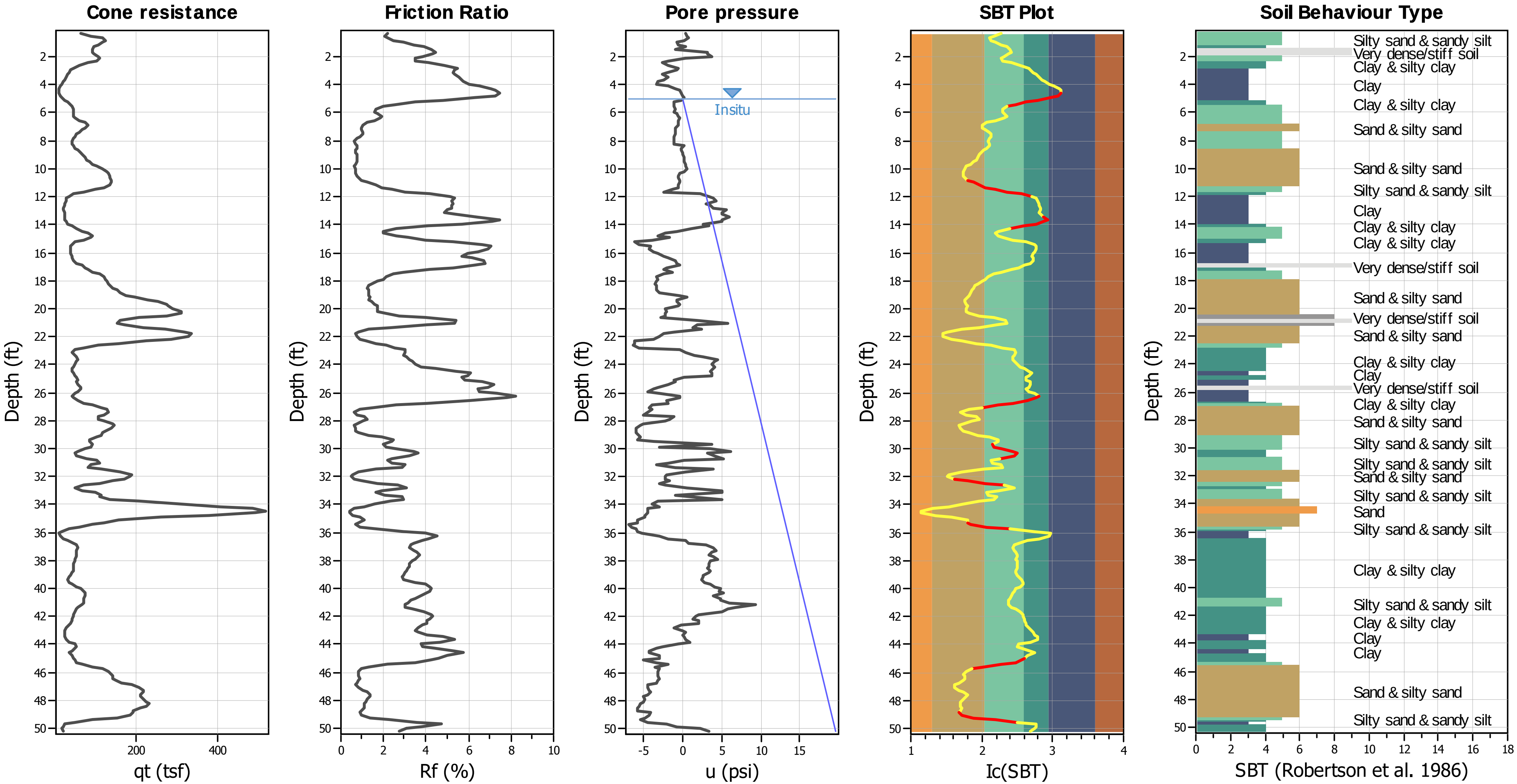






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



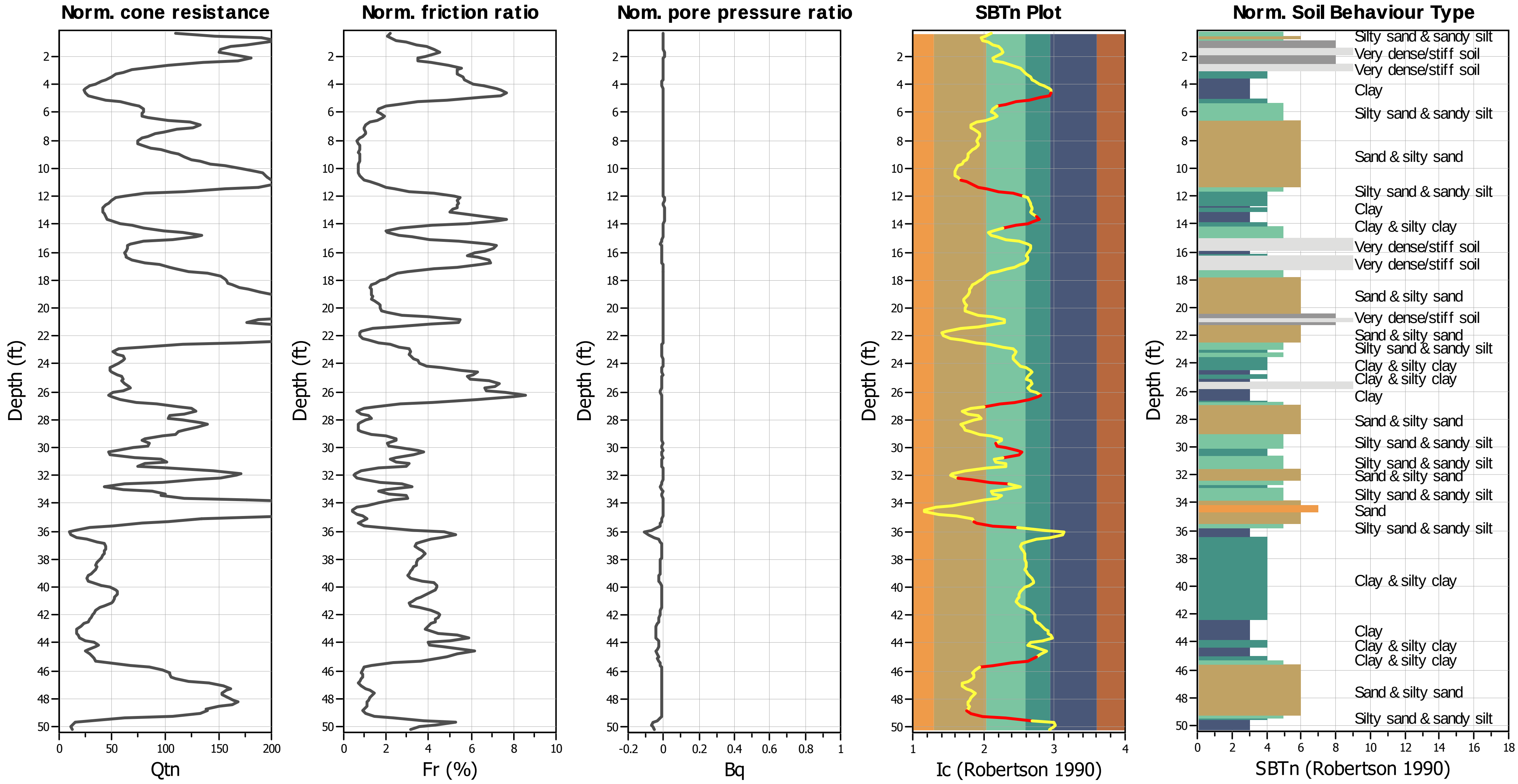
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CPT basic interpretation plots (normalized)



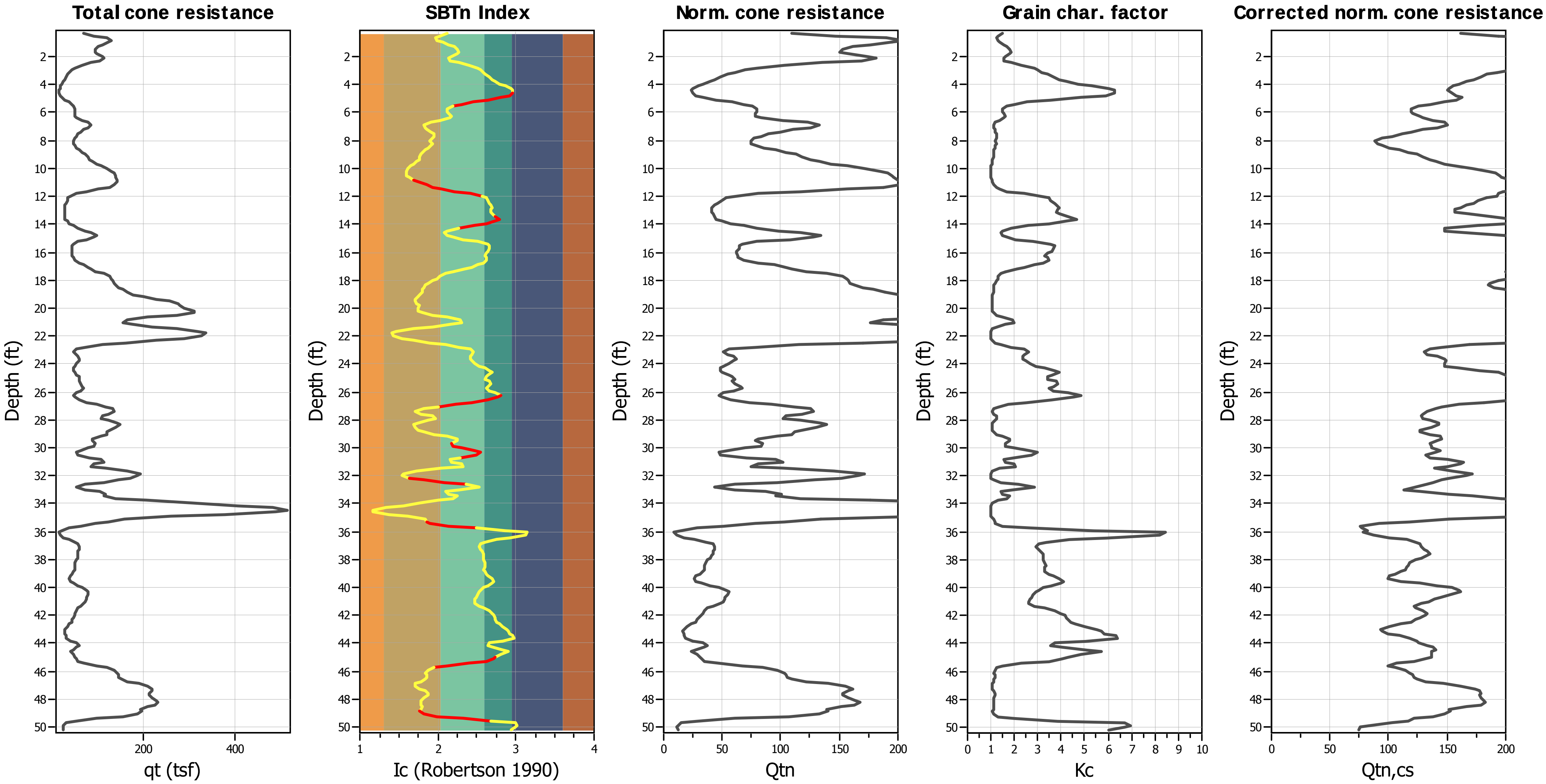
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

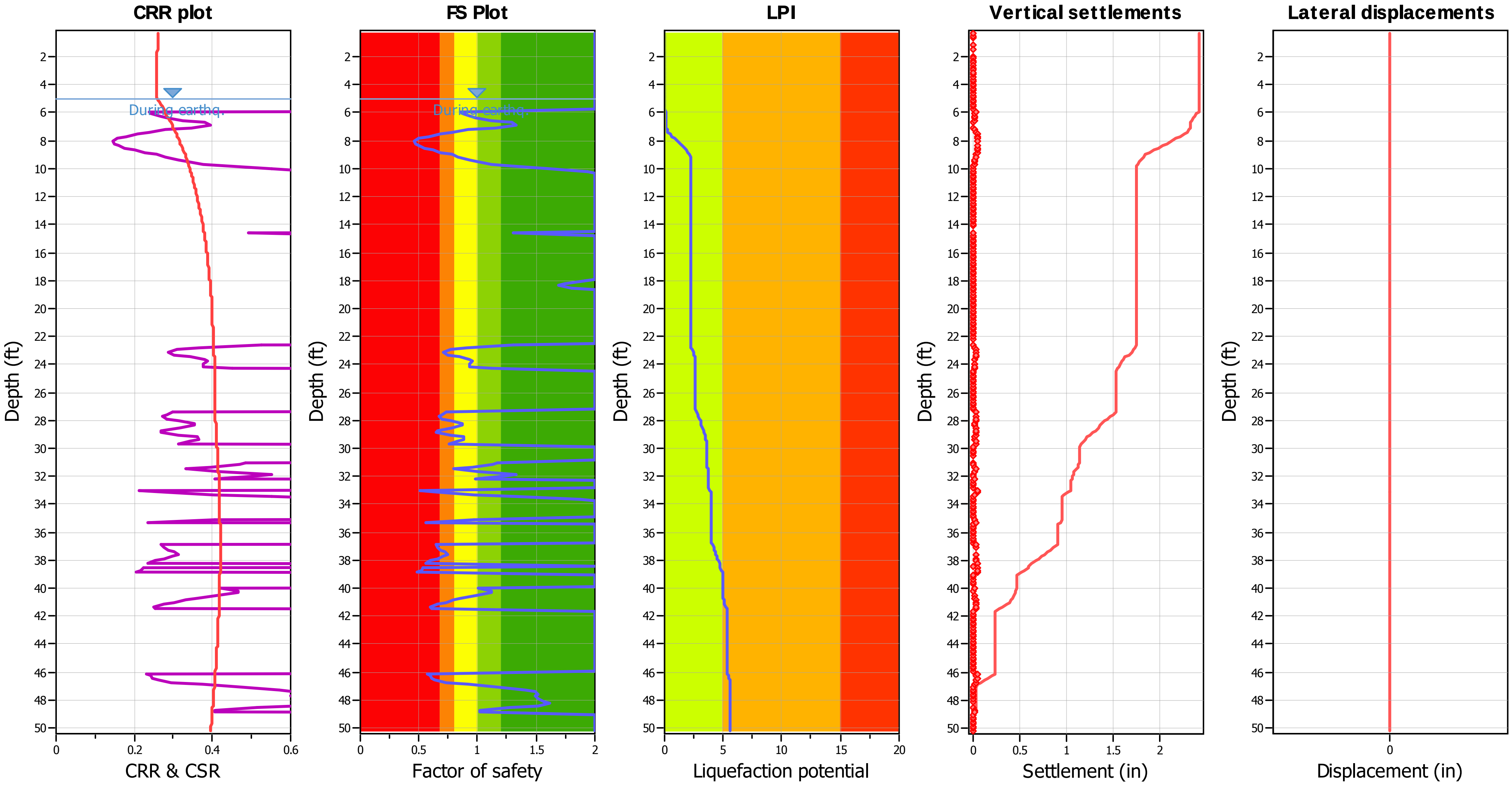
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

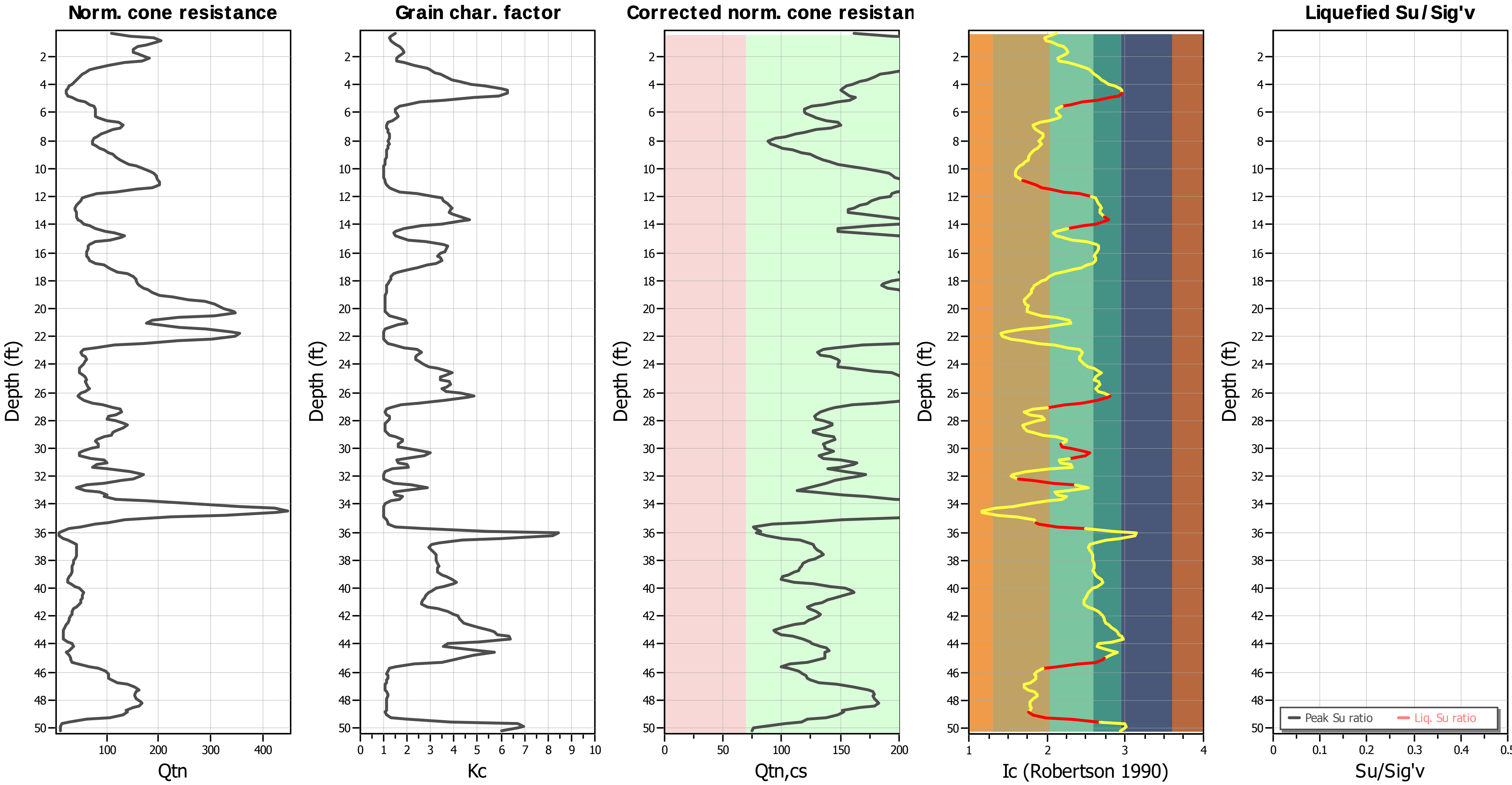
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

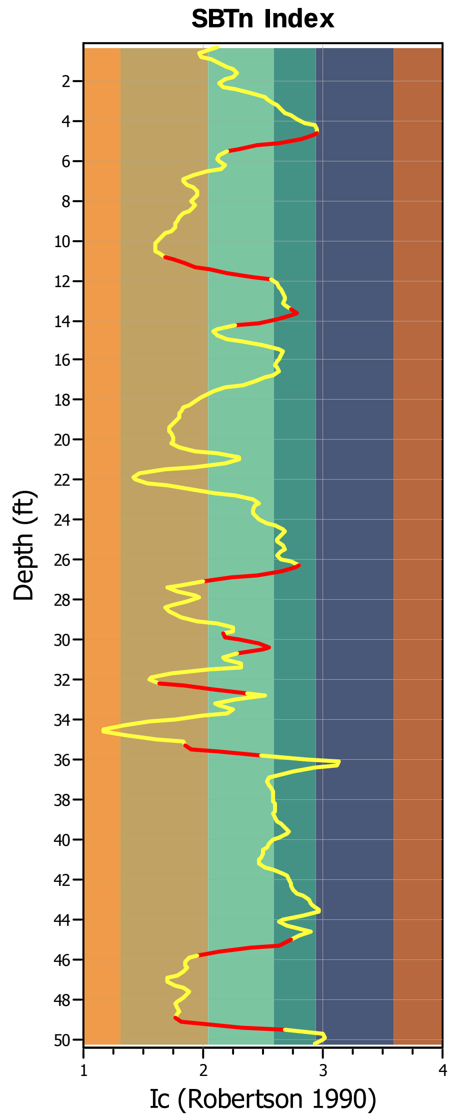
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

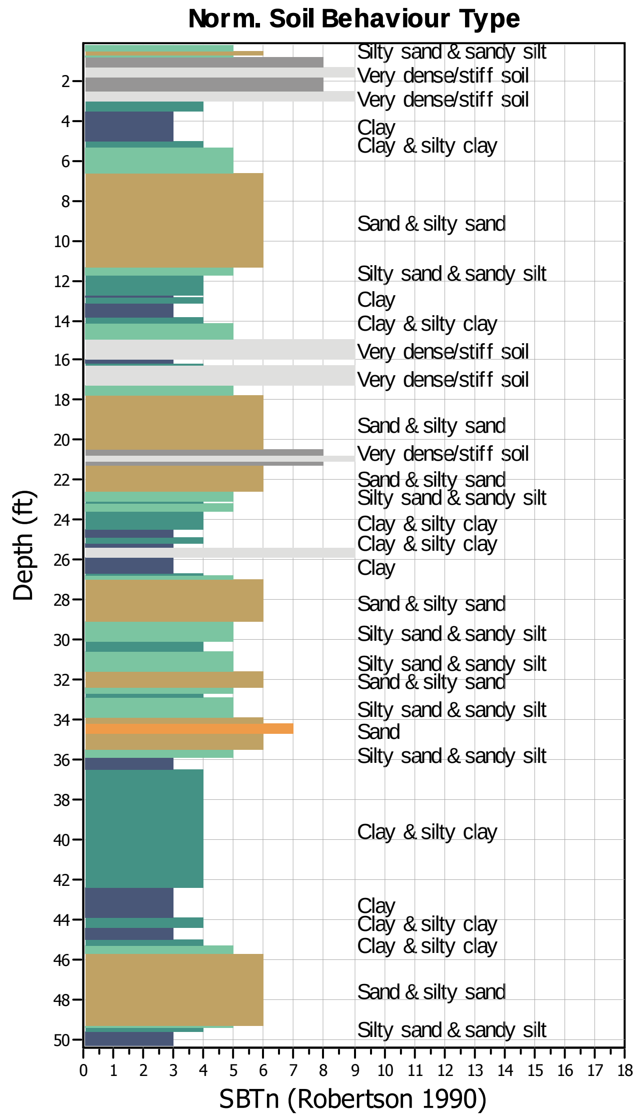
TRANSITION LAYER DETECTION ALGORITHM REPORT
Summary Details & Plots

Short description

The software will delete data when the cone is in transition from either clay to sand or vise-versa. To do this the software requires a range of I_c values over which the transition will be defined (typically somewhere between 1.80 < I_c < 3.0) and a rate of change of I_c. Transitions typically occur when the rate of change of I_c is fast (i.e. delta I_c is small).

The SBT_n plot below, displays in red the detected transition layers based on the parameters listed below the graphs.





Transition layer algorithm properties		**General statistics**	
I_c minimum check value:	1.70	Total points in CPT file:	305
I_c maximum check value:	3.00	Total points excluded:	54
I_c change ratio value:	0.0250	Exclusion percentage:	17.70%
Minimum number of points in layer:	4	Number of layers detected:	10

Transition layer No	Number of points	Depth	SBT_n number	SBT_n description
Transition layer 1	7	Start depth: 4.76 (ft)	3	Clay
		End depth: 5.74 (ft)	5	Silty sand & sandy silt
Transition layer 2	8	Start depth: 10.99 (ft)	6	Sand & silty sand
		End depth: 12.14 (ft)	4	Clay & silty clay
Transition layer 3	6	Start depth: 13.62 (ft)	3	Clay
		End depth: 14.44 (ft)	5	Silty sand & sandy silt
Transition layer 4	6	Start depth: 26.41 (ft)	3	Clay
		End depth: 27.23 (ft)	6	Sand & silty sand
Transition layer 5	4	Start depth: 29.86 (ft)	5	Silty sand & sandy silt
		End depth: 30.35 (ft)	4	Clay & silty clay
Transition layer 6	4	Start depth: 30.35 (ft)	4	Clay & silty clay
		End depth: 30.84 (ft)	5	Silty sand & sandy silt
Transition layer 7	4	Start depth: 32.32 (ft)	6	Sand & silty sand
		End depth: 32.81 (ft)	4	Clay & silty clay
Transition layer 8	4	Start depth: 35.43 (ft)	6	Sand & silty sand
		End depth: 35.93 (ft)	3	Clay
Transition layer 9	6	Start depth: 45.11 (ft)	4	Clay & silty clay
		End depth: 45.93 (ft)	6	Sand & silty sand
Transition layer 10	5	Start depth: 49.05 (ft)	6	Sand & silty sand
		End depth: 49.71 (ft)	3	Clay

Start depth: Depth where the transition layer begins
End depth: Depth where the transition layer ends

:: Field input data ::

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	0.33	54.10	1.20	0.30	16.24	123.36
2	0.49	95.40	2.00	0.50	13.44	125.97
3	0.66	123.80	2.50	0.70	12.10	129.00
4	0.82	136.20	3.40	0.10	12.61	130.53
5	0.98	122.90	3.60	-0.70	14.67	131.36
6	1.15	106.10	3.80	-0.60	17.03	131.44
7	1.31	100.70	3.90	0.40	19.23	131.47
8	1.48	94.20	4.00	-0.90	20.86	131.65
9	1.64	90.50	4.30	3.20	21.61	131.84
10	1.80	96.30	4.30	3.10	20.69	132.09
11	1.97	109.10	4.20	3.80	18.36	132.09
12	2.13	119.90	3.90	0.30	17.02	131.82
13	2.30	109.50	3.70	-1.80	17.70	131.20
14	2.46	85.90	3.50	-2.60	21.52	130.18
15	2.62	57.20	3.20	-1.80	26.56	128.77
16	2.79	49.20	2.70	-0.50	31.26	127.15
17	2.95	42.60	2.30	-0.80	32.56	125.55
18	3.12	37.70	1.90	-2.10	34.17	124.21
19	3.28	33.40	1.80	-2.60	35.85	123.16
20	3.45	30.60	1.70	-1.90	38.08	122.50
21	3.61	27.90	1.60	-2.50	40.01	121.65
22	3.77	24.50	1.40	-3.20	42.07	120.74
23	3.94	22.20	1.30	-3.40	45.42	119.67
24	4.10	17.80	1.20	-1.80	49.32	118.73
25	4.27	15.70	1.10	-0.90	53.91	117.95
26	4.43	14.60	1.10	-0.30	55.47	117.60
27	4.59	15.30	1.10	-0.20	55.69	118.09
28	4.76	16.80	1.30	0.00	53.35	118.71
29	4.92	18.80	1.30	0.20	46.58	119.81
30	5.09	27.70	1.40	-0.20	37.18	120.49
31	5.25	37.20	1.30	-1.10	28.65	120.78
32	5.41	44.70	1.10	-1.20	22.76	120.15
33	5.58	47.70	0.90	-1.10	18.89	119.19
34	5.74	50.30	0.80	-1.00	16.59	118.16
35	5.91	50.80	0.70	-1.20	16.41	118.18
36	6.07	49.20	0.90	-0.80	17.08	118.45
37	6.23	48.00	0.90	-0.50	18.41	119.24
38	6.40	49.00	1.00	-0.40	17.24	119.69
39	6.56	60.70	1.00	-0.60	13.88	120.42
40	6.73	82.60	1.00	-0.60	10.59	120.63
41	6.89	88.50	0.90	-0.60	8.75	120.01
42	7.05	79.00	0.70	-0.90	8.76	118.97
43	7.22	68.40	0.70	-1.00	9.57	117.65
44	7.38	61.40	0.60	-0.90	10.93	117.00
45	7.55	56.30	0.60	-1.00	11.61	115.95
46	7.71	51.70	0.50	-1.10	11.55	114.34
47	7.87	48.30	0.30	-1.10	11.04	112.41
48	8.04	46.20	0.30	-1.10	10.41	110.85

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	8.20	46.30	0.30	-1.20	11.03	111.62
50	8.37	48.30	0.40	0.20	10.81	112.45
51	8.53	53.90	0.40	-0.10	10.03	113.30
52	8.69	60.00	0.40	-0.10	8.97	114.15
53	8.86	66.90	0.50	0.00	8.14	114.94
54	9.02	72.90	0.50	0.00	7.93	116.10
55	9.19	76.20	0.60	0.10	7.56	116.70
56	9.35	80.70	0.60	0.20	7.45	117.66
57	9.51	87.60	0.70	0.20	6.64	117.85
58	9.68	95.70	0.60	0.30	5.93	118.45
59	9.84	106.60	0.70	0.40	5.10	119.07
60	10.01	120.70	0.80	0.60	4.69	120.30
61	10.17	130.70	0.90	0.20	4.31	121.08
62	10.34	135.60	0.90	-0.30	4.27	121.72
63	10.50	137.00	1.00	-0.50	4.41	122.28
64	10.66	139.30	1.10	-0.50	4.93	123.22
65	10.83	141.00	1.30	-0.40	5.80	124.62
66	10.99	141.50	1.70	-0.30	7.18	126.36
67	11.16	138.80	2.20	-0.50	9.17	128.15
68	11.32	130.50	2.80	-0.60	11.11	128.55
69	11.48	105.00	2.30	-1.30	14.31	128.04
70	11.65	68.80	2.20	-2.40	19.26	126.64
71	11.81	47.10	2.20	2.20	27.22	125.41
72	11.98	37.10	2.00	3.30	33.63	124.29
73	12.14	33.00	1.80	3.90	36.56	123.15
74	12.30	30.60	1.60	4.20	37.06	122.45
75	12.47	31.70	1.60	2.90	38.25	121.83
76	12.63	26.70	1.50	3.50	38.94	121.21
77	12.80	25.90	1.30	3.90	40.00	120.53
78	12.96	26.20	1.30	5.60	39.43	120.15
79	13.12	26.10	1.30	5.10	38.81	120.20
80	13.29	27.40	1.30	5.10	39.95	121.14
81	13.45	28.30	1.80	5.90	42.54	122.71
82	13.62	28.40	2.30	5.10	45.07	123.99
83	13.78	28.80	2.30	5.00	42.30	124.71
84	13.94	38.40	2.20	2.70	36.42	124.49
85	14.11	42.80	1.80	3.30	29.06	124.14
86	14.27	54.40	1.60	1.20	21.49	122.68
87	14.44	67.70	0.90	-0.80	16.48	123.11
88	14.60	89.40	1.70	-2.30	15.08	124.97
89	14.76	96.40	2.50	-3.10	16.37	128.12
90	14.93	104.00	3.30	-1.70	18.88	129.09
91	15.09	75.30	2.90	-4.00	23.38	128.86
92	15.26	47.70	2.80	-6.20	30.80	127.83
93	15.42	41.60	3.00	-5.60	36.94	127.59
94	15.58	45.80	3.20	-4.10	38.30	127.77
95	15.75	44.50	3.10	-4.20	38.07	127.61
96	15.91	41.50	2.80	-3.80	37.28	126.99

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	16.08	44.00	2.50	-3.10	36.13	126.46
98	16.24	44.80	2.50	-2.50	35.20	126.32
99	16.40	44.30	2.60	-1.80	36.18	127.01
100	16.57	46.20	3.20	-0.90	36.74	128.31
101	16.73	54.40	3.90	-0.70	34.68	130.12
102	16.90	72.40	4.60	-0.40	31.48	131.39
103	17.06	80.90	4.60	-2.00	27.61	131.15
104	17.23	79.20	3.00	-2.40	24.00	130.22
105	17.39	89.60	2.90	-1.30	18.66	129.01
106	17.55	118.10	2.60	-2.40	15.56	129.22
107	17.72	127.60	2.80	-3.30	13.44	129.21
108	17.88	127.50	2.60	-3.20	12.60	129.02
109	18.05	131.10	2.30	-3.30	11.33	128.15
110	18.21	134.90	1.90	-3.50	9.92	127.17
111	18.37	137.60	1.70	-3.40	8.86	126.61
112	18.54	145.40	1.80	-3.40	8.40	126.86
113	18.70	154.70	2.00	-3.30	8.29	127.63
114	18.87	162.60	2.20	-2.90	8.00	128.25
115	19.03	173.40	2.20	-0.40	7.53	128.99
116	19.19	195.10	2.50	0.50	7.17	130.35
117	19.36	225.30	3.30	-0.80	6.33	131.64
118	19.52	266.10	3.30	-0.80	6.42	133.43
119	19.69	276.10	4.60	-0.30	6.73	134.81
120	19.85	281.10	5.30	-0.60	7.20	135.48
121	20.01	277.20	4.50	-2.20	6.97	135.83
122	20.18	311.50	5.10	-2.00	6.82	136.60
123	20.34	339.80	6.60	-2.20	7.98	137.28
124	20.51	285.00	7.50	-2.30	11.11	137.28
125	20.67	195.90	8.40	-2.80	16.49	137.28
126	20.83	145.40	8.80	1.80	22.27	137.28
127	21.00	147.20	9.20	5.80	22.68	137.28
128	21.16	168.70	6.70	1.80	18.34	137.11
129	21.33	202.40	5.20	1.40	10.99	135.23
130	21.49	284.30	3.20	2.40	5.78	133.39
131	21.65	330.60	2.50	-1.20	2.47	131.32
132	21.82	341.10	2.10	-2.50	1.73	130.86
133	21.98	333.50	2.60	-2.90	1.86	130.70
134	22.15	308.40	2.40	-3.70	3.41	131.07
135	22.31	220.50	2.80	-6.20	5.97	130.68
136	22.47	153.50	2.80	-6.10	10.41	129.73
137	22.64	106.30	2.30	-6.30	15.73	127.91
138	22.80	66.90	1.90	-5.60	21.50	125.31
139	22.97	46.30	1.40	-0.40	27.43	123.21
140	23.13	44.20	1.40	0.30	29.01	122.32
141	23.30	51.80	1.50	1.50	27.70	123.02
142	23.46	58.80	1.70	2.70	26.89	124.14
143	23.62	59.30	2.00	4.40	27.02	124.92
144	23.79	59.10	2.00	4.10	28.09	124.97

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	23.95	53.50	1.80	3.80	29.54	124.55
146	24.12	47.80	1.80	4.10	32.03	124.18
147	24.28	44.40	1.90	3.90	35.17	124.95
148	24.44	47.10	2.50	3.60	38.30	126.33
149	24.61	47.50	3.10	3.70	39.78	127.60
150	24.77	49.90	3.20	3.70	37.66	128.51
151	24.94	64.50	3.30	0.10	36.04	128.82
152	25.10	58.50	3.30	-1.20	35.91	129.35
153	25.26	56.70	3.80	-1.00	38.74	130.07
154	25.43	59.20	4.50	-1.90	39.38	131.08
155	25.59	67.10	4.80	-3.20	37.80	131.60
156	25.76	71.20	4.40	-3.70	36.41	131.26
157	25.92	62.90	3.80	-4.40	38.09	130.37
158	26.08	48.20	3.70	-3.00	42.60	129.75
159	26.25	45.50	4.00	-0.40	46.33	129.72
160	26.41	49.50	4.10	-0.40	44.34	129.86
161	26.58	56.70	3.70	-2.10	37.63	129.67
162	26.74	72.00	3.10	-1.90	28.15	129.02
163	26.90	97.80	2.40	-3.90	19.96	128.11
164	27.07	118.00	2.00	-4.20	12.93	126.04
165	27.23	134.60	0.90	-3.90	8.43	123.50
166	27.40	141.20	0.70	-4.40	6.11	120.90
167	27.56	128.90	0.90	-5.10	7.92	121.78
168	27.72	102.60	1.30	-1.20	11.16	123.28
169	27.89	100.20	1.50	-1.60	12.27	123.98
170	28.05	122.20	1.30	-2.20	9.65	123.76
171	28.22	150.20	1.00	-5.10	6.92	123.08
172	28.38	157.40	1.00	-5.50	5.80	122.23
173	28.54	139.50	0.90	-5.90	6.37	121.82
174	28.71	122.70	0.90	-6.00	6.96	120.75
175	28.87	119.20	0.70	-5.90	8.63	121.97
176	29.04	121.30	1.40	-5.60	11.74	124.88
177	29.20	114.50	2.40	-5.50	16.36	126.83
178	29.36	81.20	2.30	-5.70	20.70	126.86
179	29.53	70.10	1.80	-3.70	20.67	126.47
180	29.69	109.10	2.10	3.70	17.99	125.91
181	29.86	102.10	1.70	-3.00	18.70	126.13
182	30.02	65.80	2.00	3.60	22.72	125.84
183	30.19	65.50	2.20	6.10	29.55	125.75
184	30.35	53.60	2.10	3.20	32.62	124.94
185	30.51	42.20	1.60	4.10	30.43	124.22
186	30.68	69.70	1.60	5.30	21.89	125.80
187	30.84	129.70	2.60	0.20	17.68	127.88
188	31.01	123.40	2.80	-1.90	18.20	129.28
189	31.17	90.80	2.90	-3.40	23.02	128.75
190	31.33	62.80	2.60	-0.90	23.43	127.62
191	31.50	102.00	1.80	3.90	14.36	126.42
192	31.66	181.30	1.20	0.40	6.79	124.80

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	31.83	204.80	1.00	-2.10	3.75	123.34
194	31.99	190.50	0.90	-2.20	3.46	122.26
195	32.15	165.80	0.80	-2.20	4.93	123.06
196	32.32	157.50	1.40	-1.70	8.68	125.07
197	32.48	116.00	2.10	-2.90	15.18	126.48
198	32.65	63.40	2.20	-2.20	24.91	125.55
199	32.81	38.70	1.50	0.60	31.57	123.35
200	32.97	54.30	1.10	5.10	21.40	123.18
201	33.14	124.10	1.60	5.10	15.81	125.30
202	33.30	129.30	2.30	-1.00	16.74	128.41
203	33.47	100.20	3.40	0.90	20.70	130.48
204	33.63	111.80	4.10	5.10	19.06	132.69
205	33.79	205.80	4.90	-3.10	13.03	134.71
206	33.96	303.70	5.30	-4.00	7.53	135.91
207	34.12	410.20	4.60	-2.90	3.60	135.66
208	34.29	507.50	3.10	-4.50	0.69	133.55
209	34.45	536.60	1.50	-4.40	0.00	130.81
210	34.61	501.40	1.60	-4.40	0.00	129.95
211	34.78	432.10	2.50	-4.90	1.22	130.52
212	34.94	201.80	2.50	-4.90	4.53	129.72
213	35.11	148.10	1.70	-5.70	8.95	126.52
214	35.27	128.40	0.90	-5.70	9.36	122.26
215	35.43	94.80	0.50	-6.90	10.40	118.02
216	35.60	60.10	0.50	-6.50	16.66	116.23
217	35.76	35.40	0.70	-5.90	30.01	115.37
218	35.93	17.20	0.60	-5.80	50.24	114.43
219	36.09	12.70	0.60	-5.20	68.32	112.60
220	36.26	13.10	0.50	-2.90	67.05	114.78
221	36.42	22.70	1.10	-1.90	53.77	118.04
222	36.58	36.70	1.40	0.40	43.07	121.50
223	36.75	49.70	1.70	0.70	35.81	123.48
224	36.91	59.20	1.90	3.00	32.83	124.52
225	37.08	58.60	1.90	3.90	32.00	124.89
226	37.24	57.50	1.90	4.20	32.82	125.12
227	37.40	57.60	2.10	3.70	33.80	125.33
228	37.57	56.20	2.10	3.40	34.48	125.56
229	37.73	56.70	2.10	3.90	34.52	125.28
230	37.90	55.10	1.90	4.50	34.37	124.73
231	38.06	52.00	1.70	3.50	34.77	123.92
232	38.22	48.20	1.60	3.30	35.18	123.22
233	38.39	47.90	1.50	3.40	35.61	123.02
234	38.55	48.90	1.60	3.20	35.09	122.88
235	38.72	49.40	1.50	3.50	34.89	122.71
236	38.88	47.60	1.40	3.30	35.10	122.12
237	39.04	43.80	1.30	2.70	36.33	121.20
238	39.21	38.60	1.10	2.60	37.79	120.16
239	39.37	36.50	1.00	2.40	39.75	119.78
240	39.54	36.10	1.20	2.80	41.20	121.51

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	39.70	44.90	1.90	3.60	40.37	124.04
242	39.86	56.40	2.40	4.10	37.22	126.42
243	40.03	68.60	2.80	4.80	34.73	128.14
244	40.19	75.40	3.30	4.60	32.88	129.15
245	40.36	79.80	3.30	5.30	31.85	129.33
246	40.52	78.00	2.90	4.00	30.97	128.65
247	40.68	72.50	2.50	4.80	30.46	127.77
248	40.85	71.90	2.40	4.90	29.81	127.26
249	41.01	76.20	2.40	6.00	29.24	126.71
250	41.18	69.60	2.00	9.30	29.43	125.92
251	41.34	61.50	1.80	6.80	31.58	124.88
252	41.50	53.00	1.80	5.70	34.94	124.63
253	41.67	51.20	2.00	5.10	38.45	124.96
254	41.83	50.20	2.20	2.00	40.47	125.23
255	42.00	48.00	2.10	1.60	41.54	125.03
256	42.16	46.10	1.90	1.30	42.12	124.43
257	42.32	43.90	1.80	2.10	42.35	123.82
258	42.49	43.00	1.70	2.10	43.52	123.27
259	42.65	39.00	1.60	-0.20	44.87	121.76
260	42.82	31.00	1.00	-1.10	47.69	119.87
261	42.98	26.70	0.90	0.00	50.76	118.13
262	43.15	25.70	1.00	0.30	52.18	118.34
263	43.31	29.60	1.10	0.00	53.04	119.34
264	43.47	29.50	1.30	0.20	55.89	120.95
265	43.64	28.00	1.80	0.30	56.32	122.39
266	43.80	35.60	1.90	0.90	47.67	123.83
267	43.97	56.20	1.90	-0.60	38.59	124.86
268	44.13	64.50	2.10	-2.60	36.97	126.05
269	44.29	53.40	2.70	-3.30	40.59	126.30
270	44.46	43.70	2.30	-4.30	47.93	125.95
271	44.62	37.50	2.20	-4.20	51.96	125.36
272	44.79	38.90	2.40	-3.00	46.21	125.70
273	44.95	61.80	2.30	-2.90	42.68	126.05
274	45.11	52.00	2.30	-5.00	40.83	125.68
275	45.28	42.70	2.00	-3.40	36.69	124.74
276	45.44	70.10	1.40	-1.90	26.50	123.75
277	45.61	96.00	1.20	-3.60	16.58	122.93
278	45.77	121.30	1.10	-2.90	11.72	122.61
279	45.93	137.80	1.00	-3.10	9.90	123.14
280	46.10	143.80	1.30	-3.20	9.07	123.27
281	46.26	144.40	1.10	-3.10	9.40	123.93
282	46.43	144.40	1.30	-2.90	9.50	124.14
283	46.59	146.60	1.40	-3.20	8.90	124.24
284	46.75	162.70	1.10	-3.30	7.64	124.46
285	46.92	187.00	1.30	-4.40	6.19	125.17
286	47.08	218.50	1.60	-4.40	6.20	127.04
287	47.25	222.60	2.10	-4.20	7.29	129.19
288	47.41	217.80	2.90	-4.10	8.78	130.57

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	47.57	211.50	3.00	-4.40	9.86	131.31
290	47.74	211.40	3.00	-5.10	9.61	131.06
291	47.90	217.80	2.60	-4.90	8.75	130.69
292	48.07	230.30	2.50	-5.10	7.94	130.40
293	48.23	233.40	2.60	-5.50	7.59	130.35
294	48.39	231.20	2.50	-5.60	7.77	130.10
295	48.56	212.90	2.30	-5.70	8.10	129.19
296	48.72	186.70	1.90	-5.80	7.85	127.41
297	48.89	180.30	1.20	-4.10	7.49	127.16
298	49.05	218.80	2.10	-4.30	8.50	127.46
299	49.22	160.80	2.20	-4.80	12.71	128.24
300	49.38	87.40	2.20	-5.40	23.04	127.06
301	49.54	40.30	2.10	-4.50	39.61	124.49
302	49.71	29.20	1.30	-2.10	58.26	121.00
303	49.87	19.50	0.80	-0.80	59.83	117.26
304	50.04	23.60	0.60	2.30	58.38	115.27
305	50.20	24.80	0.70	3.40	54.07	115.10

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_c: Measured cone resistance (tsf)
f_s: Sleeve friction resistance (tsf)
u: Pore pressure (tsf)
Fines content: Percentage of fines in soil (%)
Unit weight: Bulk soil unit weight (pcf)

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data ::

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
1	0.33	0.02	0.00	0.02	1.00	0.247	1.24	0.200	1.00	1.30	2.000	No
2	0.49	0.03	0.00	0.03	1.00	0.247	1.24	0.200	1.00	1.30	2.000	No
3	0.66	0.04	0.00	0.04	1.00	0.247	1.24	0.200	1.00	1.30	2.000	No
4	0.82	0.05	0.00	0.05	1.00	0.247	1.24	0.200	1.00	1.30	2.000	No
5	0.98	0.06	0.00	0.06	1.00	0.247	1.24	0.200	1.00	1.30	2.000	No
6	1.15	0.07	0.00	0.07	1.00	0.247	1.24	0.199	1.00	1.30	2.000	No
7	1.31	0.08	0.00	0.08	1.00	0.247	1.24	0.199	1.00	1.30	2.000	No
8	1.48	0.10	0.00	0.10	1.00	0.247	1.24	0.199	1.00	1.30	2.000	No
9	1.64	0.11	0.00	0.11	1.00	0.247	1.24	0.199	1.00	1.30	2.000	No
10	1.80	0.12	0.00	0.12	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
11	1.97	0.13	0.00	0.13	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
12	2.13	0.14	0.00	0.14	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
13	2.30	0.15	0.00	0.15	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
14	2.46	0.16	0.00	0.16	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
15	2.62	0.17	0.00	0.17	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
16	2.79	0.18	0.00	0.18	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
17	2.95	0.19	0.00	0.19	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
18	3.12	0.20	0.00	0.20	0.99	0.246	1.24	0.199	1.00	1.30	2.000	No
19	3.28	0.21	0.00	0.21	0.99	0.246	1.24	0.198	1.00	1.30	2.000	No
20	3.45	0.22	0.00	0.22	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
21	3.61	0.23	0.00	0.23	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
22	3.77	0.24	0.00	0.24	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
23	3.94	0.25	0.00	0.25	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
24	4.10	0.26	0.00	0.26	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
25	4.27	0.27	0.00	0.27	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
26	4.43	0.28	0.00	0.28	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
27	4.59	0.29	0.00	0.29	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
28	4.76	0.30	0.00	0.30	0.99	0.245	1.24	0.198	1.00	1.30	2.000	Yes
29	4.92	0.31	0.00	0.31	0.99	0.245	1.24	0.198	1.00	1.30	2.000	Yes
30	5.09	0.32	0.00	0.32	0.99	0.247	1.24	0.199	1.00	1.30	2.000	Yes
31	5.25	0.33	0.01	0.32	0.99	0.250	1.24	0.202	1.00	1.30	2.000	Yes
32	5.41	0.34	0.01	0.33	0.99	0.254	1.24	0.205	1.00	1.30	2.000	Yes
33	5.58	0.35	0.02	0.33	0.99	0.258	1.24	0.208	1.00	1.30	2.000	Yes
34	5.74	0.36	0.02	0.34	0.99	0.261	1.24	0.211	1.00	1.30	2.000	Yes
35	5.91	0.37	0.03	0.34	0.99	0.264	1.24	0.214	1.00	1.30	0.278	No
36	6.07	0.38	0.03	0.34	0.99	0.268	1.24	0.216	1.00	1.30	0.281	No
37	6.23	0.39	0.04	0.35	0.99	0.271	1.24	0.219	1.00	1.30	0.284	No
38	6.40	0.40	0.04	0.35	0.99	0.274	1.24	0.221	1.00	1.30	0.288	No
39	6.56	0.41	0.05	0.36	0.99	0.277	1.24	0.224	1.00	1.30	0.291	No
40	6.73	0.42	0.05	0.36	0.99	0.280	1.24	0.226	1.00	1.30	0.294	No
41	6.89	0.43	0.06	0.37	0.99	0.283	1.24	0.228	1.00	1.30	0.297	No
42	7.05	0.44	0.06	0.37	0.99	0.285	1.24	0.230	1.00	1.30	0.300	No
43	7.22	0.45	0.07	0.38	0.99	0.288	1.24	0.233	1.00	1.30	0.303	No
44	7.38	0.46	0.07	0.38	0.98	0.291	1.24	0.235	1.00	1.30	0.305	No
45	7.55	0.47	0.08	0.39	0.98	0.293	1.24	0.237	1.00	1.30	0.308	No
46	7.71	0.47	0.08	0.39	0.98	0.296	1.24	0.239	1.00	1.30	0.311	No
47	7.87	0.48	0.09	0.39	0.98	0.298	1.24	0.241	1.00	1.30	0.313	No
48	8.04	0.49	0.09	0.40	0.98	0.301	1.24	0.243	1.00	1.30	0.316	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
49	8.20	0.50	0.10	0.40	0.98	0.303	1.24	0.245	1.00	1.30	0.318	No
50	8.37	0.51	0.11	0.41	0.98	0.305	1.24	0.247	1.00	1.30	0.321	No
51	8.53	0.52	0.11	0.41	0.98	0.308	1.24	0.249	1.00	1.30	0.323	No
52	8.69	0.53	0.12	0.41	0.98	0.310	1.24	0.250	1.00	1.30	0.325	No
53	8.86	0.54	0.12	0.42	0.98	0.312	1.24	0.252	1.00	1.30	0.328	No
54	9.02	0.55	0.13	0.42	0.98	0.314	1.24	0.254	1.00	1.30	0.330	No
55	9.19	0.56	0.13	0.43	0.98	0.316	1.24	0.256	1.00	1.30	0.332	No
56	9.35	0.57	0.14	0.43	0.98	0.318	1.24	0.257	1.00	1.30	0.334	No
57	9.51	0.58	0.14	0.44	0.98	0.320	1.24	0.259	1.00	1.30	0.336	No
58	9.68	0.59	0.15	0.44	0.98	0.322	1.24	0.260	1.00	1.30	0.338	No
59	9.84	0.60	0.15	0.45	0.98	0.324	1.24	0.262	1.00	1.30	0.340	No
60	10.01	0.61	0.16	0.45	0.98	0.326	1.24	0.263	1.00	1.30	0.342	No
61	10.17	0.62	0.16	0.46	0.98	0.327	1.24	0.264	1.00	1.30	0.344	No
62	10.34	0.63	0.17	0.46	0.98	0.329	1.24	0.266	1.00	1.30	0.346	No
63	10.50	0.64	0.17	0.47	0.98	0.331	1.24	0.267	1.00	1.30	0.347	No
64	10.66	0.65	0.18	0.47	0.98	0.332	1.24	0.268	1.00	1.30	0.349	No
65	10.83	0.66	0.18	0.48	0.98	0.334	1.24	0.270	1.00	1.30	0.350	No
66	10.99	0.67	0.19	0.48	0.98	0.335	1.24	0.271	1.00	1.30	2.000	Yes
67	11.16	0.68	0.19	0.49	0.98	0.336	1.24	0.272	1.00	1.30	2.000	Yes
68	11.32	0.69	0.20	0.49	0.98	0.338	1.24	0.273	1.00	1.30	2.000	Yes
69	11.48	0.70	0.20	0.50	0.98	0.339	1.24	0.274	1.00	1.30	2.000	Yes
70	11.65	0.71	0.21	0.50	0.98	0.340	1.24	0.275	1.00	1.30	2.000	Yes
71	11.81	0.72	0.21	0.51	0.98	0.342	1.24	0.276	1.00	1.30	2.000	Yes
72	11.98	0.73	0.22	0.51	0.97	0.343	1.24	0.277	1.00	1.30	2.000	Yes
73	12.14	0.74	0.22	0.52	0.97	0.344	1.24	0.278	1.00	1.30	2.000	Yes
74	12.30	0.75	0.23	0.52	0.97	0.345	1.24	0.279	1.00	1.30	0.363	No
75	12.47	0.76	0.23	0.53	0.97	0.347	1.24	0.280	1.00	1.30	0.364	No
76	12.63	0.77	0.24	0.53	0.97	0.348	1.24	0.281	1.00	1.30	0.366	No
77	12.80	0.78	0.24	0.54	0.97	0.349	1.24	0.282	1.00	1.30	0.367	No
78	12.96	0.79	0.25	0.54	0.97	0.350	1.24	0.283	1.00	1.30	0.368	No
79	13.12	0.80	0.25	0.55	0.97	0.352	1.24	0.284	1.00	1.30	0.369	No
80	13.29	0.81	0.26	0.55	0.97	0.353	1.24	0.285	1.00	1.30	0.371	No
81	13.45	0.82	0.26	0.56	0.97	0.354	1.24	0.286	1.00	1.30	0.372	No
82	13.62	0.83	0.27	0.56	0.97	0.355	1.24	0.287	1.00	1.30	2.000	Yes
83	13.78	0.84	0.27	0.57	0.97	0.356	1.24	0.288	1.00	1.30	2.000	Yes
84	13.94	0.85	0.28	0.57	0.97	0.357	1.24	0.288	1.00	1.30	2.000	Yes
85	14.11	0.86	0.28	0.58	0.97	0.358	1.24	0.289	1.00	1.30	2.000	Yes
86	14.27	0.87	0.29	0.58	0.97	0.359	1.24	0.290	1.00	1.30	2.000	Yes
87	14.44	0.88	0.29	0.59	0.97	0.360	1.24	0.291	1.00	1.30	2.000	Yes
88	14.60	0.89	0.30	0.59	0.97	0.361	1.24	0.291	1.00	1.30	0.379	No
89	14.76	0.90	0.30	0.60	0.97	0.361	1.24	0.292	1.00	1.30	0.380	No
90	14.93	0.91	0.31	0.60	0.97	0.362	1.24	0.293	1.00	1.30	0.381	No
91	15.09	0.92	0.31	0.61	0.97	0.363	1.24	0.293	1.00	1.30	0.381	No
92	15.26	0.93	0.32	0.61	0.97	0.364	1.24	0.294	1.00	1.30	0.382	No
93	15.42	0.94	0.33	0.62	0.97	0.365	1.24	0.295	1.00	1.30	0.383	No
94	15.58	0.95	0.33	0.62	0.97	0.365	1.24	0.295	1.00	1.30	0.384	No
95	15.75	0.97	0.34	0.63	0.97	0.366	1.24	0.296	1.00	1.30	0.385	No
96	15.91	0.98	0.34	0.63	0.97	0.367	1.24	0.296	1.00	1.30	0.385	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
97	16.08	0.99	0.35	0.64	0.97	0.367	1.24	0.297	1.00	1.30	0.386	No
98	16.24	1.00	0.35	0.65	0.97	0.368	1.24	0.298	1.00	1.30	0.387	No
99	16.40	1.01	0.36	0.65	0.97	0.369	1.24	0.298	1.00	1.30	0.387	No
100	16.57	1.02	0.36	0.66	0.97	0.370	1.24	0.299	1.00	1.30	0.388	No
101	16.73	1.03	0.37	0.66	0.96	0.370	1.24	0.299	1.00	1.30	0.389	No
102	16.90	1.04	0.37	0.67	0.96	0.371	1.24	0.300	1.00	1.30	0.389	No
103	17.06	1.05	0.38	0.67	0.96	0.371	1.24	0.300	1.00	1.30	0.390	No
104	17.23	1.06	0.38	0.68	0.96	0.372	1.24	0.300	1.00	1.30	0.391	No
105	17.39	1.07	0.39	0.68	0.96	0.372	1.24	0.301	1.00	1.30	0.391	No
106	17.55	1.08	0.39	0.69	0.96	0.373	1.24	0.301	1.00	1.30	0.392	No
107	17.72	1.09	0.40	0.70	0.96	0.373	1.24	0.302	1.00	1.30	0.392	No
108	17.88	1.10	0.40	0.70	0.96	0.374	1.24	0.302	1.00	1.30	0.393	No
109	18.05	1.11	0.41	0.71	0.96	0.375	1.24	0.303	1.00	1.30	0.393	No
110	18.21	1.12	0.41	0.71	0.96	0.375	1.24	0.303	1.00	1.30	0.394	No
111	18.37	1.13	0.42	0.72	0.96	0.376	1.24	0.303	1.00	1.30	0.395	No
112	18.54	1.14	0.42	0.72	0.96	0.376	1.24	0.304	1.00	1.30	0.395	No
113	18.70	1.15	0.43	0.73	0.96	0.377	1.24	0.304	1.00	1.30	0.396	No
114	18.87	1.17	0.43	0.73	0.96	0.377	1.24	0.305	1.00	1.30	0.396	No
115	19.03	1.18	0.44	0.74	0.96	0.378	1.24	0.305	1.00	1.30	0.397	No
116	19.19	1.19	0.44	0.74	0.96	0.378	1.24	0.305	1.00	1.30	0.397	No
117	19.36	1.20	0.45	0.75	0.96	0.378	1.24	0.306	1.00	1.30	0.397	No
118	19.52	1.21	0.45	0.75	0.96	0.379	1.24	0.306	1.00	1.30	0.398	No
119	19.69	1.22	0.46	0.76	0.96	0.379	1.24	0.306	1.00	1.30	0.398	No
120	19.85	1.23	0.46	0.77	0.96	0.379	1.24	0.306	1.00	1.30	0.398	No
121	20.01	1.24	0.47	0.77	0.96	0.380	1.24	0.307	1.00	1.30	0.399	No
122	20.18	1.25	0.47	0.78	0.96	0.380	1.24	0.307	1.00	1.30	0.399	No
123	20.34	1.26	0.48	0.79	0.96	0.380	1.24	0.307	1.00	1.30	0.399	No
124	20.51	1.28	0.48	0.79	0.96	0.380	1.24	0.307	1.00	1.30	0.400	No
125	20.67	1.29	0.49	0.80	0.96	0.381	1.24	0.308	1.00	1.30	0.400	No
126	20.83	1.30	0.49	0.80	0.95	0.381	1.24	0.308	1.00	1.30	0.400	No
127	21.00	1.31	0.50	0.81	0.95	0.381	1.24	0.308	1.00	1.30	0.400	No
128	21.16	1.32	0.50	0.82	0.95	0.381	1.24	0.308	1.00	1.30	0.400	No
129	21.33	1.33	0.51	0.82	0.95	0.381	1.24	0.308	1.00	1.30	0.401	No
130	21.49	1.34	0.51	0.83	0.95	0.382	1.24	0.308	1.00	1.30	0.401	No
131	21.65	1.35	0.52	0.83	0.95	0.382	1.24	0.309	1.00	1.30	0.401	No
132	21.82	1.36	0.52	0.84	0.95	0.382	1.24	0.309	1.00	1.30	0.401	No
133	21.98	1.37	0.53	0.84	0.95	0.382	1.24	0.309	1.00	1.30	0.402	No
134	22.15	1.39	0.54	0.85	0.95	0.383	1.24	0.309	1.00	1.30	0.402	No
135	22.31	1.40	0.54	0.86	0.95	0.383	1.24	0.309	1.00	1.30	0.402	No
136	22.47	1.41	0.55	0.86	0.95	0.383	1.24	0.310	1.00	1.30	0.403	No
137	22.64	1.42	0.55	0.87	0.95	0.383	1.24	0.310	1.00	1.30	0.403	No
138	22.80	1.43	0.56	0.87	0.95	0.384	1.24	0.310	1.00	1.30	0.403	No
139	22.97	1.44	0.56	0.88	0.95	0.384	1.24	0.310	1.00	1.30	0.403	No
140	23.13	1.45	0.57	0.88	0.95	0.384	1.24	0.311	1.00	1.30	0.404	No
141	23.30	1.46	0.57	0.89	0.95	0.385	1.24	0.311	1.00	1.30	0.404	No
142	23.46	1.47	0.58	0.89	0.95	0.385	1.24	0.311	1.00	1.30	0.404	No
143	23.62	1.48	0.58	0.90	0.95	0.385	1.24	0.311	1.00	1.30	0.405	No
144	23.79	1.49	0.59	0.90	0.95	0.385	1.24	0.311	1.00	1.30	0.405	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
145	23.95	1.50	0.59	0.91	0.95	0.386	1.24	0.312	1.00	1.30	0.405	No
146	24.12	1.51	0.60	0.91	0.94	0.386	1.24	0.312	1.00	1.30	0.405	No
147	24.28	1.52	0.60	0.92	0.94	0.386	1.24	0.312	1.00	1.30	0.406	No
148	24.44	1.53	0.61	0.92	0.94	0.386	1.24	0.312	1.00	1.30	0.406	No
149	24.61	1.54	0.61	0.93	0.94	0.387	1.24	0.312	1.00	1.30	0.406	No
150	24.77	1.55	0.62	0.93	0.94	0.387	1.24	0.312	1.00	1.30	0.406	No
151	24.94	1.56	0.62	0.94	0.94	0.387	1.24	0.313	1.00	1.30	0.406	No
152	25.10	1.57	0.63	0.94	0.94	0.387	1.24	0.313	1.00	1.30	0.407	No
153	25.26	1.58	0.63	0.95	0.94	0.387	1.24	0.313	1.00	1.30	0.407	No
154	25.43	1.59	0.64	0.96	0.94	0.387	1.24	0.313	1.00	1.30	0.407	No
155	25.59	1.60	0.64	0.96	0.94	0.387	1.24	0.313	1.00	1.30	0.407	No
156	25.76	1.61	0.65	0.97	0.94	0.387	1.24	0.313	1.00	1.30	0.407	No
157	25.92	1.63	0.65	0.97	0.94	0.387	1.24	0.313	1.00	1.30	0.407	No
158	26.08	1.64	0.66	0.98	0.94	0.387	1.24	0.313	1.00	1.30	0.407	No
159	26.25	1.65	0.66	0.98	0.94	0.388	1.24	0.313	1.00	1.30	0.407	No
160	26.41	1.66	0.67	0.99	0.94	0.388	1.24	0.313	1.00	1.30	2.000	Yes
161	26.58	1.67	0.67	0.99	0.94	0.388	1.24	0.313	1.00	1.30	2.000	Yes
162	26.74	1.68	0.68	1.00	0.94	0.388	1.24	0.313	1.00	1.30	2.000	Yes
163	26.90	1.69	0.68	1.01	0.93	0.388	1.24	0.313	1.00	1.30	2.000	Yes
164	27.07	1.70	0.69	1.01	0.93	0.388	1.24	0.313	1.00	1.30	2.000	Yes
165	27.23	1.71	0.69	1.02	0.93	0.388	1.24	0.314	1.00	1.30	2.000	Yes
166	27.40	1.72	0.70	1.02	0.93	0.388	1.24	0.314	1.00	1.30	0.408	No
167	27.56	1.73	0.70	1.03	0.93	0.388	1.24	0.314	1.00	1.30	0.408	No
168	27.72	1.74	0.71	1.03	0.93	0.388	1.24	0.314	1.00	1.30	0.408	No
169	27.89	1.75	0.71	1.04	0.93	0.388	1.24	0.314	1.00	1.30	0.408	No
170	28.05	1.76	0.72	1.04	0.93	0.388	1.24	0.314	1.00	1.30	0.408	No
171	28.22	1.77	0.72	1.05	0.93	0.388	1.24	0.314	1.00	1.30	0.408	No
172	28.38	1.78	0.73	1.05	0.93	0.389	1.24	0.314	1.00	1.30	0.408	No
173	28.54	1.79	0.73	1.05	0.93	0.389	1.24	0.314	1.00	1.30	0.408	No
174	28.71	1.80	0.74	1.06	0.93	0.389	1.24	0.314	1.00	1.30	0.408	No
175	28.87	1.81	0.74	1.06	0.93	0.389	1.24	0.314	1.00	1.30	0.409	No
176	29.04	1.82	0.75	1.07	0.93	0.389	1.24	0.314	1.00	1.30	0.409	No
177	29.20	1.83	0.76	1.08	0.92	0.389	1.24	0.314	1.00	1.30	0.410	No
178	29.36	1.84	0.76	1.08	0.92	0.389	1.24	0.314	1.00	1.30	0.410	No
179	29.53	1.85	0.77	1.09	0.92	0.389	1.24	0.314	0.99	1.30	0.411	No
180	29.69	1.86	0.77	1.09	0.92	0.389	1.24	0.314	0.99	1.30	0.411	No
181	29.86	1.87	0.78	1.10	0.92	0.389	1.24	0.314	0.99	1.30	2.000	Yes
182	30.02	1.88	0.78	1.10	0.92	0.389	1.24	0.314	0.99	1.30	2.000	Yes
183	30.19	1.89	0.79	1.11	0.92	0.388	1.24	0.314	0.99	1.30	2.000	Yes
184	30.35	1.90	0.79	1.11	0.92	0.388	1.24	0.314	0.99	1.30	2.000	Yes
185	30.51	1.91	0.80	1.12	0.92	0.388	1.24	0.314	0.99	1.30	2.000	Yes
186	30.68	1.92	0.80	1.12	0.92	0.388	1.24	0.314	0.99	1.30	2.000	Yes
187	30.84	1.93	0.81	1.13	0.92	0.388	1.24	0.314	0.99	1.30	2.000	Yes
188	31.01	1.94	0.81	1.13	0.92	0.388	1.24	0.314	0.98	1.30	0.414	No
189	31.17	1.95	0.82	1.14	0.91	0.388	1.24	0.313	0.98	1.30	0.414	No
190	31.33	1.97	0.82	1.14	0.91	0.388	1.24	0.313	0.98	1.30	0.415	No
191	31.50	1.98	0.83	1.15	0.91	0.388	1.24	0.313	0.98	1.30	0.415	No
192	31.66	1.99	0.83	1.15	0.91	0.388	1.24	0.313	0.98	1.30	0.415	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
193	31.83	2.00	0.84	1.16	0.91	0.387	1.24	0.313	0.98	1.30	0.416	No
194	31.99	2.01	0.84	1.16	0.91	0.387	1.24	0.313	0.98	1.30	0.416	No
195	32.15	2.02	0.85	1.17	0.91	0.387	1.24	0.313	0.98	1.30	0.416	No
196	32.32	2.03	0.85	1.17	0.91	0.387	1.24	0.313	0.98	1.30	2.000	Yes
197	32.48	2.04	0.86	1.18	0.91	0.387	1.24	0.313	0.98	1.30	2.000	Yes
198	32.65	2.05	0.86	1.18	0.91	0.387	1.24	0.312	0.97	1.30	2.000	Yes
199	32.81	2.06	0.87	1.19	0.90	0.387	1.24	0.312	0.97	1.30	2.000	Yes
200	32.97	2.07	0.87	1.19	0.90	0.386	1.24	0.312	0.97	1.30	0.417	No
201	33.14	2.08	0.88	1.20	0.90	0.386	1.24	0.312	0.97	1.30	0.418	No
202	33.30	2.09	0.88	1.20	0.90	0.386	1.24	0.312	0.97	1.30	0.418	No
203	33.47	2.10	0.89	1.21	0.90	0.386	1.24	0.312	0.97	1.30	0.418	No
204	33.63	2.11	0.89	1.22	0.90	0.385	1.24	0.311	0.97	1.30	0.418	No
205	33.79	2.12	0.90	1.22	0.90	0.385	1.24	0.311	0.97	1.30	0.418	No
206	33.96	2.13	0.90	1.23	0.90	0.385	1.24	0.311	0.97	1.30	0.418	No
207	34.12	2.14	0.91	1.23	0.90	0.384	1.24	0.311	0.97	1.30	0.418	No
208	34.29	2.15	0.91	1.24	0.90	0.384	1.24	0.310	0.96	1.30	0.419	No
209	34.45	2.16	0.92	1.25	0.89	0.384	1.24	0.310	0.96	1.30	0.419	No
210	34.61	2.18	0.92	1.25	0.89	0.384	1.24	0.310	0.96	1.30	0.419	No
211	34.78	2.19	0.93	1.26	0.89	0.383	1.24	0.310	0.96	1.30	0.419	No
212	34.94	2.20	0.93	1.26	0.89	0.383	1.24	0.309	0.96	1.30	0.419	No
213	35.11	2.21	0.94	1.27	0.89	0.383	1.24	0.309	0.96	1.30	0.419	No
214	35.27	2.22	0.94	1.27	0.89	0.382	1.24	0.309	0.96	1.30	0.419	No
215	35.43	2.23	0.95	1.28	0.89	0.382	1.24	0.309	0.96	1.30	2.000	Yes
216	35.60	2.24	0.95	1.28	0.89	0.382	1.24	0.309	0.96	1.30	2.000	Yes
217	35.76	2.25	0.96	1.29	0.89	0.382	1.24	0.309	0.96	1.30	2.000	Yes
218	35.93	2.26	0.97	1.29	0.88	0.382	1.24	0.308	0.96	1.30	2.000	Yes
219	36.09	2.26	0.97	1.29	0.88	0.381	1.24	0.308	0.95	1.30	0.420	No
220	36.26	2.27	0.98	1.30	0.88	0.381	1.24	0.308	0.95	1.30	0.420	No
221	36.42	2.28	0.98	1.30	0.88	0.381	1.24	0.308	0.95	1.30	0.420	No
222	36.58	2.29	0.99	1.31	0.88	0.381	1.24	0.308	0.95	1.30	0.420	No
223	36.75	2.30	0.99	1.31	0.88	0.380	1.24	0.307	0.95	1.30	0.420	No
224	36.91	2.31	1.00	1.32	0.88	0.380	1.24	0.307	0.95	1.30	0.420	No
225	37.08	2.32	1.00	1.32	0.88	0.380	1.24	0.307	0.95	1.30	0.420	No
226	37.24	2.33	1.01	1.33	0.87	0.379	1.24	0.307	0.95	1.30	0.420	No
227	37.40	2.34	1.01	1.33	0.87	0.379	1.24	0.306	0.95	1.30	0.420	No
228	37.57	2.36	1.02	1.34	0.87	0.379	1.24	0.306	0.95	1.30	0.420	No
229	37.73	2.37	1.02	1.34	0.87	0.378	1.24	0.306	0.95	1.30	0.420	No
230	37.90	2.38	1.03	1.35	0.87	0.378	1.24	0.305	0.95	1.30	0.420	No
231	38.06	2.39	1.03	1.35	0.87	0.377	1.24	0.305	0.94	1.30	0.420	No
232	38.22	2.40	1.04	1.36	0.87	0.377	1.24	0.305	0.94	1.30	0.420	No
233	38.39	2.41	1.04	1.36	0.86	0.377	1.24	0.304	0.94	1.30	0.420	No
234	38.55	2.42	1.05	1.37	0.86	0.376	1.24	0.304	0.94	1.30	0.419	No
235	38.72	2.43	1.05	1.37	0.86	0.376	1.24	0.304	0.94	1.30	0.419	No
236	38.88	2.44	1.06	1.38	0.86	0.376	1.24	0.303	0.94	1.30	0.419	No
237	39.04	2.45	1.06	1.38	0.86	0.375	1.24	0.303	0.94	1.30	0.419	No
238	39.21	2.46	1.07	1.39	0.86	0.375	1.24	0.303	0.94	1.30	0.419	No
239	39.37	2.47	1.07	1.39	0.86	0.374	1.24	0.303	0.94	1.30	0.419	No
240	39.54	2.48	1.08	1.40	0.86	0.374	1.24	0.302	0.94	1.30	0.419	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
241	39.70	2.49	1.08	1.40	0.85	0.374	1.24	0.302	0.94	1.30	0.419	No
242	39.86	2.50	1.09	1.41	0.85	0.373	1.24	0.301	0.94	1.30	0.419	No
243	40.03	2.51	1.09	1.41	0.85	0.373	1.24	0.301	0.94	1.30	0.418	No
244	40.19	2.52	1.10	1.42	0.85	0.372	1.24	0.301	0.93	1.30	0.418	No
245	40.36	2.53	1.10	1.42	0.85	0.372	1.24	0.300	0.93	1.30	0.418	No
246	40.52	2.54	1.11	1.43	0.85	0.371	1.24	0.300	0.93	1.30	0.418	No
247	40.68	2.55	1.11	1.44	0.84	0.371	1.24	0.299	0.93	1.30	0.418	No
248	40.85	2.56	1.12	1.44	0.84	0.370	1.24	0.299	0.93	1.30	0.417	No
249	41.01	2.57	1.12	1.45	0.84	0.370	1.24	0.299	0.93	1.30	0.417	No
250	41.18	2.58	1.13	1.45	0.84	0.369	1.24	0.298	0.93	1.30	0.417	No
251	41.34	2.59	1.13	1.46	0.84	0.369	1.24	0.298	0.93	1.30	0.417	No
252	41.50	2.60	1.14	1.46	0.84	0.368	1.24	0.297	0.93	1.30	0.416	No
253	41.67	2.61	1.14	1.47	0.84	0.368	1.24	0.297	0.93	1.30	0.416	No
254	41.83	2.62	1.15	1.47	0.83	0.367	1.24	0.297	0.93	1.30	0.416	No
255	42.00	2.63	1.15	1.48	0.83	0.366	1.24	0.296	0.93	1.30	0.416	No
256	42.16	2.64	1.16	1.48	0.83	0.366	1.24	0.296	0.93	1.30	0.415	No
257	42.32	2.65	1.16	1.49	0.83	0.365	1.24	0.295	0.92	1.30	0.415	No
258	42.49	2.66	1.17	1.49	0.83	0.365	1.24	0.295	0.92	1.30	0.415	No
259	42.65	2.67	1.17	1.50	0.83	0.364	1.24	0.294	0.92	1.30	0.415	No
260	42.82	2.68	1.18	1.50	0.83	0.364	1.24	0.294	0.92	1.30	0.414	No
261	42.98	2.69	1.18	1.51	0.82	0.363	1.24	0.294	0.92	1.30	0.414	No
262	43.15	2.70	1.19	1.51	0.82	0.363	1.24	0.293	0.92	1.30	0.414	No
263	43.31	2.71	1.20	1.52	0.82	0.362	1.24	0.293	0.92	1.30	0.414	No
264	43.47	2.72	1.20	1.52	0.82	0.362	1.24	0.292	0.92	1.30	0.413	No
265	43.64	2.73	1.21	1.53	0.82	0.361	1.24	0.292	0.92	1.30	0.413	No
266	43.80	2.74	1.21	1.53	0.82	0.361	1.24	0.292	0.92	1.30	0.413	No
267	43.97	2.75	1.22	1.54	0.81	0.360	1.24	0.291	0.92	1.30	0.412	No
268	44.13	2.76	1.22	1.54	0.81	0.360	1.24	0.291	0.92	1.30	0.412	No
269	44.29	2.77	1.23	1.55	0.81	0.359	1.24	0.290	0.92	1.30	0.412	No
270	44.46	2.78	1.23	1.55	0.81	0.358	1.24	0.290	0.92	1.30	0.411	No
271	44.62	2.79	1.24	1.56	0.81	0.358	1.24	0.289	0.92	1.30	0.411	No
272	44.79	2.80	1.24	1.56	0.81	0.357	1.24	0.289	0.91	1.30	0.410	No
273	44.95	2.81	1.25	1.57	0.80	0.357	1.24	0.288	0.91	1.30	0.410	No
274	45.11	2.82	1.25	1.57	0.80	0.356	1.24	0.288	0.91	1.30	2.000	Yes
275	45.28	2.83	1.26	1.58	0.80	0.355	1.24	0.287	0.91	1.30	2.000	Yes
276	45.44	2.84	1.26	1.58	0.80	0.355	1.24	0.287	0.91	1.30	2.000	Yes
277	45.61	2.85	1.27	1.59	0.80	0.354	1.24	0.286	0.91	1.30	2.000	Yes
278	45.77	2.86	1.27	1.59	0.80	0.354	1.24	0.286	0.91	1.30	2.000	Yes
279	45.93	2.87	1.28	1.60	0.79	0.353	1.24	0.285	0.91	1.30	2.000	Yes
280	46.10	2.88	1.28	1.60	0.79	0.352	1.24	0.285	0.91	1.30	0.407	No
281	46.26	2.89	1.29	1.61	0.79	0.352	1.24	0.284	0.91	1.30	0.407	No
282	46.43	2.90	1.29	1.61	0.79	0.351	1.24	0.284	0.91	1.30	0.406	No
283	46.59	2.91	1.30	1.62	0.79	0.351	1.24	0.283	0.91	1.30	0.406	No
284	46.75	2.92	1.30	1.62	0.79	0.350	1.24	0.283	0.91	1.30	0.406	No
285	46.92	2.94	1.31	1.63	0.78	0.349	1.24	0.282	0.91	1.30	0.405	No
286	47.08	2.95	1.31	1.63	0.78	0.349	1.24	0.282	0.91	1.30	0.405	No
287	47.25	2.96	1.32	1.64	0.78	0.348	1.24	0.281	0.90	1.30	0.404	No
288	47.41	2.97	1.32	1.64	0.78	0.347	1.24	0.281	0.90	1.30	0.404	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
289	47.57	2.98	1.33	1.65	0.78	0.347	1.24	0.280	0.90	1.30	0.403	No
290	47.74	2.99	1.33	1.65	0.78	0.346	1.24	0.280	0.90	1.30	0.403	No
291	47.90	3.00	1.34	1.66	0.77	0.345	1.24	0.279	0.90	1.30	0.402	No
292	48.07	3.01	1.34	1.67	0.77	0.345	1.24	0.279	0.90	1.30	0.402	No
293	48.23	3.02	1.35	1.67	0.77	0.344	1.24	0.278	0.90	1.30	0.401	No
294	48.39	3.03	1.35	1.68	0.77	0.343	1.24	0.277	0.90	1.30	0.401	No
295	48.56	3.04	1.36	1.68	0.77	0.343	1.24	0.277	0.90	1.30	0.400	No
296	48.72	3.05	1.36	1.69	0.77	0.342	1.24	0.276	0.90	1.30	0.400	No
297	48.89	3.06	1.37	1.69	0.76	0.341	1.24	0.276	0.90	1.30	0.400	No
298	49.05	3.07	1.37	1.70	0.76	0.341	1.24	0.275	0.90	1.30	2.000	Yes
299	49.22	3.08	1.38	1.70	0.76	0.340	1.24	0.275	0.90	1.30	2.000	Yes
300	49.38	3.09	1.38	1.71	0.76	0.339	1.24	0.274	0.90	1.30	2.000	Yes
301	49.54	3.10	1.39	1.71	0.76	0.339	1.24	0.274	0.89	1.30	2.000	Yes
302	49.71	3.11	1.39	1.72	0.76	0.338	1.24	0.273	0.89	1.30	2.000	Yes
303	49.87	3.12	1.40	1.72	0.75	0.338	1.24	0.273	0.89	1.30	0.397	No
304	50.04	3.13	1.41	1.73	0.75	0.337	1.24	0.272	0.89	1.30	0.396	No
305	50.20	3.14	1.41	1.73	0.75	0.336	1.24	0.272	0.89	1.30	0.396	No

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
σ_v: Total overburden pressure at test point (tsf)
u_0: Water pressure at test point (tsf)
σ_v': Effective overburden pressure based on GWT during earthquake (tsf)
r_d: Nonlinear shear mass factor
CSR: Cyclic Stress Ratio
MSF: Magnitude Scaling Factor
CSR_{eq}: CSR adjusted for M=7.5
K_σ: Effective overburden stress factor
CSR^*: CSR fully adjusted

:: Cyclic Resistance Ratio (CRR) calculation data ::

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
1	0.33	67.87	2.11	2.16	0.68	109.01	1.48	161.44	4.000	No	No	2.00
2	0.49	91.11	2.02	2.09	0.64	146.33	1.32	193.74	4.000	No	No	2.00
3	0.66	118.47	1.97	2.22	0.62	190.28	1.26	239.83	4.000	No	No	2.00
4	0.82	127.63	1.99	2.48	0.63	204.98	1.28	263.14	4.000	No	No	2.00
5	0.98	121.73	2.06	2.96	0.66	195.47	1.39	271.53	4.000	No	No	2.00
6	1.15	109.90	2.14	3.43	0.69	176.44	1.53	270.14	4.000	No	No	2.00
7	1.31	100.33	2.21	3.89	0.72	161.06	1.68	271.28	4.000	No	No	2.00
8	1.48	95.15	2.25	4.28	0.73	152.71	1.81	276.43	4.000	No	No	2.00
9	1.64	93.69	2.28	4.49	0.74	150.36	1.87	281.37	4.000	No	No	2.00
10	1.80	98.68	2.25	4.33	0.73	158.36	1.80	284.51	4.000	No	No	2.00
11	1.97	108.47	2.18	3.82	0.71	174.06	1.62	282.23	4.000	No	No	2.00
12	2.13	112.84	2.14	3.49	0.69	181.08	1.53	277.16	4.000	No	No	2.00
13	2.30	105.08	2.16	3.53	0.70	168.59	1.58	265.67	4.000	No	No	2.00
14	2.46	84.17	2.27	4.13	0.74	134.97	1.86	251.53	4.000	No	No	2.00
15	2.62	64.08	2.40	4.90	0.79	102.67	2.33	238.93	4.000	No	No	2.00
16	2.79	49.65	2.51	5.53	0.83	79.48	2.83	225.31	4.000	No	No	2.00
17	2.95	43.15	2.54	5.35	0.84	69.02	2.99	206.05	4.000	No	No	2.00
18	3.12	37.87	2.58	5.31	0.86	60.53	3.18	192.43	4.000	No	No	2.00
19	3.28	33.87	2.61	5.35	0.87	54.07	3.39	183.27	4.000	No	Yes	2.00
20	3.45	30.60	2.65	5.60	0.89	48.81	3.68	179.47	4.000	No	Yes	2.00
21	3.61	27.63	2.69	5.72	0.90	44.02	3.94	173.25	4.000	No	Yes	2.00
22	3.77	24.82	2.73	5.83	0.92	39.49	4.22	166.66	4.000	No	Yes	2.00
23	3.94	21.46	2.79	6.13	0.94	34.07	4.70	160.14	4.000	No	Yes	2.00
24	4.10	18.54	2.86	6.57	0.96	29.36	5.28	155.17	4.000	No	Yes	2.00
25	4.27	16.02	2.93	7.20	0.99	25.30	6.00	151.82	4.000	No	Yes	2.00
26	4.43	15.19	2.95	7.38	1.00	23.96	6.25	149.79	4.000	No	Yes	2.00
27	4.59	15.56	2.96	7.64	1.00	24.54	6.29	154.31	4.000	No	Yes	2.00
28	4.76	16.97	2.92	7.40	0.99	26.78	5.91	158.32	4.000	Yes	Yes	2.00
29	4.92	21.10	2.81	6.41	0.95	33.40	4.87	162.70	4.000	Yes	Yes	2.00
30	5.09	27.89	2.64	4.84	0.88	44.30	3.56	157.68	4.000	Yes	Yes	2.00
31	5.25	36.52	2.45	3.50	0.81	58.15	2.54	147.99	4.000	Yes	No	2.00
32	5.41	43.18	2.31	2.57	0.75	68.84	1.97	135.56	4.000	Yes	No	2.00
33	5.58	47.55	2.20	1.98	0.71	75.84	1.66	125.85	4.000	Yes	No	2.00
34	5.74	49.58	2.13	1.63	0.69	79.09	1.50	118.88	4.000	Yes	No	2.00
35	5.91	50.09	2.12	1.61	0.68	79.88	1.49	119.12	0.237	No	No	0.85
36	6.07	49.32	2.14	1.70	0.69	78.63	1.53	120.65	0.243	No	No	0.87
37	6.23	48.73	2.18	1.93	0.71	77.66	1.62	126.19	0.267	No	No	0.94
38	6.40	52.56	2.15	1.85	0.69	83.81	1.54	129.47	0.282	No	No	0.98
39	6.56	64.09	2.03	1.57	0.65	102.32	1.35	137.81	0.323	No	No	1.11
40	6.73	77.26	1.91	1.26	0.60	123.46	1.20	147.75	0.380	No	No	1.29
41	6.89	83.36	1.83	1.05	0.57	133.24	1.13	150.35	0.396	No	No	1.33
42	7.05	78.62	1.83	0.98	0.57	125.61	1.13	141.80	0.345	No	No	1.15
43	7.22	69.59	1.87	0.96	0.59	111.08	1.16	128.60	0.278	No	No	0.92
44	7.38	62.02	1.92	1.03	0.61	98.91	1.21	119.69	0.239	No	No	0.78
45	7.55	56.45	1.95	1.01	0.62	89.95	1.24	111.45	0.209	No	No	0.68
46	7.71	52.08	1.95	0.90	0.62	82.92	1.24	102.52	0.180	No	No	0.58
47	7.87	48.72	1.93	0.76	0.61	77.49	1.21	94.13	0.158	No	No	0.50
48	8.04	46.92	1.90	0.65	0.60	74.59	1.19	88.73	0.145	No	No	0.46

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
49	8.20	46.92	1.93	0.72	0.61	74.58	1.21	90.57	0.149	No	No	0.47
50	8.37	49.49	1.92	0.75	0.61	78.70	1.21	94.85	0.159	No	No	0.50
51	8.53	54.07	1.88	0.75	0.59	86.03	1.17	101.08	0.176	No	No	0.54
52	8.69	60.27	1.84	0.73	0.58	95.97	1.14	109.04	0.201	No	No	0.62
53	8.86	66.60	1.80	0.71	0.56	104.96	1.11	116.21	0.226	No	No	0.69
54	9.02	72.00	1.79	0.75	0.56	112.52	1.10	123.78	0.256	No	No	0.78
55	9.19	76.60	1.77	0.75	0.55	118.32	1.09	128.69	0.278	No	No	0.84
56	9.35	81.50	1.77	0.78	0.55	125.00	1.08	135.48	0.311	No	No	0.93
57	9.51	88.00	1.73	0.72	0.53	132.48	1.06	139.92	0.335	No	No	1.00
58	9.68	96.64	1.69	0.69	0.52	142.80	1.03	147.25	0.377	No	No	1.11
59	9.84	107.67	1.64	0.65	0.50	156.01	1.00	155.85	0.432	No	No	1.27
60	10.01	119.34	1.62	0.67	0.50	171.80	1.00	171.80	0.552	No	No	1.61
61	10.17	129.00	1.60	0.68	0.50	184.81	1.00	184.81	0.667	No	No	1.94
62	10.34	134.43	1.59	0.70	0.50	191.55	1.00	191.55	0.734	No	No	2.00
63	10.50	137.29	1.60	0.73	0.50	194.63	1.00	194.63	0.766	No	No	2.00
64	10.66	139.09	1.63	0.82	0.50	196.15	1.00	196.15	0.782	No	No	2.00
65	10.83	140.59	1.68	0.98	0.52	199.72	1.03	204.93	4.000	No	No	2.00
66	10.99	140.43	1.75	1.24	0.54	202.70	1.07	217.83	4.000	Yes	No	2.00
67	11.16	136.93	1.85	1.64	0.58	202.00	1.14	230.95	4.000	Yes	No	2.00
68	11.32	124.76	1.93	1.96	0.61	187.16	1.22	227.93	4.000	Yes	No	2.00
69	11.48	101.41	2.05	2.42	0.66	156.21	1.37	213.96	4.000	Yes	No	2.00
70	11.65	73.63	2.21	3.06	0.72	117.15	1.69	197.53	4.000	Yes	No	2.00
71	11.81	51.01	2.42	4.24	0.80	80.81	2.39	193.50	4.000	Yes	No	2.00
72	11.98	39.11	2.56	5.21	0.85	61.66	3.11	191.97	4.000	Yes	No	2.00
73	12.14	33.62	2.62	5.47	0.88	52.83	3.48	183.82	4.000	Yes	Yes	2.00
74	12.30	31.82	2.63	5.36	0.88	49.92	3.54	176.89	4.000	No	Yes	2.00
75	12.47	29.72	2.66	5.41	0.89	46.52	3.70	172.09	4.000	No	Yes	2.00
76	12.63	28.15	2.67	5.36	0.89	43.99	3.79	166.76	4.000	No	Yes	2.00
77	12.80	26.33	2.69	5.35	0.90	41.05	3.93	161.46	4.000	No	Yes	2.00
78	12.96	26.14	2.68	5.13	0.90	40.72	3.86	157.05	4.000	No	Yes	2.00
79	13.12	26.64	2.67	5.03	0.89	41.52	3.77	156.68	4.000	No	Yes	2.00
80	13.29	27.34	2.69	5.53	0.90	42.63	3.93	167.39	4.000	No	Yes	2.00
81	13.45	28.11	2.74	6.60	0.92	43.85	4.29	187.95	4.000	No	Yes	2.00
82	13.62	28.58	2.78	7.69	0.94	44.58	4.65	207.25	4.000	Yes	Yes	2.00
83	13.78	31.93	2.73	7.29	0.92	49.95	4.25	212.40	4.000	Yes	Yes	2.00
84	13.94	36.72	2.62	5.85	0.87	57.63	3.46	199.44	4.000	Yes	Yes	2.00
85	14.11	45.23	2.46	4.21	0.81	68.70	2.59	177.86	4.000	Yes	No	2.00
86	14.27	54.98	2.27	2.65	0.74	79.65	1.86	148.25	4.000	Yes	No	2.00
87	14.44	70.49	2.12	2.01	0.68	98.42	1.50	147.21	4.000	Yes	No	2.00
88	14.60	84.47	2.08	2.03	0.67	116.29	1.41	164.24	0.492	No	No	1.30
89	14.76	96.57	2.12	2.61	0.68	133.56	1.49	198.88	0.812	No	No	2.00
90	14.93	91.86	2.20	3.19	0.71	128.29	1.66	212.79	4.000	No	No	2.00
91	15.09	75.61	2.32	4.02	0.76	107.53	2.02	217.67	4.000	No	No	2.00
92	15.26	54.79	2.50	5.38	0.83	79.95	2.78	222.40	4.000	No	No	2.00
93	15.42	44.96	2.63	6.82	0.88	66.62	3.53	235.08	4.000	No	Yes	2.00
94	15.58	43.90	2.66	7.22	0.89	64.87	3.71	240.39	4.000	No	Yes	2.00
95	15.75	43.88	2.65	7.07	0.89	64.25	3.68	236.15	4.000	No	Yes	2.00
96	15.91	43.28	2.64	6.62	0.88	62.70	3.57	223.97	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
97	16.08	43.39	2.62	6.13	0.87	62.10	3.42	212.69	4.000	No	Yes	2.00
98	16.24	44.33	2.60	5.85	0.86	62.80	3.31	207.69	4.000	No	No	2.00
99	16.40	45.08	2.62	6.28	0.87	63.66	3.43	218.43	4.000	No	Yes	2.00
100	16.57	48.28	2.63	6.84	0.88	67.91	3.50	237.88	4.000	No	Yes	2.00
101	16.73	57.66	2.59	6.89	0.86	80.17	3.24	259.96	4.000	No	No	2.00
102	16.90	69.22	2.52	6.40	0.83	94.65	2.86	270.61	4.000	No	No	2.00
103	17.06	77.48	2.43	5.32	0.80	103.79	2.44	252.73	4.000	No	No	2.00
104	17.23	83.21	2.34	4.26	0.77	109.10	2.08	227.01	4.000	No	No	2.00
105	17.39	95.60	2.19	3.00	0.71	121.74	1.64	199.96	0.824	No	No	2.00
106	17.55	111.73	2.09	2.50	0.67	139.46	1.44	200.80	4.000	No	No	2.00
107	17.72	124.36	2.02	2.16	0.64	152.69	1.32	202.22	4.000	No	No	2.00
108	17.88	128.69	1.99	2.01	0.63	156.50	1.28	200.85	4.000	No	No	2.00
109	18.05	131.12	1.94	1.74	0.61	157.48	1.23	193.20	0.751	No	No	1.91
110	18.21	134.48	1.88	1.47	0.59	159.42	1.17	186.63	0.685	No	No	1.74
111	18.37	139.25	1.83	1.30	0.57	163.27	1.13	184.84	0.667	No	No	1.69
112	18.54	145.85	1.81	1.27	0.57	169.81	1.12	189.56	0.713	No	No	1.81
113	18.70	154.19	1.81	1.31	0.56	178.71	1.11	198.82	0.811	No	No	2.00
114	18.87	163.53	1.79	1.31	0.56	188.44	1.10	207.75	4.000	No	No	2.00
115	19.03	177.02	1.77	1.31	0.55	202.63	1.09	220.20	4.000	No	No	2.00
116	19.19	197.93	1.75	1.36	0.54	225.25	1.07	242.00	4.000	No	No	2.00
117	19.36	228.83	1.71	1.33	0.53	258.05	1.05	269.76	4.000	No	No	2.00
118	19.52	255.82	1.72	1.47	0.53	287.66	1.05	301.61	4.000	No	No	2.00
119	19.69	274.43	1.73	1.61	0.54	307.96	1.06	326.24	4.000	No	No	2.00
120	19.85	278.12	1.76	1.73	0.54	311.74	1.08	335.21	4.000	No	No	2.00
121	20.01	289.91	1.74	1.72	0.54	323.21	1.07	345.04	4.000	No	No	2.00
122	20.18	309.47	1.74	1.75	0.54	343.28	1.06	364.69	4.000	No	No	2.00
123	20.34	312.07	1.79	2.06	0.56	346.99	1.10	382.36	4.000	No	No	2.00
124	20.51	273.53	1.93	2.75	0.61	307.18	1.22	374.00	4.000	No	No	2.00
125	20.67	208.75	2.12	3.97	0.68	237.90	1.50	355.96	4.000	No	No	2.00
126	20.83	162.86	2.29	5.45	0.75	187.64	1.93	361.58	4.000	No	No	2.00
127	21.00	153.81	2.30	5.40	0.75	176.28	1.96	345.89	4.000	No	No	2.00
128	21.16	172.81	2.18	4.10	0.71	194.73	1.62	315.39	4.000	No	No	2.00
129	21.33	218.49	1.92	2.32	0.61	239.31	1.21	290.19	4.000	No	No	2.00
130	21.49	272.45	1.68	1.34	0.52	290.81	1.03	298.18	4.000	No	No	2.00
131	21.65	318.66	1.47	0.82	0.50	337.93	1.00	337.93	4.000	No	No	2.00
132	21.82	335.03	1.42	0.72	0.50	354.13	1.00	354.13	4.000	No	No	2.00
133	21.98	327.62	1.43	0.73	0.50	345.13	1.00	345.13	4.000	No	No	2.00
134	22.15	287.41	1.54	0.91	0.50	301.53	1.00	301.53	4.000	No	No	2.00
135	22.31	227.39	1.69	1.18	0.52	238.49	1.03	246.21	4.000	No	No	2.00
136	22.47	160.01	1.90	1.66	0.60	169.59	1.19	201.75	4.000	No	No	2.00
137	22.64	108.81	2.10	2.17	0.67	116.11	1.45	168.34	0.524	No	No	1.30
138	22.80	73.11	2.27	2.60	0.74	78.20	1.86	145.59	0.367	No	No	0.91
139	22.97	52.44	2.42	3.07	0.80	56.00	2.42	135.33	0.311	No	No	0.77
140	23.13	47.44	2.46	3.12	0.81	50.41	2.58	130.20	0.285	No	No	0.71
141	23.30	51.62	2.43	3.06	0.80	54.61	2.44	133.46	0.301	No	No	0.74
142	23.46	56.67	2.41	3.14	0.79	59.76	2.36	141.06	0.341	No	No	0.84
143	23.62	59.12	2.41	3.30	0.80	62.13	2.37	147.53	0.379	No	No	0.94
144	23.79	57.36	2.44	3.46	0.81	60.03	2.49	149.21	0.389	No	No	0.96

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
145	23.95	53.52	2.47	3.59	0.82	55.76	2.64	147.26	0.377	No	No	0.93
146	24.12	48.62	2.53	3.89	0.84	50.42	2.92	147.43	0.378	No	No	0.93
147	24.28	46.49	2.60	4.60	0.86	48.08	3.30	158.83	0.453	No	No	1.12
148	24.44	46.39	2.66	5.57	0.89	47.89	3.71	177.46	4.000	No	Yes	2.00
149	24.61	48.22	2.69	6.28	0.90	49.64	3.90	193.78	4.000	No	Yes	2.00
150	24.77	54.00	2.65	6.10	0.88	55.38	3.62	200.61	4.000	No	Yes	2.00
151	24.94	57.65	2.61	5.82	0.87	58.82	3.41	200.77	4.000	No	Yes	2.00
152	25.10	59.89	2.61	5.94	0.87	60.85	3.40	206.63	4.000	No	Yes	2.00
153	25.26	58.11	2.67	6.84	0.89	58.83	3.76	221.46	4.000	No	Yes	2.00
154	25.43	60.97	2.68	7.35	0.90	61.48	3.85	236.71	4.000	No	Yes	2.00
155	25.59	65.79	2.65	7.11	0.88	66.04	3.64	240.39	4.000	No	Yes	2.00
156	25.76	67.01	2.62	6.63	0.87	66.87	3.46	231.41	4.000	No	Yes	2.00
157	25.92	60.71	2.65	6.71	0.89	60.18	3.68	221.42	4.000	No	Yes	2.00
158	26.08	52.16	2.74	7.59	0.92	51.34	4.29	220.50	4.000	No	Yes	2.00
159	26.25	47.72	2.81	8.54	0.94	46.65	4.83	225.49	4.000	No	Yes	2.00
160	26.41	50.55	2.77	8.04	0.93	49.21	4.54	223.59	4.000	Yes	Yes	2.00
161	26.58	59.38	2.65	6.30	0.88	57.60	3.62	208.38	4.000	Yes	Yes	2.00
162	26.74	75.46	2.44	4.16	0.81	72.98	2.49	181.82	4.000	Yes	No	2.00
163	26.90	95.89	2.23	2.65	0.72	92.39	1.74	160.67	4.000	Yes	No	2.00
164	27.07	116.74	2.00	1.54	0.64	111.95	1.30	145.42	4.000	Yes	No	2.00
165	27.23	131.21	1.81	0.93	0.57	125.27	1.12	139.95	4.000	Yes	No	2.00
166	27.40	134.84	1.70	0.63	0.52	128.21	1.04	133.03	0.299	No	No	0.73
167	27.56	124.18	1.79	0.79	0.56	117.78	1.10	129.52	0.282	No	No	0.69
168	27.72	110.53	1.93	1.13	0.61	104.51	1.22	127.47	0.273	No	No	0.67
169	27.89	108.31	1.97	1.28	0.63	102.09	1.27	129.45	0.282	No	No	0.69
170	28.05	124.16	1.87	1.03	0.59	116.84	1.16	135.61	0.312	No	No	0.76
171	28.22	143.21	1.74	0.78	0.54	134.54	1.07	143.39	0.354	No	No	0.87
172	28.38	148.95	1.68	0.66	0.52	139.63	1.03	143.29	0.354	No	No	0.87
173	28.54	139.78	1.71	0.68	0.53	130.62	1.05	136.76	0.318	No	No	0.78
174	28.71	127.05	1.74	0.67	0.54	118.26	1.07	126.21	0.267	No	No	0.65
175	28.87	120.98	1.82	0.84	0.57	112.23	1.12	126.15	0.267	No	No	0.65
176	29.04	118.25	1.95	1.29	0.62	109.28	1.24	135.97	0.314	No	No	0.77
177	29.20	105.59	2.12	1.96	0.68	96.99	1.49	144.39	0.360	No	No	0.88
178	29.36	88.53	2.25	2.50	0.73	80.69	1.80	145.02	0.364	No	No	0.89
179	29.53	86.77	2.25	2.43	0.73	78.76	1.79	141.33	0.343	No	No	0.83
180	29.69	93.75	2.17	2.03	0.70	85.01	1.60	135.64	0.312	No	No	0.76
181	29.86	92.35	2.19	2.14	0.71	83.39	1.65	137.19	4.000	Yes	No	2.00
182	30.02	77.83	2.31	2.59	0.75	69.65	1.97	136.93	4.000	Yes	No	2.00
183	30.19	61.70	2.47	3.51	0.82	54.48	2.64	143.97	4.000	Yes	No	2.00
184	30.35	53.83	2.54	3.79	0.84	47.07	2.99	140.86	4.000	Yes	No	2.00
185	30.51	55.23	2.49	3.31	0.83	48.19	2.74	132.07	4.000	Yes	No	2.00
186	30.68	80.58	2.28	2.46	0.74	71.16	1.89	134.82	4.000	Yes	No	2.00
187	30.84	107.62	2.16	2.21	0.70	95.56	1.57	150.42	4.000	Yes	No	2.00
188	31.01	114.61	2.18	2.46	0.70	101.47	1.61	163.36	0.485	No	No	1.17
189	31.17	92.30	2.31	3.06	0.76	80.80	1.99	161.01	0.468	No	No	1.13
190	31.33	85.20	2.32	2.92	0.76	74.15	2.03	150.44	0.397	No	No	0.96
191	31.50	115.38	2.05	1.65	0.66	101.54	1.37	139.30	0.331	No	No	0.80
192	31.66	162.71	1.73	0.83	0.54	145.00	1.06	153.89	0.419	No	No	1.01

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
193	31.83	192.18	1.56	0.54	0.50	171.73	1.00	171.73	0.551	No	No	1.33
194	31.99	187.00	1.54	0.49	0.50	166.70	1.00	166.70	0.511	No	No	1.23
195	32.15	171.24	1.63	0.61	0.50	152.17	1.00	152.17	0.408	No	No	0.98
196	32.32	146.40	1.83	0.99	0.57	128.58	1.13	144.75	4.000	Yes	No	2.00
197	32.48	112.27	2.08	1.72	0.67	96.91	1.42	137.42	4.000	Yes	No	2.00
198	32.65	72.68	2.36	2.74	0.78	61.16	2.17	132.43	4.000	Yes	No	2.00
199	32.81	52.15	2.52	3.19	0.84	42.93	2.87	123.21	4.000	Yes	No	2.00
200	32.97	72.42	2.27	1.99	0.74	60.79	1.85	112.72	0.213	No	No	0.51
201	33.14	102.61	2.10	1.66	0.68	87.29	1.45	126.99	0.270	No	No	0.65
202	33.30	117.89	2.13	2.10	0.69	100.10	1.51	151.42	0.403	No	No	0.96
203	33.47	113.79	2.25	2.92	0.73	95.64	1.80	171.90	0.552	No	No	1.32
204	33.63	139.28	2.20	3.01	0.71	117.36	1.67	196.14	0.782	No	No	1.87
205	33.79	207.09	2.00	2.33	0.64	176.68	1.30	230.40	4.000	No	No	2.00
206	33.96	306.52	1.77	1.62	0.55	264.99	1.09	287.96	4.000	No	No	2.00
207	34.12	407.08	1.55	1.07	0.50	354.34	1.00	354.34	4.000	No	No	2.00
208	34.29	484.71	1.33	0.64	0.50	421.23	1.00	421.23	4.000	No	No	2.00
209	34.45	515.10	1.16	0.40	0.50	446.77	1.00	446.77	4.000	No	No	2.00
210	34.61	489.97	1.16	0.38	0.50	423.94	1.00	423.94	4.000	No	No	2.00
211	34.78	378.37	1.37	0.58	0.50	326.19	1.00	326.19	4.000	No	No	2.00
212	34.94	260.59	1.61	0.86	0.50	223.58	1.00	223.58	4.000	No	No	2.00
213	35.11	159.36	1.84	1.08	0.58	133.84	1.14	151.95	0.406	No	No	0.97
214	35.27	123.68	1.86	0.85	0.58	103.09	1.15	118.54	0.235	No	No	0.56
215	35.43	94.34	1.90	0.69	0.60	77.78	1.19	92.50	4.000	Yes	No	2.00
216	35.60	63.34	2.13	0.93	0.69	50.63	1.51	76.31	4.000	Yes	No	2.00
217	35.76	37.48	2.48	1.70	0.82	28.37	2.69	76.41	4.000	Yes	No	2.00
218	35.93	21.69	2.87	3.26	0.97	15.15	5.43	82.20	4.000	Yes	Yes	2.00
219	36.09	14.27	3.14	4.72	1.00	9.27	8.42	78.09	4.000	No	Yes	2.00
220	36.26	16.12	3.12	5.30	1.00	10.66	8.20	87.40	4.000	No	Yes	2.00
221	36.42	24.15	2.93	4.57	0.99	16.81	5.98	100.47	4.000	No	Yes	2.00
222	36.58	36.36	2.75	4.11	0.92	26.48	4.36	115.50	4.000	No	Yes	2.00
223	36.75	48.55	2.61	3.60	0.87	36.23	3.38	122.61	4.000	No	Yes	2.00
224	36.91	55.87	2.55	3.42	0.85	42.03	3.02	126.84	0.270	No	No	0.64
225	37.08	58.49	2.53	3.38	0.84	44.00	2.92	128.47	0.277	No	No	0.66
226	37.24	57.96	2.55	3.54	0.85	43.37	3.02	130.84	0.288	No	No	0.69
227	37.40	57.15	2.57	3.71	0.85	42.52	3.13	133.26	0.300	No	No	0.71
228	37.57	56.89	2.58	3.85	0.86	42.10	3.22	135.50	0.311	No	No	0.74
229	37.73	56.06	2.58	3.79	0.86	41.32	3.22	133.16	0.300	No	No	0.71
230	37.90	54.66	2.58	3.63	0.86	40.11	3.20	128.53	0.277	No	No	0.66
231	38.06	51.82	2.59	3.51	0.86	37.78	3.25	122.91	0.253	No	No	0.60
232	38.22	49.42	2.60	3.40	0.86	35.79	3.30	118.27	0.234	No	No	0.56
233	38.39	48.38	2.61	3.41	0.87	34.85	3.36	117.07	4.000	No	Yes	2.00
234	38.55	48.78	2.59	3.31	0.86	35.08	3.29	115.51	0.223	No	No	0.53
235	38.72	48.68	2.59	3.24	0.86	34.90	3.27	114.06	0.218	No	No	0.52
236	38.88	46.98	2.59	3.14	0.86	33.49	3.29	110.34	0.205	No	No	0.49
237	39.04	43.37	2.62	3.09	0.87	30.60	3.45	105.59	4.000	No	Yes	2.00
238	39.21	39.67	2.65	3.05	0.88	27.66	3.64	100.64	4.000	No	Yes	2.00
239	39.37	37.10	2.69	3.18	0.90	25.57	3.90	99.70	4.000	No	Yes	2.00
240	39.54	39.21	2.71	3.72	0.91	26.95	4.10	110.46	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
241	39.70	45.85	2.70	4.23	0.90	31.76	3.98	126.56	4.000	No	Yes	2.00
242	39.86	56.69	2.64	4.37	0.88	39.83	3.56	141.96	4.000	No	Yes	2.00
243	40.03	66.86	2.59	4.40	0.86	47.40	3.25	153.95	0.419	No	No	1.00
244	40.19	74.67	2.55	4.34	0.85	53.19	3.02	160.87	0.467	No	No	1.12
245	40.36	77.80	2.53	4.21	0.84	55.45	2.90	160.93	0.468	No	No	1.12
246	40.52	76.83	2.51	3.90	0.83	54.68	2.80	153.14	0.414	No	No	0.99
247	40.68	74.20	2.50	3.63	0.83	52.64	2.74	144.43	0.360	No	No	0.86
248	40.85	73.61	2.48	3.42	0.82	52.13	2.67	139.20	0.331	No	No	0.79
249	41.01	72.66	2.47	3.23	0.82	51.35	2.61	133.95	0.304	No	No	0.73
250	41.18	69.21	2.47	3.10	0.82	48.64	2.63	127.87	0.274	No	No	0.66
251	41.34	61.47	2.52	3.17	0.84	42.61	2.87	122.33	0.250	No	No	0.60
252	41.50	55.32	2.59	3.54	0.86	37.71	3.27	123.48	0.255	No	No	0.61
253	41.67	51.53	2.66	4.09	0.89	34.58	3.73	128.82	4.000	No	Yes	2.00
254	41.83	49.84	2.70	4.45	0.90	33.12	4.00	132.43	4.000	No	Yes	2.00
255	42.00	48.12	2.72	4.54	0.91	31.72	4.15	131.52	4.000	No	Yes	2.00
256	42.16	46.02	2.73	4.46	0.92	30.12	4.23	127.30	4.000	No	Yes	2.00
257	42.32	44.36	2.74	4.32	0.92	28.85	4.26	122.87	4.000	No	Yes	2.00
258	42.49	41.99	2.76	4.32	0.93	27.04	4.42	119.65	4.000	No	Yes	2.00
259	42.65	37.67	2.78	4.10	0.93	23.92	4.62	110.51	4.000	No	Yes	2.00
260	42.82	32.23	2.83	3.95	0.95	20.00	5.04	100.75	4.000	No	Yes	2.00
261	42.98	27.80	2.88	3.85	0.97	16.83	5.51	92.67	4.000	No	Yes	2.00
262	43.15	27.33	2.90	4.06	0.98	16.41	5.73	94.01	4.000	No	Yes	2.00
263	43.31	28.27	2.92	4.43	0.99	16.95	5.86	99.36	4.000	No	Yes	2.00
264	43.47	29.04	2.96	5.32	1.00	17.31	6.32	109.39	4.000	No	Yes	2.00
265	43.64	31.04	2.97	5.89	1.00	18.56	6.39	118.59	4.000	No	Yes	2.00
266	43.80	39.94	2.83	5.02	0.95	24.73	5.03	124.49	4.000	No	Yes	2.00
267	43.97	52.09	2.66	3.99	0.89	33.47	3.74	125.32	4.000	No	Yes	2.00
268	44.13	58.00	2.63	4.04	0.88	37.53	3.53	132.56	4.000	No	Yes	2.00
269	44.29	53.82	2.70	4.64	0.91	34.24	4.01	137.45	4.000	No	Yes	2.00
270	44.46	44.81	2.83	5.71	0.95	27.57	5.07	139.85	4.000	No	Yes	2.00
271	44.62	39.98	2.90	6.19	0.98	24.08	5.69	137.09	4.000	No	Yes	2.00
272	44.79	46.02	2.80	5.32	0.94	28.29	4.82	136.26	4.000	No	Yes	2.00
273	44.95	50.85	2.74	4.86	0.92	31.64	4.31	136.26	4.000	No	Yes	2.00
274	45.11	52.11	2.71	4.46	0.91	32.54	4.05	131.70	4.000	Yes	Yes	2.00
275	45.28	54.88	2.63	3.65	0.88	34.68	3.50	121.25	4.000	Yes	Yes	2.00
276	45.44	69.56	2.40	2.30	0.79	45.88	2.32	106.53	4.000	Yes	No	2.00
277	45.61	95.76	2.13	1.33	0.68	66.52	1.50	99.93	4.000	Yes	No	2.00
278	45.77	118.32	1.95	0.95	0.62	84.73	1.24	105.36	4.000	Yes	No	2.00
279	45.93	134.26	1.88	0.86	0.59	97.36	1.17	113.89	4.000	Yes	No	2.00
280	46.10	141.95	1.84	0.81	0.58	103.45	1.14	117.88	0.232	No	No	0.57
281	46.26	144.16	1.86	0.87	0.58	104.65	1.15	120.50	0.243	No	No	0.60
282	46.43	145.09	1.86	0.89	0.58	105.06	1.15	121.34	0.246	No	No	0.61
283	46.59	151.19	1.84	0.85	0.57	109.83	1.13	124.49	0.259	No	No	0.64
284	46.75	165.38	1.78	0.78	0.55	121.27	1.09	132.22	0.295	No	No	0.73
285	46.92	189.34	1.70	0.72	0.52	140.58	1.04	146.25	0.371	No	No	0.92
286	47.08	209.30	1.70	0.81	0.52	155.34	1.04	161.71	0.473	No	No	1.17
287	47.25	219.57	1.76	1.02	0.55	161.27	1.08	173.95	0.570	No	No	1.41
288	47.41	217.24	1.83	1.24	0.57	157.38	1.13	177.74	0.602	No	No	1.49

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
289	47.57	213.50	1.88	1.41	0.59	153.10	1.17	178.89	0.612	No	No	1.52
290	47.74	213.50	1.87	1.36	0.59	153.05	1.16	177.41	0.599	No	No	1.49
291	47.90	219.76	1.83	1.25	0.57	158.32	1.13	178.62	0.610	No	No	1.52
292	48.07	227.09	1.79	1.15	0.56	164.41	1.10	180.90	0.631	No	No	1.57
293	48.23	231.56	1.77	1.11	0.55	167.85	1.09	182.73	0.647	No	No	1.61
294	48.39	225.75	1.78	1.11	0.55	163.04	1.09	178.48	0.609	No	No	1.52
295	48.56	210.18	1.80	1.08	0.56	150.93	1.11	166.92	0.513	No	No	1.28
296	48.72	193.23	1.79	0.95	0.56	138.62	1.10	152.14	0.408	No	No	1.02
297	48.89	195.20	1.77	0.90	0.55	140.24	1.09	152.18	0.408	No	No	1.02
298	49.05	186.57	1.82	1.00	0.57	132.56	1.12	148.42	4.000	Yes	No	2.00
299	49.22	155.60	1.99	1.42	0.63	106.56	1.29	137.30	4.000	Yes	No	2.00
300	49.38	96.10	2.31	2.33	0.76	61.14	1.99	121.93	4.000	Yes	No	2.00
301	49.54	52.24	2.68	3.80	0.90	30.11	3.88	116.86	4.000	Yes	Yes	2.00
302	49.71	29.63	3.00	5.28	1.00	15.42	6.71	103.46	4.000	Yes	Yes	2.00
303	49.87	24.10	3.02	4.29	1.00	12.17	6.97	84.78	4.000	No	Yes	2.00
304	50.04	22.66	3.00	3.59	1.00	11.30	6.73	76.00	4.000	No	Yes	2.00
305	50.20	24.44	2.93	3.13	0.99	12.34	6.03	74.36	4.000	No	Yes	2.00

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_t: Total cone resistance
I_c: Soil behavior type index
Fr: Normalized friction ratio (%)
n: Stress exponent
Q_{tn}: Normalized cone resistance
K_c: Cone resistance correction factor due to fines
$Q_{tn,cs}$: Normalized and adjusted cone resistance
$CRR_{7.5}$: Cyclic resistance ratio for M_w=7.5
FS: Factor of safety against soil liquefaction

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.33	2.00	0.00	9.95	0.16	0.00	0.49	2.00	0.00	9.93	0.16	0.00
0.66	2.00	0.00	9.90	0.17	0.00	0.82	2.00	0.00	9.88	0.16	0.00
0.98	2.00	0.00	9.85	0.16	0.00	1.15	2.00	0.00	9.82	0.17	0.00
1.31	2.00	0.00	9.80	0.16	0.00	1.48	2.00	0.00	9.77	0.17	0.00
1.64	2.00	0.00	9.75	0.16	0.00	1.80	2.00	0.00	9.73	0.16	0.00
1.97	2.00	0.00	9.70	0.17	0.00	2.13	2.00	0.00	9.68	0.16	0.00
2.30	2.00	0.00	9.65	0.17	0.00	2.46	2.00	0.00	9.63	0.16	0.00
2.62	2.00	0.00	9.60	0.16	0.00	2.79	2.00	0.00	9.57	0.17	0.00
2.95	2.00	0.00	9.55	0.16	0.00	3.12	2.00	0.00	9.52	0.17	0.00
3.28	2.00	0.00	9.50	0.16	0.00	3.45	2.00	0.00	9.47	0.17	0.00
3.61	2.00	0.00	9.45	0.16	0.00	3.77	2.00	0.00	9.43	0.16	0.00
3.94	2.00	0.00	9.40	0.17	0.00	4.10	2.00	0.00	9.38	0.16	0.00
4.27	2.00	0.00	9.35	0.17	0.00	4.43	2.00	0.00	9.32	0.16	0.00
4.59	2.00	0.00	9.30	0.16	0.00	4.76	2.00	0.00	9.27	0.17	0.00
4.92	2.00	0.00	9.25	0.16	0.00	5.09	2.00	0.00	9.22	0.17	0.00
5.25	2.00	0.00	9.20	0.16	0.00	5.41	2.00	0.00	9.18	0.16	0.00
5.58	2.00	0.00	9.15	0.17	0.00	5.74	2.00	0.00	9.13	0.16	0.00
5.91	0.85	0.15	9.10	0.17	0.07	6.07	0.87	0.13	9.07	0.16	0.06
6.23	0.94	0.06	9.05	0.16	0.03	6.40	0.98	0.02	9.02	0.17	0.01
6.56	1.11	0.00	9.00	0.16	0.00	6.73	1.29	0.00	8.97	0.17	0.00
6.89	1.33	0.00	8.95	0.16	0.00	7.05	1.15	0.00	8.93	0.16	0.00
7.22	0.92	0.08	8.90	0.17	0.04	7.38	0.78	0.22	8.88	0.16	0.09
7.55	0.68	0.32	8.85	0.17	0.15	7.71	0.58	0.42	8.82	0.16	0.18
7.87	0.50	0.50	8.80	0.16	0.21	8.04	0.46	0.54	8.77	0.17	0.25
8.20	0.47	0.53	8.75	0.16	0.23	8.37	0.50	0.50	8.72	0.17	0.23
8.53	0.54	0.46	8.70	0.16	0.19	8.69	0.62	0.38	8.68	0.16	0.16
8.86	0.69	0.31	8.65	0.17	0.14	9.02	0.78	0.22	8.63	0.16	0.09
9.19	0.84	0.16	8.60	0.17	0.07	9.35	0.93	0.07	8.58	0.16	0.03
9.51	1.00	0.00	8.55	0.16	0.00	9.68	1.11	0.00	8.52	0.17	0.00
9.84	1.27	0.00	8.50	0.16	0.00	10.01	1.61	0.00	8.47	0.17	0.00
10.17	1.94	0.00	8.45	0.16	0.00	10.34	2.00	0.00	8.42	0.17	0.00
10.50	2.00	0.00	8.40	0.16	0.00	10.66	2.00	0.00	8.38	0.16	0.00
10.83	2.00	0.00	8.35	0.17	0.00	10.99	2.00	0.00	8.33	0.16	0.00
11.16	2.00	0.00	8.30	0.17	0.00	11.32	2.00	0.00	8.27	0.16	0.00
11.48	2.00	0.00	8.25	0.16	0.00	11.65	2.00	0.00	8.22	0.17	0.00
11.81	2.00	0.00	8.20	0.16	0.00	11.98	2.00	0.00	8.17	0.17	0.00
12.14	2.00	0.00	8.15	0.16	0.00	12.30	2.00	0.00	8.13	0.16	0.00
12.47	2.00	0.00	8.10	0.17	0.00	12.63	2.00	0.00	8.08	0.16	0.00
12.80	2.00	0.00	8.05	0.17	0.00	12.96	2.00	0.00	8.02	0.16	0.00
13.12	2.00	0.00	8.00	0.16	0.00	13.29	2.00	0.00	7.97	0.17	0.00
13.45	2.00	0.00	7.95	0.16	0.00	13.62	2.00	0.00	7.92	0.17	0.00
13.78	2.00	0.00	7.90	0.16	0.00	13.94	2.00	0.00	7.88	0.16	0.00
14.11	2.00	0.00	7.85	0.17	0.00	14.27	2.00	0.00	7.83	0.16	0.00
14.44	2.00	0.00	7.80	0.17	0.00	14.60	1.30	0.00	7.77	0.16	0.00
14.76	2.00	0.00	7.75	0.16	0.00	14.93	2.00	0.00	7.72	0.17	0.00
15.09	2.00	0.00	7.70	0.16	0.00	15.26	2.00	0.00	7.67	0.17	0.00
15.42	2.00	0.00	7.65	0.16	0.00	15.58	2.00	0.00	7.63	0.16	0.00
15.75	2.00	0.00	7.60	0.17	0.00	15.91	2.00	0.00	7.58	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
16.08	2.00	0.00	7.55	0.17	0.00	16.24	2.00	0.00	7.53	0.16	0.00
16.40	2.00	0.00	7.50	0.16	0.00	16.57	2.00	0.00	7.47	0.17	0.00
16.73	2.00	0.00	7.45	0.16	0.00	16.90	2.00	0.00	7.42	0.17	0.00
17.06	2.00	0.00	7.40	0.16	0.00	17.23	2.00	0.00	7.37	0.17	0.00
17.39	2.00	0.00	7.35	0.16	0.00	17.55	2.00	0.00	7.33	0.16	0.00
17.72	2.00	0.00	7.30	0.17	0.00	17.88	2.00	0.00	7.28	0.16	0.00
18.05	1.91	0.00	7.25	0.17	0.00	18.21	1.74	0.00	7.22	0.16	0.00
18.37	1.69	0.00	7.20	0.16	0.00	18.54	1.81	0.00	7.17	0.17	0.00
18.70	2.00	0.00	7.15	0.16	0.00	18.87	2.00	0.00	7.12	0.17	0.00
19.03	2.00	0.00	7.10	0.16	0.00	19.19	2.00	0.00	7.08	0.16	0.00
19.36	2.00	0.00	7.05	0.17	0.00	19.52	2.00	0.00	7.03	0.16	0.00
19.69	2.00	0.00	7.00	0.17	0.00	19.85	2.00	0.00	6.97	0.16	0.00
20.01	2.00	0.00	6.95	0.16	0.00	20.18	2.00	0.00	6.92	0.17	0.00
20.34	2.00	0.00	6.90	0.16	0.00	20.51	2.00	0.00	6.87	0.17	0.00
20.67	2.00	0.00	6.85	0.16	0.00	20.83	2.00	0.00	6.83	0.16	0.00
21.00	2.00	0.00	6.80	0.17	0.00	21.16	2.00	0.00	6.78	0.16	0.00
21.33	2.00	0.00	6.75	0.17	0.00	21.49	2.00	0.00	6.72	0.16	0.00
21.65	2.00	0.00	6.70	0.16	0.00	21.82	2.00	0.00	6.67	0.17	0.00
21.98	2.00	0.00	6.65	0.16	0.00	22.15	2.00	0.00	6.62	0.17	0.00
22.31	2.00	0.00	6.60	0.16	0.00	22.47	2.00	0.00	6.58	0.16	0.00
22.64	1.30	0.00	6.55	0.17	0.00	22.80	0.91	0.09	6.53	0.16	0.03
22.97	0.77	0.23	6.50	0.17	0.08	23.13	0.71	0.29	6.47	0.16	0.09
23.30	0.74	0.26	6.45	0.17	0.09	23.46	0.84	0.16	6.42	0.16	0.05
23.62	0.94	0.06	6.40	0.16	0.02	23.79	0.96	0.04	6.37	0.17	0.01
23.95	0.93	0.07	6.35	0.16	0.02	24.12	0.93	0.07	6.32	0.17	0.02
24.28	1.12	0.00	6.30	0.16	0.00	24.44	2.00	0.00	6.28	0.16	0.00
24.61	2.00	0.00	6.25	0.17	0.00	24.77	2.00	0.00	6.23	0.16	0.00
24.94	2.00	0.00	6.20	0.17	0.00	25.10	2.00	0.00	6.17	0.16	0.00
25.26	2.00	0.00	6.15	0.16	0.00	25.43	2.00	0.00	6.12	0.17	0.00
25.59	2.00	0.00	6.10	0.16	0.00	25.76	2.00	0.00	6.07	0.17	0.00
25.92	2.00	0.00	6.05	0.16	0.00	26.08	2.00	0.00	6.03	0.16	0.00
26.25	2.00	0.00	6.00	0.17	0.00	26.41	2.00	0.00	5.98	0.16	0.00
26.58	2.00	0.00	5.95	0.17	0.00	26.74	2.00	0.00	5.92	0.16	0.00
26.90	2.00	0.00	5.90	0.16	0.00	27.07	2.00	0.00	5.87	0.17	0.00
27.23	2.00	0.00	5.85	0.16	0.00	27.40	0.73	0.27	5.82	0.17	0.08
27.56	0.69	0.31	5.80	0.16	0.09	27.72	0.67	0.33	5.78	0.16	0.09
27.89	0.69	0.31	5.75	0.17	0.09	28.05	0.76	0.24	5.73	0.16	0.07
28.22	0.87	0.13	5.70	0.17	0.04	28.38	0.87	0.13	5.67	0.16	0.04
28.54	0.78	0.22	5.65	0.16	0.06	28.71	0.65	0.35	5.62	0.17	0.10
28.87	0.65	0.35	5.60	0.16	0.10	29.04	0.77	0.23	5.57	0.17	0.07
29.20	0.88	0.12	5.55	0.16	0.03	29.36	0.89	0.11	5.53	0.16	0.03
29.53	0.83	0.17	5.50	0.17	0.05	29.69	0.76	0.24	5.48	0.16	0.06
29.86	2.00	0.00	5.45	0.17	0.00	30.02	2.00	0.00	5.42	0.16	0.00
30.19	2.00	0.00	5.40	0.17	0.00	30.35	2.00	0.00	5.37	0.16	0.00
30.51	2.00	0.00	5.35	0.16	0.00	30.68	2.00	0.00	5.32	0.17	0.00
30.84	2.00	0.00	5.30	0.16	0.00	31.01	1.17	0.00	5.27	0.17	0.00
31.17	1.13	0.00	5.25	0.16	0.00	31.33	0.96	0.04	5.23	0.16	0.01
31.50	0.80	0.20	5.20	0.17	0.05	31.66	1.01	0.00	5.18	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
31.83	1.33	0.00	5.15	0.17	0.00	31.99	1.23	0.00	5.12	0.16	0.00
32.15	0.98	0.02	5.10	0.16	0.01	32.32	2.00	0.00	5.07	0.17	0.00
32.48	2.00	0.00	5.05	0.16	0.00	32.65	2.00	0.00	5.02	0.17	0.00
32.81	2.00	0.00	5.00	0.16	0.00	32.97	0.51	0.49	4.98	0.16	0.12
33.14	0.65	0.35	4.95	0.17	0.09	33.30	0.96	0.04	4.93	0.16	0.01
33.47	1.32	0.00	4.90	0.17	0.00	33.63	1.87	0.00	4.87	0.16	0.00
33.79	2.00	0.00	4.85	0.16	0.00	33.96	2.00	0.00	4.82	0.17	0.00
34.12	2.00	0.00	4.80	0.16	0.00	34.29	2.00	0.00	4.77	0.17	0.00
34.45	2.00	0.00	4.75	0.16	0.00	34.61	2.00	0.00	4.73	0.16	0.00
34.78	2.00	0.00	4.70	0.17	0.00	34.94	2.00	0.00	4.68	0.16	0.00
35.11	0.97	0.03	4.65	0.17	0.01	35.27	0.56	0.44	4.62	0.16	0.10
35.43	2.00	0.00	4.60	0.16	0.00	35.60	2.00	0.00	4.57	0.17	0.00
35.76	2.00	0.00	4.55	0.16	0.00	35.93	2.00	0.00	4.52	0.17	0.00
36.09	2.00	0.00	4.50	0.16	0.00	36.26	2.00	0.00	4.47	0.17	0.00
36.42	2.00	0.00	4.45	0.16	0.00	36.58	2.00	0.00	4.43	0.16	0.00
36.75	2.00	0.00	4.40	0.17	0.00	36.91	0.64	0.36	4.37	0.16	0.08
37.08	0.66	0.34	4.35	0.17	0.08	37.24	0.69	0.31	4.32	0.16	0.07
37.40	0.71	0.29	4.30	0.16	0.06	37.57	0.74	0.26	4.27	0.17	0.06
37.73	0.71	0.29	4.25	0.16	0.06	37.90	0.66	0.34	4.22	0.17	0.07
38.06	0.60	0.40	4.20	0.16	0.08	38.22	0.56	0.44	4.18	0.16	0.09
38.39	2.00	0.00	4.15	0.17	0.00	38.55	0.53	0.47	4.12	0.16	0.09
38.72	0.52	0.48	4.10	0.17	0.10	38.88	0.49	0.51	4.07	0.16	0.10
39.04	2.00	0.00	4.05	0.16	0.00	39.21	2.00	0.00	4.02	0.17	0.00
39.37	2.00	0.00	4.00	0.16	0.00	39.54	2.00	0.00	3.97	0.17	0.00
39.70	2.00	0.00	3.95	0.16	0.00	39.86	2.00	0.00	3.93	0.16	0.00
40.03	1.00	0.00	3.90	0.17	0.00	40.19	1.12	0.00	3.88	0.16	0.00
40.36	1.12	0.00	3.85	0.17	0.00	40.52	0.99	0.01	3.82	0.16	0.00
40.68	0.86	0.14	3.80	0.16	0.03	40.85	0.79	0.21	3.77	0.17	0.04
41.01	0.73	0.27	3.75	0.16	0.05	41.18	0.66	0.34	3.72	0.17	0.07
41.34	0.60	0.40	3.70	0.16	0.07	41.50	0.61	0.39	3.68	0.16	0.07
41.67	2.00	0.00	3.65	0.17	0.00	41.83	2.00	0.00	3.63	0.16	0.00
42.00	2.00	0.00	3.60	0.17	0.00	42.16	2.00	0.00	3.57	0.16	0.00
42.32	2.00	0.00	3.55	0.16	0.00	42.49	2.00	0.00	3.52	0.17	0.00
42.65	2.00	0.00	3.50	0.16	0.00	42.82	2.00	0.00	3.47	0.17	0.00
42.98	2.00	0.00	3.45	0.16	0.00	43.15	2.00	0.00	3.42	0.17	0.00
43.31	2.00	0.00	3.40	0.16	0.00	43.47	2.00	0.00	3.38	0.16	0.00
43.64	2.00	0.00	3.35	0.17	0.00	43.80	2.00	0.00	3.32	0.16	0.00
43.97	2.00	0.00	3.30	0.17	0.00	44.13	2.00	0.00	3.27	0.16	0.00
44.29	2.00	0.00	3.25	0.16	0.00	44.46	2.00	0.00	3.22	0.17	0.00
44.62	2.00	0.00	3.20	0.16	0.00	44.79	2.00	0.00	3.17	0.17	0.00
44.95	2.00	0.00	3.15	0.16	0.00	45.11	2.00	0.00	3.13	0.16	0.00
45.28	2.00	0.00	3.10	0.17	0.00	45.44	2.00	0.00	3.07	0.16	0.00
45.61	2.00	0.00	3.05	0.17	0.00	45.77	2.00	0.00	3.02	0.16	0.00
45.93	2.00	0.00	3.00	0.16	0.00	46.10	0.57	0.43	2.97	0.17	0.07
46.26	0.60	0.40	2.95	0.16	0.06	46.43	0.61	0.39	2.92	0.17	0.06
46.59	0.64	0.36	2.90	0.16	0.05	46.75	0.73	0.27	2.88	0.16	0.04
46.92	0.92	0.08	2.85	0.17	0.01	47.08	1.17	0.00	2.83	0.16	0.00
47.25	1.41	0.00	2.80	0.17	0.00	47.41	1.49	0.00	2.77	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
47.57	1.52	0.00	2.75	0.16	0.00	47.74	1.49	0.00	2.72	0.17	0.00
47.90	1.52	0.00	2.70	0.16	0.00	48.07	1.57	0.00	2.67	0.17	0.00
48.23	1.61	0.00	2.65	0.16	0.00	48.39	1.52	0.00	2.63	0.16	0.00
48.56	1.28	0.00	2.60	0.17	0.00	48.72	1.02	0.00	2.58	0.16	0.00
48.89	1.02	0.00	2.55	0.17	0.00	49.05	2.00	0.00	2.52	0.16	0.00
49.22	2.00	0.00	2.50	0.17	0.00	49.38	2.00	0.00	2.47	0.16	0.00
49.54	2.00	0.00	2.45	0.16	0.00	49.71	2.00	0.00	2.42	0.17	0.00
49.87	2.00	0.00	2.40	0.16	0.00	50.04	2.00	0.00	2.37	0.17	0.00
50.20	2.00	0.00	2.35	0.16	0.00						

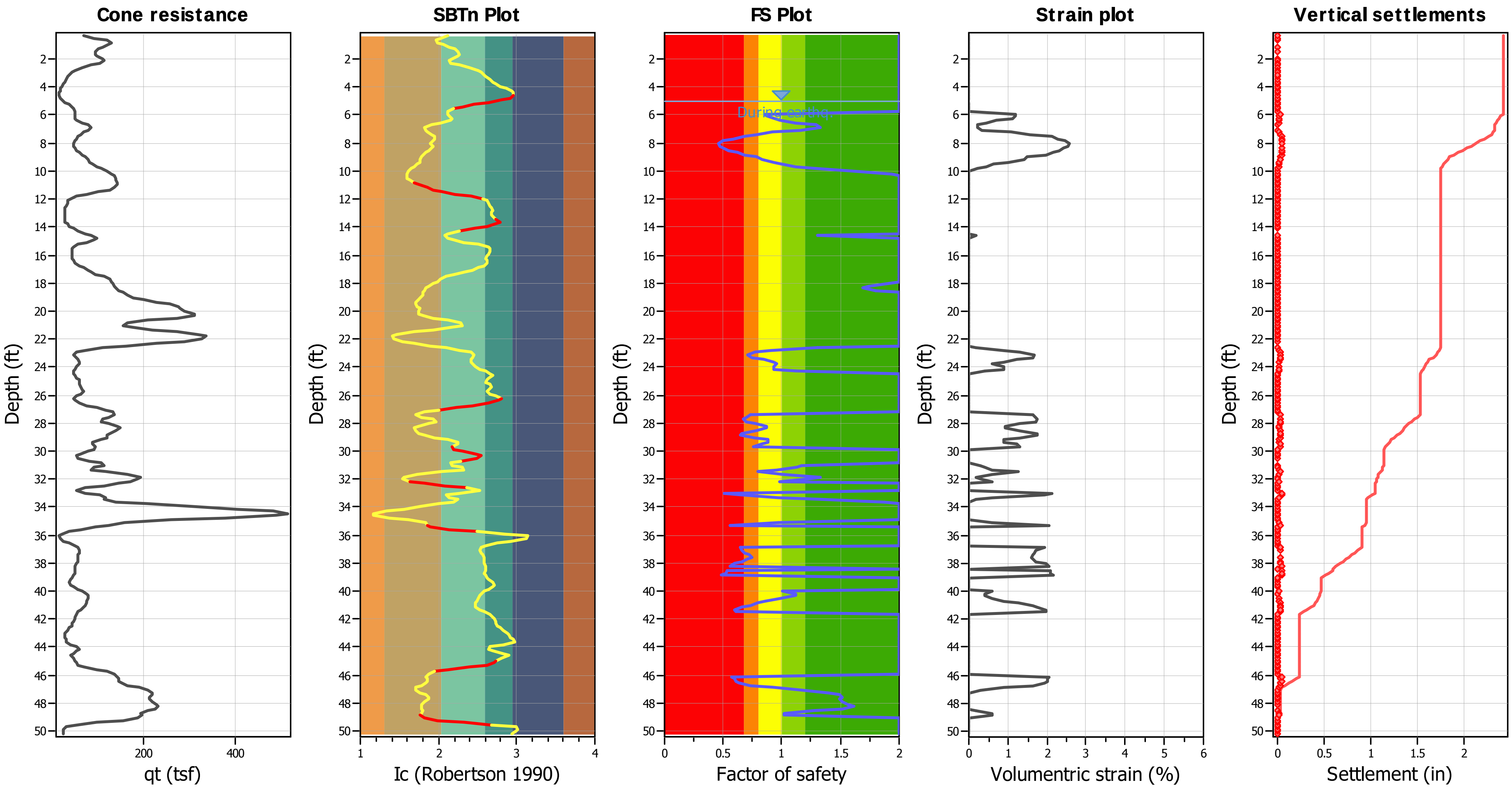
Overall liquefaction potential: 5.58

LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
F_L: 1 - FS
w_z: Function value of the extend of soil liquefaction according to depth
d_z: Layer thickness (ft)
LPI: Liquefaction potential index value for test point

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Kc	Qc1n	Qc1n,cs	N1,60 (blows)	Vs (ft/s)	Gmax (tsf)	CSR	Shear, γ (%)	Svol,15 (%)	Nc	ev (%)	Settle. (in)
0.33	2.11	1.48	109.01	161.44	35	903.9	217	0.26	0.003	0.00	10.08	0.00	0.000
0.49	2.02	1.32	146.33	193.74	41	985.3	322	0.26	0.003	0.00	10.08	0.00	0.000
0.66	1.97	1.26	190.28	239.83	49	1088.7	470	0.26	0.003	0.00	10.08	0.00	0.000
0.82	1.99	1.28	204.98	263.14	55	1143.8	587	0.26	0.003	0.00	10.08	0.00	0.000
0.98	2.06	1.39	195.47	271.53	58	1170.7	679	0.26	0.003	0.00	10.08	0.00	0.000
1.15	2.14	1.53	176.44	270.14	59	1168.6	735	0.26	0.003	0.00	10.08	0.00	0.000
1.31	2.21	1.68	161.06	271.28	61	1165.3	782	0.26	0.003	0.00	10.08	0.00	0.000
1.48	2.25	1.81	152.71	276.43	64	1169.0	838	0.26	0.003	0.00	10.08	0.00	0.000
1.64	2.28	1.87	150.36	281.37	65	1175.4	895	0.26	0.003	0.00	10.08	0.00	0.000
1.80	2.25	1.80	158.36	284.51	66	1186.9	958	0.26	0.003	0.00	10.08	0.00	0.000
1.97	2.18	1.62	174.06	282.23	63	1191.5	1012	0.26	0.003	0.00	10.08	0.00	0.000
2.13	2.14	1.53	181.08	277.16	61	1183.7	1037	0.26	0.004	0.00	10.08	0.00	0.000
2.30	2.16	1.58	168.59	265.67	59	1157.7	1026	0.26	0.004	0.00	10.08	0.00	0.000
2.46	2.27	1.86	134.97	251.53	58	1111.9	971	0.26	0.005	0.00	10.08	0.00	0.000
2.62	2.40	2.33	102.67	238.93	59	1053.7	890	0.26	0.005	0.00	10.08	0.00	0.000
2.79	2.51	2.83	79.48	225.31	58	993.5	806	0.26	0.007	0.00	10.08	0.00	0.000
2.95	2.54	2.99	69.02	206.05	54	942.5	736	0.26	0.008	0.00	10.08	0.00	0.000
3.12	2.58	3.18	60.53	192.43	51	902.0	685	0.26	0.009	0.00	10.08	0.00	0.000
3.28	2.61	3.39	54.07	183.27	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
3.45	2.65	3.68	48.81	179.47	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
3.61	2.69	3.94	44.02	173.25	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
3.77	2.73	4.22	39.49	166.66	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
3.94	2.79	4.70	34.07	160.14	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.10	2.86	5.28	29.36	155.17	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.27	2.93	6.00	25.30	151.82	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.43	2.95	6.25	23.96	149.79	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.59	2.96	6.29	24.54	154.31	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.76	2.92	5.91	26.78	158.32	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.92	2.81	4.87	33.40	162.70	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000

Total estimated settlement: 0.00

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
5.09	157.68	2.00	0.00	1.00	0.00	5.25	147.99	2.00	0.00	1.00	0.00
5.41	135.56	2.00	0.00	1.00	0.00	5.58	125.85	2.00	0.00	1.00	0.00
5.74	118.88	2.00	0.00	1.00	0.00	5.91	119.12	0.85	1.21	1.00	0.02
6.07	120.65	0.87	1.19	1.00	0.02	6.23	126.19	0.94	1.11	1.00	0.02
6.40	129.47	0.98	0.69	1.00	0.01	6.56	137.81	1.11	0.45	1.00	0.01
6.73	147.75	1.29	0.22	1.00	0.00	6.89	150.35	1.33	0.22	1.00	0.00
7.05	141.80	1.15	0.32	1.00	0.01	7.22	128.60	0.92	1.08	1.00	0.02
7.38	119.69	0.78	1.56	1.00	0.03	7.55	111.45	0.68	2.11	1.00	0.04
7.71	102.52	0.58	2.29	1.00	0.04	7.87	94.13	0.50	2.46	1.00	0.05
8.04	88.73	0.46	2.58	1.00	0.05	8.20	90.57	0.47	2.53	1.00	0.05
8.37	94.85	0.50	2.44	1.00	0.05	8.53	101.08	0.54	2.32	1.00	0.04
8.69	109.04	0.62	2.18	1.00	0.04	8.86	116.21	0.69	1.99	1.00	0.04
9.02	123.78	0.78	1.49	1.00	0.03	9.19	128.69	0.84	1.41	1.00	0.03

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
9.35	135.48	0.93	1.00	1.00	0.02	9.51	139.92	1.00	0.65	1.00	0.01
9.68	147.25	1.11	0.43	1.00	0.01	9.84	155.85	1.27	0.21	1.00	0.00
10.01	171.80	1.61	0.00	1.00	0.00	10.17	184.81	1.94	0.00	1.00	0.00
10.34	191.55	2.00	0.00	1.00	0.00	10.50	194.63	2.00	0.00	1.00	0.00
10.66	196.15	2.00	0.00	1.00	0.00	10.83	204.93	2.00	0.00	1.00	0.00
10.99	217.83	2.00	0.00	1.00	0.00	11.16	230.95	2.00	0.00	1.00	0.00
11.32	227.93	2.00	0.00	1.00	0.00	11.48	213.96	2.00	0.00	1.00	0.00
11.65	197.53	2.00	0.00	1.00	0.00	11.81	193.50	2.00	0.00	1.00	0.00
11.98	191.97	2.00	0.00	1.00	0.00	12.14	183.82	2.00	0.00	1.00	0.00
12.30	176.89	2.00	0.00	1.00	0.00	12.47	172.09	2.00	0.00	1.00	0.00
12.63	166.76	2.00	0.00	1.00	0.00	12.80	161.46	2.00	0.00	1.00	0.00
12.96	157.05	2.00	0.00	1.00	0.00	13.12	156.68	2.00	0.00	1.00	0.00
13.29	167.39	2.00	0.00	1.00	0.00	13.45	187.95	2.00	0.00	1.00	0.00
13.62	207.25	2.00	0.00	1.00	0.00	13.78	212.40	2.00	0.00	1.00	0.00
13.94	199.44	2.00	0.00	1.00	0.00	14.11	177.86	2.00	0.00	1.00	0.00
14.27	148.25	2.00	0.00	1.00	0.00	14.44	147.21	2.00	0.00	1.00	0.00
14.60	164.24	1.30	0.20	1.00	0.00	14.76	198.88	2.00	0.00	1.00	0.00
14.93	212.79	2.00	0.00	1.00	0.00	15.09	217.67	2.00	0.00	1.00	0.00
15.26	222.40	2.00	0.00	1.00	0.00	15.42	235.08	2.00	0.00	1.00	0.00
15.58	240.39	2.00	0.00	1.00	0.00	15.75	236.15	2.00	0.00	1.00	0.00
15.91	223.97	2.00	0.00	1.00	0.00	16.08	212.69	2.00	0.00	1.00	0.00
16.24	207.69	2.00	0.00	1.00	0.00	16.40	218.43	2.00	0.00	1.00	0.00
16.57	237.88	2.00	0.00	1.00	0.00	16.73	259.96	2.00	0.00	1.00	0.00
16.90	270.61	2.00	0.00	1.00	0.00	17.06	252.73	2.00	0.00	1.00	0.00
17.23	227.01	2.00	0.00	1.00	0.00	17.39	199.96	2.00	0.00	1.00	0.00
17.55	200.80	2.00	0.00	1.00	0.00	17.72	202.22	2.00	0.00	1.00	0.00
17.88	200.85	2.00	0.00	1.00	0.00	18.05	193.20	1.91	0.00	1.00	0.00
18.21	186.63	1.74	0.00	1.00	0.00	18.37	184.84	1.69	0.00	1.00	0.00
18.54	189.56	1.81	0.00	1.00	0.00	18.70	198.82	2.00	0.00	1.00	0.00
18.87	207.75	2.00	0.00	1.00	0.00	19.03	220.20	2.00	0.00	1.00	0.00
19.19	242.00	2.00	0.00	1.00	0.00	19.36	269.76	2.00	0.00	1.00	0.00
19.52	301.61	2.00	0.00	1.00	0.00	19.69	326.24	2.00	0.00	1.00	0.00
19.85	335.21	2.00	0.00	1.00	0.00	20.01	345.04	2.00	0.00	1.00	0.00
20.18	364.69	2.00	0.00	1.00	0.00	20.34	382.36	2.00	0.00	1.00	0.00
20.51	374.00	2.00	0.00	1.00	0.00	20.67	355.96	2.00	0.00	1.00	0.00
20.83	361.58	2.00	0.00	1.00	0.00	21.00	345.89	2.00	0.00	1.00	0.00
21.16	315.39	2.00	0.00	1.00	0.00	21.33	290.19	2.00	0.00	1.00	0.00
21.49	298.18	2.00	0.00	1.00	0.00	21.65	337.93	2.00	0.00	1.00	0.00
21.82	354.13	2.00	0.00	1.00	0.00	21.98	345.13	2.00	0.00	1.00	0.00
22.15	301.53	2.00	0.00	1.00	0.00	22.31	246.21	2.00	0.00	1.00	0.00
22.47	201.75	2.00	0.00	1.00	0.00	22.64	168.34	1.30	0.20	1.00	0.00
22.80	145.59	0.91	0.90	1.00	0.02	22.97	135.33	0.77	1.31	1.00	0.03
23.13	130.20	0.71	1.69	1.00	0.03	23.30	133.46	0.74	1.63	1.00	0.03
23.46	141.06	0.84	1.23	1.00	0.02	23.62	147.53	0.94	0.88	1.00	0.02
23.79	149.21	0.96	0.61	1.00	0.01	23.95	147.26	0.93	0.88	1.00	0.02
24.12	147.43	0.93	0.88	1.00	0.02	24.28	158.83	1.12	0.41	1.00	0.01
24.44	177.46	2.00	0.00	1.00	0.00	24.61	193.78	2.00	0.00	1.00	0.00
24.77	200.61	2.00	0.00	1.00	0.00	24.94	200.77	2.00	0.00	1.00	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
25.10	206.63	2.00	0.00	1.00	0.00	25.26	221.46	2.00	0.00	1.00	0.00
25.43	236.71	2.00	0.00	1.00	0.00	25.59	240.39	2.00	0.00	1.00	0.00
25.76	231.41	2.00	0.00	1.00	0.00	25.92	221.42	2.00	0.00	1.00	0.00
26.08	220.50	2.00	0.00	1.00	0.00	26.25	225.49	2.00	0.00	1.00	0.00
26.41	223.59	2.00	0.00	1.00	0.00	26.58	208.38	2.00	0.00	1.00	0.00
26.74	181.82	2.00	0.00	1.00	0.00	26.90	160.67	2.00	0.00	1.00	0.00
27.07	145.42	2.00	0.00	1.00	0.00	27.23	139.95	2.00	0.00	1.00	0.00
27.40	133.03	0.73	1.64	1.00	0.03	27.56	129.52	0.69	1.70	1.00	0.03
27.72	127.47	0.67	1.74	1.00	0.03	27.89	129.45	0.69	1.70	1.00	0.03
28.05	135.61	0.76	1.30	1.00	0.03	28.22	143.39	0.87	0.92	1.00	0.02
28.38	143.29	0.87	0.92	1.00	0.02	28.54	136.76	0.78	1.29	1.00	0.02
28.71	126.21	0.65	1.77	1.00	0.04	28.87	126.15	0.65	1.77	1.00	0.03
29.04	135.97	0.77	1.30	1.00	0.03	29.20	144.39	0.88	0.91	1.00	0.02
29.36	145.02	0.89	0.90	1.00	0.02	29.53	141.33	0.83	1.23	1.00	0.03
29.69	135.64	0.76	1.30	1.00	0.02	29.86	137.19	2.00	0.00	1.00	0.00
30.02	136.93	2.00	0.00	1.00	0.00	30.19	143.97	2.00	0.00	1.00	0.00
30.35	140.86	2.00	0.00	1.00	0.00	30.51	132.07	2.00	0.00	1.00	0.00
30.68	134.82	2.00	0.00	1.00	0.00	30.84	150.42	2.00	0.00	1.00	0.00
31.01	163.36	1.17	0.29	1.00	0.01	31.17	161.01	1.13	0.40	1.00	0.01
31.33	150.44	0.96	0.60	1.00	0.01	31.50	139.30	0.80	1.25	1.00	0.03
31.66	153.89	1.01	0.59	1.00	0.01	31.83	171.73	1.33	0.20	1.00	0.00
31.99	166.70	1.23	0.28	1.00	0.01	32.15	152.17	0.98	0.60	1.00	0.01
32.32	144.75	2.00	0.00	1.00	0.00	32.48	137.42	2.00	0.00	1.00	0.00
32.65	132.43	2.00	0.00	1.00	0.00	32.81	123.21	2.00	0.00	1.00	0.00
32.97	112.72	0.51	2.12	1.00	0.04	33.14	126.99	0.65	1.92	1.00	0.04
33.30	151.42	0.96	0.60	1.00	0.01	33.47	171.90	1.32	0.20	1.00	0.00
33.63	196.14	1.87	0.00	1.00	0.00	33.79	230.40	2.00	0.00	1.00	0.00
33.96	287.96	2.00	0.00	1.00	0.00	34.12	354.34	2.00	0.00	1.00	0.00
34.29	421.23	2.00	0.00	1.00	0.00	34.45	446.77	2.00	0.00	1.00	0.00
34.61	423.94	2.00	0.00	1.00	0.00	34.78	326.19	2.00	0.00	1.00	0.00
34.94	223.58	2.00	0.00	1.00	0.00	35.11	151.95	0.97	0.60	1.00	0.01
35.27	118.54	0.56	2.03	1.00	0.04	35.43	92.50	2.00	0.00	1.00	0.00
35.60	76.31	2.00	0.00	1.00	0.00	35.76	76.41	2.00	0.00	1.00	0.00
35.93	82.20	2.00	0.00	1.00	0.00	36.09	78.09	2.00	0.00	1.00	0.00
36.26	87.40	2.00	0.00	1.00	0.00	36.42	100.47	2.00	0.00	1.00	0.00
36.58	115.50	2.00	0.00	1.00	0.00	36.75	122.61	2.00	0.00	1.00	0.00
36.91	126.84	0.64	1.92	1.00	0.04	37.08	128.47	0.66	1.72	1.00	0.04
37.24	130.84	0.69	1.68	1.00	0.03	37.40	133.26	0.71	1.64	1.00	0.03
37.57	135.50	0.74	1.60	1.00	0.03	37.73	133.16	0.71	1.64	1.00	0.03
37.90	128.53	0.66	1.72	1.00	0.04	38.06	122.91	0.60	1.97	1.00	0.04
38.22	118.27	0.56	2.04	1.00	0.04	38.39	117.07	2.00	0.00	1.00	0.00
38.55	115.51	0.53	2.08	1.00	0.04	38.72	114.06	0.52	2.10	1.00	0.04
38.88	110.34	0.49	2.16	1.00	0.04	39.04	105.59	2.00	0.00	1.00	0.00
39.21	100.64	2.00	0.00	1.00	0.00	39.37	99.70	2.00	0.00	1.00	0.00
39.54	110.46	2.00	0.00	1.00	0.00	39.70	126.56	2.00	0.00	1.00	0.00
39.86	141.96	2.00	0.00	1.00	0.00	40.03	153.95	1.00	0.59	1.00	0.01
40.19	160.87	1.12	0.40	1.00	0.01	40.36	160.93	1.12	0.40	1.00	0.01
40.52	153.14	0.99	0.59	1.00	0.01	40.68	144.43	0.86	0.91	1.00	0.02

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
40.85	139.20	0.79	1.25	1.00	0.03	41.01	133.95	0.73	1.62	1.00	0.03
41.18	127.87	0.66	1.73	1.00	0.04	41.34	122.33	0.60	1.98	1.00	0.04
41.50	123.48	0.61	1.97	1.00	0.04	41.67	128.82	2.00	0.00	1.00	0.00
41.83	132.43	2.00	0.00	1.00	0.00	42.00	131.52	2.00	0.00	1.00	0.00
42.16	127.30	2.00	0.00	1.00	0.00	42.32	122.87	2.00	0.00	1.00	0.00
42.49	119.65	2.00	0.00	1.00	0.00	42.65	110.51	2.00	0.00	1.00	0.00
42.82	100.75	2.00	0.00	1.00	0.00	42.98	92.67	2.00	0.00	1.00	0.00
43.15	94.01	2.00	0.00	1.00	0.00	43.31	99.36	2.00	0.00	1.00	0.00
43.47	109.39	2.00	0.00	1.00	0.00	43.64	118.59	2.00	0.00	1.00	0.00
43.80	124.49	2.00	0.00	1.00	0.00	43.97	125.32	2.00	0.00	1.00	0.00
44.13	132.56	2.00	0.00	1.00	0.00	44.29	137.45	2.00	0.00	1.00	0.00
44.46	139.85	2.00	0.00	1.00	0.00	44.62	137.09	2.00	0.00	1.00	0.00
44.79	136.26	2.00	0.00	1.00	0.00	44.95	136.26	2.00	0.00	1.00	0.00
45.11	131.70	2.00	0.00	1.00	0.00	45.28	121.25	2.00	0.00	1.00	0.00
45.44	106.53	2.00	0.00	1.00	0.00	45.61	99.93	2.00	0.00	1.00	0.00
45.77	105.36	2.00	0.00	1.00	0.00	45.93	113.89	2.00	0.00	1.00	0.00
46.10	117.88	0.57	2.04	1.00	0.04	46.26	120.50	0.60	2.01	1.00	0.04
46.43	121.34	0.61	1.99	1.00	0.04	46.59	124.49	0.64	1.95	1.00	0.04
46.75	132.22	0.73	1.65	1.00	0.03	46.92	146.25	0.92	0.89	1.00	0.02
47.08	161.71	1.17	0.29	1.00	0.01	47.25	173.95	1.41	0.00	1.00	0.00
47.41	177.74	1.49	0.00	1.00	0.00	47.57	178.89	1.52	0.00	1.00	0.00
47.74	177.41	1.49	0.00	1.00	0.00	47.90	178.62	1.52	0.00	1.00	0.00
48.07	180.90	1.57	0.00	1.00	0.00	48.23	182.73	1.61	0.00	1.00	0.00
48.39	178.48	1.52	0.00	1.00	0.00	48.56	166.92	1.28	0.20	1.00	0.00
48.72	152.14	1.02	0.60	1.00	0.01	48.89	152.18	1.02	0.60	1.00	0.01
49.05	148.42	2.00	0.00	1.00	0.00	49.22	137.30	2.00	0.00	1.00	0.00
49.38	121.93	2.00	0.00	1.00	0.00	49.54	116.86	2.00	0.00	1.00	0.00
49.71	103.46	2.00	0.00	1.00	0.00	49.87	84.78	2.00	0.00	1.00	0.00
50.04	76.00	2.00	0.00	1.00	0.00	50.20	74.36	2.00	0.00	1.00	0.00

Total estimated settlement: 2.42

Abbreviations

$Q_{tn,cs}$: Equivalent clean sand normalized cone resistance
FS: Factor of safety against liquefaction
e_v (%): Post-liquefaction volumentric strain
DF: e_v depth weighting factor
Settlement: Calculated settlement

:: Strength loss calculation (Robertson (2009) ::

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
0.33	67.87	109.01	1.48	161.44	2.11	N/A	N/A
0.49	91.11	146.33	1.32	193.74	2.02	N/A	N/A
0.66	118.47	190.28	1.26	239.83	1.97	N/A	N/A
0.82	127.63	204.98	1.28	263.14	1.99	N/A	N/A
0.98	121.73	195.47	1.39	271.53	2.06	N/A	N/A
1.15	109.90	176.44	1.53	270.14	2.14	N/A	N/A
1.31	100.33	161.06	1.68	271.28	2.21	N/A	N/A
1.48	95.15	152.71	1.81	276.43	2.25	N/A	N/A
1.64	93.69	150.36	1.87	281.37	2.28	N/A	N/A
1.80	98.68	158.36	1.80	284.51	2.25	N/A	N/A
1.97	108.47	174.06	1.62	282.23	2.18	N/A	N/A
2.13	112.84	181.08	1.53	277.16	2.14	N/A	N/A
2.30	105.08	168.59	1.58	265.67	2.16	N/A	N/A
2.46	84.17	134.97	1.86	251.53	2.27	N/A	N/A
2.62	64.08	102.67	2.33	238.93	2.40	N/A	N/A
2.79	49.65	79.48	2.83	225.31	2.51	N/A	N/A
2.95	43.15	69.02	2.99	206.05	2.54	N/A	N/A
3.12	37.87	60.53	3.18	192.43	2.58	N/A	N/A
3.28	33.87	54.07	3.39	183.27	2.61	N/A	N/A
3.45	30.60	48.81	3.68	179.47	2.65	N/A	N/A
3.61	27.63	44.02	3.94	173.25	2.69	N/A	N/A
3.77	24.82	39.49	4.22	166.66	2.73	N/A	N/A
3.94	21.46	34.07	4.70	160.14	2.79	N/A	N/A
4.10	18.54	29.36	5.28	155.17	2.86	N/A	N/A
4.27	16.02	25.30	6.00	151.82	2.93	N/A	N/A
4.43	15.19	23.96	6.25	149.79	2.95	N/A	N/A
4.59	15.56	24.54	6.29	154.31	2.96	N/A	N/A
4.76	16.97	26.78	5.91	158.32	2.92	N/A	N/A
4.92	21.10	33.40	4.87	162.70	2.81	N/A	N/A
5.09	27.89	44.30	3.56	157.68	2.64	6.22	6.22
5.25	36.52	58.15	2.54	147.99	2.45	0.75	0.75
5.41	43.18	68.84	1.97	135.56	2.31	0.78	0.78
5.58	47.55	75.84	1.66	125.85	2.20	0.79	0.79
5.74	49.58	79.09	1.50	118.88	2.13	0.79	0.79
5.91	50.09	79.88	1.49	119.12	2.12	0.80	0.80
6.07	49.32	78.63	1.53	120.65	2.14	0.79	0.79
6.23	48.73	77.66	1.62	126.19	2.18	0.79	0.79
6.40	52.56	83.81	1.54	129.47	2.15	0.80	0.80
6.56	64.09	102.32	1.35	137.81	2.03	0.83	0.83
6.73	77.26	123.46	1.20	147.75	1.91	0.86	0.86
6.89	83.36	133.24	1.13	150.35	1.83	0.87	0.87
7.05	78.62	125.61	1.13	141.80	1.83	0.86	0.86
7.22	69.59	111.08	1.16	128.60	1.87	0.84	0.84
7.38	62.02	98.91	1.21	119.69	1.92	0.83	0.83
7.55	56.45	89.95	1.24	111.45	1.95	0.81	0.81
7.71	52.08	82.92	1.24	102.52	1.95	0.80	0.80
7.87	48.72	77.49	1.21	94.13	1.93	0.79	0.79
8.04	46.92	74.59	1.19	88.73	1.90	0.79	0.79

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
8.20	46.92	74.58	1.21	90.57	1.93	0.79	0.79
8.37	49.49	78.70	1.21	94.85	1.92	0.79	0.79
8.53	54.07	86.03	1.17	101.08	1.88	0.81	0.81
8.69	60.27	95.97	1.14	109.04	1.84	0.82	0.82
8.86	66.60	104.96	1.11	116.21	1.80	0.83	0.83
9.02	72.00	112.52	1.10	123.78	1.79	0.84	0.84
9.19	76.60	118.32	1.09	128.69	1.77	0.85	0.85
9.35	81.50	125.00	1.08	135.48	1.77	0.86	0.86
9.51	88.00	132.48	1.06	139.92	1.73	0.87	0.87
9.68	96.64	142.80	1.03	147.25	1.69	0.88	0.88
9.84	107.67	156.01	1.00	155.85	1.64	0.89	0.89
10.01	119.34	171.80	1.00	171.80	1.62	0.91	0.91
10.17	129.00	184.81	1.00	184.81	1.60	0.92	0.92
10.34	134.43	191.55	1.00	191.55	1.59	0.92	0.92
10.50	137.29	194.63	1.00	194.63	1.60	0.93	0.93
10.66	139.09	196.15	1.00	196.15	1.63	0.93	0.93
10.83	140.59	199.72	1.03	204.93	1.68	0.93	0.93
10.99	140.43	202.70	1.07	217.83	1.75	0.93	0.93
11.16	136.93	202.00	1.14	230.95	1.85	0.93	0.93
11.32	124.76	187.16	1.22	227.93	1.93	0.92	0.92
11.48	101.41	156.21	1.37	213.96	2.05	0.89	0.89
11.65	73.63	117.15	1.69	197.53	2.21	0.85	0.85
11.81	51.01	80.81	2.39	193.50	2.42	0.80	0.80
11.98	39.11	61.66	3.11	191.97	2.56	0.76	0.76
12.14	33.62	52.83	3.48	183.82	2.62	4.53	4.53
12.30	31.82	49.92	3.54	176.89	2.63	4.25	4.25
12.47	29.72	46.52	3.70	172.09	2.66	3.92	3.92
12.63	28.15	43.99	3.79	166.76	2.67	3.67	3.67
12.80	26.33	41.05	3.93	161.46	2.69	3.40	3.40
12.96	26.14	40.72	3.86	157.05	2.68	3.34	3.34
13.12	26.64	41.52	3.77	156.68	2.67	3.38	3.38
13.29	27.34	42.63	3.93	167.39	2.69	3.44	3.44
13.45	28.11	43.85	4.29	187.95	2.74	3.50	3.50
13.62	28.58	44.58	4.65	207.25	2.78	3.53	3.53
13.78	31.93	49.95	4.25	212.40	2.73	3.92	3.92
13.94	36.72	57.63	3.46	199.44	2.62	4.48	4.48
14.11	45.23	68.70	2.59	177.86	2.46	0.78	0.78
14.27	54.98	79.65	1.86	148.25	2.27	0.80	0.80
14.44	70.49	98.42	1.50	147.21	2.12	0.83	0.83
14.60	84.47	116.29	1.41	164.24	2.08	0.85	0.85
14.76	96.57	133.56	1.49	198.88	2.12	0.87	0.87
14.93	91.86	128.29	1.66	212.79	2.20	0.86	0.86
15.09	75.61	107.53	2.02	217.67	2.32	0.84	0.84
15.26	54.79	79.95	2.78	222.40	2.50	0.80	0.80
15.42	44.96	66.62	3.53	235.08	2.63	5.08	5.08
15.58	43.90	64.87	3.71	240.39	2.66	4.91	4.91
15.75	43.88	64.25	3.68	236.15	2.65	4.87	4.87
15.91	43.28	62.70	3.57	223.97	2.64	4.76	4.76

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
16.08	43.39	62.10	3.42	212.69	2.62	4.73	4.73
16.24	44.33	62.80	3.31	207.69	2.60	0.76	0.76
16.40	45.08	63.66	3.43	218.43	2.62	4.84	4.84
16.57	48.28	67.91	3.50	237.88	2.63	5.14	5.14
16.73	57.66	80.17	3.24	259.96	2.59	0.80	0.80
16.90	69.22	94.65	2.86	270.61	2.52	0.82	0.82
17.06	77.48	103.79	2.44	252.73	2.43	0.83	0.83
17.23	83.21	109.10	2.08	227.01	2.34	0.84	0.84
17.39	95.60	121.74	1.64	199.96	2.19	0.86	0.86
17.55	111.73	139.46	1.44	200.80	2.09	0.88	0.88
17.72	124.36	152.69	1.32	202.22	2.02	0.89	0.89
17.88	128.69	156.50	1.28	200.85	1.99	0.89	0.89
18.05	131.12	157.48	1.23	193.20	1.94	0.89	0.89
18.21	134.48	159.42	1.17	186.63	1.88	0.89	0.89
18.37	139.25	163.27	1.13	184.84	1.83	0.90	0.90
18.54	145.85	169.81	1.12	189.56	1.81	0.90	0.90
18.70	154.19	178.71	1.11	198.82	1.81	0.91	0.91
18.87	163.53	188.44	1.10	207.75	1.79	0.92	0.92
19.03	177.02	202.63	1.09	220.20	1.77	0.93	0.93
19.19	197.93	225.25	1.07	242.00	1.75	0.95	0.95
19.36	228.83	258.05	1.05	269.76	1.71	0.97	0.97
19.52	255.82	287.66	1.05	301.61	1.72	0.99	0.99
19.69	274.43	307.96	1.06	326.24	1.73	1.00	1.00
19.85	278.12	311.74	1.08	335.21	1.76	1.00	1.00
20.01	289.91	323.21	1.07	345.04	1.74	1.01	1.01
20.18	309.47	343.28	1.06	364.69	1.74	1.02	1.02
20.34	312.07	346.99	1.10	382.36	1.79	1.02	1.02
20.51	273.53	307.18	1.22	374.00	1.93	1.00	1.00
20.67	208.75	237.90	1.50	355.96	2.12	0.96	0.96
20.83	162.86	187.64	1.93	361.58	2.29	0.92	0.92
21.00	153.81	176.28	1.96	345.89	2.30	0.91	0.91
21.16	172.81	194.73	1.62	315.39	2.18	0.93	0.93
21.33	218.49	239.31	1.21	290.19	1.92	0.96	0.96
21.49	272.45	290.81	1.03	298.18	1.68	0.99	0.99
21.65	318.66	337.93	1.00	337.93	1.47	1.01	1.01
21.82	335.03	354.13	1.00	354.13	1.42	1.02	1.02
21.98	327.62	345.13	1.00	345.13	1.43	1.02	1.02
22.15	287.41	301.53	1.00	301.53	1.54	1.00	1.00
22.31	227.39	238.49	1.03	246.21	1.69	0.96	0.96
22.47	160.01	169.59	1.19	201.75	1.90	0.90	0.90
22.64	108.81	116.11	1.45	168.34	2.10	0.85	0.85
22.80	73.11	78.20	1.86	145.59	2.27	0.79	0.79
22.97	52.44	56.00	2.42	135.33	2.42	0.75	0.75
23.13	47.44	50.41	2.58	130.20	2.46	0.74	0.74
23.30	51.62	54.61	2.44	133.46	2.43	0.75	0.75
23.46	56.67	59.76	2.36	141.06	2.41	0.76	0.76
23.62	59.12	62.13	2.37	147.53	2.41	0.76	0.76
23.79	57.36	60.03	2.49	149.21	2.44	0.76	0.76

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
23.95	53.52	55.76	2.64	147.26	2.47	0.75	0.75
24.12	48.62	50.42	2.92	147.43	2.53	0.74	0.74
24.28	46.49	48.08	3.30	158.83	2.60	0.73	0.73
24.44	46.39	47.89	3.71	177.46	2.66	3.47	3.47
24.61	48.22	49.64	3.90	193.78	2.69	3.59	3.59
24.77	54.00	55.38	3.62	200.61	2.65	4.01	4.01
24.94	57.65	58.82	3.41	200.77	2.61	4.27	4.27
25.10	59.89	60.85	3.40	206.63	2.61	4.41	4.41
25.26	58.11	58.83	3.76	221.46	2.67	4.25	4.25
25.43	60.97	61.48	3.85	236.71	2.68	4.44	4.44
25.59	65.79	66.04	3.64	240.39	2.65	4.77	4.77
25.76	67.01	66.87	3.46	231.41	2.62	4.83	4.83
25.92	60.71	60.18	3.68	221.42	2.65	4.34	4.34
26.08	52.16	51.34	4.29	220.50	2.74	3.69	3.69
26.25	47.72	46.65	4.83	225.49	2.81	3.35	3.35
26.41	50.55	49.21	4.54	223.59	2.77	3.53	3.53
26.58	59.38	57.60	3.62	208.38	2.65	4.14	4.14
26.74	75.46	72.98	2.49	181.82	2.44	0.78	0.78
26.90	95.89	92.39	1.74	160.67	2.23	0.82	0.82
27.07	116.74	111.95	1.30	145.42	2.00	0.84	0.84
27.23	131.21	125.27	1.12	139.95	1.81	0.86	0.86
27.40	134.84	128.21	1.04	133.03	1.70	0.86	0.86
27.56	124.18	117.78	1.10	129.52	1.79	0.85	0.85
27.72	110.53	104.51	1.22	127.47	1.93	0.83	0.83
27.89	108.31	102.09	1.27	129.45	1.97	0.83	0.83
28.05	124.16	116.84	1.16	135.61	1.87	0.85	0.85
28.22	143.21	134.54	1.07	143.39	1.74	0.87	0.87
28.38	148.95	139.63	1.03	143.29	1.68	0.88	0.88
28.54	139.78	130.62	1.05	136.76	1.71	0.87	0.87
28.71	127.05	118.26	1.07	126.21	1.74	0.85	0.85
28.87	120.98	112.23	1.12	126.15	1.82	0.84	0.84
29.04	118.25	109.28	1.24	135.97	1.95	0.84	0.84
29.20	105.59	96.99	1.49	144.39	2.12	0.82	0.82
29.36	88.53	80.69	1.80	145.02	2.25	0.80	0.80
29.53	86.77	78.76	1.79	141.33	2.25	0.79	0.79
29.69	93.75	85.01	1.60	135.64	2.17	0.80	0.80
29.86	92.35	83.39	1.65	137.19	2.19	0.80	0.80
30.02	77.83	69.65	1.97	136.93	2.31	0.78	0.78
30.19	61.70	54.48	2.64	143.97	2.47	0.75	0.75
30.35	53.83	47.07	2.99	140.86	2.54	0.73	0.73
30.51	55.23	48.19	2.74	132.07	2.49	0.73	0.73
30.68	80.58	71.16	1.89	134.82	2.28	0.78	0.78
30.84	107.62	95.56	1.57	150.42	2.16	0.82	0.82
31.01	114.61	101.47	1.61	163.36	2.18	0.83	0.83
31.17	92.30	80.80	1.99	161.01	2.31	0.80	0.80
31.33	85.20	74.15	2.03	150.44	2.32	0.79	0.79
31.50	115.38	101.54	1.37	139.30	2.05	0.83	0.83
31.66	162.71	145.00	1.06	153.89	1.73	0.88	0.88

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
31.83	192.18	171.73	1.00	171.73	1.56	0.91	0.91
31.99	187.00	166.70	1.00	166.70	1.54	0.90	0.90
32.15	171.24	152.17	1.00	152.17	1.63	0.89	0.89
32.32	146.40	128.58	1.13	144.75	1.83	0.86	0.86
32.48	112.27	96.91	1.42	137.42	2.08	0.82	0.82
32.65	72.68	61.16	2.17	132.43	2.36	0.76	0.76
32.81	52.15	42.93	2.87	123.21	2.52	0.71	0.71
32.97	72.42	60.79	1.85	112.72	2.27	0.76	0.76
33.14	102.61	87.29	1.45	126.99	2.10	0.81	0.81
33.30	117.89	100.10	1.51	151.42	2.13	0.83	0.83
33.47	113.79	95.64	1.80	171.90	2.25	0.82	0.82
33.63	139.28	117.36	1.67	196.14	2.20	0.85	0.85
33.79	207.09	176.68	1.30	230.40	2.00	0.91	0.91
33.96	306.52	264.99	1.09	287.96	1.77	0.97	0.97
34.12	407.08	354.34	1.00	354.34	1.55	1.02	1.02
34.29	484.71	421.23	1.00	421.23	1.33	1.05	1.05
34.45	515.10	446.77	1.00	446.77	1.16	1.06	1.06
34.61	489.97	423.94	1.00	423.94	1.16	1.05	1.05
34.78	378.37	326.19	1.00	326.19	1.37	1.01	1.01
34.94	260.59	223.58	1.00	223.58	1.61	0.95	0.95
35.11	159.36	133.84	1.14	151.95	1.84	0.87	0.87
35.27	123.68	103.09	1.15	118.54	1.86	0.83	0.83
35.43	94.34	77.78	1.19	92.50	1.90	0.79	0.79
35.60	63.34	50.63	1.51	76.31	2.13	0.74	0.74
35.76	37.48	28.37	2.69	76.41	2.48	0.66	0.66
35.93	21.69	15.15	5.43	82.20	2.87	1.08	1.08
36.09	14.27	9.27	8.42	78.09	3.14	0.66	0.66
36.26	16.12	10.66	8.20	87.40	3.12	0.76	0.76
36.42	24.15	16.81	5.98	100.47	2.93	1.20	1.20
36.58	36.36	26.48	4.36	115.50	2.75	1.86	1.86
36.75	48.55	36.23	3.38	122.61	2.61	2.52	2.52
36.91	55.87	42.03	3.02	126.84	2.55	0.71	0.71
37.08	58.49	44.00	2.92	128.47	2.53	0.72	0.72
37.24	57.96	43.37	3.02	130.84	2.55	0.72	0.72
37.40	57.15	42.52	3.13	133.26	2.57	0.71	0.71
37.57	56.89	42.10	3.22	135.50	2.58	0.71	0.71
37.73	56.06	41.32	3.22	133.16	2.58	0.71	0.71
37.90	54.66	40.11	3.20	128.53	2.58	0.71	0.71
38.06	51.82	37.78	3.25	122.91	2.59	0.70	0.70
38.22	49.42	35.79	3.30	118.27	2.60	0.69	0.69
38.39	48.38	34.85	3.36	117.07	2.61	2.41	2.41
38.55	48.78	35.08	3.29	115.51	2.59	0.69	0.69
38.72	48.68	34.90	3.27	114.06	2.59	0.69	0.69
38.88	46.98	33.49	3.29	110.34	2.59	0.68	0.68
39.04	43.37	30.60	3.45	105.59	2.62	2.11	2.11
39.21	39.67	27.66	3.64	100.64	2.65	1.91	1.91
39.37	37.10	25.57	3.90	99.70	2.69	1.78	1.78
39.54	39.21	26.95	4.10	110.46	2.71	1.88	1.88

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
39.70	45.85	31.76	3.98	126.56	2.70	2.21	2.21
39.86	56.69	39.83	3.56	141.96	2.64	2.75	2.75
40.03	66.86	47.40	3.25	153.95	2.59	0.73	0.73
40.19	74.67	53.19	3.02	160.87	2.55	0.74	0.74
40.36	77.80	55.45	2.90	160.93	2.53	0.75	0.75
40.52	76.83	54.68	2.80	153.14	2.51	0.75	0.75
40.68	74.20	52.64	2.74	144.43	2.50	0.74	0.74
40.85	73.61	52.13	2.67	139.20	2.48	0.74	0.74
41.01	72.66	51.35	2.61	133.95	2.47	0.74	0.74
41.18	69.21	48.64	2.63	127.87	2.47	0.73	0.73
41.34	61.47	42.61	2.87	122.33	2.52	0.71	0.71
41.50	55.32	37.71	3.27	123.48	2.59	0.70	0.70
41.67	51.53	34.58	3.73	128.82	2.66	2.38	2.38
41.83	49.84	33.12	4.00	132.43	2.70	2.29	2.29
42.00	48.12	31.72	4.15	131.52	2.72	2.20	2.20
42.16	46.02	30.12	4.23	127.30	2.73	2.09	2.09
42.32	44.36	28.85	4.26	122.87	2.74	2.00	2.00
42.49	41.99	27.04	4.42	119.65	2.76	1.88	1.88
42.65	37.67	23.92	4.62	110.51	2.78	1.67	1.67
42.82	32.23	20.00	5.04	100.75	2.83	1.41	1.41
42.98	27.80	16.83	5.51	92.67	2.88	1.19	1.19
43.15	27.33	16.41	5.73	94.01	2.90	1.16	1.16
43.31	28.27	16.95	5.86	99.36	2.92	1.20	1.20
43.47	29.04	17.31	6.32	109.39	2.96	1.24	1.24
43.64	31.04	18.56	6.39	118.59	2.97	1.33	1.33
43.80	39.94	24.73	5.03	124.49	2.83	1.74	1.74
43.97	52.09	33.47	3.74	125.32	2.66	2.30	2.30
44.13	58.00	37.53	3.53	132.56	2.63	2.56	2.56
44.29	53.82	34.24	4.01	137.45	2.70	2.36	2.36
44.46	44.81	27.57	5.07	139.85	2.83	1.94	1.94
44.62	39.98	24.08	5.69	137.09	2.90	1.71	1.71
44.79	46.02	28.29	4.82	136.26	2.80	1.98	1.98
44.95	50.85	31.64	4.31	136.26	2.74	2.19	2.19
45.11	52.11	32.54	4.05	131.70	2.71	2.24	2.24
45.28	54.88	34.68	3.50	121.25	2.63	2.36	2.36
45.44	69.56	45.88	2.32	106.53	2.40	0.72	0.72
45.61	95.76	66.52	1.50	99.93	2.13	0.77	0.77
45.77	118.32	84.73	1.24	105.36	1.95	0.80	0.80
45.93	134.26	97.36	1.17	113.89	1.88	0.82	0.82
46.10	141.95	103.45	1.14	117.88	1.84	0.83	0.83
46.26	144.16	104.65	1.15	120.50	1.86	0.83	0.83
46.43	145.09	105.06	1.15	121.34	1.86	0.83	0.83
46.59	151.19	109.83	1.13	124.49	1.84	0.84	0.84
46.75	165.38	121.27	1.09	132.22	1.78	0.85	0.85
46.92	189.34	140.58	1.04	146.25	1.70	0.88	0.88
47.08	209.30	155.34	1.04	161.71	1.70	0.89	0.89
47.25	219.57	161.27	1.08	173.95	1.76	0.90	0.90
47.41	217.24	157.38	1.13	177.74	1.83	0.89	0.89

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
47.57	213.50	153.10	1.17	178.89	1.88	0.89	0.89
47.74	213.50	153.05	1.16	177.41	1.87	0.89	0.89
47.90	219.76	158.32	1.13	178.62	1.83	0.89	0.89
48.07	227.09	164.41	1.10	180.90	1.79	0.90	0.90
48.23	231.56	167.85	1.09	182.73	1.77	0.90	0.90
48.39	225.75	163.04	1.09	178.48	1.78	0.90	0.90
48.56	210.18	150.93	1.11	166.92	1.80	0.89	0.89
48.72	193.23	138.62	1.10	152.14	1.79	0.87	0.87
48.89	195.20	140.24	1.09	152.18	1.77	0.88	0.88
49.05	186.57	132.56	1.12	148.42	1.82	0.87	0.87
49.22	155.60	106.56	1.29	137.30	1.99	0.84	0.84
49.38	96.10	61.14	1.99	121.93	2.31	0.76	0.76
49.54	52.24	30.11	3.88	116.86	2.68	2.05	2.05
49.71	29.63	15.42	6.71	103.46	3.00	1.10	1.10
49.87	24.10	12.17	6.97	84.78	3.02	0.87	0.87
50.04	22.66	11.30	6.73	76.00	3.00	0.81	0.81
50.20	24.44	12.34	6.03	74.36	2.93	0.88	0.88

Abbreviations

q_t: Total cone resistance
K_c: Cone resistance correction factor due to fines
$Q_{tn,cs}$: Adjusted and corrected cone resistance due to fines
I_c: Soil behavior type index
$S_{u(liq)}/\sigma'_v$: Calculated liquefied undrained strength ratio
$S_{u(peak)}/\sigma'_v$: Calculated peak undrained strength ratio

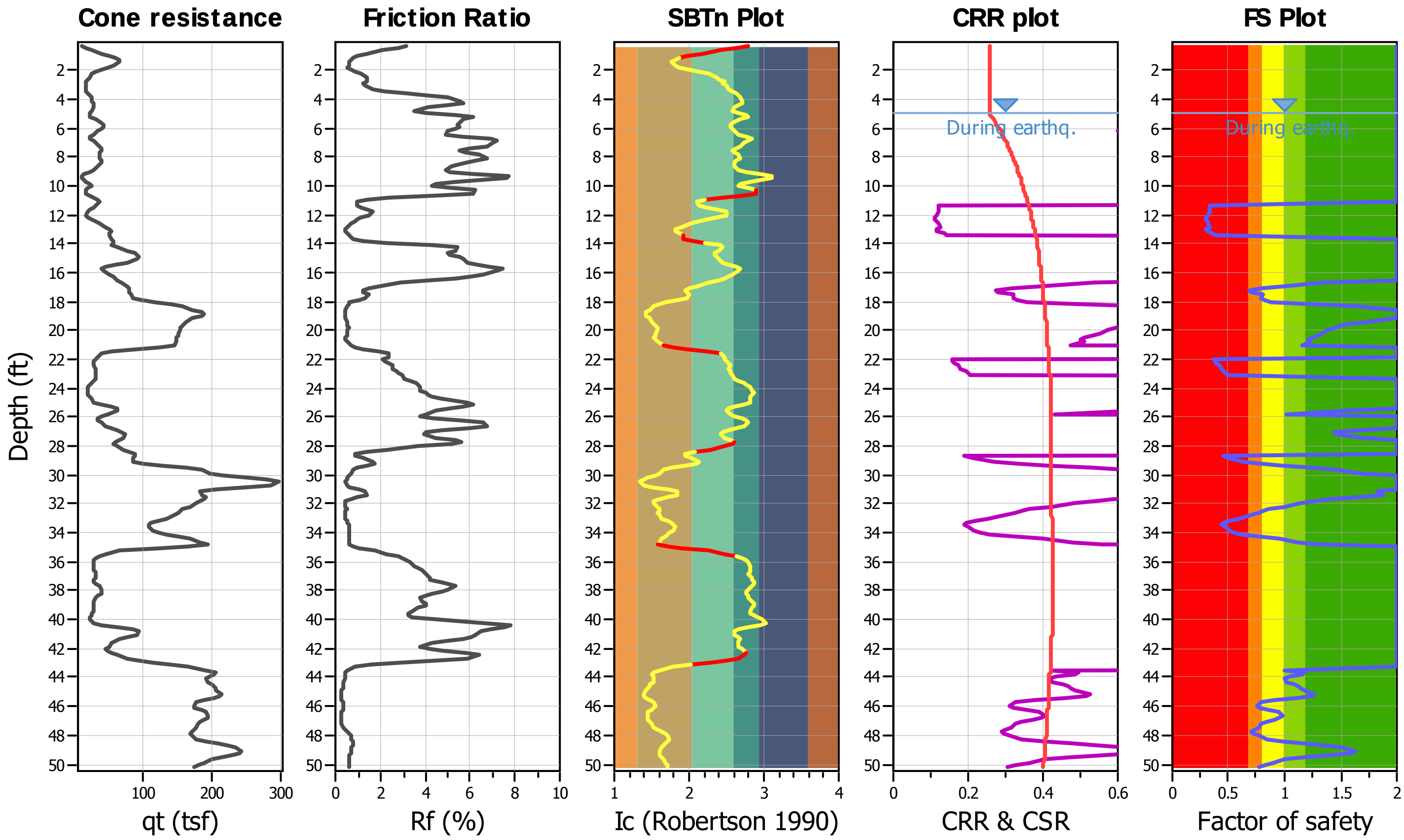
LIQUEFACTION ANALYSIS REPORT

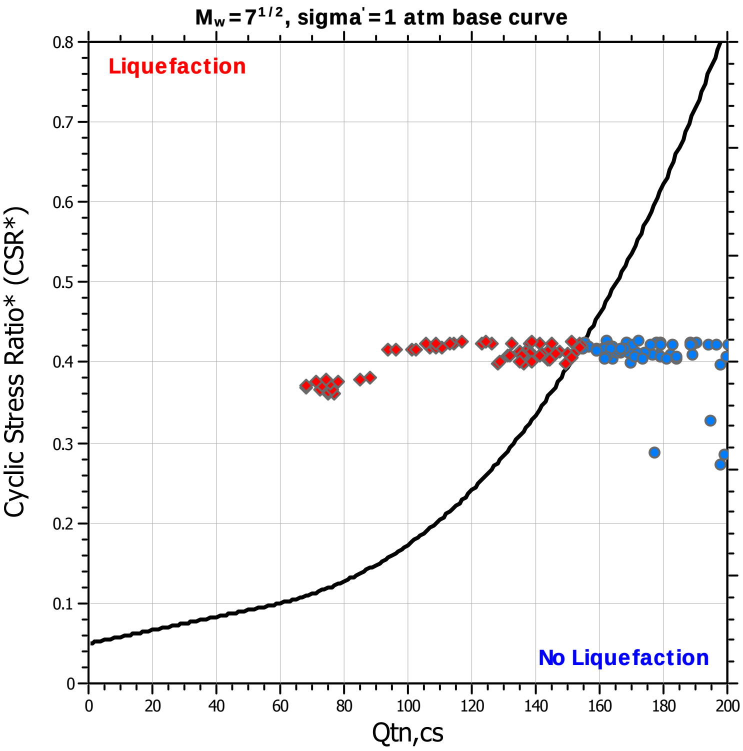
Project title : **Location :**

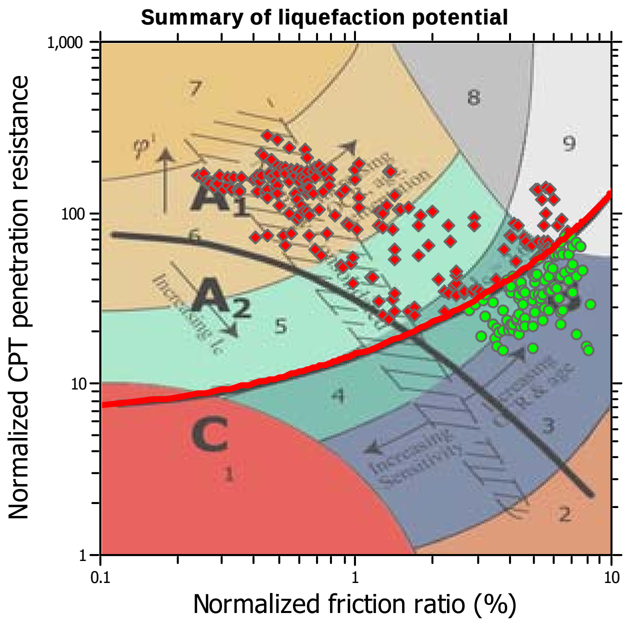
CPT file : CPT-02

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	5.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.38	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

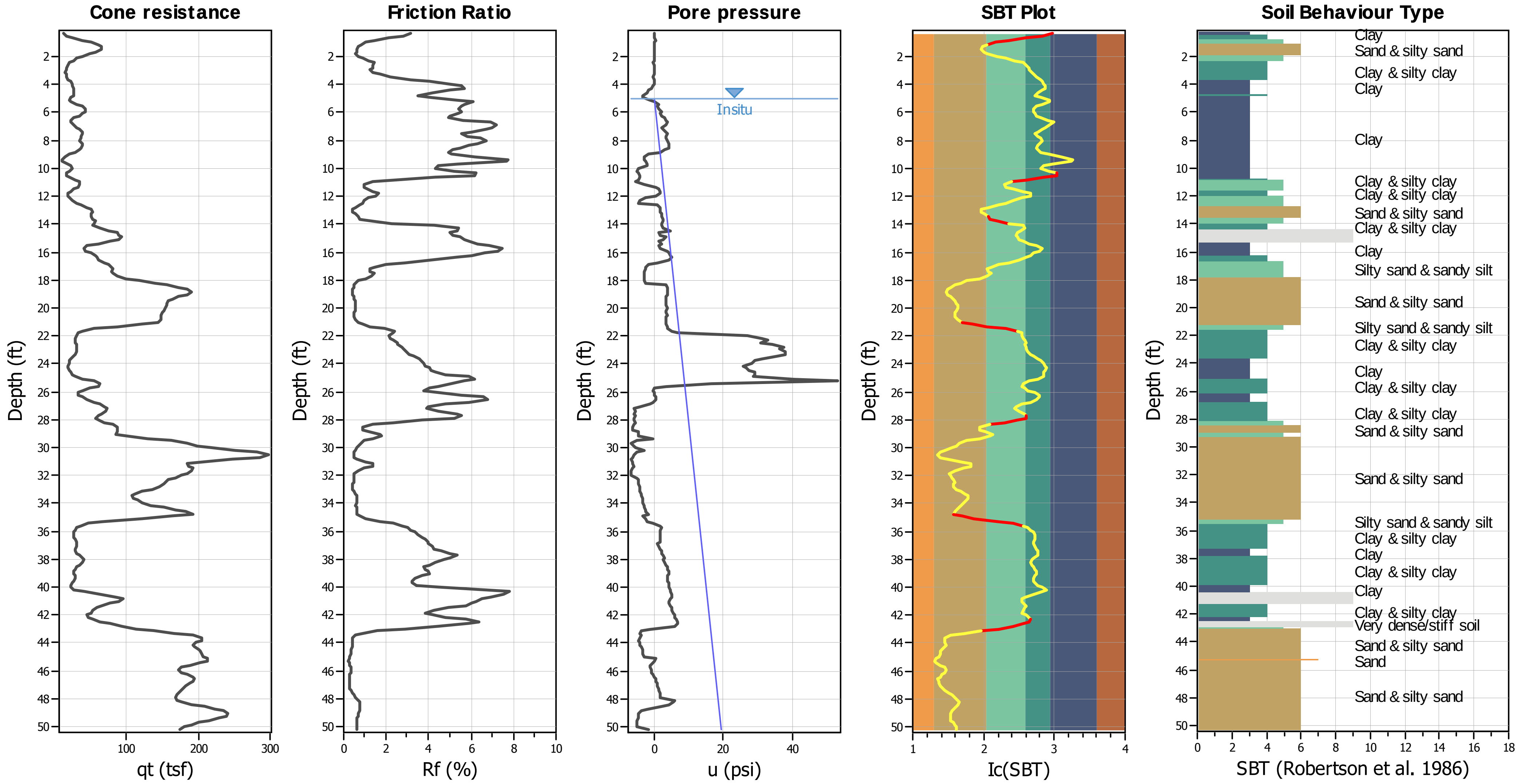






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



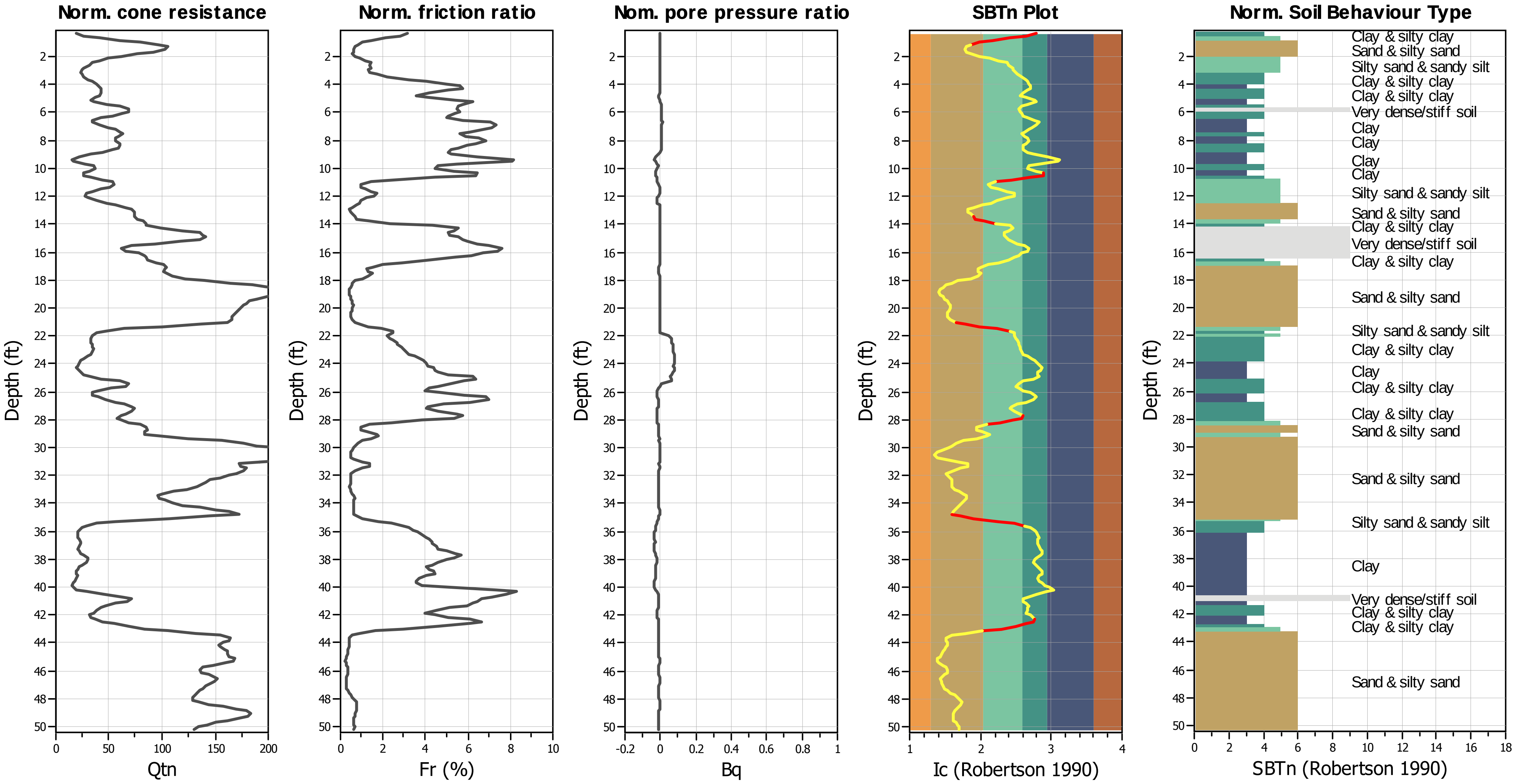
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

CPT basic interpretation plots (normalized)



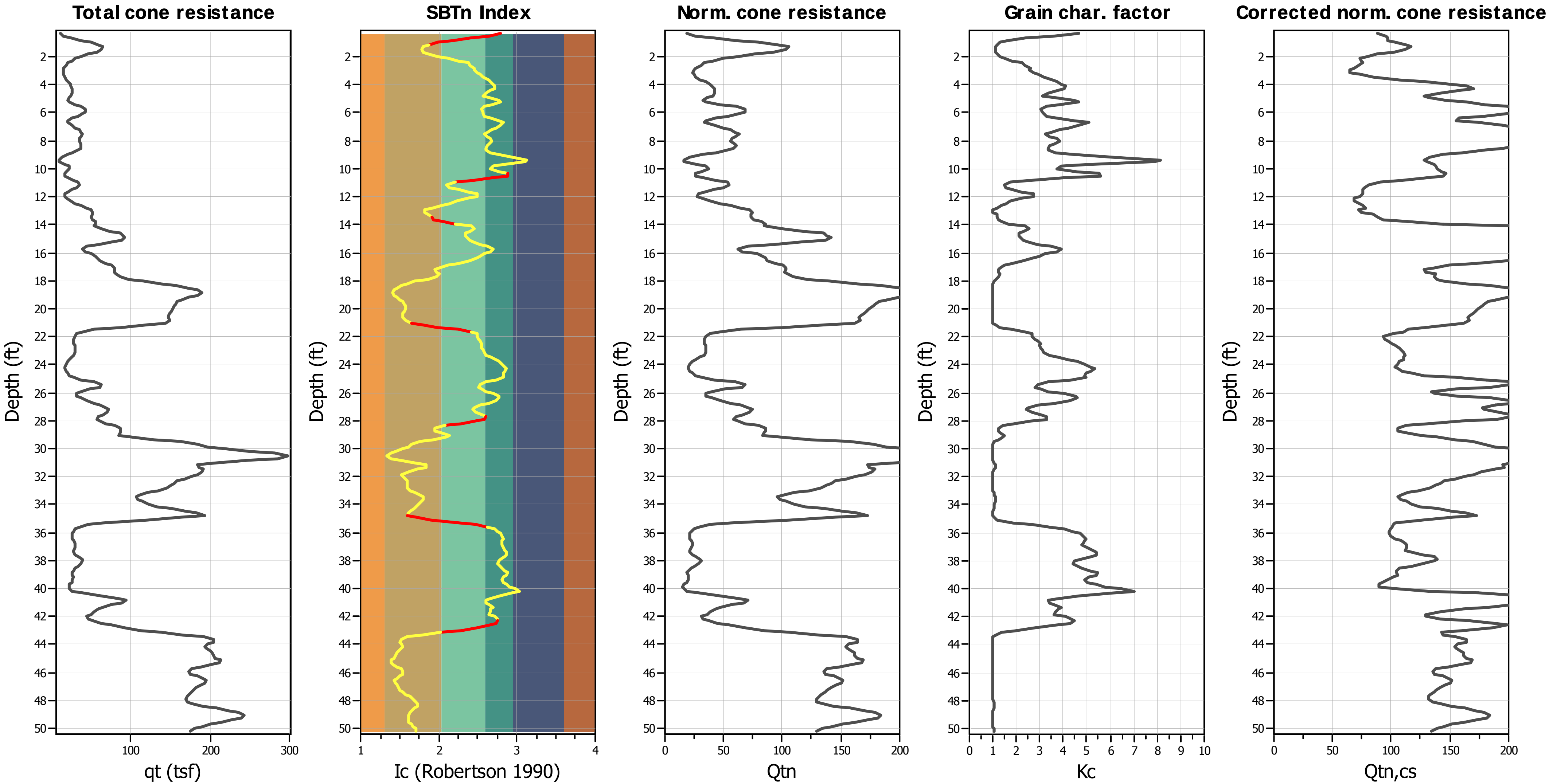
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

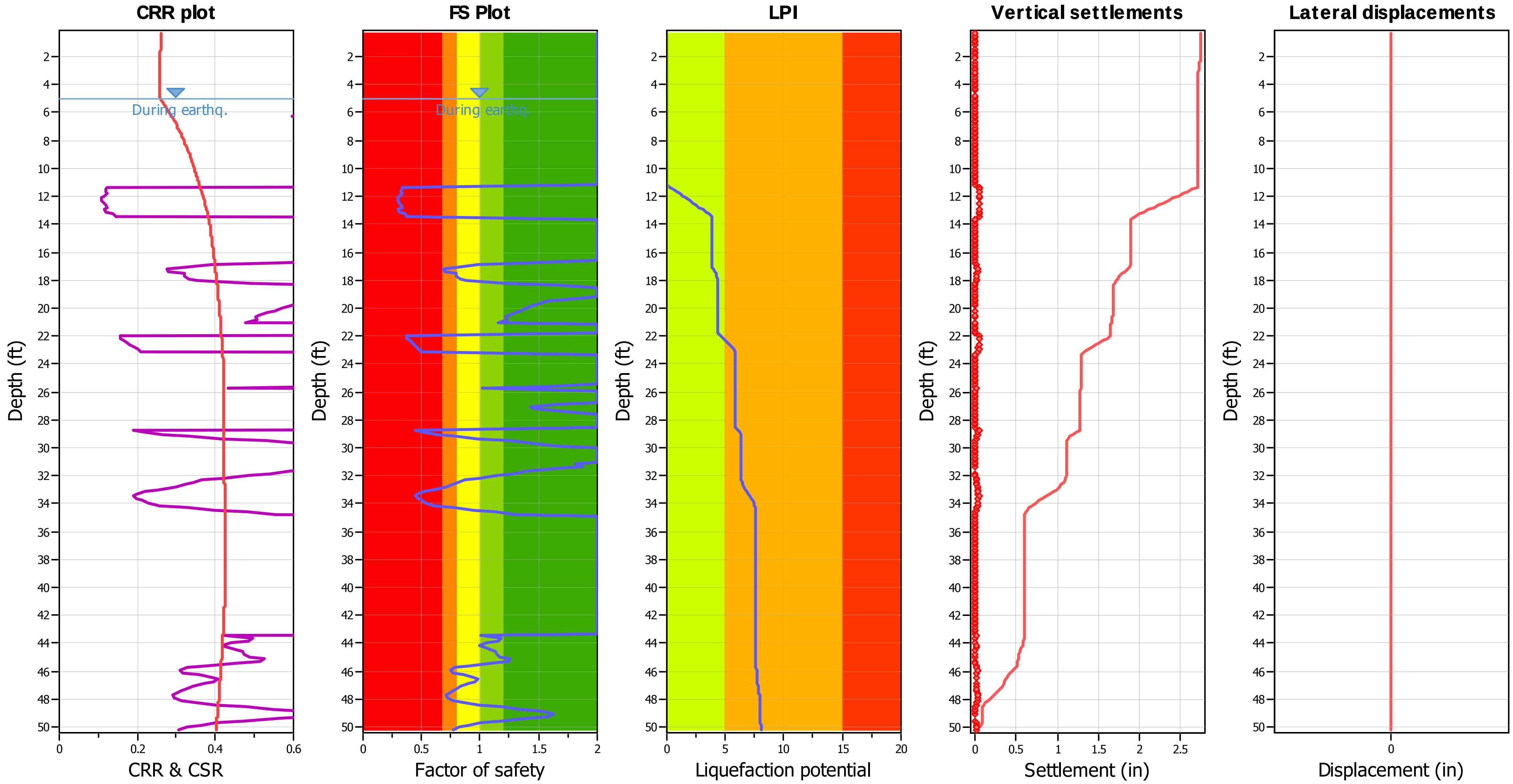
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

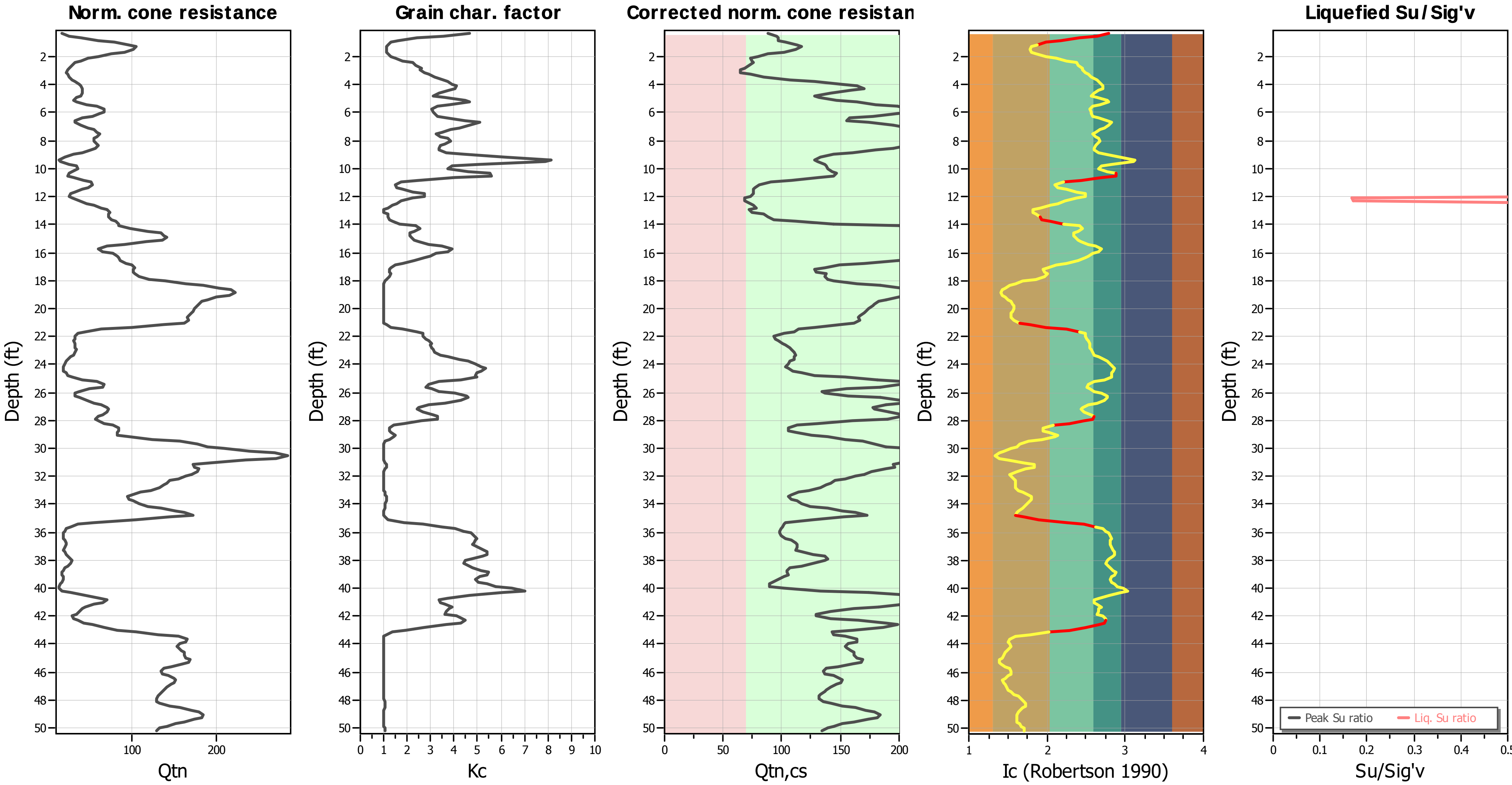
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

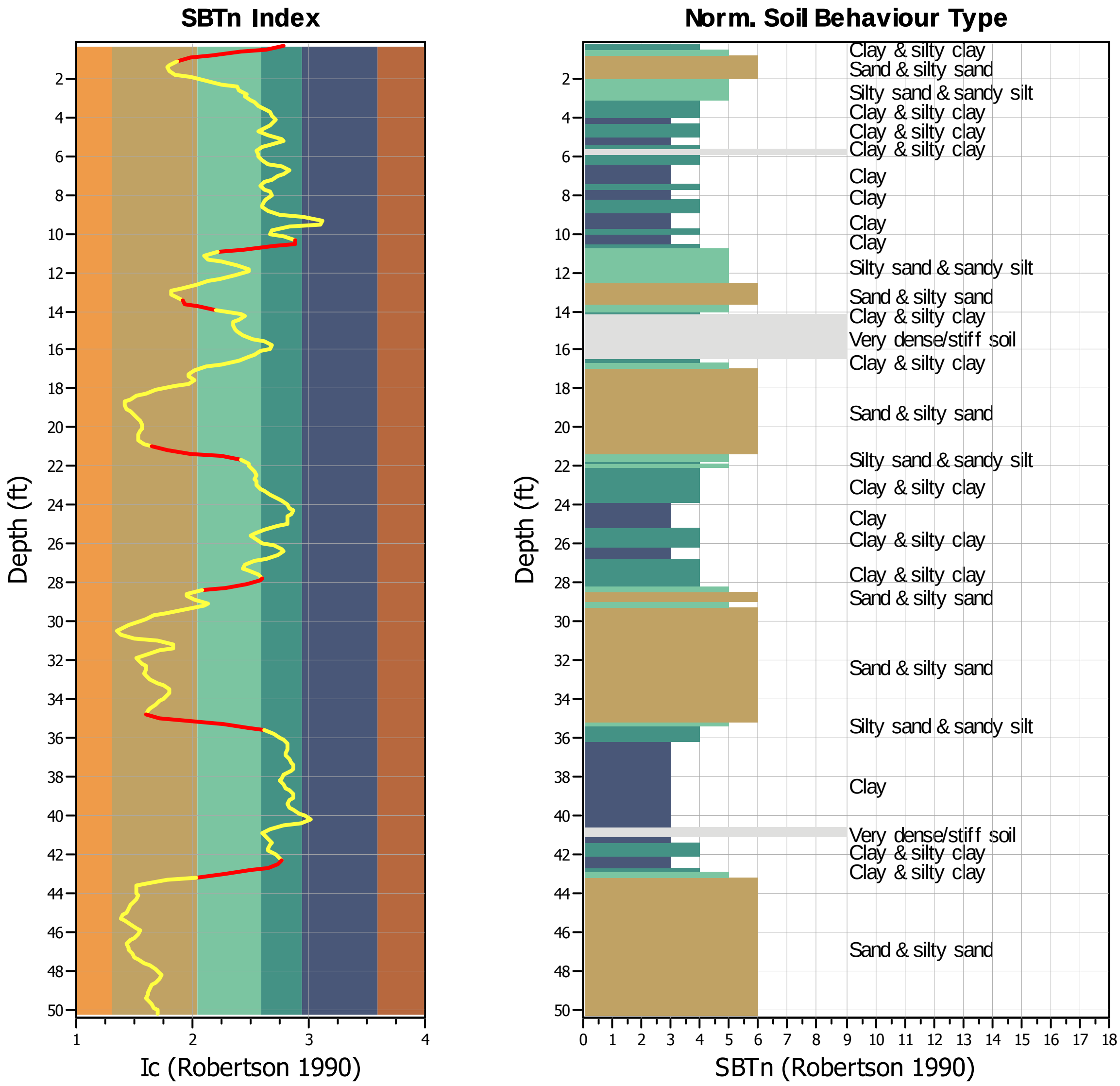
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	N/A

TRANSITION LAYER DETECTION ALGORITHM REPORT
Summary Details & Plots

Short description

The software will delete data when the cone is in transition from either clay to sand or vise-versa. To do this the software requires a range of I_c values over which the transition will be defined (typically somewhere between 1.80 < I_c < 3.0) and a rate of change of I_c. Transitions typically occur when the rate of change of I_c is fast (i.e. delta I_c is small).

The SBT_n plot below, displays in red the detected transition layers based on the parameters listed below the graphs.



Transition layer algorithm properties

I_c minimum check value:	1.70
I_c maximum check value:	3.00
I_c change ratio value:	0.0250
Minimum number of points in layer:	4

General statistics

Total points in CPT file:	305
Total points excluded:	38
Exclusion percentage:	12.46%
Number of layers detected:	7

Transition layer No	Number of points	Depth	SBT_n number	SBT_n description
Transition layer 1	7	Start depth: 0.33 (ft)	4	Clay & silty clay
		End depth: 1.31 (ft)	6	Sand & silty sand
Transition layer 2	5	Start depth: 10.50 (ft)	3	Clay
		End depth: 11.16 (ft)	5	Silty sand & sandy silt
Transition layer 3	4	Start depth: 13.62 (ft)	6	Sand & silty sand
		End depth: 14.11 (ft)	4	Clay & silty clay
Transition layer 4	5	Start depth: 21.16 (ft)	6	Sand & silty sand
		End depth: 21.82 (ft)	4	Clay & silty clay
Transition layer 5	5	Start depth: 27.89 (ft)	4	Clay & silty clay
		End depth: 28.54 (ft)	6	Sand & silty sand
Transition layer 6	6	Start depth: 34.94 (ft)	6	Sand & silty sand
		End depth: 35.76 (ft)	4	Clay & silty clay
Transition layer 7	6	Start depth: 42.49 (ft)	3	Clay
		End depth: 43.31 (ft)	6	Sand & silty sand

Start depth: Depth where the transition layer begins
End depth: Depth where the transition layer ends

:: Field input data ::

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	0.33	12.00	0.30	0.10	45.19	108.94
2	0.49	11.20	0.50	0.00	37.27	111.55
3	0.66	26.70	0.60	0.10	27.29	113.54
4	0.82	37.70	0.50	0.40	18.15	114.53
5	0.98	48.80	0.50	0.00	12.58	114.74
6	1.15	63.20	0.50	0.10	9.68	115.20
7	1.31	69.20	0.50	0.00	8.18	114.89
8	1.48	64.00	0.40	0.00	7.60	113.72
9	1.64	59.60	0.30	0.00	8.18	112.10
10	1.80	47.60	0.30	0.00	9.39	110.03
11	1.97	36.20	0.20	0.10	12.65	109.50
12	2.13	31.40	0.30	0.10	16.43	108.97
13	2.30	25.00	0.30	0.00	20.91	109.40
14	2.46	21.30	0.30	-0.10	25.47	108.91
15	2.62	17.40	0.30	0.10	26.60	107.82
16	2.79	19.30	0.20	0.10	28.99	106.49
17	2.95	13.40	0.20	0.10	28.65	105.25
18	3.12	15.10	0.20	0.00	30.32	105.09
19	3.28	16.40	0.20	0.00	32.06	107.33
20	3.45	15.80	0.40	-0.10	34.08	109.81
21	3.61	18.20	0.50	0.00	37.09	113.71
22	3.77	22.80	0.90	0.10	38.50	116.71
23	3.94	23.60	1.20	0.30	39.99	119.37
24	4.10	26.00	1.50	-0.40	41.02	120.61
25	4.27	26.30	1.50	-0.80	40.80	121.22
26	4.43	26.90	1.50	-1.40	38.70	120.37
27	4.59	26.40	1.00	-2.10	35.72	118.96
28	4.76	26.30	0.80	-3.40	33.80	117.41
29	4.92	24.30	0.90	-3.20	37.65	117.41
30	5.09	18.50	1.10	-1.30	43.97	118.35
31	5.25	19.10	1.30	0.30	45.02	120.13
32	5.41	29.30	1.70	1.40	38.97	122.44
33	5.58	41.10	2.10	1.10	34.97	124.57
34	5.74	43.40	2.50	1.30	32.93	125.65
35	5.91	44.60	2.40	2.10	33.43	125.73
36	6.07	39.90	2.20	1.80	34.01	124.79
37	6.23	34.10	1.80	2.30	35.02	122.75
38	6.40	27.70	1.10	3.20	38.18	120.42
39	6.56	19.30	1.10	3.30	43.95	119.34
40	6.73	18.60	1.50	3.80	47.95	120.74
41	6.89	26.90	1.90	3.40	45.30	122.94
42	7.05	33.30	2.30	2.20	41.93	124.44
43	7.22	33.70	2.40	2.70	39.42	125.26
44	7.38	38.40	2.40	3.40	36.41	125.12
45	7.55	41.20	2.00	3.80	34.60	125.01
46	7.71	38.80	2.20	3.50	36.12	124.75
47	7.87	31.70	2.30	3.60	38.44	125.09
48	8.04	36.60	2.40	3.90	39.48	125.26

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	8.20	37.00	2.40	4.40	37.30	125.43
50	8.37	39.20	2.30	4.40	35.99	125.16
51	8.53	38.80	2.10	4.40	35.35	124.27
52	8.69	32.90	1.70	3.00	35.69	122.87
53	8.86	29.20	1.40	1.80	38.16	120.65
54	9.02	20.60	1.00	-1.60	43.28	118.16
55	9.19	13.10	0.80	-3.00	54.68	115.67
56	9.35	8.60	0.80	-2.70	66.75	114.33
57	9.51	9.40	0.80	-2.20	65.28	114.76
58	9.68	14.70	0.90	-2.00	47.54	116.75
59	9.84	28.50	1.10	-2.00	39.97	117.86
60	10.01	24.20	1.00	-4.50	38.44	118.25
61	10.17	19.10	1.00	-4.80	44.80	117.80
62	10.34	16.40	1.10	-4.50	50.95	117.67
63	10.50	16.00	1.10	-4.10	51.14	117.39
64	10.66	18.10	0.90	-3.90	40.60	116.92
65	10.83	29.00	0.70	-4.50	28.03	115.41
66	10.99	36.30	0.40	-5.30	19.59	113.28
67	11.16	36.10	0.30	-2.90	16.04	110.91
68	11.32	32.80	0.30	0.60	17.07	109.90
69	11.48	26.60	0.30	1.20	20.60	109.48
70	11.65	21.00	0.30	1.80	25.60	108.96
71	11.81	17.30	0.30	1.70	30.13	108.55
72	11.98	16.40	0.30	0.40	30.12	107.57
73	12.14	18.60	0.20	-2.50	25.36	106.91
74	12.30	24.60	0.20	-3.90	20.26	107.45
75	12.47	31.20	0.30	-4.30	17.09	108.93
76	12.63	35.60	0.30	1.00	13.94	109.40
77	12.80	44.00	0.20	1.80	10.58	108.89
78	12.96	54.10	0.20	1.90	5.00	108.06
79	13.12	53.10	0.20	2.00	5.00	109.28
80	13.29	50.20	0.30	2.20	9.41	110.22
81	13.45	51.70	0.30	2.30	10.68	111.83
82	13.62	51.40	0.40	2.50	11.23	113.25
83	13.78	55.80	0.50	2.60	14.11	117.47
84	13.94	60.20	1.20	2.10	19.25	121.81
85	14.11	51.10	2.10	2.40	26.85	125.97
86	14.27	49.30	3.50	2.60	28.66	129.31
87	14.44	86.90	4.60	4.80	26.34	130.95
88	14.60	89.40	3.90	1.40	24.22	132.02
89	14.76	86.30	4.70	1.80	24.24	132.41
90	14.93	94.40	5.20	3.60	25.05	133.18
91	15.09	96.10	5.30	2.60	25.97	133.15
92	15.26	77.30	4.80	1.30	27.88	132.00
93	15.42	59.10	3.60	2.10	31.80	130.03
94	15.58	43.60	3.00	1.60	36.51	127.95
95	15.75	34.30	2.80	2.00	39.88	127.21
96	15.91	41.40	3.10	3.80	38.44	127.72

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	16.08	52.80	3.40	4.40	34.72	128.84
98	16.24	59.90	3.70	4.70	32.30	129.06
99	16.40	56.00	3.10	5.10	30.10	128.47
100	16.57	58.90	2.50	4.30	26.09	127.01
101	16.73	68.50	1.90	0.90	20.75	125.54
102	16.90	78.60	1.50	-1.70	16.16	123.80
103	17.06	81.10	1.10	-2.50	13.31	122.08
104	17.23	79.40	0.90	-2.50	11.87	120.72
105	17.39	80.00	0.90	-2.70	12.20	120.95
106	17.55	80.30	1.20	-2.70	13.28	122.34
107	17.72	84.30	1.50	-2.60	11.98	122.06
108	17.88	94.70	0.70	-2.60	9.29	121.47
109	18.05	116.80	0.80	-2.60	5.81	119.95
110	18.21	140.10	0.80	-2.50	4.26	120.67
111	18.37	160.30	0.80	3.70	3.17	120.96
112	18.54	168.60	0.80	4.00	2.34	121.20
113	18.70	188.40	0.80	3.80	1.80	121.37
114	18.87	197.50	0.80	3.80	1.63	121.43
115	19.03	182.70	0.80	3.90	1.86	121.36
116	19.19	172.50	0.80	3.60	2.40	121.20
117	19.36	162.30	0.80	3.60	2.86	121.08
118	19.52	156.90	0.80	3.60	3.33	121.29
119	19.69	156.50	0.90	3.70	3.64	121.54
120	19.85	155.20	0.90	3.70	3.89	121.80
121	20.01	153.50	0.90	3.80	3.87	121.50
122	20.18	150.50	0.80	3.70	3.67	120.88
123	20.34	150.00	0.70	3.70	3.42	120.22
124	20.51	149.70	0.70	3.80	3.38	119.85
125	20.67	144.80	0.70	3.40	3.43	119.84
126	20.83	148.00	0.70	3.50	4.08	121.14
127	21.00	153.20	1.10	3.70	5.21	122.40
128	21.16	132.70	1.20	3.60	7.71	122.68
129	21.33	78.70	1.00	3.80	12.46	121.86
130	21.49	49.20	1.10	3.90	20.47	120.27
131	21.65	36.20	1.00	5.30	27.42	118.69
132	21.82	30.90	0.70	7.00	29.86	116.82
133	21.98	29.80	0.60	27.20	29.98	115.21
134	22.15	27.90	0.60	31.40	31.09	115.12
135	22.31	27.20	0.70	32.80	32.00	115.48
136	22.47	29.10	0.70	31.00	32.81	116.21
137	22.64	29.20	0.80	34.40	32.46	116.62
138	22.80	30.20	0.80	37.50	33.19	117.27
139	22.97	30.30	0.90	36.40	33.33	117.59
140	23.13	30.60	0.90	37.90	34.25	117.84
141	23.30	29.10	0.90	38.10	35.83	117.72
142	23.46	25.90	0.90	35.90	38.53	117.20
143	23.62	22.40	0.80	31.20	42.00	116.62
144	23.79	20.40	0.80	29.10	44.54	115.76

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	23.95	19.00	0.70	28.50	46.77	115.24
146	24.12	17.80	0.70	25.80	48.36	114.76
147	24.28	17.10	0.70	26.70	49.89	115.06
148	24.44	18.10	0.80	27.40	48.45	115.88
149	24.61	22.10	0.90	29.20	47.04	117.27
150	24.77	23.70	1.10	29.20	46.99	118.92
151	24.94	24.30	1.40	28.70	47.36	122.16
152	25.10	35.40	2.50	40.70	42.56	125.48
153	25.26	54.10	3.20	53.20	35.78	128.31
154	25.43	73.20	3.60	16.40	32.18	128.89
155	25.59	61.10	2.80	3.60	30.87	127.66
156	25.76	48.60	1.80	0.20	32.86	124.68
157	25.92	35.10	1.30	-0.40	35.59	121.77
158	26.08	30.00	1.20	0.00	40.59	121.40
159	26.25	32.50	1.80	0.20	44.32	123.23
160	26.41	36.30	2.50	0.50	44.73	125.85
161	26.58	45.30	3.20	0.50	42.47	127.67
162	26.74	53.10	3.40	-0.30	37.40	128.51
163	26.90	63.70	3.00	-1.10	32.04	128.30
164	27.07	70.10	2.50	-4.20	28.26	128.05
165	27.23	73.70	2.80	-5.80	27.47	128.33
166	27.40	73.30	3.20	-5.30	29.79	128.99
167	27.56	63.20	3.40	-5.80	33.45	129.47
168	27.72	57.70	3.70	-5.50	35.26	129.15
169	27.89	60.40	3.00	-5.70	34.88	128.20
170	28.05	55.20	2.30	-5.80	29.08	126.43
171	28.22	70.20	1.60	-5.40	21.85	124.05
172	28.38	83.00	0.90	-5.80	15.24	121.67
173	28.54	88.80	0.80	-6.00	11.54	119.54
174	28.71	90.20	0.70	-6.10	11.42	119.56
175	28.87	85.40	0.90	-4.70	13.60	121.39
176	29.04	83.80	1.50	-4.70	16.73	123.93
177	29.20	88.30	2.00	-4.50	15.60	125.66
178	29.36	127.30	1.80	-0.20	11.40	126.42
179	29.53	171.40	1.60	-5.00	7.38	126.12
180	29.69	188.10	1.40	-6.40	5.39	125.80
181	29.86	194.60	1.40	-5.80	4.45	125.63
182	30.02	210.10	1.40	-5.40	3.52	125.86
183	30.19	248.20	1.40	-3.00	2.21	126.03
184	30.35	292.40	1.30	-5.00	1.33	126.31
185	30.51	302.60	1.40	-5.90	0.85	126.27
186	30.68	297.70	1.30	-6.30	1.33	126.52
187	30.84	254.40	1.50	-6.40	2.88	127.00
188	31.01	191.80	1.90	-6.30	6.26	128.56
189	31.17	167.60	2.80	-6.20	8.78	129.59
190	31.33	192.40	2.70	-5.80	8.81	129.82
191	31.50	198.90	2.10	-6.10	6.54	127.79
192	31.66	185.60	0.90	-6.40	4.55	124.79

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	31.83	184.90	0.80	-6.60	3.13	121.65
194	31.99	180.60	0.80	-6.50	3.35	121.26
195	32.15	164.10	0.80	-4.90	3.86	121.12
196	32.32	157.10	0.80	-4.70	4.27	120.67
197	32.48	152.80	0.70	-4.50	4.36	120.29
198	32.65	152.10	0.70	-4.40	4.19	119.54
199	32.81	148.10	0.60	-4.20	4.37	119.07
200	32.97	136.30	0.60	-4.00	4.94	118.50
201	33.14	120.70	0.60	-4.00	6.07	118.25
202	33.30	108.80	0.60	-3.70	7.19	118.02
203	33.47	104.10	0.60	-3.60	8.01	118.32
204	33.63	107.30	0.70	-3.40	8.28	119.10
205	33.79	115.60	0.80	-3.30	7.82	119.58
206	33.96	122.40	0.70	-3.10	7.08	119.72
207	34.12	128.60	0.70	-2.90	6.28	120.26
208	34.29	148.30	0.90	-2.70	5.76	122.01
209	34.45	176.80	1.20	-2.40	4.90	122.78
210	34.61	181.10	0.90	-2.30	4.56	123.66
211	34.78	187.90	1.20	-1.50	4.23	124.24
212	34.94	210.20	1.40	-3.10	6.43	124.44
213	35.11	94.50	1.20	-2.50	10.35	123.52
214	35.27	60.60	1.10	-1.90	21.18	121.41
215	35.43	43.30	1.10	-0.40	29.76	120.09
216	35.60	34.50	1.00	1.70	36.47	119.02
217	35.76	30.50	0.90	2.10	40.84	118.14
218	35.93	27.70	0.90	2.00	43.61	117.65
219	36.09	26.60	0.90	1.90	45.48	117.54
220	36.26	26.60	0.90	1.90	46.55	117.78
221	36.42	26.90	1.00	1.90	47.24	118.32
222	36.58	27.70	1.10	1.90	46.89	119.14
223	36.75	30.90	1.20	1.70	46.22	119.92
224	36.91	31.90	1.30	1.10	46.00	120.16
225	37.08	29.50	1.20	1.50	47.70	120.06
226	37.24	27.20	1.20	1.90	49.16	119.75
227	37.40	27.90	1.20	2.20	50.21	120.58
228	37.57	31.40	1.60	2.20	50.07	121.94
229	37.73	34.10	1.90	2.50	48.74	123.51
230	37.90	39.20	2.10	3.20	45.40	124.16
231	38.06	43.80	1.90	2.60	43.83	123.98
232	38.22	37.40	1.70	3.10	43.35	122.74
233	38.39	32.80	1.30	3.70	44.93	121.14
234	38.55	30.90	1.10	3.80	46.06	119.51
235	38.72	27.00	1.00	3.80	48.36	118.86
236	38.88	25.70	1.10	4.30	50.36	118.75
237	39.04	27.10	1.10	4.20	50.11	119.03
238	39.21	28.70	1.10	3.90	47.92	118.64
239	39.37	28.10	0.90	4.00	46.87	117.86
240	39.54	25.90	0.80	4.10	47.65	116.88

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	39.70	23.60	0.80	4.20	49.91	116.06
242	39.86	21.70	0.70	4.20	52.56	115.91
243	40.03	21.80	0.80	4.30	56.78	118.17
244	40.19	25.50	1.60	4.80	60.15	122.78
245	40.36	34.80	3.10	4.90	54.43	127.63
246	40.52	59.90	4.70	5.10	44.98	131.62
247	40.68	91.60	6.20	5.10	38.44	133.99
248	40.85	101.50	6.60	4.90	35.68	134.69
249	41.01	91.40	5.70	4.50	35.85	133.85
250	41.18	76.20	4.50	4.20	37.70	132.08
251	41.34	62.70	3.70	4.70	39.76	130.01
252	41.50	54.40	2.90	5.00	38.73	128.10
253	41.67	60.60	2.20	5.00	38.13	126.08
254	41.83	46.10	1.80	5.50	37.63	124.51
255	42.00	43.00	1.70	6.00	41.25	124.11
256	42.16	45.00	2.10	6.10	42.97	125.52
257	42.32	51.30	2.90	6.50	43.77	128.16
258	42.49	62.70	4.20	6.70	42.49	130.51
259	42.65	74.30	4.90	6.90	37.82	131.86
260	42.82	92.30	4.40	6.10	30.49	131.78
261	42.98	113.00	3.20	-1.30	22.04	130.39
262	43.15	133.80	2.10	-3.80	13.84	128.06
263	43.31	168.10	1.30	-4.00	7.76	125.38
264	43.47	196.80	0.90	-3.70	4.34	123.34
265	43.64	212.10	0.90	-4.10	3.06	122.21
266	43.80	206.30	0.80	-4.30	2.98	121.91
267	43.97	193.90	0.80	-4.10	3.18	121.52
268	44.13	189.00	0.80	-3.90	3.38	121.47
269	44.29	194.50	0.80	-3.70	3.12	121.19
270	44.46	201.60	0.70	-3.40	2.61	120.59
271	44.62	204.30	0.60	-3.20	2.35	120.26
272	44.79	203.40	0.70	-3.10	2.16	119.90
273	44.95	205.20	0.60	-2.90	1.93	119.53
274	45.11	211.10	0.50	0.70	1.42	118.75
275	45.28	222.50	0.50	0.30	1.32	118.26
276	45.44	201.50	0.50	-0.40	1.64	118.15
277	45.61	184.10	0.50	-1.10	2.40	118.44
278	45.77	177.50	0.60	-1.00	3.09	118.74
279	45.93	168.40	0.60	-0.80	3.48	119.10
280	46.10	172.00	0.60	-0.50	3.36	119.13
281	46.26	185.50	0.60	-0.10	2.76	118.84
282	46.43	195.10	0.50	0.20	2.27	118.49
283	46.59	194.60	0.50	0.40	1.99	118.06
284	46.75	195.10	0.50	0.60	2.07	118.03
285	46.92	189.10	0.50	0.80	2.25	117.98
286	47.08	182.00	0.50	1.10	2.51	117.90
287	47.25	177.50	0.50	1.30	2.88	118.32
288	47.41	176.90	0.60	1.50	3.37	119.15

:: Field input data :: (continued)

Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	47.57	174.80	0.70	1.80	4.10	120.23
290	47.74	166.70	0.80	1.70	4.92	121.47
291	47.90	170.30	1.00	1.80	5.73	122.53
292	48.07	169.80	1.10	6.10	6.43	123.72
293	48.23	171.90	1.30	5.80	6.74	124.82
294	48.39	189.20	1.50	4.20	6.49	125.88
295	48.56	211.20	1.60	2.20	5.95	126.72
296	48.72	222.50	1.70	-1.80	5.33	127.20
297	48.89	235.50	1.70	-3.60	4.97	127.61
298	49.05	246.60	1.80	-4.50	4.57	127.54
299	49.22	243.50	1.60	-4.50	4.52	127.22
300	49.38	226.30	1.50	-4.70	4.47	126.32
301	49.54	216.50	1.30	-4.90	4.73	125.46
302	49.71	199.40	1.20	-4.90	5.20	124.93
303	49.87	185.90	1.30	-5.00	5.60	124.40
304	50.04	183.10	1.10	-5.00	6.09	124.06
305	50.20	170.70	1.10	-1.70	6.15	123.56

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_c: Measured cone resistance (tsf)
f_s: Sleeve friction resistance (tsf)
u: Pore pressure (tsf)
Fines content: Percentage of fines in soil (%)
Unit weight: Bulk soil unit weight (pcf)

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data ::

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
1	0.33	0.02	0.00	0.02	1.00	0.247	1.24	0.200	1.00	1.30	2.000	Yes
2	0.49	0.03	0.00	0.03	1.00	0.247	1.24	0.200	1.00	1.30	2.000	Yes
3	0.66	0.04	0.00	0.04	1.00	0.247	1.24	0.200	1.00	1.30	2.000	Yes
4	0.82	0.05	0.00	0.05	1.00	0.247	1.24	0.200	1.00	1.30	2.000	Yes
5	0.98	0.05	0.00	0.05	1.00	0.247	1.24	0.200	1.00	1.30	2.000	Yes
6	1.15	0.06	0.00	0.06	1.00	0.247	1.24	0.199	1.00	1.30	2.000	Yes
7	1.31	0.07	0.00	0.07	1.00	0.247	1.24	0.199	1.00	1.30	2.000	Yes
8	1.48	0.08	0.00	0.08	1.00	0.247	1.24	0.199	1.00	1.30	2.000	No
9	1.64	0.09	0.00	0.09	1.00	0.247	1.24	0.199	1.00	1.30	2.000	No
10	1.80	0.10	0.00	0.10	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
11	1.97	0.11	0.00	0.11	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
12	2.13	0.12	0.00	0.12	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
13	2.30	0.13	0.00	0.13	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
14	2.46	0.14	0.00	0.14	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
15	2.62	0.15	0.00	0.15	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
16	2.79	0.16	0.00	0.16	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
17	2.95	0.16	0.00	0.16	1.00	0.246	1.24	0.199	1.00	1.30	2.000	No
18	3.12	0.17	0.00	0.17	0.99	0.246	1.24	0.199	1.00	1.30	2.000	No
19	3.28	0.18	0.00	0.18	0.99	0.246	1.24	0.198	1.00	1.30	2.000	No
20	3.45	0.19	0.00	0.19	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
21	3.61	0.20	0.00	0.20	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
22	3.77	0.21	0.00	0.21	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
23	3.94	0.22	0.00	0.22	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
24	4.10	0.23	0.00	0.23	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
25	4.27	0.24	0.00	0.24	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
26	4.43	0.25	0.00	0.25	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
27	4.59	0.26	0.00	0.26	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
28	4.76	0.27	0.00	0.27	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
29	4.92	0.28	0.00	0.28	0.99	0.245	1.24	0.198	1.00	1.30	2.000	No
30	5.09	0.29	0.00	0.28	0.99	0.247	1.24	0.200	1.00	1.30	0.259	No
31	5.25	0.30	0.01	0.29	0.99	0.251	1.24	0.203	1.00	1.30	0.264	No
32	5.41	0.31	0.01	0.29	0.99	0.255	1.24	0.206	1.00	1.30	0.268	No
33	5.58	0.32	0.02	0.30	0.99	0.259	1.24	0.209	1.00	1.30	0.272	No
34	5.74	0.33	0.02	0.30	0.99	0.263	1.24	0.212	1.00	1.30	0.276	No
35	5.91	0.34	0.03	0.31	0.99	0.266	1.24	0.215	1.00	1.30	0.280	No
36	6.07	0.35	0.03	0.31	0.99	0.270	1.24	0.218	1.00	1.30	0.283	No
37	6.23	0.36	0.04	0.32	0.99	0.273	1.24	0.221	1.00	1.30	0.287	No
38	6.40	0.37	0.04	0.32	0.99	0.277	1.24	0.224	1.00	1.30	0.291	No
39	6.56	0.38	0.05	0.33	0.99	0.280	1.24	0.226	1.00	1.30	0.294	No
40	6.73	0.39	0.05	0.33	0.99	0.283	1.24	0.229	1.00	1.30	0.297	No
41	6.89	0.40	0.06	0.34	0.99	0.286	1.24	0.231	1.00	1.30	0.300	No
42	7.05	0.41	0.06	0.34	0.99	0.289	1.24	0.233	1.00	1.30	0.303	No
43	7.22	0.42	0.07	0.35	0.99	0.292	1.24	0.236	1.00	1.30	0.306	No
44	7.38	0.43	0.07	0.35	0.98	0.294	1.24	0.238	1.00	1.30	0.309	No
45	7.55	0.44	0.08	0.36	0.98	0.297	1.24	0.240	1.00	1.30	0.312	No
46	7.71	0.45	0.08	0.36	0.98	0.299	1.24	0.242	1.00	1.30	0.315	No
47	7.87	0.46	0.09	0.37	0.98	0.302	1.24	0.244	1.00	1.30	0.317	No
48	8.04	0.47	0.09	0.37	0.98	0.304	1.24	0.246	1.00	1.30	0.320	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
49	8.20	0.48	0.10	0.38	0.98	0.307	1.24	0.248	1.00	1.30	0.322	No
50	8.37	0.49	0.11	0.39	0.98	0.309	1.24	0.250	1.00	1.30	0.325	No
51	8.53	0.50	0.11	0.39	0.98	0.311	1.24	0.251	1.00	1.30	0.327	No
52	8.69	0.51	0.12	0.40	0.98	0.313	1.24	0.253	1.00	1.30	0.329	No
53	8.86	0.52	0.12	0.40	0.98	0.315	1.24	0.255	1.00	1.30	0.331	No
54	9.02	0.53	0.13	0.40	0.98	0.318	1.24	0.257	1.00	1.30	0.334	No
55	9.19	0.54	0.13	0.41	0.98	0.320	1.24	0.258	1.00	1.30	0.336	No
56	9.35	0.55	0.14	0.41	0.98	0.322	1.24	0.260	1.00	1.30	0.338	No
57	9.51	0.56	0.14	0.42	0.98	0.324	1.24	0.262	1.00	1.30	0.340	No
58	9.68	0.57	0.15	0.42	0.98	0.326	1.24	0.263	1.00	1.30	0.342	No
59	9.84	0.58	0.15	0.43	0.98	0.328	1.24	0.265	1.00	1.30	0.344	No
60	10.01	0.59	0.16	0.43	0.98	0.330	1.24	0.266	1.00	1.30	0.346	No
61	10.17	0.60	0.16	0.44	0.98	0.331	1.24	0.268	1.00	1.30	0.348	No
62	10.34	0.61	0.17	0.44	0.98	0.333	1.24	0.269	1.00	1.30	0.350	No
63	10.50	0.62	0.17	0.44	0.98	0.335	1.24	0.271	1.00	1.30	2.000	Yes
64	10.66	0.63	0.18	0.45	0.98	0.336	1.24	0.272	1.00	1.30	2.000	Yes
65	10.83	0.64	0.18	0.45	0.98	0.338	1.24	0.273	1.00	1.30	2.000	Yes
66	10.99	0.64	0.19	0.46	0.98	0.340	1.24	0.275	1.00	1.30	2.000	Yes
67	11.16	0.65	0.19	0.46	0.98	0.342	1.24	0.276	1.00	1.30	2.000	Yes
68	11.32	0.66	0.20	0.47	0.98	0.343	1.24	0.277	1.00	1.30	0.361	No
69	11.48	0.67	0.20	0.47	0.98	0.345	1.24	0.279	1.00	1.30	0.362	No
70	11.65	0.68	0.21	0.47	0.98	0.347	1.24	0.280	1.00	1.30	0.364	No
71	11.81	0.69	0.21	0.48	0.98	0.348	1.24	0.281	1.00	1.30	0.366	No
72	11.98	0.70	0.22	0.48	0.97	0.350	1.24	0.283	1.00	1.30	0.368	No
73	12.14	0.71	0.22	0.48	0.97	0.351	1.24	0.284	1.00	1.30	0.369	No
74	12.30	0.72	0.23	0.49	0.97	0.353	1.24	0.285	1.00	1.30	0.371	No
75	12.47	0.72	0.23	0.49	0.97	0.355	1.24	0.287	1.00	1.30	0.372	No
76	12.63	0.73	0.24	0.50	0.97	0.356	1.24	0.288	1.00	1.30	0.374	No
77	12.80	0.74	0.24	0.50	0.97	0.357	1.24	0.289	1.00	1.30	0.376	No
78	12.96	0.75	0.25	0.50	0.97	0.359	1.24	0.290	1.00	1.30	0.377	No
79	13.12	0.76	0.25	0.51	0.97	0.360	1.24	0.291	1.00	1.30	0.378	No
80	13.29	0.77	0.26	0.51	0.97	0.362	1.24	0.292	1.00	1.30	0.380	No
81	13.45	0.78	0.26	0.52	0.97	0.363	1.24	0.293	1.00	1.30	0.381	No
82	13.62	0.79	0.27	0.52	0.97	0.364	1.24	0.294	1.00	1.30	2.000	Yes
83	13.78	0.80	0.27	0.52	0.97	0.365	1.24	0.295	1.00	1.30	2.000	Yes
84	13.94	0.81	0.28	0.53	0.97	0.366	1.24	0.296	1.00	1.30	2.000	Yes
85	14.11	0.82	0.28	0.53	0.97	0.367	1.24	0.297	1.00	1.30	2.000	Yes
86	14.27	0.83	0.29	0.54	0.97	0.368	1.24	0.297	1.00	1.30	0.387	No
87	14.44	0.84	0.29	0.55	0.97	0.369	1.24	0.298	1.00	1.30	0.388	No
88	14.60	0.85	0.30	0.55	0.97	0.370	1.24	0.299	1.00	1.30	0.388	No
89	14.76	0.86	0.30	0.56	0.97	0.370	1.24	0.299	1.00	1.30	0.389	No
90	14.93	0.87	0.31	0.56	0.97	0.371	1.24	0.300	1.00	1.30	0.390	No
91	15.09	0.88	0.31	0.57	0.97	0.372	1.24	0.300	1.00	1.30	0.391	No
92	15.26	0.89	0.32	0.57	0.97	0.372	1.24	0.301	1.00	1.30	0.391	No
93	15.42	0.90	0.33	0.58	0.97	0.373	1.24	0.302	1.00	1.30	0.392	No
94	15.58	0.91	0.33	0.58	0.97	0.374	1.24	0.302	1.00	1.30	0.393	No
95	15.75	0.93	0.34	0.59	0.97	0.375	1.24	0.303	1.00	1.30	0.394	No
96	15.91	0.94	0.34	0.60	0.97	0.375	1.24	0.303	1.00	1.30	0.394	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
97	16.08	0.95	0.35	0.60	0.97	0.376	1.24	0.304	1.00	1.30	0.395	No
98	16.24	0.96	0.35	0.61	0.97	0.377	1.24	0.304	1.00	1.30	0.396	No
99	16.40	0.97	0.36	0.61	0.97	0.377	1.24	0.305	1.00	1.30	0.396	No
100	16.57	0.98	0.36	0.62	0.97	0.378	1.24	0.305	1.00	1.30	0.397	No
101	16.73	0.99	0.37	0.62	0.96	0.378	1.24	0.306	1.00	1.30	0.398	No
102	16.90	1.00	0.37	0.63	0.96	0.379	1.24	0.306	1.00	1.30	0.398	No
103	17.06	1.01	0.38	0.63	0.96	0.380	1.24	0.307	1.00	1.30	0.399	No
104	17.23	1.02	0.38	0.64	0.96	0.381	1.24	0.308	1.00	1.30	0.400	No
105	17.39	1.03	0.39	0.64	0.96	0.381	1.24	0.308	1.00	1.30	0.401	No
106	17.55	1.04	0.39	0.65	0.96	0.382	1.24	0.309	1.00	1.30	0.401	No
107	17.72	1.05	0.40	0.65	0.96	0.383	1.24	0.309	1.00	1.30	0.402	No
108	17.88	1.06	0.40	0.66	0.96	0.383	1.24	0.310	1.00	1.30	0.403	No
109	18.05	1.07	0.41	0.66	0.96	0.384	1.24	0.310	1.00	1.30	0.403	No
110	18.21	1.08	0.41	0.67	0.96	0.384	1.24	0.311	1.00	1.30	0.404	No
111	18.37	1.09	0.42	0.67	0.96	0.385	1.24	0.311	1.00	1.30	0.404	No
112	18.54	1.10	0.42	0.68	0.96	0.386	1.24	0.312	1.00	1.30	0.405	No
113	18.70	1.11	0.43	0.68	0.96	0.386	1.24	0.312	1.00	1.30	0.406	No
114	18.87	1.12	0.43	0.69	0.96	0.387	1.24	0.313	1.00	1.30	0.406	No
115	19.03	1.13	0.44	0.69	0.96	0.387	1.24	0.313	1.00	1.30	0.407	No
116	19.19	1.14	0.44	0.69	0.96	0.388	1.24	0.313	1.00	1.30	0.407	No
117	19.36	1.15	0.45	0.70	0.96	0.388	1.24	0.314	1.00	1.30	0.408	No
118	19.52	1.16	0.45	0.70	0.96	0.389	1.24	0.314	1.00	1.30	0.409	No
119	19.69	1.17	0.46	0.71	0.96	0.389	1.24	0.315	1.00	1.30	0.409	No
120	19.85	1.18	0.46	0.71	0.96	0.390	1.24	0.315	1.00	1.30	0.410	No
121	20.01	1.19	0.47	0.72	0.96	0.390	1.24	0.315	1.00	1.30	0.410	No
122	20.18	1.20	0.47	0.72	0.96	0.391	1.24	0.316	1.00	1.30	0.411	No
123	20.34	1.21	0.48	0.73	0.96	0.391	1.24	0.316	1.00	1.30	0.411	No
124	20.51	1.22	0.48	0.73	0.96	0.392	1.24	0.317	1.00	1.30	0.412	No
125	20.67	1.23	0.49	0.74	0.96	0.392	1.24	0.317	1.00	1.30	0.412	No
126	20.83	1.24	0.49	0.74	0.95	0.393	1.24	0.317	1.00	1.30	0.412	No
127	21.00	1.25	0.50	0.75	0.95	0.393	1.24	0.318	1.00	1.30	0.413	No
128	21.16	1.26	0.50	0.75	0.95	0.393	1.24	0.318	1.00	1.30	2.000	Yes
129	21.33	1.27	0.51	0.76	0.95	0.394	1.24	0.318	1.00	1.30	2.000	Yes
130	21.49	1.28	0.51	0.76	0.95	0.394	1.24	0.319	1.00	1.30	2.000	Yes
131	21.65	1.29	0.52	0.77	0.95	0.395	1.24	0.319	1.00	1.30	2.000	Yes
132	21.82	1.30	0.52	0.77	0.95	0.395	1.24	0.319	1.00	1.30	2.000	Yes
133	21.98	1.31	0.53	0.78	0.95	0.396	1.24	0.320	1.00	1.30	0.416	No
134	22.15	1.32	0.54	0.78	0.95	0.396	1.24	0.320	1.00	1.30	0.416	No
135	22.31	1.32	0.54	0.78	0.95	0.396	1.24	0.320	1.00	1.30	0.416	No
136	22.47	1.33	0.55	0.79	0.95	0.397	1.24	0.321	1.00	1.30	0.417	No
137	22.64	1.34	0.55	0.79	0.95	0.397	1.24	0.321	1.00	1.30	0.417	No
138	22.80	1.35	0.56	0.80	0.95	0.398	1.24	0.321	1.00	1.30	0.418	No
139	22.97	1.36	0.56	0.80	0.95	0.398	1.24	0.322	1.00	1.30	0.418	No
140	23.13	1.37	0.57	0.81	0.95	0.398	1.24	0.322	1.00	1.30	0.418	No
141	23.30	1.38	0.57	0.81	0.95	0.399	1.24	0.322	1.00	1.30	0.419	No
142	23.46	1.39	0.58	0.82	0.95	0.399	1.24	0.322	1.00	1.30	0.419	No
143	23.62	1.40	0.58	0.82	0.95	0.399	1.24	0.323	1.00	1.30	0.420	No
144	23.79	1.41	0.59	0.82	0.95	0.400	1.24	0.323	1.00	1.30	0.420	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
145	23.95	1.42	0.59	0.83	0.95	0.400	1.24	0.323	1.00	1.30	0.420	No
146	24.12	1.43	0.60	0.83	0.94	0.400	1.24	0.324	1.00	1.30	0.421	No
147	24.28	1.44	0.60	0.84	0.94	0.401	1.24	0.324	1.00	1.30	0.421	No
148	24.44	1.45	0.61	0.84	0.94	0.401	1.24	0.324	1.00	1.30	0.421	No
149	24.61	1.46	0.61	0.85	0.94	0.401	1.24	0.324	1.00	1.30	0.422	No
150	24.77	1.47	0.62	0.85	0.94	0.402	1.24	0.325	1.00	1.30	0.422	No
151	24.94	1.48	0.62	0.86	0.94	0.402	1.24	0.325	1.00	1.30	0.422	No
152	25.10	1.49	0.63	0.86	0.94	0.402	1.24	0.325	1.00	1.30	0.422	No
153	25.26	1.50	0.63	0.87	0.94	0.402	1.24	0.325	1.00	1.30	0.422	No
154	25.43	1.51	0.64	0.87	0.94	0.402	1.24	0.325	1.00	1.30	0.422	No
155	25.59	1.52	0.64	0.88	0.94	0.402	1.24	0.325	1.00	1.30	0.422	No
156	25.76	1.53	0.65	0.88	0.94	0.402	1.24	0.325	1.00	1.30	0.422	No
157	25.92	1.54	0.65	0.89	0.94	0.402	1.24	0.325	1.00	1.30	0.423	No
158	26.08	1.55	0.66	0.89	0.94	0.402	1.24	0.325	1.00	1.30	0.423	No
159	26.25	1.56	0.66	0.90	0.94	0.403	1.24	0.325	1.00	1.30	0.423	No
160	26.41	1.57	0.67	0.90	0.94	0.403	1.24	0.325	1.00	1.30	0.423	No
161	26.58	1.58	0.67	0.91	0.94	0.403	1.24	0.325	1.00	1.30	0.423	No
162	26.74	1.59	0.68	0.91	0.94	0.403	1.24	0.325	1.00	1.30	0.423	No
163	26.90	1.60	0.68	0.92	0.93	0.403	1.24	0.325	1.00	1.30	0.423	No
164	27.07	1.61	0.69	0.92	0.93	0.403	1.24	0.325	1.00	1.30	0.423	No
165	27.23	1.62	0.69	0.93	0.93	0.403	1.24	0.325	1.00	1.30	0.423	No
166	27.40	1.63	0.70	0.93	0.93	0.403	1.24	0.325	1.00	1.30	0.423	No
167	27.56	1.64	0.70	0.94	0.93	0.402	1.24	0.325	1.00	1.30	0.423	No
168	27.72	1.65	0.71	0.95	0.93	0.402	1.24	0.325	1.00	1.30	0.423	No
169	27.89	1.67	0.71	0.95	0.93	0.402	1.24	0.325	1.00	1.30	2.000	Yes
170	28.05	1.68	0.72	0.96	0.93	0.402	1.24	0.325	1.00	1.30	2.000	Yes
171	28.22	1.69	0.72	0.96	0.93	0.402	1.24	0.325	1.00	1.30	2.000	Yes
172	28.38	1.70	0.73	0.97	0.93	0.402	1.24	0.325	1.00	1.30	2.000	Yes
173	28.54	1.71	0.73	0.97	0.93	0.402	1.24	0.325	1.00	1.30	2.000	Yes
174	28.71	1.72	0.74	0.98	0.93	0.402	1.24	0.325	1.00	1.30	0.423	No
175	28.87	1.73	0.74	0.98	0.93	0.402	1.24	0.325	1.00	1.30	0.423	No
176	29.04	1.74	0.75	0.99	0.93	0.402	1.24	0.325	1.00	1.30	0.423	No
177	29.20	1.75	0.76	0.99	0.92	0.402	1.24	0.325	1.00	1.30	0.423	No
178	29.36	1.76	0.76	1.00	0.92	0.402	1.24	0.325	1.00	1.30	0.423	No
179	29.53	1.77	0.77	1.00	0.92	0.402	1.24	0.325	1.00	1.30	0.423	No
180	29.69	1.78	0.77	1.01	0.92	0.402	1.24	0.325	1.00	1.30	0.422	No
181	29.86	1.79	0.78	1.01	0.92	0.402	1.24	0.325	1.00	1.30	0.422	No
182	30.02	1.80	0.78	1.02	0.92	0.402	1.24	0.325	1.00	1.30	0.422	No
183	30.19	1.81	0.79	1.02	0.92	0.402	1.24	0.325	1.00	1.30	0.422	No
184	30.35	1.82	0.79	1.03	0.92	0.402	1.24	0.325	1.00	1.30	0.422	No
185	30.51	1.83	0.80	1.03	0.92	0.402	1.24	0.324	1.00	1.30	0.422	No
186	30.68	1.84	0.80	1.04	0.92	0.401	1.24	0.324	1.00	1.30	0.422	No
187	30.84	1.85	0.81	1.04	0.92	0.401	1.24	0.324	1.00	1.30	0.421	No
188	31.01	1.86	0.81	1.05	0.92	0.401	1.24	0.324	1.00	1.30	0.421	No
189	31.17	1.87	0.82	1.05	0.91	0.401	1.24	0.324	1.00	1.30	0.421	No
190	31.33	1.88	0.82	1.06	0.91	0.401	1.24	0.324	1.00	1.30	0.421	No
191	31.50	1.89	0.83	1.07	0.91	0.400	1.24	0.324	1.00	1.30	0.421	No
192	31.66	1.90	0.83	1.07	0.91	0.400	1.24	0.323	1.00	1.30	0.422	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
193	31.83	1.91	0.84	1.08	0.91	0.400	1.24	0.323	1.00	1.30	0.422	No
194	31.99	1.92	0.84	1.08	0.91	0.400	1.24	0.323	1.00	1.30	0.422	No
195	32.15	1.93	0.85	1.08	0.91	0.400	1.24	0.323	0.99	1.30	0.422	No
196	32.32	1.94	0.85	1.09	0.91	0.400	1.24	0.323	0.99	1.30	0.423	No
197	32.48	1.95	0.86	1.09	0.91	0.400	1.24	0.323	0.99	1.30	0.423	No
198	32.65	1.96	0.86	1.10	0.91	0.399	1.24	0.323	0.99	1.30	0.423	No
199	32.81	1.97	0.87	1.10	0.90	0.399	1.24	0.323	0.99	1.30	0.424	No
200	32.97	1.98	0.87	1.11	0.90	0.399	1.24	0.323	0.99	1.30	0.424	No
201	33.14	1.99	0.88	1.11	0.90	0.399	1.24	0.322	0.99	1.30	0.424	No
202	33.30	2.00	0.88	1.12	0.90	0.399	1.24	0.322	0.99	1.30	0.424	No
203	33.47	2.01	0.89	1.12	0.90	0.399	1.24	0.322	0.99	1.30	0.424	No
204	33.63	2.02	0.89	1.13	0.90	0.398	1.24	0.322	0.99	1.30	0.425	No
205	33.79	2.03	0.90	1.13	0.90	0.398	1.24	0.322	0.98	1.30	0.425	No
206	33.96	2.04	0.90	1.14	0.90	0.398	1.24	0.322	0.98	1.30	0.425	No
207	34.12	2.05	0.91	1.14	0.90	0.398	1.24	0.322	0.98	1.30	0.425	No
208	34.29	2.06	0.91	1.15	0.90	0.398	1.24	0.321	0.98	1.30	0.425	No
209	34.45	2.07	0.92	1.15	0.89	0.397	1.24	0.321	0.98	1.30	0.426	No
210	34.61	2.08	0.92	1.16	0.89	0.397	1.24	0.321	0.98	1.30	0.426	No
211	34.78	2.09	0.93	1.16	0.89	0.397	1.24	0.321	0.98	1.30	0.426	No
212	34.94	2.10	0.93	1.17	0.89	0.396	1.24	0.320	0.98	1.30	2.000	Yes
213	35.11	2.11	0.94	1.17	0.89	0.396	1.24	0.320	0.98	1.30	2.000	Yes
214	35.27	2.12	0.94	1.18	0.89	0.396	1.24	0.320	0.98	1.30	2.000	Yes
215	35.43	2.13	0.95	1.18	0.89	0.396	1.24	0.320	0.98	1.30	2.000	Yes
216	35.60	2.14	0.95	1.18	0.89	0.395	1.24	0.319	0.97	1.30	2.000	Yes
217	35.76	2.15	0.96	1.19	0.89	0.395	1.24	0.319	0.97	1.30	2.000	Yes
218	35.93	2.16	0.97	1.19	0.88	0.395	1.24	0.319	0.97	1.30	0.426	No
219	36.09	2.17	0.97	1.20	0.88	0.395	1.24	0.319	0.97	1.30	0.427	No
220	36.26	2.18	0.98	1.20	0.88	0.394	1.24	0.319	0.97	1.30	0.427	No
221	36.42	2.19	0.98	1.21	0.88	0.394	1.24	0.318	0.97	1.30	0.427	No
222	36.58	2.20	0.99	1.21	0.88	0.394	1.24	0.318	0.97	1.30	0.427	No
223	36.75	2.21	0.99	1.22	0.88	0.393	1.24	0.318	0.97	1.30	0.427	No
224	36.91	2.22	1.00	1.22	0.88	0.393	1.24	0.318	0.97	1.30	0.427	No
225	37.08	2.23	1.00	1.23	0.88	0.393	1.24	0.317	0.97	1.30	0.427	No
226	37.24	2.24	1.01	1.23	0.87	0.392	1.24	0.317	0.97	1.30	0.427	No
227	37.40	2.25	1.01	1.24	0.87	0.392	1.24	0.317	0.96	1.30	0.427	No
228	37.57	2.26	1.02	1.24	0.87	0.392	1.24	0.316	0.96	1.30	0.427	No
229	37.73	2.27	1.02	1.25	0.87	0.391	1.24	0.316	0.96	1.30	0.427	No
230	37.90	2.28	1.03	1.25	0.87	0.391	1.24	0.316	0.96	1.30	0.427	No
231	38.06	2.29	1.03	1.26	0.87	0.390	1.24	0.315	0.96	1.30	0.426	No
232	38.22	2.30	1.04	1.26	0.87	0.390	1.24	0.315	0.96	1.30	0.426	No
233	38.39	2.31	1.04	1.27	0.86	0.389	1.24	0.315	0.96	1.30	0.426	No
234	38.55	2.32	1.05	1.27	0.86	0.389	1.24	0.314	0.96	1.30	0.426	No
235	38.72	2.33	1.05	1.28	0.86	0.389	1.24	0.314	0.96	1.30	0.426	No
236	38.88	2.34	1.06	1.28	0.86	0.388	1.24	0.314	0.96	1.30	0.426	No
237	39.04	2.35	1.06	1.28	0.86	0.388	1.24	0.313	0.96	1.30	0.426	No
238	39.21	2.36	1.07	1.29	0.86	0.387	1.24	0.313	0.96	1.30	0.426	No
239	39.37	2.37	1.07	1.29	0.86	0.387	1.24	0.313	0.95	1.30	0.426	No
240	39.54	2.38	1.08	1.30	0.86	0.387	1.24	0.312	0.95	1.30	0.426	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
241	39.70	2.38	1.08	1.30	0.85	0.386	1.24	0.312	0.95	1.30	0.425	No
242	39.86	2.39	1.09	1.31	0.85	0.386	1.24	0.312	0.95	1.30	0.425	No
243	40.03	2.40	1.09	1.31	0.85	0.385	1.24	0.311	0.95	1.30	0.425	No
244	40.19	2.41	1.10	1.32	0.85	0.385	1.24	0.311	0.95	1.30	0.425	No
245	40.36	2.42	1.10	1.32	0.85	0.384	1.24	0.310	0.95	1.30	0.425	No
246	40.52	2.44	1.11	1.33	0.85	0.384	1.24	0.310	0.95	1.30	0.425	No
247	40.68	2.45	1.11	1.33	0.84	0.383	1.24	0.310	0.95	1.30	0.424	No
248	40.85	2.46	1.12	1.34	0.84	0.382	1.24	0.309	0.95	1.30	0.424	No
249	41.01	2.47	1.12	1.34	0.84	0.382	1.24	0.308	0.95	1.30	0.424	No
250	41.18	2.48	1.13	1.35	0.84	0.381	1.24	0.308	0.95	1.30	0.423	No
251	41.34	2.49	1.13	1.36	0.84	0.380	1.24	0.307	0.94	1.30	0.423	No
252	41.50	2.50	1.14	1.36	0.84	0.380	1.24	0.307	0.94	1.30	0.423	No
253	41.67	2.51	1.14	1.37	0.84	0.379	1.24	0.306	0.94	1.30	0.423	No
254	41.83	2.52	1.15	1.37	0.83	0.379	1.24	0.306	0.94	1.30	0.422	No
255	42.00	2.53	1.15	1.38	0.83	0.378	1.24	0.306	0.94	1.30	0.422	No
256	42.16	2.54	1.16	1.38	0.83	0.378	1.24	0.305	0.94	1.30	0.422	No
257	42.32	2.55	1.16	1.39	0.83	0.377	1.24	0.305	0.94	1.30	0.421	No
258	42.49	2.56	1.17	1.39	0.83	0.376	1.24	0.304	0.94	1.30	2.000	Yes
259	42.65	2.57	1.17	1.40	0.83	0.376	1.24	0.304	0.94	1.30	2.000	Yes
260	42.82	2.58	1.18	1.40	0.83	0.375	1.24	0.303	0.94	1.30	2.000	Yes
261	42.98	2.60	1.18	1.41	0.82	0.374	1.24	0.302	0.94	1.30	2.000	Yes
262	43.15	2.61	1.19	1.42	0.82	0.374	1.24	0.302	0.94	1.30	2.000	Yes
263	43.31	2.62	1.20	1.42	0.82	0.373	1.24	0.301	0.93	1.30	2.000	Yes
264	43.47	2.63	1.20	1.43	0.82	0.373	1.24	0.301	0.93	1.30	0.419	No
265	43.64	2.64	1.21	1.43	0.82	0.372	1.24	0.301	0.93	1.30	0.419	No
266	43.80	2.65	1.21	1.44	0.82	0.371	1.24	0.300	0.93	1.30	0.418	No
267	43.97	2.66	1.22	1.44	0.81	0.371	1.24	0.300	0.93	1.30	0.418	No
268	44.13	2.67	1.22	1.45	0.81	0.370	1.24	0.299	0.93	1.30	0.418	No
269	44.29	2.68	1.23	1.45	0.81	0.370	1.24	0.299	0.93	1.30	0.417	No
270	44.46	2.69	1.23	1.45	0.81	0.369	1.24	0.298	0.93	1.30	0.417	No
271	44.62	2.70	1.24	1.46	0.81	0.368	1.24	0.298	0.93	1.30	0.417	No
272	44.79	2.71	1.24	1.46	0.81	0.368	1.24	0.297	0.93	1.30	0.416	No
273	44.95	2.72	1.25	1.47	0.80	0.367	1.24	0.297	0.93	1.30	0.416	No
274	45.11	2.72	1.25	1.47	0.80	0.367	1.24	0.296	0.93	1.30	0.416	No
275	45.28	2.73	1.26	1.48	0.80	0.366	1.24	0.296	0.93	1.30	0.415	No
276	45.44	2.74	1.26	1.48	0.80	0.365	1.24	0.295	0.93	1.30	0.415	No
277	45.61	2.75	1.27	1.49	0.80	0.365	1.24	0.295	0.92	1.30	0.414	No
278	45.77	2.76	1.27	1.49	0.80	0.364	1.24	0.294	0.92	1.30	0.414	No
279	45.93	2.77	1.28	1.50	0.79	0.364	1.24	0.294	0.92	1.30	0.414	No
280	46.10	2.78	1.28	1.50	0.79	0.363	1.24	0.293	0.92	1.30	0.413	No
281	46.26	2.79	1.29	1.51	0.79	0.362	1.24	0.293	0.92	1.30	0.413	No
282	46.43	2.80	1.29	1.51	0.79	0.362	1.24	0.292	0.92	1.30	0.412	No
283	46.59	2.81	1.30	1.51	0.79	0.361	1.24	0.292	0.92	1.30	0.412	No
284	46.75	2.82	1.30	1.52	0.79	0.361	1.24	0.291	0.92	1.30	0.412	No
285	46.92	2.83	1.31	1.52	0.78	0.360	1.24	0.291	0.92	1.30	0.411	No
286	47.08	2.84	1.31	1.53	0.78	0.359	1.24	0.290	0.92	1.30	0.411	No
287	47.25	2.85	1.32	1.53	0.78	0.359	1.24	0.290	0.92	1.30	0.410	No
288	47.41	2.86	1.32	1.54	0.78	0.358	1.24	0.289	0.92	1.30	0.410	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
289	47.57	2.87	1.33	1.54	0.78	0.357	1.24	0.289	0.92	1.30	0.409	No
290	47.74	2.88	1.33	1.55	0.78	0.357	1.24	0.288	0.92	1.30	0.409	No
291	47.90	2.89	1.34	1.55	0.77	0.356	1.24	0.288	0.92	1.30	0.409	No
292	48.07	2.90	1.34	1.56	0.77	0.355	1.24	0.287	0.91	1.30	0.408	No
293	48.23	2.91	1.35	1.56	0.77	0.355	1.24	0.287	0.91	1.30	0.408	No
294	48.39	2.92	1.35	1.57	0.77	0.354	1.24	0.286	0.91	1.30	0.407	No
295	48.56	2.93	1.36	1.57	0.77	0.353	1.24	0.286	0.91	1.30	0.407	No
296	48.72	2.94	1.36	1.58	0.77	0.353	1.24	0.285	0.91	1.30	0.406	No
297	48.89	2.95	1.37	1.58	0.76	0.352	1.24	0.284	0.91	1.30	0.406	No
298	49.05	2.96	1.37	1.59	0.76	0.351	1.24	0.284	0.91	1.30	0.405	No
299	49.22	2.97	1.38	1.59	0.76	0.350	1.24	0.283	0.91	1.30	0.405	No
300	49.38	2.98	1.38	1.60	0.76	0.350	1.24	0.283	0.91	1.30	0.404	No
301	49.54	2.99	1.39	1.60	0.76	0.349	1.24	0.282	0.91	1.30	0.404	No
302	49.71	3.00	1.39	1.61	0.76	0.348	1.24	0.282	0.91	1.30	0.403	No
303	49.87	3.01	1.40	1.61	0.75	0.348	1.24	0.281	0.91	1.30	0.403	No
304	50.04	3.03	1.41	1.62	0.75	0.347	1.24	0.280	0.91	1.30	0.402	No
305	50.20	3.04	1.41	1.63	0.75	0.346	1.24	0.280	0.91	1.30	0.402	No

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
σ_v: Total overburden pressure at test point (tsf)
u_0: Water pressure at test point (tsf)
σ_v': Effective overburden pressure based on GWT during earthquake (tsf)
r_d: Nonlinear shear mass factor
CSR: Cyclic Stress Ratio
MSF: Magnitude Scaling Factor
CSR_{eq}: CSR adjusted for M=7.5
K_σ: Effective overburden stress factor
CSR^*: CSR fully adjusted

:: Cyclic Resistance Ratio (CRR) calculation data ::

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
1	0.33	11.73	2.79	3.13	0.94	18.82	4.67	87.85	4.000	Yes	Yes	2.00
2	0.49	16.63	2.64	2.81	0.88	26.68	3.57	95.27	4.000	Yes	Yes	2.00
3	0.66	25.20	2.42	2.12	0.80	40.43	2.40	97.09	4.000	Yes	No	2.00
4	0.82	37.74	2.17	1.42	0.70	60.55	1.61	97.27	4.000	Yes	No	2.00
5	0.98	49.90	1.99	1.00	0.63	80.09	1.28	102.71	4.000	Yes	No	2.00
6	1.15	60.40	1.87	0.83	0.59	96.94	1.16	112.62	4.000	Yes	No	2.00
7	1.31	65.47	1.80	0.71	0.56	105.06	1.11	116.50	4.000	Yes	No	2.00
8	1.48	64.27	1.78	0.62	0.55	103.12	1.09	112.29	4.000	No	No	2.00
9	1.64	57.07	1.80	0.59	0.56	91.54	1.11	101.48	4.000	No	No	2.00
10	1.80	47.80	1.86	0.56	0.58	76.64	1.15	88.22	4.000	No	No	2.00
11	1.97	38.40	1.99	0.70	0.63	61.52	1.29	79.09	4.000	No	No	2.00
12	2.13	30.87	2.12	0.87	0.68	49.40	1.49	73.76	4.000	No	No	2.00
13	2.30	25.90	2.26	1.16	0.73	41.41	1.81	75.10	4.000	No	No	2.00
14	2.46	21.23	2.38	1.42	0.78	33.89	2.22	75.22	4.000	No	No	2.00
15	2.62	19.33	2.40	1.39	0.79	30.83	2.33	71.87	4.000	No	No	2.00
16	2.79	16.70	2.46	1.41	0.81	26.58	2.58	68.61	4.000	No	No	2.00
17	2.95	15.93	2.45	1.27	0.81	25.34	2.54	64.48	4.000	No	No	2.00
18	3.12	14.97	2.49	1.35	0.82	23.77	2.73	64.84	4.000	No	No	2.00
19	3.28	15.77	2.53	1.71	0.84	25.04	2.93	73.28	4.000	No	No	2.00
20	3.45	16.80	2.57	2.21	0.86	26.69	3.17	84.54	4.000	No	No	2.00
21	3.61	18.93	2.64	3.20	0.88	30.10	3.55	106.79	4.000	No	Yes	2.00
22	3.77	21.54	2.66	4.06	0.89	34.26	3.73	127.90	4.000	No	Yes	2.00
23	3.94	24.13	2.69	5.02	0.90	38.42	3.93	151.13	4.000	No	Yes	2.00
24	4.10	25.30	2.71	5.58	0.91	40.27	4.07	164.07	4.000	No	Yes	2.00
25	4.27	26.39	2.71	5.74	0.91	42.01	4.04	169.87	4.000	No	Yes	2.00
26	4.43	26.51	2.67	5.08	0.89	42.20	3.76	158.65	4.000	No	Yes	2.00
27	4.59	26.50	2.61	4.19	0.87	42.16	3.37	142.19	4.000	No	Yes	2.00
28	4.76	25.62	2.57	3.55	0.85	40.74	3.13	127.70	4.000	No	No	2.00
29	4.92	23.00	2.65	4.11	0.88	36.50	3.62	132.16	4.000	No	Yes	2.00
30	5.09	20.61	2.76	5.41	0.93	32.66	4.49	146.60	4.000	No	Yes	2.00
31	5.25	22.30	2.78	6.21	0.94	35.35	4.64	164.10	4.000	No	Yes	2.00
32	5.41	29.85	2.67	5.75	0.89	47.46	3.79	180.10	4.000	No	Yes	2.00
33	5.58	37.95	2.59	5.58	0.86	60.46	3.28	198.22	0.804	No	No	2.00
34	5.74	43.05	2.55	5.46	0.85	68.65	3.03	208.02	4.000	No	No	2.00
35	5.91	42.66	2.56	5.59	0.85	67.99	3.09	210.09	4.000	No	No	2.00
36	6.07	39.56	2.57	5.44	0.86	63.00	3.16	199.08	0.814	No	No	2.00
37	6.23	33.94	2.59	5.06	0.86	53.95	3.28	177.20	0.597	No	No	2.00
38	6.40	27.08	2.66	4.99	0.89	42.91	3.69	158.32	4.000	No	Yes	2.00
39	6.56	21.92	2.76	5.73	0.93	34.60	4.49	155.27	4.000	No	Yes	2.00
40	6.73	21.65	2.83	7.05	0.95	34.16	5.08	173.40	4.000	No	Yes	2.00
41	6.89	26.31	2.79	7.33	0.94	41.63	4.68	194.96	4.000	No	Yes	2.00
42	7.05	31.34	2.73	7.11	0.91	49.70	4.20	208.75	4.000	No	Yes	2.00
43	7.22	35.17	2.68	6.81	0.90	55.84	3.86	215.28	4.000	No	Yes	2.00
44	7.38	37.81	2.62	6.06	0.87	60.07	3.46	207.83	4.000	No	Yes	2.00
45	7.55	39.52	2.58	5.63	0.86	62.79	3.23	202.94	4.000	No	No	2.00
46	7.71	37.29	2.62	5.88	0.87	59.18	3.42	202.57	4.000	No	Yes	2.00
47	7.87	35.75	2.66	6.52	0.89	56.70	3.72	211.18	4.000	No	Yes	2.00
48	8.04	35.16	2.68	6.82	0.90	55.73	3.86	215.33	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
49	8.20	37.66	2.64	6.37	0.88	59.74	3.57	213.53	4.000	No	Yes	2.00
50	8.37	38.40	2.61	5.98	0.87	60.90	3.41	207.47	4.000	No	Yes	2.00
51	8.53	37.02	2.60	5.57	0.87	58.68	3.33	195.13	0.771	No	No	2.00
52	8.69	33.68	2.61	5.23	0.87	53.29	3.37	179.54	4.000	No	Yes	2.00
53	8.86	27.58	2.66	5.05	0.89	43.48	3.69	160.32	4.000	No	Yes	2.00
54	9.02	20.95	2.75	5.22	0.92	32.81	4.39	144.06	4.000	No	Yes	2.00
55	9.19	14.06	2.94	6.41	1.00	21.73	6.12	133.07	4.000	No	Yes	2.00
56	9.35	10.33	3.12	8.18	1.00	15.71	8.15	128.01	4.000	No	Yes	2.00
57	9.51	10.87	3.10	8.08	1.00	16.56	7.89	130.72	4.000	No	Yes	2.00
58	9.68	17.50	2.83	5.51	0.95	27.21	5.01	136.42	4.000	No	Yes	2.00
59	9.84	22.43	2.69	4.58	0.90	35.10	3.93	137.96	4.000	No	Yes	2.00
60	10.01	23.88	2.66	4.44	0.89	37.42	3.73	139.40	4.000	No	Yes	2.00
61	10.17	19.83	2.78	5.37	0.93	30.91	4.61	142.45	4.000	No	Yes	2.00
62	10.34	17.10	2.88	6.47	0.97	26.50	5.54	146.70	4.000	No	Yes	2.00
63	10.50	16.77	2.89	6.40	0.97	25.96	5.56	144.45	4.000	Yes	Yes	2.00
64	10.66	20.97	2.70	4.42	0.90	32.69	4.02	131.31	4.000	Yes	Yes	2.00
65	10.83	27.73	2.44	2.46	0.80	43.54	2.48	107.90	4.000	Yes	No	2.00
66	10.99	33.74	2.22	1.41	0.72	53.17	1.71	90.97	4.000	Yes	No	2.00
67	11.16	35.03	2.11	0.97	0.68	55.23	1.47	81.10	4.000	Yes	No	2.00
68	11.32	31.83	2.14	0.96	0.69	50.07	1.53	76.78	0.122	No	No	0.34
69	11.48	26.82	2.25	1.15	0.73	42.01	1.79	75.16	0.119	No	No	0.33
70	11.65	21.66	2.38	1.43	0.78	33.70	2.23	75.24	0.120	No	No	0.33
71	11.81	18.25	2.49	1.71	0.82	28.22	2.71	76.37	0.121	No	No	0.33
72	11.98	17.43	2.49	1.59	0.82	26.88	2.71	72.73	0.116	No	No	0.31
73	12.14	19.84	2.37	1.22	0.78	30.74	2.21	67.91	0.109	No	No	0.30
74	12.30	24.75	2.24	0.97	0.73	38.61	1.76	68.04	0.109	No	No	0.29
75	12.47	30.43	2.14	0.90	0.69	47.67	1.54	73.19	0.116	No	No	0.31
76	12.63	36.93	2.04	0.74	0.65	56.06	1.35	75.68	0.120	No	No	0.32
77	12.80	44.59	1.91	0.53	0.60	65.09	1.20	77.86	0.124	No	No	0.33
78	12.96	50.43	1.81	0.40	0.57	71.50	1.00	71.50	0.114	No	No	0.30
79	13.12	52.50	1.82	0.45	0.57	74.33	1.00	74.33	0.118	No	No	0.31
80	13.29	51.70	1.86	0.52	0.58	73.56	1.15	84.73	0.137	No	No	0.36
81	13.45	51.13	1.91	0.66	0.60	73.49	1.20	88.21	0.144	No	No	0.38
82	13.62	53.00	1.93	0.77	0.61	76.27	1.22	93.25	4.000	Yes	No	2.00
83	13.78	55.83	2.04	1.27	0.65	82.39	1.36	111.95	4.000	Yes	No	2.00
84	13.94	55.73	2.21	2.31	0.72	85.37	1.69	143.88	4.000	Yes	No	2.00
85	14.11	53.57	2.41	4.30	0.79	84.75	2.36	199.73	4.000	Yes	No	2.00
86	14.27	62.48	2.45	5.51	0.81	99.05	2.55	252.11	4.000	No	No	2.00
87	14.44	75.24	2.40	5.38	0.79	118.67	2.31	273.63	4.000	No	No	2.00
88	14.60	87.57	2.34	5.07	0.77	135.41	2.10	284.48	4.000	No	No	2.00
89	14.76	90.07	2.35	5.16	0.77	138.24	2.10	290.76	4.000	No	No	2.00
90	14.93	92.31	2.37	5.54	0.78	141.22	2.18	307.76	4.000	No	No	2.00
91	15.09	89.30	2.39	5.77	0.79	136.26	2.27	309.15	4.000	No	No	2.00
92	15.26	77.53	2.44	5.96	0.80	118.40	2.46	291.61	4.000	No	No	2.00
93	15.42	60.02	2.52	6.43	0.84	92.53	2.90	268.02	4.000	No	No	2.00
94	15.58	45.69	2.62	7.00	0.87	71.12	3.47	246.98	4.000	No	Yes	2.00
95	15.75	39.80	2.69	7.63	0.90	62.15	3.92	243.50	4.000	No	Yes	2.00
96	15.91	42.88	2.66	7.39	0.89	66.13	3.72	246.32	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
97	16.08	51.43	2.59	6.74	0.86	77.66	3.25	252.15	4.000	No	No	2.00
98	16.24	56.30	2.54	6.14	0.84	83.59	2.96	247.03	4.000	No	No	2.00
99	16.40	58.33	2.49	5.40	0.82	85.14	2.70	230.11	4.000	No	No	2.00
100	16.57	61.18	2.39	4.15	0.79	86.97	2.28	198.33	0.806	No	No	2.00
101	16.73	68.68	2.25	2.91	0.73	94.43	1.80	170.12	0.538	No	No	1.35
102	16.90	76.05	2.11	2.00	0.68	101.20	1.48	149.36	0.390	No	No	0.98
103	17.06	79.67	2.01	1.48	0.64	103.49	1.32	136.36	0.316	No	No	0.79
104	17.23	80.13	1.96	1.22	0.62	102.49	1.25	128.12	0.276	No	No	0.69
105	17.39	79.86	1.97	1.27	0.63	101.91	1.26	128.90	0.279	No	No	0.70
106	17.55	81.49	2.01	1.49	0.64	104.32	1.32	137.33	0.321	No	No	0.80
107	17.72	86.40	1.96	1.33	0.62	109.12	1.26	136.95	0.319	No	No	0.79
108	17.88	98.56	1.85	1.03	0.58	121.63	1.15	139.57	0.333	No	No	0.83
109	18.05	117.16	1.68	0.66	0.52	139.89	1.03	143.63	0.356	No	No	0.88
110	18.21	139.06	1.59	0.58	0.50	164.39	1.00	164.39	0.493	No	No	1.22
111	18.37	156.36	1.52	0.52	0.50	184.34	1.00	184.34	0.663	No	No	1.64
112	18.54	172.49	1.46	0.47	0.50	202.73	1.00	202.73	4.000	No	No	2.00
113	18.70	184.89	1.42	0.44	0.50	216.63	1.00	216.63	4.000	No	No	2.00
114	18.87	189.59	1.41	0.42	0.50	221.34	1.00	221.34	4.000	No	No	2.00
115	19.03	184.29	1.43	0.44	0.50	214.37	1.00	214.37	4.000	No	No	2.00
116	19.19	172.55	1.47	0.47	0.50	199.94	1.00	199.94	0.823	No	No	2.00
117	19.36	163.95	1.50	0.49	0.50	189.22	1.00	189.22	0.710	No	No	1.74
118	19.52	158.62	1.53	0.53	0.50	182.40	1.00	182.40	0.644	No	No	1.58
119	19.69	156.25	1.55	0.56	0.50	179.01	1.00	179.01	0.613	No	No	1.50
120	19.85	155.12	1.57	0.58	0.50	177.10	1.00	177.10	0.597	No	No	1.46
121	20.01	153.12	1.57	0.57	0.50	174.21	1.00	174.21	0.572	No	No	1.39
122	20.18	151.39	1.56	0.53	0.50	171.62	1.00	171.62	0.550	No	No	1.34
123	20.34	150.12	1.54	0.49	0.50	169.62	1.00	169.62	0.534	No	No	1.30
124	20.51	148.22	1.54	0.48	0.50	166.88	1.00	166.88	0.512	No	No	1.24
125	20.67	147.55	1.54	0.48	0.50	165.59	1.00	165.59	0.502	No	No	1.22
126	20.83	148.72	1.58	0.57	0.50	166.37	1.00	166.37	0.508	No	No	1.23
127	21.00	144.69	1.65	0.70	0.50	161.49	1.00	162.04	0.476	No	No	1.15
128	21.16	121.59	1.78	0.91	0.55	137.33	1.09	150.04	4.000	Yes	No	2.00
129	21.33	86.92	1.98	1.28	0.63	99.92	1.28	127.58	4.000	Yes	No	2.00
130	21.49	54.76	2.24	1.93	0.73	64.22	1.78	114.24	4.000	Yes	No	2.00
131	21.65	38.84	2.42	2.49	0.80	45.92	2.42	110.90	4.000	Yes	No	2.00
132	21.82	32.49	2.48	2.46	0.82	38.21	2.68	102.27	4.000	Yes	No	2.00
133	21.98	29.85	2.48	2.22	0.82	34.82	2.69	93.64	0.156	No	No	0.38
134	22.15	28.74	2.51	2.31	0.83	33.39	2.81	94.00	0.157	No	No	0.38
135	22.31	28.52	2.53	2.45	0.84	33.05	2.92	96.48	0.164	No	No	0.39
136	22.47	28.97	2.55	2.65	0.85	33.49	3.02	100.99	0.176	No	No	0.42
137	22.64	29.99	2.54	2.68	0.84	34.52	2.97	102.64	0.181	No	No	0.43
138	22.80	30.42	2.55	2.87	0.85	34.92	3.06	106.88	0.194	No	No	0.46
139	22.97	30.90	2.56	2.93	0.85	35.32	3.08	108.68	0.199	No	No	0.48
140	23.13	30.54	2.58	3.09	0.86	34.78	3.19	110.94	0.207	No	No	0.49
141	23.30	29.07	2.61	3.25	0.87	32.96	3.39	111.60	4.000	No	Yes	2.00
142	23.46	26.30	2.66	3.48	0.89	29.68	3.74	110.89	4.000	No	Yes	2.00
143	23.62	23.36	2.73	3.79	0.91	26.20	4.21	110.32	4.000	No	Yes	2.00
144	23.79	21.03	2.77	3.91	0.93	23.39	4.57	106.91	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
145	23.95	19.47	2.81	4.06	0.95	21.49	4.90	105.28	4.000	No	Yes	2.00
146	24.12	18.36	2.84	4.14	0.96	20.10	5.14	103.29	4.000	No	Yes	2.00
147	24.28	18.05	2.87	4.41	0.97	19.68	5.37	105.70	4.000	No	Yes	2.00
148	24.44	19.50	2.84	4.43	0.96	21.24	5.15	109.40	4.000	No	Yes	2.00
149	24.61	21.71	2.82	4.61	0.95	23.65	4.94	116.84	4.000	No	Yes	2.00
150	24.77	23.78	2.82	5.08	0.95	25.93	4.93	127.89	4.000	No	Yes	2.00
151	24.94	28.27	2.82	6.22	0.95	30.97	4.99	154.47	4.000	No	Yes	2.00
152	25.10	38.52	2.74	6.39	0.92	42.29	4.29	181.39	4.000	No	Yes	2.00
153	25.26	54.76	2.61	5.82	0.87	59.89	3.38	202.42	4.000	No	Yes	2.00
154	25.43	63.15	2.53	5.19	0.84	68.53	2.94	201.51	4.000	No	No	2.00
155	25.59	61.06	2.50	4.59	0.83	65.73	2.79	183.39	0.654	No	No	1.55
156	25.76	48.28	2.55	4.21	0.85	51.51	3.02	155.65	0.431	No	No	1.02
157	25.92	37.90	2.60	3.94	0.87	40.03	3.36	134.35	4.000	No	Yes	2.00
158	26.08	32.53	2.70	4.63	0.90	34.17	4.01	137.17	4.000	No	Yes	2.00
159	26.25	32.94	2.77	5.84	0.93	34.57	4.54	156.97	4.000	No	Yes	2.00
160	26.41	38.04	2.78	6.86	0.93	39.99	4.60	183.94	4.000	No	Yes	2.00
161	26.58	44.90	2.74	7.00	0.92	47.12	4.28	201.53	4.000	No	Yes	2.00
162	26.74	54.03	2.64	6.10	0.88	56.43	3.59	202.45	4.000	No	Yes	2.00
163	26.90	62.27	2.53	4.89	0.84	64.57	2.92	188.85	0.706	No	No	1.67
164	27.07	69.11	2.44	4.10	0.81	71.16	2.50	178.15	0.606	No	No	1.43
165	27.23	72.29	2.43	4.01	0.80	74.09	2.42	179.35	0.616	No	No	1.46
166	27.40	69.99	2.48	4.58	0.82	71.50	2.67	190.80	0.726	No	No	1.72
167	27.56	64.65	2.56	5.45	0.85	65.84	3.09	203.55	4.000	No	No	2.00
168	27.72	60.35	2.60	5.74	0.87	61.14	3.31	202.64	4.000	No	No	2.00
169	27.89	57.69	2.59	5.36	0.86	58.03	3.27	189.62	4.000	Yes	No	2.00
170	28.05	61.85	2.46	3.82	0.81	61.75	2.59	159.95	4.000	Yes	No	2.00
171	28.22	69.39	2.28	2.36	0.74	68.70	1.89	129.94	4.000	Yes	No	2.00
172	28.38	80.58	2.08	1.39	0.67	79.21	1.42	112.58	4.000	Yes	No	2.00
173	28.54	87.25	1.95	0.94	0.62	85.25	1.24	105.34	4.000	Yes	No	2.00
174	28.71	88.05	1.94	0.93	0.61	85.76	1.23	105.56	0.189	No	No	0.45
175	28.87	86.39	2.02	1.22	0.65	84.05	1.33	111.98	0.211	No	No	0.50
176	29.04	85.77	2.13	1.75	0.69	83.37	1.51	126.02	0.266	No	No	0.63
177	29.20	99.75	2.09	1.80	0.67	96.81	1.44	139.63	0.333	No	No	0.79
178	29.36	128.95	1.94	1.42	0.61	124.77	1.23	153.45	0.416	No	No	0.98
179	29.53	162.21	1.76	1.00	0.55	156.28	1.08	169.04	0.529	No	No	1.25
180	29.69	184.62	1.66	0.80	0.51	177.25	1.01	179.10	0.614	No	No	1.45
181	29.86	197.52	1.61	0.72	0.50	189.17	1.00	189.17	0.710	No	No	1.68
182	30.02	217.57	1.55	0.65	0.50	208.01	1.00	208.01	4.000	No	No	2.00
183	30.19	250.17	1.45	0.55	0.50	238.80	1.00	238.80	4.000	No	No	2.00
184	30.35	281.00	1.38	0.49	0.50	267.77	1.00	267.77	4.000	No	No	2.00
185	30.51	297.48	1.34	0.45	0.50	282.86	1.00	282.86	4.000	No	No	2.00
186	30.68	284.81	1.38	0.49	0.50	270.02	1.00	270.02	4.000	No	No	2.00
187	30.84	247.88	1.50	0.64	0.50	234.18	1.00	234.18	4.000	No	No	2.00
188	31.01	204.51	1.71	1.02	0.53	192.42	1.04	200.67	4.000	No	No	2.00
189	31.17	183.85	1.83	1.36	0.57	172.35	1.13	194.66	0.766	No	No	1.82
190	31.33	186.21	1.83	1.37	0.57	174.08	1.13	196.81	0.789	No	No	1.87
191	31.50	192.21	1.72	1.00	0.53	179.24	1.05	188.73	0.705	No	No	1.67
192	31.66	189.71	1.61	0.67	0.50	176.50	1.00	176.50	0.591	No	No	1.40

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
193	31.83	183.61	1.52	0.46	0.50	170.35	1.00	170.35	0.540	No	No	1.28
194	31.99	176.45	1.54	0.46	0.50	163.28	1.00	163.28	0.485	No	No	1.15
195	32.15	167.19	1.57	0.48	0.50	154.27	1.00	154.27	0.421	No	No	1.00
196	32.32	157.93	1.59	0.49	0.50	145.29	1.00	145.29	0.365	No	No	0.86
197	32.48	153.93	1.60	0.48	0.50	141.26	1.00	141.26	0.342	No	No	0.81
198	32.65	150.94	1.59	0.45	0.50	138.15	1.00	138.15	0.325	No	No	0.77
199	32.81	145.44	1.60	0.44	0.50	132.77	1.00	132.77	0.298	No	No	0.70
200	32.97	134.97	1.63	0.45	0.50	122.83	1.00	122.83	0.252	No	No	0.60
201	33.14	121.88	1.70	0.50	0.52	110.37	1.04	114.37	0.219	No	No	0.52
202	33.30	111.15	1.76	0.55	0.54	100.15	1.08	107.68	0.196	No	No	0.46
203	33.47	106.68	1.79	0.61	0.56	95.74	1.10	105.57	0.189	No	No	0.45
204	33.63	108.95	1.81	0.65	0.56	97.56	1.11	108.47	0.199	No	No	0.47
205	33.79	115.05	1.79	0.65	0.56	102.93	1.10	112.87	0.214	No	No	0.50
206	33.96	122.16	1.75	0.61	0.54	109.24	1.07	117.03	0.229	No	No	0.54
207	34.12	133.06	1.71	0.59	0.53	119.02	1.04	124.21	0.258	No	No	0.61
208	34.29	151.19	1.68	0.63	0.52	135.29	1.02	138.65	0.328	No	No	0.77
209	34.45	168.70	1.63	0.60	0.50	151.03	1.00	151.03	0.400	No	No	0.94
210	34.61	181.90	1.61	0.61	0.50	162.64	1.00	162.64	0.480	No	No	1.13
211	34.78	193.03	1.59	0.61	0.50	172.31	1.00	172.31	0.556	No	No	1.31
212	34.94	164.17	1.72	0.78	0.53	145.52	1.05	152.67	4.000	Yes	No	2.00
213	35.11	121.73	1.90	1.03	0.60	106.41	1.19	126.33	4.000	Yes	No	2.00
214	35.27	66.11	2.26	1.77	0.74	55.96	1.84	102.73	4.000	Yes	No	2.00
215	35.43	46.13	2.48	2.42	0.82	38.03	2.67	101.36	4.000	Yes	No	2.00
216	35.60	36.12	2.62	2.94	0.87	29.09	3.47	100.85	4.000	Yes	Yes	2.00
217	35.76	30.93	2.71	3.24	0.91	24.46	4.05	99.04	4.000	Yes	Yes	2.00
218	35.93	28.30	2.76	3.44	0.93	22.09	4.44	98.02	4.000	No	Yes	2.00
219	36.09	26.99	2.79	3.63	0.94	20.87	4.71	98.30	4.000	No	Yes	2.00
220	36.26	26.73	2.81	3.80	0.95	20.55	4.87	99.99	4.000	No	Yes	2.00
221	36.42	27.09	2.82	4.02	0.95	20.76	4.97	103.16	4.000	No	Yes	2.00
222	36.58	28.53	2.82	4.18	0.95	21.88	4.92	107.54	4.000	No	Yes	2.00
223	36.75	30.19	2.80	4.29	0.94	23.17	4.82	111.65	4.000	No	Yes	2.00
224	36.91	30.79	2.80	4.32	0.94	23.58	4.79	112.85	4.000	No	Yes	2.00
225	37.08	29.55	2.83	4.51	0.95	22.43	5.04	113.02	4.000	No	Yes	2.00
226	37.24	28.23	2.85	4.62	0.96	21.23	5.26	111.65	4.000	No	Yes	2.00
227	37.40	28.86	2.87	5.01	0.97	21.64	5.42	117.29	4.000	No	Yes	2.00
228	37.57	31.17	2.87	5.42	0.97	23.42	5.40	126.42	4.000	No	Yes	2.00
229	37.73	34.94	2.85	5.71	0.96	26.40	5.20	137.16	4.000	No	Yes	2.00
230	37.90	39.07	2.79	5.34	0.94	29.72	4.70	139.60	4.000	No	Yes	2.00
231	38.06	40.18	2.76	5.01	0.93	30.54	4.47	136.51	4.000	No	Yes	2.00
232	38.22	38.05	2.75	4.57	0.92	28.73	4.40	126.44	4.000	No	Yes	2.00
233	38.39	33.75	2.78	4.35	0.93	25.13	4.63	116.34	4.000	No	Yes	2.00
234	38.55	30.29	2.80	4.05	0.94	22.25	4.79	106.66	4.000	No	Yes	2.00
235	38.72	27.92	2.84	4.17	0.96	20.23	5.14	103.95	4.000	No	Yes	2.00
236	38.88	26.66	2.87	4.39	0.97	19.12	5.44	104.06	4.000	No	Yes	2.00
237	39.04	27.23	2.87	4.42	0.97	19.49	5.40	105.35	4.000	No	Yes	2.00
238	39.21	28.02	2.83	4.03	0.95	20.09	5.07	101.90	4.000	No	Yes	2.00
239	39.37	27.62	2.82	3.70	0.95	19.73	4.91	96.99	4.000	No	Yes	2.00
240	39.54	25.93	2.83	3.54	0.95	18.32	5.03	92.16	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
241	39.70	23.79	2.87	3.58	0.97	16.55	5.37	88.96	4.000	No	Yes	2.00
242	39.86	22.43	2.91	3.83	0.98	15.39	5.79	89.02	4.000	No	Yes	2.00
243	40.03	23.06	2.97	5.00	1.00	15.75	6.46	101.85	4.000	No	Yes	2.00
244	40.19	27.43	3.02	7.33	1.00	19.01	7.02	133.47	4.000	No	Yes	2.00
245	40.36	40.14	2.94	8.31	0.99	28.57	6.08	173.80	4.000	No	Yes	2.00
246	40.52	62.17	2.78	7.81	0.94	45.67	4.64	211.72	4.000	No	Yes	2.00
247	40.68	84.41	2.66	7.12	0.89	63.08	3.72	234.97	4.000	No	Yes	2.00
248	40.85	94.90	2.61	6.67	0.87	71.21	3.37	239.82	4.000	No	Yes	2.00
249	41.01	89.77	2.61	6.41	0.87	66.97	3.39	226.98	4.000	No	Yes	2.00
250	41.18	76.83	2.65	6.23	0.88	56.63	3.63	205.39	4.000	No	Yes	2.00
251	41.34	64.50	2.69	5.97	0.90	46.89	3.90	182.92	4.000	No	Yes	2.00
252	41.50	59.30	2.67	5.16	0.89	42.88	3.76	161.38	4.000	No	Yes	2.00
253	41.67	53.77	2.66	4.49	0.89	38.61	3.68	142.19	4.000	No	Yes	2.00
254	41.83	49.98	2.65	4.00	0.88	35.66	3.62	129.01	4.000	No	Yes	2.00
255	42.00	44.78	2.71	4.42	0.91	31.42	4.11	129.02	4.000	No	Yes	2.00
256	42.16	46.52	2.75	5.08	0.92	32.50	4.35	141.24	4.000	No	Yes	2.00
257	42.32	53.09	2.76	6.07	0.93	37.16	4.46	165.74	4.000	No	Yes	2.00
258	42.49	62.86	2.74	6.63	0.92	44.27	4.28	189.44	4.000	Yes	Yes	2.00
259	42.65	76.53	2.65	6.08	0.88	54.60	3.64	198.93	4.000	Yes	Yes	2.00
260	42.82	93.26	2.50	4.60	0.83	67.81	2.75	186.26	4.000	Yes	No	2.00
261	42.98	113.04	2.29	2.93	0.75	84.23	1.91	160.66	4.000	Yes	No	2.00
262	43.15	138.26	2.03	1.62	0.65	106.12	1.34	142.69	4.000	Yes	No	2.00
263	43.31	166.18	1.78	0.88	0.55	131.28	1.09	143.68	4.000	Yes	No	2.00
264	43.47	192.28	1.60	0.54	0.50	154.42	1.00	154.42	0.422	No	No	1.01
265	43.64	205.01	1.52	0.43	0.50	164.48	1.00	164.48	0.494	No	No	1.18
266	43.80	204.04	1.51	0.41	0.50	163.42	1.00	163.42	0.486	No	No	1.16
267	43.97	196.34	1.52	0.41	0.50	156.89	1.00	156.89	0.439	No	No	1.05
268	44.13	192.41	1.54	0.42	0.50	153.44	1.00	153.44	0.416	No	No	1.00
269	44.29	194.98	1.52	0.40	0.50	155.26	1.00	155.26	0.428	No	No	1.03
270	44.46	200.08	1.48	0.35	0.50	159.10	1.00	159.10	0.455	No	No	1.09
271	44.62	203.05	1.46	0.33	0.50	161.23	1.00	161.23	0.470	No	No	1.13
272	44.79	204.26	1.45	0.31	0.50	161.92	1.00	161.92	0.475	No	No	1.14
273	44.95	206.54	1.43	0.29	0.50	163.49	1.00	163.49	0.486	No	No	1.17
274	45.11	212.92	1.39	0.25	0.50	168.35	1.00	168.35	0.524	No	No	1.26
275	45.28	211.70	1.38	0.24	0.50	167.09	1.00	167.09	0.514	No	No	1.24
276	45.44	202.69	1.41	0.25	0.50	159.64	1.00	159.64	0.458	No	No	1.10
277	45.61	187.69	1.47	0.29	0.50	147.42	1.00	147.42	0.378	No	No	0.91
278	45.77	176.65	1.52	0.33	0.50	138.40	1.00	138.40	0.327	No	No	0.79
279	45.93	172.62	1.54	0.35	0.50	134.98	1.00	134.98	0.309	No	No	0.75
280	46.10	175.29	1.54	0.35	0.50	136.88	1.00	136.88	0.318	No	No	0.77
281	46.26	184.20	1.49	0.31	0.50	143.72	1.00	143.72	0.356	No	No	0.86
282	46.43	191.74	1.46	0.28	0.50	149.45	1.00	149.45	0.390	No	No	0.95
283	46.59	194.94	1.44	0.26	0.50	151.75	1.00	151.75	0.405	No	No	0.98
284	46.75	192.94	1.44	0.26	0.50	149.94	1.00	149.94	0.394	No	No	0.96
285	46.92	188.75	1.46	0.27	0.50	146.40	1.00	146.40	0.372	No	No	0.90
286	47.08	182.88	1.48	0.28	0.50	141.57	1.00	141.57	0.344	No	No	0.84
287	47.25	178.82	1.50	0.30	0.50	138.15	1.00	138.15	0.325	No	No	0.79
288	47.41	176.42	1.54	0.35	0.50	136.06	1.00	136.06	0.314	No	No	0.77

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
289	47.57	172.82	1.58	0.41	0.50	133.03	1.00	133.03	0.299	No	No	0.73
290	47.74	170.63	1.63	0.50	0.50	131.09	1.00	131.09	0.290	No	No	0.71
291	47.90	168.98	1.68	0.58	0.51	128.85	1.02	131.90	0.293	No	No	0.72
292	48.07	170.73	1.72	0.68	0.53	129.26	1.05	135.61	0.312	No	No	0.76
293	48.23	177.04	1.73	0.75	0.54	133.57	1.06	141.56	0.344	No	No	0.84
294	48.39	190.83	1.72	0.78	0.53	144.17	1.05	151.52	0.403	No	No	0.99
295	48.56	207.66	1.69	0.78	0.52	157.47	1.03	162.44	0.479	No	No	1.18
296	48.72	223.05	1.66	0.76	0.51	169.88	1.01	171.29	0.547	No	No	1.35
297	48.89	234.82	1.64	0.75	0.50	179.11	1.00	179.11	0.614	No	No	1.51
298	49.05	241.81	1.61	0.71	0.50	184.20	1.00	184.20	0.661	No	No	1.63
299	49.22	238.73	1.61	0.69	0.50	181.51	1.00	181.51	0.636	No	No	1.57
300	49.38	228.70	1.61	0.65	0.50	173.49	1.00	173.49	0.566	No	No	1.40
301	49.54	214.00	1.62	0.63	0.50	161.93	1.00	161.93	0.475	No	No	1.18
302	49.71	200.53	1.65	0.64	0.50	151.10	1.00	151.55	0.404	No	No	1.00
303	49.87	189.40	1.67	0.64	0.51	141.84	1.02	144.51	0.361	No	No	0.90
304	50.04	179.84	1.70	0.66	0.52	133.76	1.04	138.71	0.328	No	No	0.82
305	50.20	174.79	1.70	0.64	0.52	129.66	1.04	134.72	0.307	No	No	0.77

Abbreviations

Depth: Depth from free surface, at which CPT was performed (ft)
q_t: Total cone resistance
I_c: Soil behavior type index
Fr: Normalized friction ratio (%)
n: Stress exponent
Q_{tn}: Normalized cone resistance
K_c: Cone resistance correction factor due to fines
$Q_{tn,cs}$: Normalized and adjusted cone resistance
$CRR_{7.5}$: Cyclic resistance ratio for M_w=7.5
FS: Factor of safety against soil liquefaction

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.33	2.00	0.00	9.95	0.16	0.00	0.49	2.00	0.00	9.93	0.16	0.00
0.66	2.00	0.00	9.90	0.17	0.00	0.82	2.00	0.00	9.88	0.16	0.00
0.98	2.00	0.00	9.85	0.16	0.00	1.15	2.00	0.00	9.82	0.17	0.00
1.31	2.00	0.00	9.80	0.16	0.00	1.48	2.00	0.00	9.77	0.17	0.00
1.64	2.00	0.00	9.75	0.16	0.00	1.80	2.00	0.00	9.73	0.16	0.00
1.97	2.00	0.00	9.70	0.17	0.00	2.13	2.00	0.00	9.68	0.16	0.00
2.30	2.00	0.00	9.65	0.17	0.00	2.46	2.00	0.00	9.63	0.16	0.00
2.62	2.00	0.00	9.60	0.16	0.00	2.79	2.00	0.00	9.57	0.17	0.00
2.95	2.00	0.00	9.55	0.16	0.00	3.12	2.00	0.00	9.52	0.17	0.00
3.28	2.00	0.00	9.50	0.16	0.00	3.45	2.00	0.00	9.47	0.17	0.00
3.61	2.00	0.00	9.45	0.16	0.00	3.77	2.00	0.00	9.43	0.16	0.00
3.94	2.00	0.00	9.40	0.17	0.00	4.10	2.00	0.00	9.38	0.16	0.00
4.27	2.00	0.00	9.35	0.17	0.00	4.43	2.00	0.00	9.32	0.16	0.00
4.59	2.00	0.00	9.30	0.16	0.00	4.76	2.00	0.00	9.27	0.17	0.00
4.92	2.00	0.00	9.25	0.16	0.00	5.09	2.00	0.00	9.22	0.17	0.00
5.25	2.00	0.00	9.20	0.16	0.00	5.41	2.00	0.00	9.18	0.16	0.00
5.58	2.00	0.00	9.15	0.17	0.00	5.74	2.00	0.00	9.13	0.16	0.00
5.91	2.00	0.00	9.10	0.17	0.00	6.07	2.00	0.00	9.07	0.16	0.00
6.23	2.00	0.00	9.05	0.16	0.00	6.40	2.00	0.00	9.02	0.17	0.00
6.56	2.00	0.00	9.00	0.16	0.00	6.73	2.00	0.00	8.97	0.17	0.00
6.89	2.00	0.00	8.95	0.16	0.00	7.05	2.00	0.00	8.93	0.16	0.00
7.22	2.00	0.00	8.90	0.17	0.00	7.38	2.00	0.00	8.88	0.16	0.00
7.55	2.00	0.00	8.85	0.17	0.00	7.71	2.00	0.00	8.82	0.16	0.00
7.87	2.00	0.00	8.80	0.16	0.00	8.04	2.00	0.00	8.77	0.17	0.00
8.20	2.00	0.00	8.75	0.16	0.00	8.37	2.00	0.00	8.72	0.17	0.00
8.53	2.00	0.00	8.70	0.16	0.00	8.69	2.00	0.00	8.68	0.16	0.00
8.86	2.00	0.00	8.65	0.17	0.00	9.02	2.00	0.00	8.63	0.16	0.00
9.19	2.00	0.00	8.60	0.17	0.00	9.35	2.00	0.00	8.58	0.16	0.00
9.51	2.00	0.00	8.55	0.16	0.00	9.68	2.00	0.00	8.52	0.17	0.00
9.84	2.00	0.00	8.50	0.16	0.00	10.01	2.00	0.00	8.47	0.17	0.00
10.17	2.00	0.00	8.45	0.16	0.00	10.34	2.00	0.00	8.42	0.17	0.00
10.50	2.00	0.00	8.40	0.16	0.00	10.66	2.00	0.00	8.38	0.16	0.00
10.83	2.00	0.00	8.35	0.17	0.00	10.99	2.00	0.00	8.33	0.16	0.00
11.16	2.00	0.00	8.30	0.17	0.00	11.32	0.34	0.66	8.27	0.16	0.27
11.48	0.33	0.67	8.25	0.16	0.27	11.65	0.33	0.67	8.22	0.17	0.29
11.81	0.33	0.67	8.20	0.16	0.27	11.98	0.31	0.69	8.17	0.17	0.29
12.14	0.30	0.70	8.15	0.16	0.28	12.30	0.29	0.71	8.13	0.16	0.28
12.47	0.31	0.69	8.10	0.17	0.29	12.63	0.32	0.68	8.08	0.16	0.27
12.80	0.33	0.67	8.05	0.17	0.28	12.96	0.30	0.70	8.02	0.16	0.27
13.12	0.31	0.69	8.00	0.16	0.27	13.29	0.36	0.64	7.97	0.17	0.26
13.45	0.38	0.62	7.95	0.16	0.24	13.62	2.00	0.00	7.92	0.17	0.00
13.78	2.00	0.00	7.90	0.16	0.00	13.94	2.00	0.00	7.88	0.16	0.00
14.11	2.00	0.00	7.85	0.17	0.00	14.27	2.00	0.00	7.83	0.16	0.00
14.44	2.00	0.00	7.80	0.17	0.00	14.60	2.00	0.00	7.77	0.16	0.00
14.76	2.00	0.00	7.75	0.16	0.00	14.93	2.00	0.00	7.72	0.17	0.00
15.09	2.00	0.00	7.70	0.16	0.00	15.26	2.00	0.00	7.67	0.17	0.00
15.42	2.00	0.00	7.65	0.16	0.00	15.58	2.00	0.00	7.63	0.16	0.00
15.75	2.00	0.00	7.60	0.17	0.00	15.91	2.00	0.00	7.58	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
16.08	2.00	0.00	7.55	0.17	0.00	16.24	2.00	0.00	7.53	0.16	0.00
16.40	2.00	0.00	7.50	0.16	0.00	16.57	2.00	0.00	7.47	0.17	0.00
16.73	1.35	0.00	7.45	0.16	0.00	16.90	0.98	0.02	7.42	0.17	0.01
17.06	0.79	0.21	7.40	0.16	0.08	17.23	0.69	0.31	7.37	0.17	0.12
17.39	0.70	0.30	7.35	0.16	0.11	17.55	0.80	0.20	7.33	0.16	0.07
17.72	0.79	0.21	7.30	0.17	0.08	17.88	0.83	0.17	7.28	0.16	0.06
18.05	0.88	0.12	7.25	0.17	0.04	18.21	1.22	0.00	7.22	0.16	0.00
18.37	1.64	0.00	7.20	0.16	0.00	18.54	2.00	0.00	7.17	0.17	0.00
18.70	2.00	0.00	7.15	0.16	0.00	18.87	2.00	0.00	7.12	0.17	0.00
19.03	2.00	0.00	7.10	0.16	0.00	19.19	2.00	0.00	7.08	0.16	0.00
19.36	1.74	0.00	7.05	0.17	0.00	19.52	1.58	0.00	7.03	0.16	0.00
19.69	1.50	0.00	7.00	0.17	0.00	19.85	1.46	0.00	6.97	0.16	0.00
20.01	1.39	0.00	6.95	0.16	0.00	20.18	1.34	0.00	6.92	0.17	0.00
20.34	1.30	0.00	6.90	0.16	0.00	20.51	1.24	0.00	6.87	0.17	0.00
20.67	1.22	0.00	6.85	0.16	0.00	20.83	1.23	0.00	6.83	0.16	0.00
21.00	1.15	0.00	6.80	0.17	0.00	21.16	2.00	0.00	6.78	0.16	0.00
21.33	2.00	0.00	6.75	0.17	0.00	21.49	2.00	0.00	6.72	0.16	0.00
21.65	2.00	0.00	6.70	0.16	0.00	21.82	2.00	0.00	6.67	0.17	0.00
21.98	0.38	0.62	6.65	0.16	0.20	22.15	0.38	0.62	6.62	0.17	0.21
22.31	0.39	0.61	6.60	0.16	0.20	22.47	0.42	0.58	6.58	0.16	0.19
22.64	0.43	0.57	6.55	0.17	0.19	22.80	0.46	0.54	6.53	0.16	0.17
22.97	0.48	0.52	6.50	0.17	0.18	23.13	0.49	0.51	6.47	0.16	0.16
23.30	2.00	0.00	6.45	0.17	0.00	23.46	2.00	0.00	6.42	0.16	0.00
23.62	2.00	0.00	6.40	0.16	0.00	23.79	2.00	0.00	6.37	0.17	0.00
23.95	2.00	0.00	6.35	0.16	0.00	24.12	2.00	0.00	6.32	0.17	0.00
24.28	2.00	0.00	6.30	0.16	0.00	24.44	2.00	0.00	6.28	0.16	0.00
24.61	2.00	0.00	6.25	0.17	0.00	24.77	2.00	0.00	6.23	0.16	0.00
24.94	2.00	0.00	6.20	0.17	0.00	25.10	2.00	0.00	6.17	0.16	0.00
25.26	2.00	0.00	6.15	0.16	0.00	25.43	2.00	0.00	6.12	0.17	0.00
25.59	1.55	0.00	6.10	0.16	0.00	25.76	1.02	0.00	6.07	0.17	0.00
25.92	2.00	0.00	6.05	0.16	0.00	26.08	2.00	0.00	6.03	0.16	0.00
26.25	2.00	0.00	6.00	0.17	0.00	26.41	2.00	0.00	5.98	0.16	0.00
26.58	2.00	0.00	5.95	0.17	0.00	26.74	2.00	0.00	5.92	0.16	0.00
26.90	1.67	0.00	5.90	0.16	0.00	27.07	1.43	0.00	5.87	0.17	0.00
27.23	1.46	0.00	5.85	0.16	0.00	27.40	1.72	0.00	5.82	0.17	0.00
27.56	2.00	0.00	5.80	0.16	0.00	27.72	2.00	0.00	5.78	0.16	0.00
27.89	2.00	0.00	5.75	0.17	0.00	28.05	2.00	0.00	5.73	0.16	0.00
28.22	2.00	0.00	5.70	0.17	0.00	28.38	2.00	0.00	5.67	0.16	0.00
28.54	2.00	0.00	5.65	0.16	0.00	28.71	0.45	0.55	5.62	0.17	0.16
28.87	0.50	0.50	5.60	0.16	0.14	29.04	0.63	0.37	5.57	0.17	0.11
29.20	0.79	0.21	5.55	0.16	0.06	29.36	0.98	0.02	5.53	0.16	0.00
29.53	1.25	0.00	5.50	0.17	0.00	29.69	1.45	0.00	5.48	0.16	0.00
29.86	1.68	0.00	5.45	0.17	0.00	30.02	2.00	0.00	5.42	0.16	0.00
30.19	2.00	0.00	5.40	0.17	0.00	30.35	2.00	0.00	5.37	0.16	0.00
30.51	2.00	0.00	5.35	0.16	0.00	30.68	2.00	0.00	5.32	0.17	0.00
30.84	2.00	0.00	5.30	0.16	0.00	31.01	2.00	0.00	5.27	0.17	0.00
31.17	1.82	0.00	5.25	0.16	0.00	31.33	1.87	0.00	5.23	0.16	0.00
31.50	1.67	0.00	5.20	0.17	0.00	31.66	1.40	0.00	5.18	0.16	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI
31.83	1.28	0.00	5.15	0.17	0.00
32.15	1.00	0.00	5.10	0.16	0.00
32.48	0.81	0.19	5.05	0.16	0.05
32.81	0.70	0.30	5.00	0.16	0.07
33.14	0.52	0.48	4.95	0.17	0.12
33.47	0.45	0.55	4.90	0.17	0.14
33.79	0.50	0.50	4.85	0.16	0.12
34.12	0.61	0.39	4.80	0.16	0.09
34.45	0.94	0.06	4.75	0.16	0.01
34.78	1.31	0.00	4.70	0.17	0.00
35.11	2.00	0.00	4.65	0.17	0.00
35.43	2.00	0.00	4.60	0.16	0.00
35.76	2.00	0.00	4.55	0.16	0.00
36.09	2.00	0.00	4.50	0.16	0.00
36.42	2.00	0.00	4.45	0.16	0.00
36.75	2.00	0.00	4.40	0.17	0.00
37.08	2.00	0.00	4.35	0.17	0.00
37.40	2.00	0.00	4.30	0.16	0.00
37.73	2.00	0.00	4.25	0.16	0.00
38.06	2.00	0.00	4.20	0.16	0.00
38.39	2.00	0.00	4.15	0.17	0.00
38.72	2.00	0.00	4.10	0.17	0.00
39.04	2.00	0.00	4.05	0.16	0.00
39.37	2.00	0.00	4.00	0.16	0.00
39.70	2.00	0.00	3.95	0.16	0.00
40.03	2.00	0.00	3.90	0.17	0.00
40.36	2.00	0.00	3.85	0.17	0.00
40.68	2.00	0.00	3.80	0.16	0.00
41.01	2.00	0.00	3.75	0.16	0.00
41.34	2.00	0.00	3.70	0.16	0.00
41.67	2.00	0.00	3.65	0.17	0.00
42.00	2.00	0.00	3.60	0.17	0.00
42.32	2.00	0.00	3.55	0.16	0.00
42.65	2.00	0.00	3.50	0.16	0.00
42.98	2.00	0.00	3.45	0.16	0.00
43.31	2.00	0.00	3.40	0.16	0.00
43.64	1.18	0.00	3.35	0.17	0.00
43.97	1.05	0.00	3.30	0.17	0.00
44.29	1.03	0.00	3.25	0.16	0.00
44.62	1.13	0.00	3.20	0.16	0.00
44.95	1.17	0.00	3.15	0.16	0.00
45.28	1.24	0.00	3.10	0.17	0.00
45.61	0.91	0.09	3.05	0.17	0.01
45.93	0.75	0.25	3.00	0.16	0.04
46.26	0.86	0.14	2.95	0.16	0.02
46.59	0.98	0.02	2.90	0.16	0.00
46.92	0.90	0.10	2.85	0.17	0.01
47.25	0.79	0.21	2.80	0.17	0.03
31.99	1.15	0.00	5.12	0.16	0.00
32.32	0.86	0.14	5.07	0.17	0.04
32.65	0.77	0.23	5.02	0.17	0.06
32.97	0.60	0.40	4.98	0.16	0.10
33.30	0.46	0.54	4.93	0.16	0.13
33.63	0.47	0.53	4.87	0.16	0.13
33.96	0.54	0.46	4.82	0.17	0.12
34.29	0.77	0.23	4.77	0.17	0.06
34.61	1.13	0.00	4.73	0.16	0.00
34.94	2.00	0.00	4.68	0.16	0.00
35.27	2.00	0.00	4.62	0.16	0.00
35.60	2.00	0.00	4.57	0.17	0.00
35.93	2.00	0.00	4.52	0.17	0.00
36.26	2.00	0.00	4.47	0.17	0.00
36.58	2.00	0.00	4.43	0.16	0.00
36.91	2.00	0.00	4.37	0.16	0.00
37.24	2.00	0.00	4.32	0.16	0.00
37.57	2.00	0.00	4.27	0.17	0.00
37.90	2.00	0.00	4.22	0.17	0.00
38.22	2.00	0.00	4.18	0.16	0.00
38.55	2.00	0.00	4.12	0.16	0.00
38.88	2.00	0.00	4.07	0.16	0.00
39.21	2.00	0.00	4.02	0.17	0.00
39.54	2.00	0.00	3.97	0.17	0.00
39.86	2.00	0.00	3.93	0.16	0.00
40.19	2.00	0.00	3.88	0.16	0.00
40.52	2.00	0.00	3.82	0.16	0.00
40.85	2.00	0.00	3.77	0.17	0.00
41.18	2.00	0.00	3.72	0.17	0.00
41.50	2.00	0.00	3.68	0.16	0.00
41.83	2.00	0.00	3.63	0.16	0.00
42.16	2.00	0.00	3.57	0.16	0.00
42.49	2.00	0.00	3.52	0.17	0.00
42.82	2.00	0.00	3.47	0.17	0.00
43.15	2.00	0.00	3.42	0.17	0.00
43.47	1.01	0.00	3.38	0.16	0.00
43.80	1.16	0.00	3.32	0.16	0.00
44.13	1.00	0.00	3.27	0.16	0.00
44.46	1.09	0.00	3.22	0.17	0.00
44.79	1.14	0.00	3.17	0.17	0.00
45.11	1.26	0.00	3.13	0.16	0.00
45.44	1.10	0.00	3.07	0.16	0.00
45.77	0.79	0.21	3.02	0.16	0.03
46.10	0.77	0.23	2.97	0.17	0.04
46.43	0.95	0.05	2.92	0.17	0.01
46.75	0.96	0.04	2.88	0.16	0.01
47.08	0.84	0.16	2.83	0.16	0.02
47.41	0.77	0.23	2.77	0.16	0.03

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI
47.57	0.73	0.27	2.75	0.16	0.04
47.90	0.72	0.28	2.70	0.16	0.04
48.23	0.84	0.16	2.65	0.16	0.02
48.56	1.18	0.00	2.60	0.17	0.00
48.89	1.51	0.00	2.55	0.17	0.00
49.22	1.57	0.00	2.50	0.17	0.00
49.54	1.18	0.00	2.45	0.16	0.00
49.87	0.90	0.10	2.40	0.16	0.01
50.20	0.77	0.23	2.35	0.16	0.03

Depth (ft)	FS	F_L	w_z	d_z	LPI
47.74	0.71	0.29	2.72	0.17	0.04
48.07	0.76	0.24	2.67	0.17	0.03
48.39	0.99	0.01	2.63	0.16	0.00
48.72	1.35	0.00	2.58	0.16	0.00
49.05	1.63	0.00	2.52	0.16	0.00
49.38	1.40	0.00	2.47	0.16	0.00
49.71	1.00	0.00	2.42	0.17	0.00
50.04	0.82	0.18	2.37	0.17	0.02

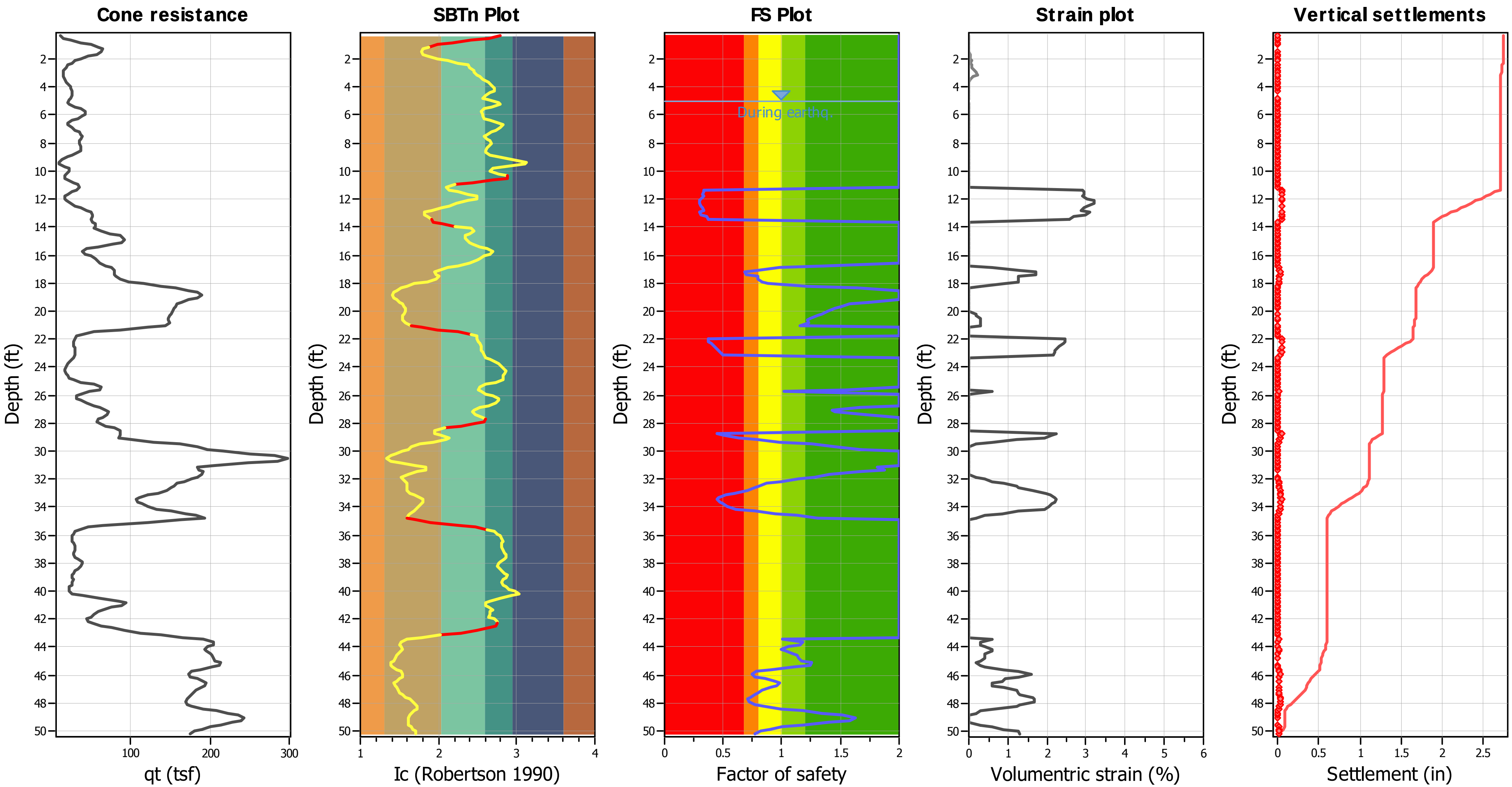
Overall liquefaction potential: 8.06

LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
F_L: 1 - FS
w_z: Function value of the extend of soil liquefaction according to depth
d_z: Layer thickness (ft)
LPI: Liquefaction potential index value for test point

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Kc	Qc1n	Qc1n,cs	N1,60 (blows)	Vs (ft/s)	Gmax (tsf)	CSR	Shear, γ (%)	Svol,15 (%)	Nc	ev (%)	Settle. (in)
0.33	2.79	4.67	18.82	87.85	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
0.49	2.64	3.57	26.68	95.27	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
0.66	2.42	2.40	40.43	97.09	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
0.82	2.17	1.61	60.55	97.27	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
0.98	1.99	1.28	80.09	102.71	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
1.15	1.87	1.16	96.94	112.62	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
1.31	1.80	1.11	105.06	116.50	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
1.48	1.78	1.09	103.12	112.29	22	709.3	250	0.26	0.018	0.02	10.08	0.01	0.001
1.64	1.80	1.11	91.54	101.48	20	680.0	238	0.26	0.024	0.02	10.08	0.02	0.001
1.80	1.86	1.15	76.64	88.22	17	644.2	219	0.26	0.035	0.04	10.08	0.03	0.001
1.97	1.99	1.29	61.52	79.09	16	627.2	216	0.26	0.044	0.06	10.08	0.05	0.002
2.13	2.12	1.49	49.40	73.76	16	610.9	212	0.26	0.054	0.07	10.08	0.06	0.002
2.30	2.26	1.81	41.41	75.10	17	609.2	220	0.26	0.056	0.07	10.08	0.06	0.002
2.46	2.38	2.22	33.89	75.22	18	595.1	216	0.26	0.068	0.08	10.08	0.06	0.002
2.62	2.40	2.33	30.83	71.87	18	577.7	208	0.26	0.090	0.10	10.08	0.09	0.003
2.79	2.46	2.58	26.58	68.61	17	556.1	196	0.26	0.133	0.16	10.08	0.13	0.005
2.95	2.45	2.54	25.34	64.48	16	540.3	188	0.26	0.184	0.24	10.08	0.20	0.008
3.12	2.49	2.73	23.77	64.84	17	536.1	189	0.26	0.201	0.25	10.08	0.21	0.009
3.28	2.53	2.93	25.04	73.28	19	563.8	219	0.26	0.117	0.12	10.08	0.10	0.004
3.45	2.57	3.17	26.69	84.54	23	598.2	259	0.26	0.069	0.06	10.08	0.05	0.002
3.61	2.64	3.55	30.10	106.79	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
3.77	2.66	3.73	34.26	127.90	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
3.94	2.69	3.93	38.42	151.13	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.10	2.71	4.07	40.27	164.07	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.27	2.71	4.04	42.01	169.87	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.43	2.67	3.76	42.20	158.65	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.59	2.61	3.37	42.16	142.19	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000
4.76	2.57	3.13	40.74	127.70	34	736.4	498	0.26	0.022	0.01	10.08	0.01	0.000
4.92	2.65	3.62	36.50	132.16	0	0.0	0	0.26	0.000	0.00	0.00	0.00	0.000

Total estimated settlement: 0.04

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
5.09	146.60	2.00	0.00	1.00	0.00	5.25	164.10	2.00	0.00	1.00	0.00
5.41	180.10	2.00	0.00	1.00	0.00	5.58	198.22	2.00	0.00	1.00	0.00
5.74	208.02	2.00	0.00	1.00	0.00	5.91	210.09	2.00	0.00	1.00	0.00
6.07	199.08	2.00	0.00	1.00	0.00	6.23	177.20	2.00	0.00	1.00	0.00
6.40	158.32	2.00	0.00	1.00	0.00	6.56	155.27	2.00	0.00	1.00	0.00
6.73	173.40	2.00	0.00	1.00	0.00	6.89	194.96	2.00	0.00	1.00	0.00
7.05	208.75	2.00	0.00	1.00	0.00	7.22	215.28	2.00	0.00	1.00	0.00
7.38	207.83	2.00	0.00	1.00	0.00	7.55	202.94	2.00	0.00	1.00	0.00
7.71	202.57	2.00	0.00	1.00	0.00	7.87	211.18	2.00	0.00	1.00	0.00
8.04	215.33	2.00	0.00	1.00	0.00	8.20	213.53	2.00	0.00	1.00	0.00
8.37	207.47	2.00	0.00	1.00	0.00	8.53	195.13	2.00	0.00	1.00	0.00
8.69	179.54	2.00	0.00	1.00	0.00	8.86	160.32	2.00	0.00	1.00	0.00
9.02	144.06	2.00	0.00	1.00	0.00	9.19	133.07	2.00	0.00	1.00	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
9.35	128.01	2.00	0.00	1.00	0.00	9.51	130.72	2.00	0.00	1.00	0.00
9.68	136.42	2.00	0.00	1.00	0.00	9.84	137.96	2.00	0.00	1.00	0.00
10.01	139.40	2.00	0.00	1.00	0.00	10.17	142.45	2.00	0.00	1.00	0.00
10.34	146.70	2.00	0.00	1.00	0.00	10.50	144.45	2.00	0.00	1.00	0.00
10.66	131.31	2.00	0.00	1.00	0.00	10.83	107.90	2.00	0.00	1.00	0.00
10.99	90.97	2.00	0.00	1.00	0.00	11.16	81.10	2.00	0.00	1.00	0.00
11.32	76.78	0.34	2.90	1.00	0.06	11.48	75.16	0.33	2.95	1.00	0.06
11.65	75.24	0.33	2.95	1.00	0.06	11.81	76.37	0.33	2.91	1.00	0.06
11.98	72.73	0.31	3.03	1.00	0.06	12.14	67.91	0.30	3.21	1.00	0.06
12.30	68.04	0.29	3.20	1.00	0.06	12.47	73.19	0.31	3.02	1.00	0.06
12.63	75.68	0.32	2.94	1.00	0.06	12.80	77.86	0.33	2.87	1.00	0.06
12.96	71.50	0.30	3.08	1.00	0.06	13.12	74.33	0.31	2.98	1.00	0.06
13.29	84.73	0.36	2.68	1.00	0.05	13.45	88.21	0.38	2.59	1.00	0.05
13.62	93.25	2.00	0.00	1.00	0.00	13.78	111.95	2.00	0.00	1.00	0.00
13.94	143.88	2.00	0.00	1.00	0.00	14.11	199.73	2.00	0.00	1.00	0.00
14.27	252.11	2.00	0.00	1.00	0.00	14.44	273.63	2.00	0.00	1.00	0.00
14.60	284.48	2.00	0.00	1.00	0.00	14.76	290.76	2.00	0.00	1.00	0.00
14.93	307.76	2.00	0.00	1.00	0.00	15.09	309.15	2.00	0.00	1.00	0.00
15.26	291.61	2.00	0.00	1.00	0.00	15.42	268.02	2.00	0.00	1.00	0.00
15.58	246.98	2.00	0.00	1.00	0.00	15.75	243.50	2.00	0.00	1.00	0.00
15.91	246.32	2.00	0.00	1.00	0.00	16.08	252.15	2.00	0.00	1.00	0.00
16.24	247.03	2.00	0.00	1.00	0.00	16.40	230.11	2.00	0.00	1.00	0.00
16.57	198.33	2.00	0.00	1.00	0.00	16.73	170.12	1.35	0.00	1.00	0.00
16.90	149.36	0.98	0.61	1.00	0.01	17.06	136.36	0.79	1.29	1.00	0.02
17.23	128.12	0.69	1.73	1.00	0.04	17.39	128.90	0.70	1.71	1.00	0.03
17.55	137.33	0.80	1.28	1.00	0.02	17.72	136.95	0.79	1.28	1.00	0.03
17.88	139.57	0.83	1.25	1.00	0.02	18.05	143.63	0.88	0.92	1.00	0.02
18.21	164.39	1.22	0.29	1.00	0.01	18.37	184.34	1.64	0.00	1.00	0.00
18.54	202.73	2.00	0.00	1.00	0.00	18.70	216.63	2.00	0.00	1.00	0.00
18.87	221.34	2.00	0.00	1.00	0.00	19.03	214.37	2.00	0.00	1.00	0.00
19.19	199.94	2.00	0.00	1.00	0.00	19.36	189.22	1.74	0.00	1.00	0.00
19.52	182.40	1.58	0.00	1.00	0.00	19.69	179.01	1.50	0.00	1.00	0.00
19.85	177.10	1.46	0.00	1.00	0.00	20.01	174.21	1.39	0.00	1.00	0.00
20.18	171.62	1.34	0.20	1.00	0.00	20.34	169.62	1.30	0.20	1.00	0.00
20.51	166.88	1.24	0.28	1.00	0.01	20.67	165.59	1.22	0.29	1.00	0.01
20.83	166.37	1.23	0.28	1.00	0.01	21.00	162.04	1.15	0.29	1.00	0.01
21.16	150.04	2.00	0.00	1.00	0.00	21.33	127.58	2.00	0.00	1.00	0.00
21.49	114.24	2.00	0.00	1.00	0.00	21.65	110.90	2.00	0.00	1.00	0.00
21.82	102.27	2.00	0.00	1.00	0.00	21.98	93.64	0.38	2.47	1.00	0.05
22.15	94.00	0.38	2.46	1.00	0.05	22.31	96.48	0.39	2.41	1.00	0.05
22.47	100.99	0.42	2.32	1.00	0.04	22.64	102.64	0.43	2.29	1.00	0.05
22.80	106.88	0.46	2.21	1.00	0.04	22.97	108.68	0.48	2.18	1.00	0.04
23.13	110.94	0.49	2.15	1.00	0.04	23.30	111.60	2.00	0.00	1.00	0.00
23.46	110.89	2.00	0.00	1.00	0.00	23.62	110.32	2.00	0.00	1.00	0.00
23.79	106.91	2.00	0.00	1.00	0.00	23.95	105.28	2.00	0.00	1.00	0.00
24.12	103.29	2.00	0.00	1.00	0.00	24.28	105.70	2.00	0.00	1.00	0.00
24.44	109.40	2.00	0.00	1.00	0.00	24.61	116.84	2.00	0.00	1.00	0.00
24.77	127.89	2.00	0.00	1.00	0.00	24.94	154.47	2.00	0.00	1.00	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
25.10	181.39	2.00	0.00	1.00	0.00	25.26	202.42	2.00	0.00	1.00	0.00
25.43	201.51	2.00	0.00	1.00	0.00	25.59	183.39	1.55	0.00	1.00	0.00
25.76	155.65	1.02	0.59	1.00	0.01	25.92	134.35	2.00	0.00	1.00	0.00
26.08	137.17	2.00	0.00	1.00	0.00	26.25	156.97	2.00	0.00	1.00	0.00
26.41	183.94	2.00	0.00	1.00	0.00	26.58	201.53	2.00	0.00	1.00	0.00
26.74	202.45	2.00	0.00	1.00	0.00	26.90	188.85	1.67	0.00	1.00	0.00
27.07	178.15	1.43	0.00	1.00	0.00	27.23	179.35	1.46	0.00	1.00	0.00
27.40	190.80	1.72	0.00	1.00	0.00	27.56	203.55	2.00	0.00	1.00	0.00
27.72	202.64	2.00	0.00	1.00	0.00	27.89	189.62	2.00	0.00	1.00	0.00
28.05	159.95	2.00	0.00	1.00	0.00	28.22	129.94	2.00	0.00	1.00	0.00
28.38	112.58	2.00	0.00	1.00	0.00	28.54	105.34	2.00	0.00	1.00	0.00
28.71	105.56	0.45	2.24	1.00	0.05	28.87	111.98	0.50	2.13	1.00	0.04
29.04	126.02	0.63	1.93	1.00	0.04	29.20	139.63	0.79	1.25	1.00	0.02
29.36	153.45	0.98	0.59	1.00	0.01	29.53	169.04	1.25	0.20	1.00	0.00
29.69	179.10	1.45	0.00	1.00	0.00	29.86	189.17	1.68	0.00	1.00	0.00
30.02	208.01	2.00	0.00	1.00	0.00	30.19	238.80	2.00	0.00	1.00	0.00
30.35	267.77	2.00	0.00	1.00	0.00	30.51	282.86	2.00	0.00	1.00	0.00
30.68	270.02	2.00	0.00	1.00	0.00	30.84	234.18	2.00	0.00	1.00	0.00
31.01	200.67	2.00	0.00	1.00	0.00	31.17	194.66	1.82	0.00	1.00	0.00
31.33	196.81	1.87	0.00	1.00	0.00	31.50	188.73	1.67	0.00	1.00	0.00
31.66	176.50	1.40	0.00	1.00	0.00	31.83	170.35	1.28	0.20	1.00	0.00
31.99	163.28	1.15	0.40	1.00	0.01	32.15	154.27	1.00	0.59	1.00	0.01
32.32	145.29	0.86	0.90	1.00	0.02	32.48	141.26	0.81	1.23	1.00	0.02
32.65	138.15	0.77	1.27	1.00	0.03	32.81	132.77	0.70	1.64	1.00	0.03
32.97	122.83	0.60	1.97	1.00	0.04	33.14	114.37	0.52	2.09	1.00	0.04
33.30	107.68	0.46	2.20	1.00	0.04	33.47	105.57	0.45	2.24	1.00	0.05
33.63	108.47	0.47	2.19	1.00	0.04	33.79	112.87	0.50	2.12	1.00	0.04
33.96	117.03	0.54	2.05	1.00	0.04	34.12	124.21	0.61	1.96	1.00	0.04
34.29	138.65	0.77	1.26	1.00	0.03	34.45	151.03	0.94	0.85	1.00	0.02
34.61	162.64	1.13	0.40	1.00	0.01	34.78	172.31	1.31	0.20	1.00	0.00
34.94	152.67	2.00	0.00	1.00	0.00	35.11	126.33	2.00	0.00	1.00	0.00
35.27	102.73	2.00	0.00	1.00	0.00	35.43	101.36	2.00	0.00	1.00	0.00
35.60	100.85	2.00	0.00	1.00	0.00	35.76	99.04	2.00	0.00	1.00	0.00
35.93	98.02	2.00	0.00	1.00	0.00	36.09	98.30	2.00	0.00	1.00	0.00
36.26	99.99	2.00	0.00	1.00	0.00	36.42	103.16	2.00	0.00	1.00	0.00
36.58	107.54	2.00	0.00	1.00	0.00	36.75	111.65	2.00	0.00	1.00	0.00
36.91	112.85	2.00	0.00	1.00	0.00	37.08	113.02	2.00	0.00	1.00	0.00
37.24	111.65	2.00	0.00	1.00	0.00	37.40	117.29	2.00	0.00	1.00	0.00
37.57	126.42	2.00	0.00	1.00	0.00	37.73	137.16	2.00	0.00	1.00	0.00
37.90	139.60	2.00	0.00	1.00	0.00	38.06	136.51	2.00	0.00	1.00	0.00
38.22	126.44	2.00	0.00	1.00	0.00	38.39	116.34	2.00	0.00	1.00	0.00
38.55	106.66	2.00	0.00	1.00	0.00	38.72	103.95	2.00	0.00	1.00	0.00
38.88	104.06	2.00	0.00	1.00	0.00	39.04	105.35	2.00	0.00	1.00	0.00
39.21	101.90	2.00	0.00	1.00	0.00	39.37	96.99	2.00	0.00	1.00	0.00
39.54	92.16	2.00	0.00	1.00	0.00	39.70	88.96	2.00	0.00	1.00	0.00
39.86	89.02	2.00	0.00	1.00	0.00	40.03	101.85	2.00	0.00	1.00	0.00
40.19	133.47	2.00	0.00	1.00	0.00	40.36	173.80	2.00	0.00	1.00	0.00
40.52	211.72	2.00	0.00	1.00	0.00	40.68	234.97	2.00	0.00	1.00	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
40.85	239.82	2.00	0.00	1.00	0.00	41.01	226.98	2.00	0.00	1.00	0.00
41.18	205.39	2.00	0.00	1.00	0.00	41.34	182.92	2.00	0.00	1.00	0.00
41.50	161.38	2.00	0.00	1.00	0.00	41.67	142.19	2.00	0.00	1.00	0.00
41.83	129.01	2.00	0.00	1.00	0.00	42.00	129.02	2.00	0.00	1.00	0.00
42.16	141.24	2.00	0.00	1.00	0.00	42.32	165.74	2.00	0.00	1.00	0.00
42.49	189.44	2.00	0.00	1.00	0.00	42.65	198.93	2.00	0.00	1.00	0.00
42.82	186.26	2.00	0.00	1.00	0.00	42.98	160.66	2.00	0.00	1.00	0.00
43.15	142.69	2.00	0.00	1.00	0.00	43.31	143.68	2.00	0.00	1.00	0.00
43.47	154.42	1.01	0.59	1.00	0.01	43.64	164.48	1.18	0.29	1.00	0.01
43.80	163.42	1.16	0.29	1.00	0.01	43.97	156.89	1.05	0.41	1.00	0.01
44.13	153.44	1.00	0.59	1.00	0.01	44.29	155.26	1.03	0.59	1.00	0.01
44.46	159.10	1.09	0.41	1.00	0.01	44.62	161.23	1.13	0.40	1.00	0.01
44.79	161.92	1.14	0.40	1.00	0.01	44.95	163.49	1.17	0.29	1.00	0.01
45.11	168.35	1.26	0.20	1.00	0.00	45.28	167.09	1.24	0.28	1.00	0.01
45.44	159.64	1.10	0.41	1.00	0.01	45.61	147.42	0.91	0.88	1.00	0.02
45.77	138.40	0.79	1.26	1.00	0.02	45.93	134.98	0.75	1.61	1.00	0.03
46.10	136.88	0.77	1.28	1.00	0.03	46.26	143.72	0.86	0.92	1.00	0.02
46.43	149.45	0.95	0.87	1.00	0.02	46.59	151.75	0.98	0.60	1.00	0.01
46.75	149.94	0.96	0.61	1.00	0.01	46.92	146.40	0.90	0.89	1.00	0.02
47.08	141.57	0.84	1.22	1.00	0.02	47.25	138.15	0.79	1.27	1.00	0.03
47.41	136.06	0.77	1.30	1.00	0.02	47.57	133.03	0.73	1.64	1.00	0.03
47.74	131.09	0.71	1.67	1.00	0.03	47.90	131.90	0.72	1.66	1.00	0.03
48.07	135.61	0.76	1.30	1.00	0.03	48.23	141.56	0.84	1.22	1.00	0.02
48.39	151.52	0.99	0.60	1.00	0.01	48.56	162.44	1.18	0.29	1.00	0.01
48.72	171.29	1.35	0.20	1.00	0.00	48.89	179.11	1.51	0.00	1.00	0.00
49.05	184.20	1.63	0.00	1.00	0.00	49.22	181.51	1.57	0.00	1.00	0.00
49.38	173.49	1.40	0.00	1.00	0.00	49.54	161.93	1.18	0.29	1.00	0.01
49.71	151.55	1.00	0.60	1.00	0.01	49.87	144.51	0.90	0.91	1.00	0.02
50.04	138.71	0.82	1.26	1.00	0.03	50.20	134.72	0.77	1.32	1.00	0.03

Total estimated settlement: 2.70

Abbreviations

$Q_{tn,cs}$: Equivalent clean sand normalized cone resistance
FS: Factor of safety against liquefaction
e_v (%): Post-liquefaction volumentric strain
DF: e_v depth weighting factor
Settlement: Calculated settlement

:: Strength loss calculation (Robertson (2009) ::

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
0.33	11.73	18.82	4.67	87.85	2.79	N/A	N/A
0.49	16.63	26.68	3.57	95.27	2.64	N/A	N/A
0.66	25.20	40.43	2.40	97.09	2.42	N/A	N/A
0.82	37.74	60.55	1.61	97.27	2.17	N/A	N/A
0.98	49.90	80.09	1.28	102.71	1.99	N/A	N/A
1.15	60.40	96.94	1.16	112.62	1.87	N/A	N/A
1.31	65.47	105.06	1.11	116.50	1.80	N/A	N/A
1.48	64.27	103.12	1.09	112.29	1.78	N/A	N/A
1.64	57.07	91.54	1.11	101.48	1.80	N/A	N/A
1.80	47.80	76.64	1.15	88.22	1.86	N/A	N/A
1.97	38.40	61.52	1.29	79.09	1.99	N/A	N/A
2.13	30.87	49.40	1.49	73.76	2.12	N/A	N/A
2.30	25.90	41.41	1.81	75.10	2.26	N/A	N/A
2.46	21.23	33.89	2.22	75.22	2.38	N/A	N/A
2.62	19.33	30.83	2.33	71.87	2.40	N/A	N/A
2.79	16.70	26.58	2.58	68.61	2.46	N/A	N/A
2.95	15.93	25.34	2.54	64.48	2.45	N/A	N/A
3.12	14.97	23.77	2.73	64.84	2.49	N/A	N/A
3.28	15.77	25.04	2.93	73.28	2.53	N/A	N/A
3.45	16.80	26.69	3.17	84.54	2.57	N/A	N/A
3.61	18.93	30.10	3.55	106.79	2.64	N/A	N/A
3.77	21.54	34.26	3.73	127.90	2.66	N/A	N/A
3.94	24.13	38.42	3.93	151.13	2.69	N/A	N/A
4.10	25.30	40.27	4.07	164.07	2.71	N/A	N/A
4.27	26.39	42.01	4.04	169.87	2.71	N/A	N/A
4.43	26.51	42.20	3.76	158.65	2.67	N/A	N/A
4.59	26.50	42.16	3.37	142.19	2.61	N/A	N/A
4.76	25.62	40.74	3.13	127.70	2.57	N/A	N/A
4.92	23.00	36.50	3.62	132.16	2.65	N/A	N/A
5.09	20.61	32.66	4.49	146.60	2.76	5.10	5.10
5.25	22.30	35.35	4.64	164.10	2.78	5.43	5.43
5.41	29.85	47.46	3.79	180.10	2.67	7.18	7.18
5.58	37.95	60.46	3.28	198.22	2.59	0.76	0.76
5.74	43.05	68.65	3.03	208.02	2.55	0.78	0.78
5.91	42.66	67.99	3.09	210.09	2.56	0.77	0.77
6.07	39.56	63.00	3.16	199.08	2.57	0.76	0.76
6.23	33.94	53.95	3.28	177.20	2.59	0.74	0.74
6.40	27.08	42.91	3.69	158.32	2.66	5.88	5.88
6.56	21.92	34.60	4.49	155.27	2.76	4.68	4.68
6.73	21.65	34.16	5.08	173.40	2.83	4.55	4.55
6.89	26.31	41.63	4.68	194.96	2.79	5.46	5.46
7.05	31.34	49.70	4.20	208.75	2.73	6.43	6.43
7.22	35.17	55.84	3.86	215.28	2.68	7.11	7.11
7.38	37.81	60.07	3.46	207.83	2.62	7.54	7.54
7.55	39.52	62.79	3.23	202.94	2.58	0.76	0.76
7.71	37.29	59.18	3.42	202.57	2.62	7.22	7.22
7.87	35.75	56.70	3.72	211.18	2.66	6.82	6.82
8.04	35.16	55.73	3.86	215.33	2.68	6.61	6.61

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
8.20	37.66	59.74	3.57	213.53	2.64	6.99	6.99
8.37	38.40	60.90	3.41	207.47	2.61	7.03	7.03
8.53	37.02	58.68	3.33	195.13	2.60	0.76	0.76
8.69	33.68	53.29	3.37	179.54	2.61	6.00	6.00
8.86	27.58	43.48	3.69	160.32	2.66	4.83	4.83
9.02	20.95	32.81	4.39	144.06	2.75	3.61	3.61
9.19	14.06	21.73	6.12	133.07	2.94	2.36	2.36
9.35	10.33	15.71	8.15	128.01	3.12	1.69	1.69
9.51	10.87	16.56	7.89	130.72	3.10	1.76	1.76
9.68	17.50	27.21	5.01	136.42	2.83	2.87	2.87
9.84	22.43	35.10	3.93	137.96	2.69	3.66	3.66
10.01	23.88	37.42	3.73	139.40	2.66	3.86	3.86
10.17	19.83	30.91	4.61	142.45	2.78	3.15	3.15
10.34	17.10	26.50	5.54	146.70	2.88	2.68	2.68
10.50	16.77	25.96	5.56	144.45	2.89	2.60	2.60
10.66	20.97	32.69	4.02	131.31	2.70	3.24	3.24
10.83	27.73	43.54	2.48	107.90	2.44	0.72	0.72
10.99	33.74	53.17	1.71	90.97	2.22	0.74	0.74
11.16	35.03	55.23	1.47	81.10	2.11	0.75	0.75
11.32	31.83	50.07	1.53	76.78	2.14	0.73	0.73
11.48	26.82	42.01	1.79	75.16	2.25	0.71	0.71
11.65	21.66	33.70	2.23	75.24	2.38	0.68	0.68
11.81	18.25	28.22	2.71	76.37	2.49	0.66	0.66
11.98	17.43	26.88	2.71	72.73	2.49	0.66	0.66
12.14	19.84	30.74	2.21	67.91	2.37	0.17	0.67
12.30	24.75	38.61	1.76	68.04	2.24	0.17	0.70
12.47	30.43	47.67	1.54	73.19	2.14	0.73	0.73
12.63	36.93	56.06	1.35	75.68	2.04	0.75	0.75
12.80	44.59	65.09	1.20	77.86	1.91	0.77	0.77
12.96	50.43	71.50	1.00	71.50	1.81	0.78	0.78
13.12	52.50	74.33	1.00	74.33	1.82	0.79	0.79
13.29	51.70	73.56	1.15	84.73	1.86	0.79	0.79
13.45	51.13	73.49	1.20	88.21	1.91	0.78	0.78
13.62	53.00	76.27	1.22	93.25	1.93	0.79	0.79
13.78	55.83	82.39	1.36	111.95	2.04	0.80	0.80
13.94	55.73	85.37	1.69	143.88	2.21	0.81	0.81
14.11	53.57	84.75	2.36	199.73	2.41	0.80	0.80
14.27	62.48	99.05	2.55	252.11	2.45	0.83	0.83
14.44	75.24	118.67	2.31	273.63	2.40	0.85	0.85
14.60	87.57	135.41	2.10	284.48	2.34	0.87	0.87
14.76	90.07	138.24	2.10	290.76	2.35	0.87	0.87
14.93	92.31	141.22	2.18	307.76	2.37	0.88	0.88
15.09	89.30	136.26	2.27	309.15	2.39	0.87	0.87
15.26	77.53	118.40	2.46	291.61	2.44	0.85	0.85
15.42	60.02	92.53	2.90	268.02	2.52	0.82	0.82
15.58	45.69	71.12	3.47	246.98	2.62	5.47	5.47
15.75	39.80	62.15	3.92	243.50	2.69	4.71	4.71
15.91	42.88	66.13	3.72	246.32	2.66	5.03	5.03

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
16.08	51.43	77.66	3.25	252.15	2.59	0.79	0.79
16.24	56.30	83.59	2.96	247.03	2.54	0.80	0.80
16.40	58.33	85.14	2.70	230.11	2.49	0.80	0.80
16.57	61.18	86.97	2.28	198.33	2.39	0.81	0.81
16.73	68.68	94.43	1.80	170.12	2.25	0.82	0.82
16.90	76.05	101.20	1.48	149.36	2.11	0.83	0.83
17.06	79.67	103.49	1.32	136.36	2.01	0.83	0.83
17.23	80.13	102.49	1.25	128.12	1.96	0.83	0.83
17.39	79.86	101.91	1.26	128.90	1.97	0.83	0.83
17.55	81.49	104.32	1.32	137.33	2.01	0.83	0.83
17.72	86.40	109.12	1.26	136.95	1.96	0.84	0.84
17.88	98.56	121.63	1.15	139.57	1.85	0.86	0.86
18.05	117.16	139.89	1.03	143.63	1.68	0.88	0.88
18.21	139.06	164.39	1.00	164.39	1.59	0.90	0.90
18.37	156.36	184.34	1.00	184.34	1.52	0.92	0.92
18.54	172.49	202.73	1.00	202.73	1.46	0.93	0.93
18.70	184.89	216.63	1.00	216.63	1.42	0.94	0.94
18.87	189.59	221.34	1.00	221.34	1.41	0.95	0.95
19.03	184.29	214.37	1.00	214.37	1.43	0.94	0.94
19.19	172.55	199.94	1.00	199.94	1.47	0.93	0.93
19.36	163.95	189.22	1.00	189.22	1.50	0.92	0.92
19.52	158.62	182.40	1.00	182.40	1.53	0.92	0.92
19.69	156.25	179.01	1.00	179.01	1.55	0.91	0.91
19.85	155.12	177.10	1.00	177.10	1.57	0.91	0.91
20.01	153.12	174.21	1.00	174.21	1.57	0.91	0.91
20.18	151.39	171.62	1.00	171.62	1.56	0.91	0.91
20.34	150.12	169.62	1.00	169.62	1.54	0.90	0.90
20.51	148.22	166.88	1.00	166.88	1.54	0.90	0.90
20.67	147.55	165.59	1.00	165.59	1.54	0.90	0.90
20.83	148.72	166.37	1.00	166.37	1.58	0.90	0.90
21.00	144.69	161.49	1.00	162.04	1.65	0.90	0.90
21.16	121.59	137.33	1.09	150.04	1.78	0.87	0.87
21.33	86.92	99.92	1.28	127.58	1.98	0.83	0.83
21.49	54.76	64.22	1.78	114.24	2.24	0.77	0.77
21.65	38.84	45.92	2.42	110.90	2.42	0.72	0.72
21.82	32.49	38.21	2.68	102.27	2.48	0.70	0.70
21.98	29.85	34.82	2.69	93.64	2.48	0.69	0.69
22.15	28.74	33.39	2.81	94.00	2.51	0.68	0.68
22.31	28.52	33.05	2.92	96.48	2.53	0.68	0.68
22.47	28.97	33.49	3.02	100.99	2.55	0.68	0.68
22.64	29.99	34.52	2.97	102.64	2.54	0.69	0.69
22.80	30.42	34.92	3.06	106.88	2.55	0.69	0.69
22.97	30.90	35.32	3.08	108.68	2.56	0.69	0.69
23.13	30.54	34.78	3.19	110.94	2.58	0.69	0.69
23.30	29.07	32.96	3.39	111.60	2.61	2.44	2.44
23.46	26.30	29.68	3.74	110.89	2.66	2.18	2.18
23.62	23.36	26.20	4.21	110.32	2.73	1.91	1.91
23.79	21.03	23.39	4.57	106.91	2.77	1.70	1.70

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
23.95	19.47	21.49	4.90	105.28	2.81	1.56	1.56
24.12	18.36	20.10	5.14	103.29	2.84	1.45	1.45
24.28	18.05	19.68	5.37	105.70	2.87	1.42	1.42
24.44	19.50	21.24	5.15	109.40	2.84	1.53	1.53
24.61	21.71	23.65	4.94	116.84	2.82	1.71	1.71
24.77	23.78	25.93	4.93	127.89	2.82	1.87	1.87
24.94	28.27	30.97	4.99	154.47	2.82	2.24	2.24
25.10	38.52	42.29	4.29	181.39	2.74	3.07	3.07
25.26	54.76	59.89	3.38	202.42	2.61	4.39	4.39
25.43	63.15	68.53	2.94	201.51	2.53	0.78	0.78
25.59	61.06	65.73	2.79	183.39	2.50	0.77	0.77
25.76	48.28	51.51	3.02	155.65	2.55	0.74	0.74
25.92	37.90	40.03	3.36	134.35	2.60	2.93	2.93
26.08	32.53	34.17	4.01	137.17	2.70	2.48	2.48
26.25	32.94	34.57	4.54	156.97	2.77	2.50	2.50
26.41	38.04	39.99	4.60	183.94	2.78	2.89	2.89
26.58	44.90	47.12	4.28	201.53	2.74	3.41	3.41
26.74	54.03	56.43	3.59	202.45	2.64	4.10	4.10
26.90	62.27	64.57	2.92	188.85	2.53	0.77	0.77
27.07	69.11	71.16	2.50	178.15	2.44	0.78	0.78
27.23	72.29	74.09	2.42	179.35	2.43	0.79	0.79
27.40	69.99	71.50	2.67	190.80	2.48	0.78	0.78
27.56	64.65	65.84	3.09	203.55	2.56	0.77	0.77
27.72	60.35	61.14	3.31	202.64	2.60	0.76	0.76
27.89	57.69	58.03	3.27	189.62	2.59	0.75	0.75
28.05	61.85	61.75	2.59	159.95	2.46	0.76	0.76
28.22	69.39	68.70	1.89	129.94	2.28	0.78	0.78
28.38	80.58	79.21	1.42	112.58	2.08	0.80	0.80
28.54	87.25	85.25	1.24	105.34	1.95	0.81	0.81
28.71	88.05	85.76	1.23	105.56	1.94	0.81	0.81
28.87	86.39	84.05	1.33	111.98	2.02	0.80	0.80
29.04	85.77	83.37	1.51	126.02	2.13	0.80	0.80
29.20	99.75	96.81	1.44	139.63	2.09	0.82	0.82
29.36	128.95	124.77	1.23	153.45	1.94	0.86	0.86
29.53	162.21	156.28	1.08	169.04	1.76	0.89	0.89
29.69	184.62	177.25	1.01	179.10	1.66	0.91	0.91
29.86	197.52	189.17	1.00	189.17	1.61	0.92	0.92
30.02	217.57	208.01	1.00	208.01	1.55	0.94	0.94
30.19	250.17	238.80	1.00	238.80	1.45	0.96	0.96
30.35	281.00	267.77	1.00	267.77	1.38	0.98	0.98
30.51	297.48	282.86	1.00	282.86	1.34	0.99	0.99
30.68	284.81	270.02	1.00	270.02	1.38	0.98	0.98
30.84	247.88	234.18	1.00	234.18	1.50	0.95	0.95
31.01	204.51	192.42	1.04	200.67	1.71	0.92	0.92
31.17	183.85	172.35	1.13	194.66	1.83	0.91	0.91
31.33	186.21	174.08	1.13	196.81	1.83	0.91	0.91
31.50	192.21	179.24	1.05	188.73	1.72	0.91	0.91
31.66	189.71	176.50	1.00	176.50	1.61	0.91	0.91

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
31.83	183.61	170.35	1.00	170.35	1.52	0.90	0.90
31.99	176.45	163.28	1.00	163.28	1.54	0.90	0.90
32.15	167.19	154.27	1.00	154.27	1.57	0.89	0.89
32.32	157.93	145.29	1.00	145.29	1.59	0.88	0.88
32.48	153.93	141.26	1.00	141.26	1.60	0.88	0.88
32.65	150.94	138.15	1.00	138.15	1.59	0.87	0.87
32.81	145.44	132.77	1.00	132.77	1.60	0.87	0.87
32.97	134.97	122.83	1.00	122.83	1.63	0.86	0.86
33.14	121.88	110.37	1.04	114.37	1.70	0.84	0.84
33.30	111.15	100.15	1.08	107.68	1.76	0.83	0.83
33.47	106.68	95.74	1.10	105.57	1.79	0.82	0.82
33.63	108.95	97.56	1.11	108.47	1.81	0.82	0.82
33.79	115.05	102.93	1.10	112.87	1.79	0.83	0.83
33.96	122.16	109.24	1.07	117.03	1.75	0.84	0.84
34.12	133.06	119.02	1.04	124.21	1.71	0.85	0.85
34.29	151.19	135.29	1.02	138.65	1.68	0.87	0.87
34.45	168.70	151.03	1.00	151.03	1.63	0.89	0.89
34.61	181.90	162.64	1.00	162.64	1.61	0.90	0.90
34.78	193.03	172.31	1.00	172.31	1.59	0.91	0.91
34.94	164.17	145.52	1.05	152.67	1.72	0.88	0.88
35.11	121.73	106.41	1.19	126.33	1.90	0.84	0.84
35.27	66.11	55.96	1.84	102.73	2.26	0.75	0.75
35.43	46.13	38.03	2.67	101.36	2.48	0.70	0.70
35.60	36.12	29.09	3.47	100.85	2.62	2.05	2.05
35.76	30.93	24.46	4.05	99.04	2.71	1.73	1.73
35.93	28.30	22.09	4.44	98.02	2.76	1.56	1.56
36.09	26.99	20.87	4.71	98.30	2.79	1.48	1.48
36.26	26.73	20.55	4.87	99.99	2.81	1.46	1.46
36.42	27.09	20.76	4.97	103.16	2.82	1.47	1.47
36.58	28.53	21.88	4.92	107.54	2.82	1.55	1.55
36.75	30.19	23.17	4.82	111.65	2.80	1.64	1.64
36.91	30.79	23.58	4.79	112.85	2.80	1.67	1.67
37.08	29.55	22.43	5.04	113.02	2.83	1.59	1.59
37.24	28.23	21.23	5.26	111.65	2.85	1.51	1.51
37.40	28.86	21.64	5.42	117.29	2.87	1.54	1.54
37.57	31.17	23.42	5.40	126.42	2.87	1.66	1.66
37.73	34.94	26.40	5.20	137.16	2.85	1.87	1.87
37.90	39.07	29.72	4.70	139.60	2.79	2.10	2.10
38.06	40.18	30.54	4.47	136.51	2.76	2.15	2.15
38.22	38.05	28.73	4.40	126.44	2.75	2.03	2.03
38.39	33.75	25.13	4.63	116.34	2.78	1.77	1.77
38.55	30.29	22.25	4.79	106.66	2.80	1.57	1.57
38.72	27.92	20.23	5.14	103.95	2.84	1.43	1.43
38.88	26.66	19.12	5.44	104.06	2.87	1.36	1.36
39.04	27.23	19.49	5.40	105.35	2.87	1.38	1.38
39.21	28.02	20.09	5.07	101.90	2.83	1.42	1.42
39.37	27.62	19.73	4.91	96.99	2.82	1.39	1.39
39.54	25.93	18.32	5.03	92.16	2.83	1.30	1.30

:: Strength loss calculation (Robertson (2009) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
39.70	23.79	16.55	5.37	88.96	2.87	1.17	1.17
39.86	22.43	15.39	5.79	89.02	2.91	1.10	1.10
40.03	23.06	15.75	6.46	101.85	2.97	1.13	1.13
40.19	27.43	19.01	7.02	133.47	3.02	1.36	1.36
40.36	40.14	28.57	6.08	173.80	2.94	2.04	2.04
40.52	62.17	45.67	4.64	211.72	2.78	3.21	3.21
40.68	84.41	63.08	3.72	234.97	2.66	4.39	4.39
40.85	94.90	71.21	3.37	239.82	2.61	4.93	4.93
41.01	89.77	66.97	3.39	226.98	2.61	4.64	4.64
41.18	76.83	56.63	3.63	205.39	2.65	3.93	3.93
41.34	64.50	46.89	3.90	182.92	2.69	3.27	3.27
41.50	59.30	42.88	3.76	161.38	2.67	2.98	2.98
41.67	53.77	38.61	3.68	142.19	2.66	2.68	2.68
41.83	49.98	35.66	3.62	129.01	2.65	2.47	2.47
42.00	44.78	31.42	4.11	129.02	2.71	2.19	2.19
42.16	46.52	32.50	4.35	141.24	2.75	2.27	2.27
42.32	53.09	37.16	4.46	165.74	2.76	2.60	2.60
42.49	62.86	44.27	4.28	189.44	2.74	3.09	3.09
42.65	76.53	54.60	3.64	198.93	2.65	3.78	3.78
42.82	93.26	67.81	2.75	186.26	2.50	0.77	0.77
42.98	113.04	84.23	1.91	160.66	2.29	0.80	0.80
43.15	138.26	106.12	1.34	142.69	2.03	0.84	0.84
43.31	166.18	131.28	1.09	143.68	1.78	0.87	0.87
43.47	192.28	154.42	1.00	154.42	1.60	0.89	0.89
43.64	205.01	164.48	1.00	164.48	1.52	0.90	0.90
43.80	204.04	163.42	1.00	163.42	1.51	0.90	0.90
43.97	196.34	156.89	1.00	156.89	1.52	0.89	0.89
44.13	192.41	153.44	1.00	153.44	1.54	0.89	0.89
44.29	194.98	155.26	1.00	155.26	1.52	0.89	0.89
44.46	200.08	159.10	1.00	159.10	1.48	0.89	0.89
44.62	203.05	161.23	1.00	161.23	1.46	0.90	0.90
44.79	204.26	161.92	1.00	161.92	1.45	0.90	0.90
44.95	206.54	163.49	1.00	163.49	1.43	0.90	0.90
45.11	212.92	168.35	1.00	168.35	1.39	0.90	0.90
45.28	211.70	167.09	1.00	167.09	1.38	0.90	0.90
45.44	202.69	159.64	1.00	159.64	1.41	0.90	0.90
45.61	187.69	147.42	1.00	147.42	1.47	0.88	0.88
45.77	176.65	138.40	1.00	138.40	1.52	0.87	0.87
45.93	172.62	134.98	1.00	134.98	1.54	0.87	0.87
46.10	175.29	136.88	1.00	136.88	1.54	0.87	0.87
46.26	184.20	143.72	1.00	143.72	1.49	0.88	0.88
46.43	191.74	149.45	1.00	149.45	1.46	0.89	0.89
46.59	194.94	151.75	1.00	151.75	1.44	0.89	0.89
46.75	192.94	149.94	1.00	149.94	1.44	0.89	0.89
46.92	188.75	146.40	1.00	146.40	1.46	0.88	0.88
47.08	182.88	141.57	1.00	141.57	1.48	0.88	0.88
47.25	178.82	138.15	1.00	138.15	1.50	0.87	0.87
47.41	176.42	136.06	1.00	136.06	1.54	0.87	0.87

:: Strength loss calculation (Robertson (2009) :: (continued)

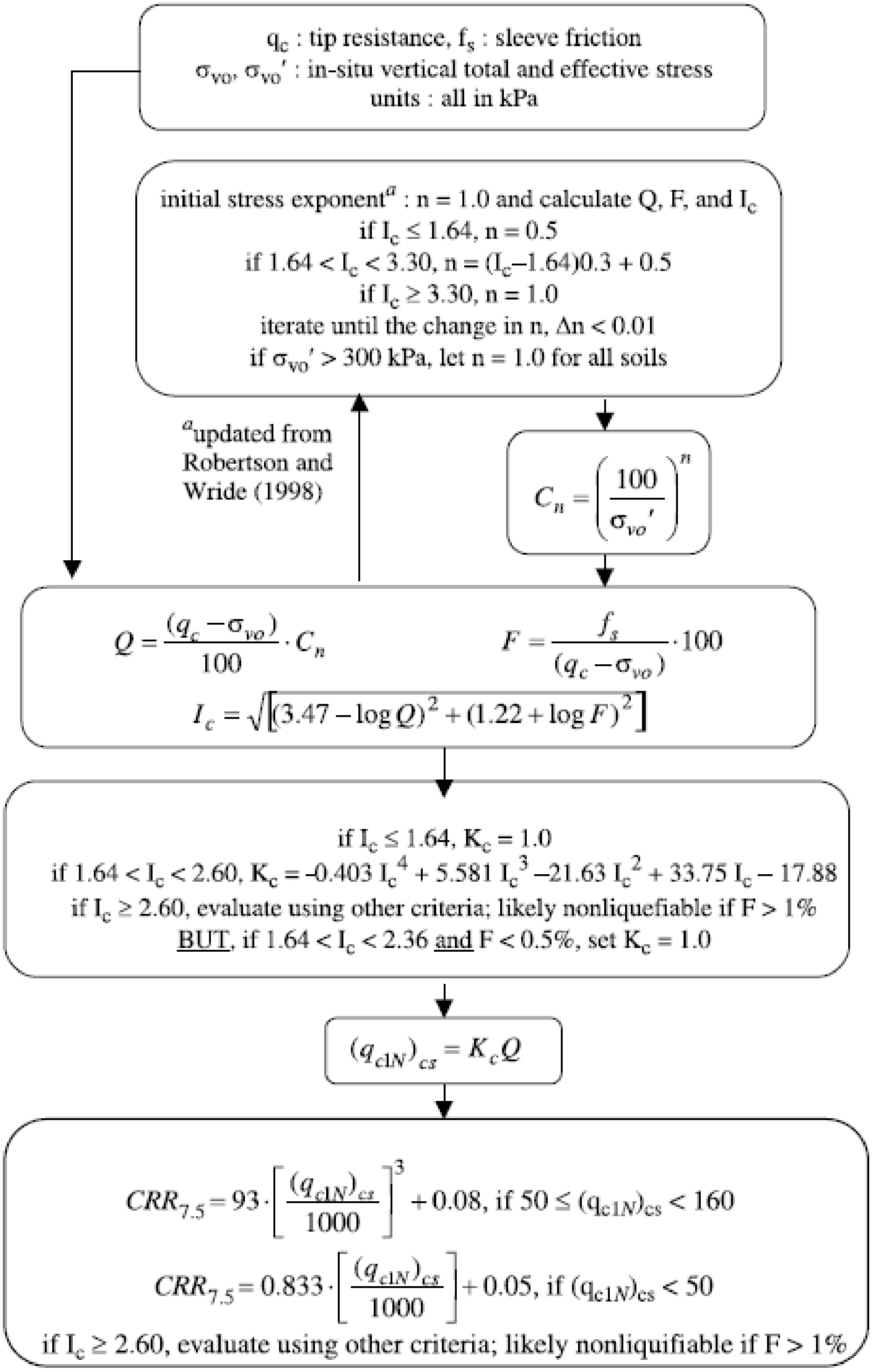
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
47.57	172.82	133.03	1.00	133.03	1.58	0.87	0.87
47.74	170.63	131.09	1.00	131.09	1.63	0.87	0.87
47.90	168.98	128.85	1.02	131.90	1.68	0.86	0.86
48.07	170.73	129.26	1.05	135.61	1.72	0.86	0.86
48.23	177.04	133.57	1.06	141.56	1.73	0.87	0.87
48.39	190.83	144.17	1.05	151.52	1.72	0.88	0.88
48.56	207.66	157.47	1.03	162.44	1.69	0.89	0.89
48.72	223.05	169.88	1.01	171.29	1.66	0.90	0.90
48.89	234.82	179.11	1.00	179.11	1.64	0.91	0.91
49.05	241.81	184.20	1.00	184.20	1.61	0.92	0.92
49.22	238.73	181.51	1.00	181.51	1.61	0.91	0.91
49.38	228.70	173.49	1.00	173.49	1.61	0.91	0.91
49.54	214.00	161.93	1.00	161.93	1.62	0.90	0.90
49.71	200.53	151.10	1.00	151.55	1.65	0.89	0.89
49.87	189.40	141.84	1.02	144.51	1.67	0.88	0.88
50.04	179.84	133.76	1.04	138.71	1.70	0.87	0.87
50.20	174.79	129.66	1.04	134.72	1.70	0.86	0.86

Abbreviations

q_t: Total cone resistance
K_c: Cone resistance correction factor due to fines
$Q_{tn,cs}$: Adjusted and corrected cone resistance due to fines
I_c: Soil behavior type index
$S_{u(liq)}/\sigma'_v$: Calculated liquefied undrained strength ratio
$S_{u(peak)}/\sigma'_v$: Calculated peak undrained strength ratio

Procedure for the evaluation of soil liquefaction resistance, NCEER (1998)

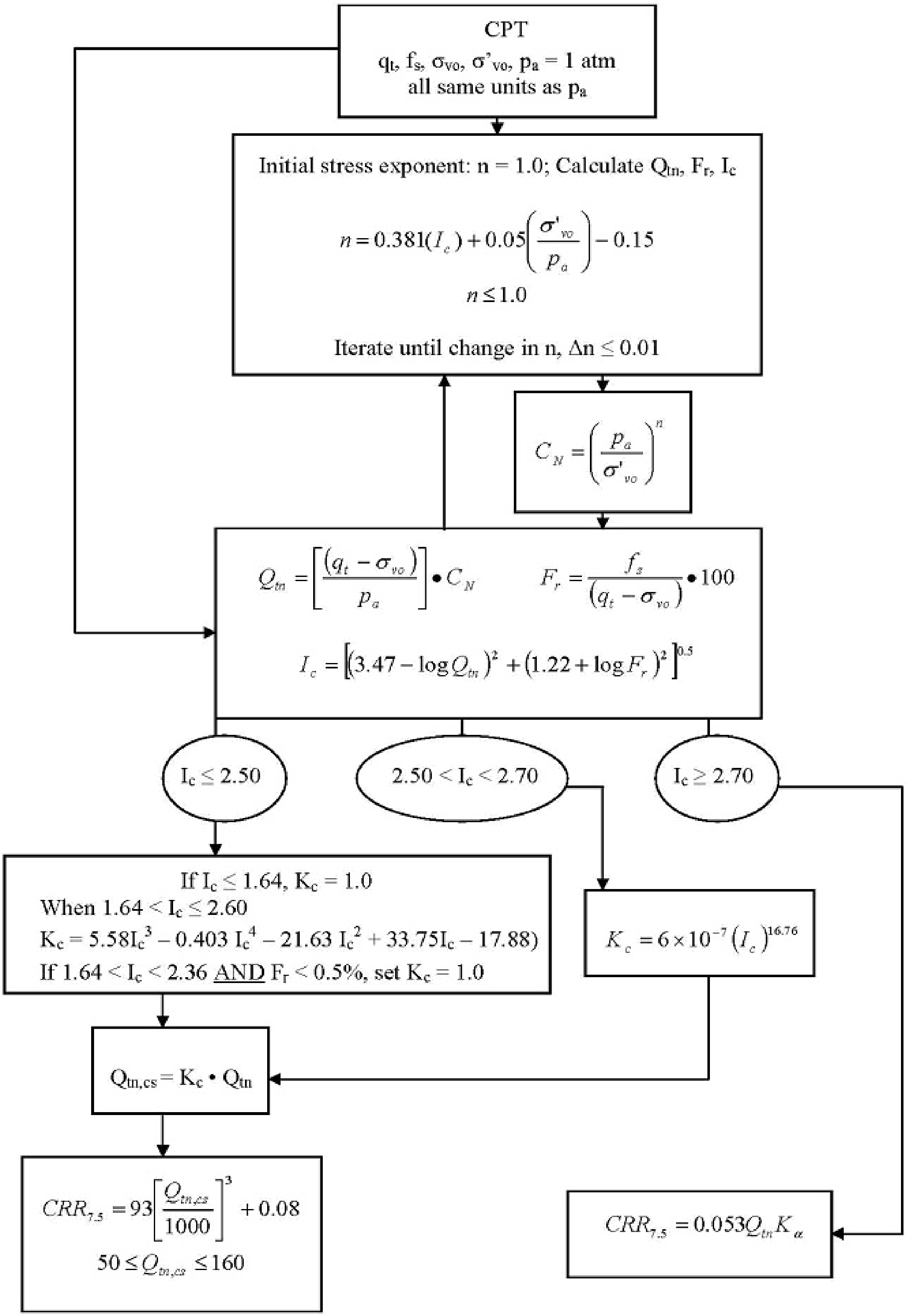
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:



[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

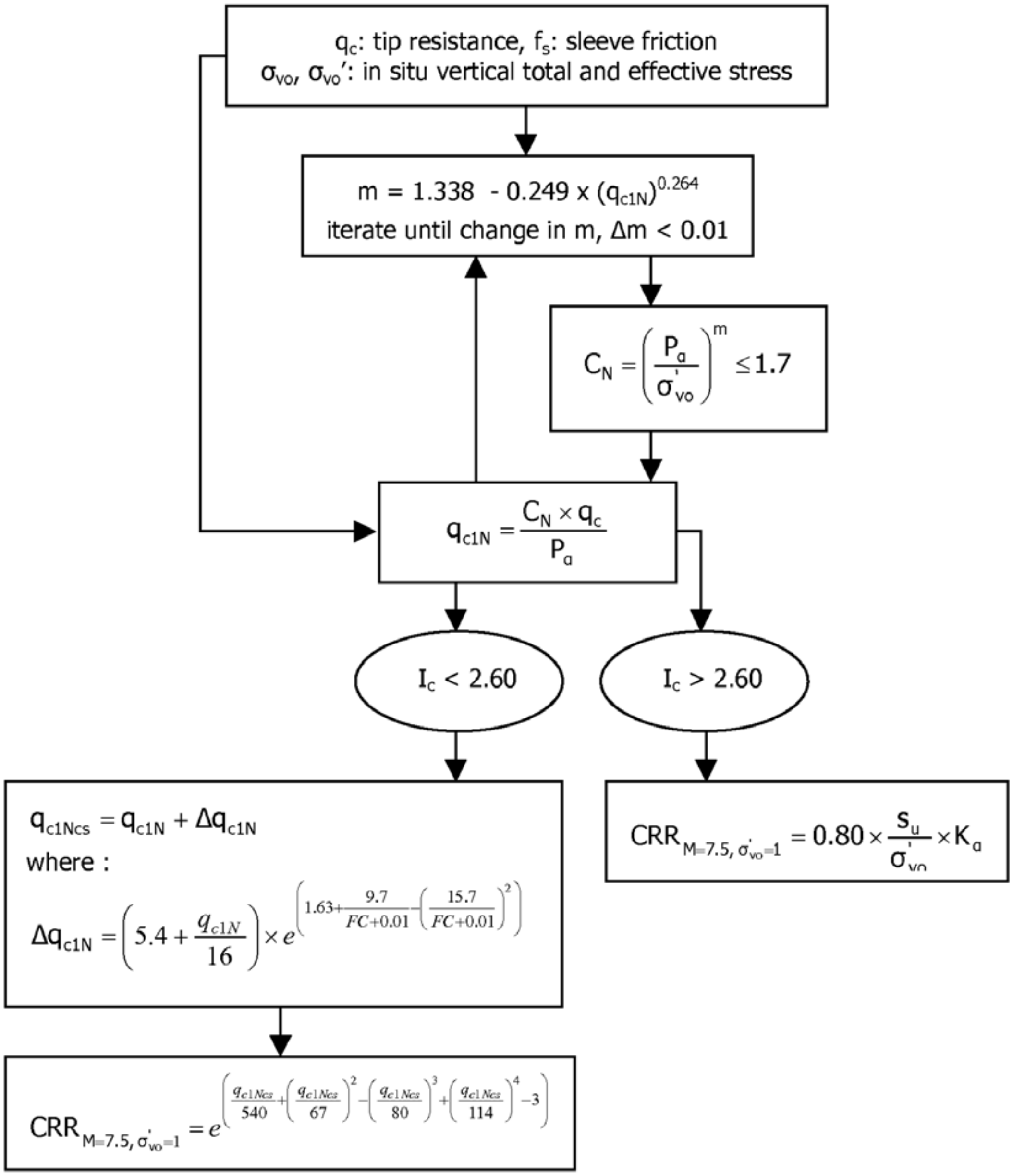
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. This procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:

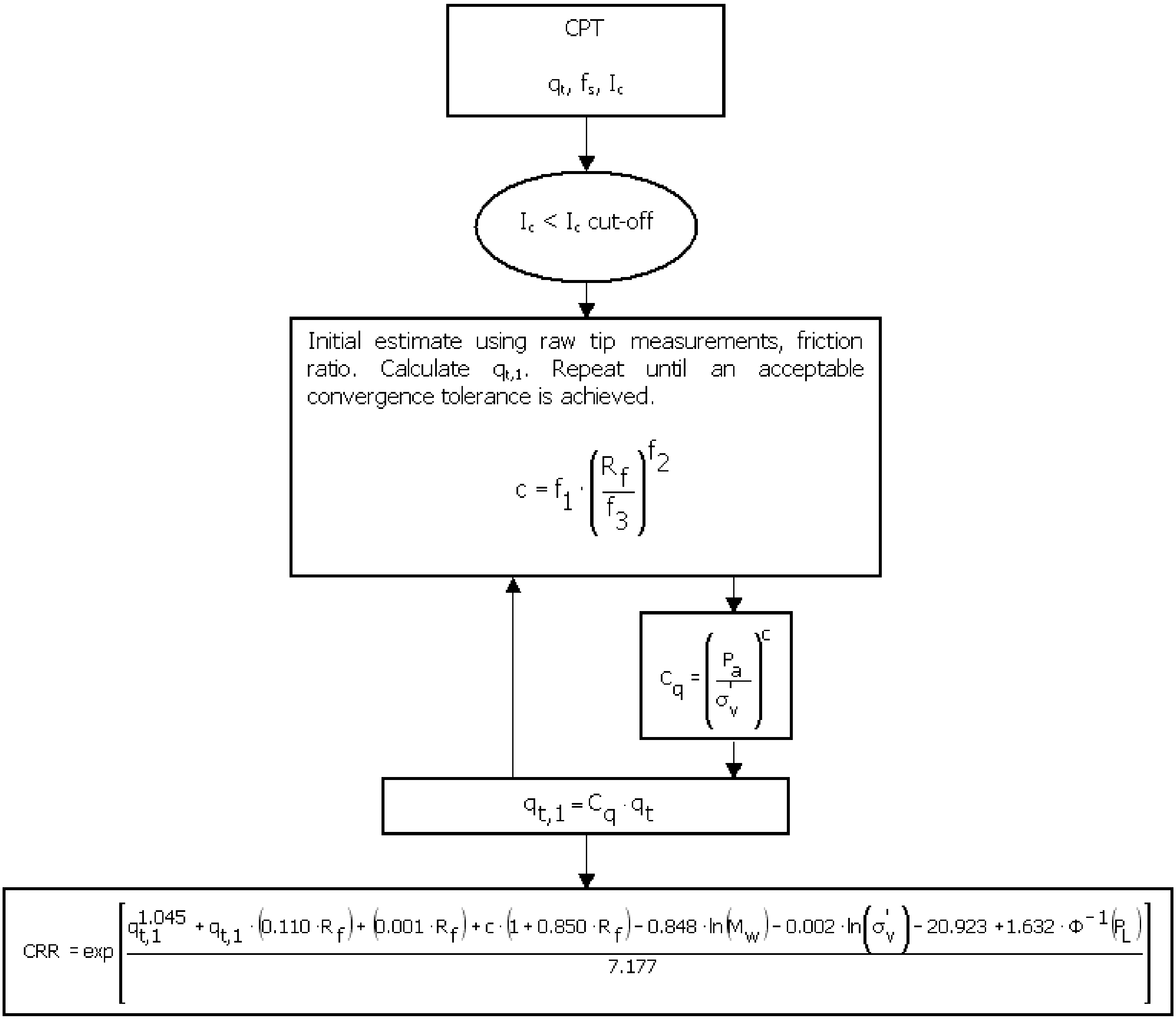


[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

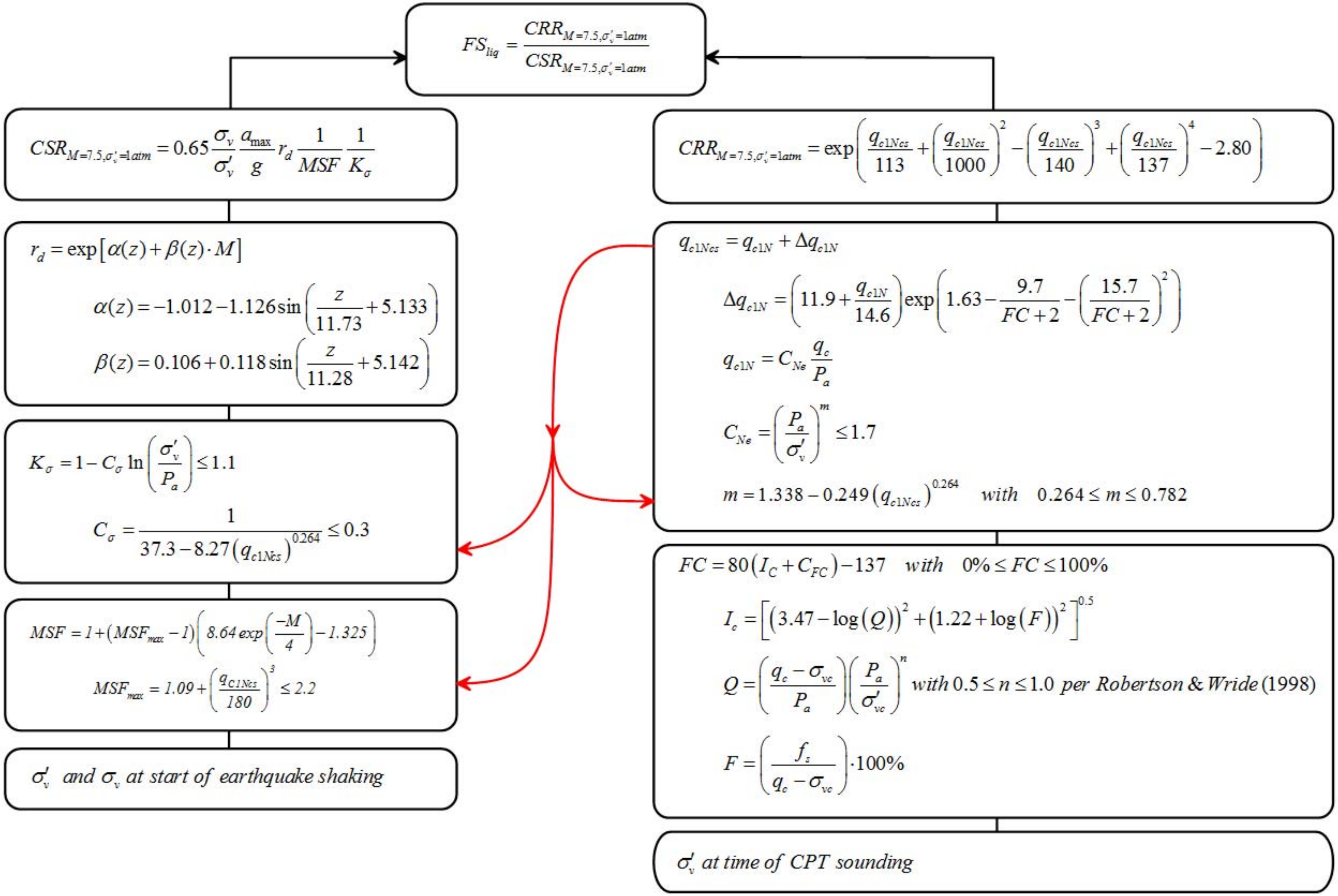
Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



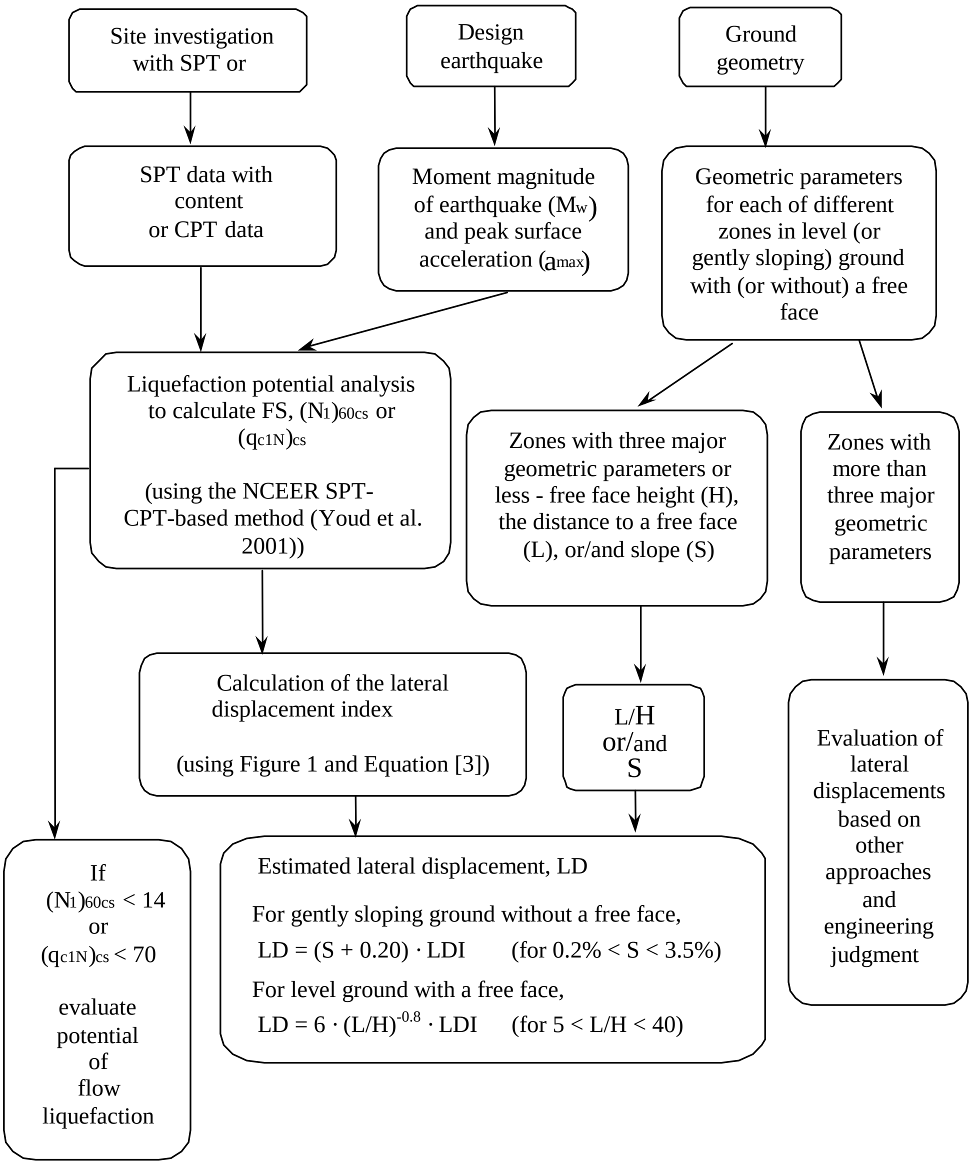
Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



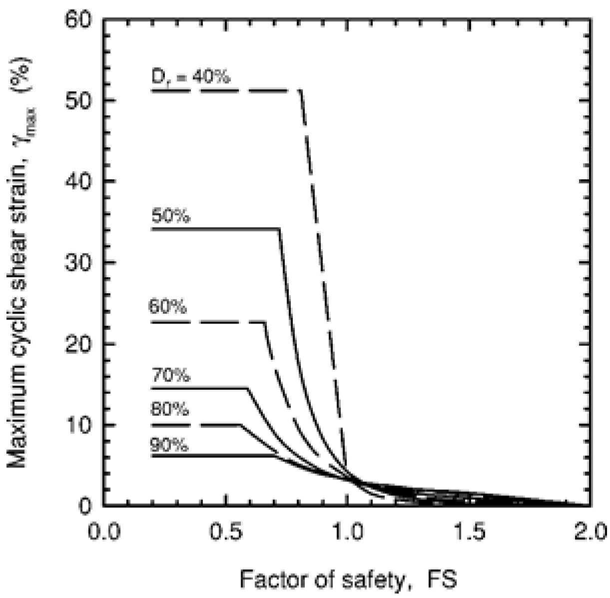
Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)



Procedure for the evaluation of liquefaction-induced lateral spreading displacements



[1] Flow chart illustrating major steps in estimating liquefaction-induced lateral spreading displacements using the proposed approach



[1] **Figure 1**

$$LDI = \int_0^{Z_{max}} \gamma_{max} dz$$

[1] **Equation [3]**

[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

Procedure for the estimation of seismic induced settlements in dry sands

Average shear stress, τ_{av}

$$\tau_{av} = CSR^{*} \cdot \sigma_{v0}' = 0.65 \cdot \frac{a_{max}}{g} \cdot \sigma_{v0} \cdot r_d$$

↓

Estimate small shear strain modulus, G_0

$$G_0 = 0.0188 \cdot \left[10^{(0.55 I_c - 1.68)}\right] \cdot (q_t - \sigma_v)$$

↓

Estimate shear strain amplitude, γ (based on Pradel (1998))

$$\gamma = \left[\frac{1 + a \cdot e^{bR}}{1 + a}\right] \cdot R \cdot 100\ (\%)$$

$$R = \frac{\tau_{av}}{G_0} \text{ (Note } \tau_{av} \text{ and } G_0 \text{ same units)}$$

$$a = 0.0389 \cdot \left(\frac{\sigma_v}{p_a}\right) + 0.124$$

$$b = 6400 \cdot \left(\frac{\sigma_v}{p_a}\right)$$

↓

Estimate volumetric strain in 15 cycles

$$\varepsilon_{vol(15)} = \gamma \cdot \left[\frac{(N_1)_{60,cs}}{20}\right]^{-1.20}$$

$$(N_1)_{60,cs} = \frac{Q_{tn,cs}}{8.5 \cdot \left[1 - \frac{I_c}{4.6}\right]}$$

↓

Volumetric strain in design earthquake

$$\Sigma_{vol} = \varepsilon_{vol(15)} \cdot \left[\frac{N_c}{15}\right]^{0.45}$$

$$N_c = (M - 4)^{2.17}$$

↓

Seismic settlement, s

$$s = 2 \cdot \int_0^{GWT} \Sigma_{vol} \cdot dz$$

Robertson, P.K. and Lisheng, S., 2010, “Estimation of seismic compression in dry soils using the CPT” FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, Symposium in honor of professor I. M. Idriss, San Diego, CA

Liquefaction Potential Index (LPI) calculation procedure

Calculation of the Liquefaction Potential Index (LPI) is used to interpret the liquefaction assessment calculations in terms of severity over depth. The calculation procedure is based on the methology developed by Iwasaki (1982) and is adopted by AFPS.

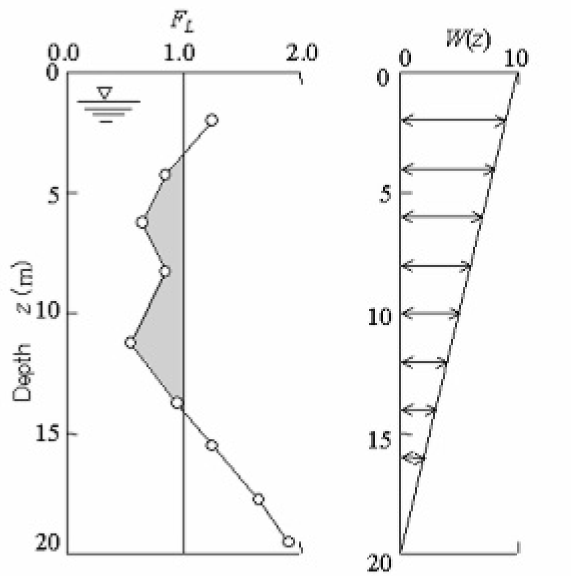
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\textbf{LPI} = \int_0^{20} (10 - 0{,}5_z) \times F_L \times d_z$$

where:
F_L = 1 - F.S. when F.S. less than 1
F_L = 0 when F.S. greater than 1
z depth of measurment in meters

Values of LPI range between zero (0) when no test point is characterized as liquefiable and 100 when all points are characterized as susceptible to liquefaction. Iwasaki proposed four (4) discrete categories based on the numeric value of LPI:

- LPI = 0 : Liquefaction risk is very low
- 0 < LPI <= 5 : Liquefaction risk is low
- 5 < LPI <= 15 : Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high



Graphical presentation of the LPI calculation procedure

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APPENDIX D

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