

April 2018 | Final Environmental Impact Report
State Clearinghouse No. 2017111086

MULTIPLE-CAMPUS MODERNIZATION/INTERIM HOUSING PROJECT

for Ocean View School District of Orange County

Prepared for:

Ocean View School District of Orange County
Contact: Michael Conroy, Ed.D., Deputy Superintendent
17200 Pinehurst Lane
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Prepared by:

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1. Introduction

1.1 INTRODUCTION

This Final Environmental Impact Report (FEIR) has been prepared in accordance with the California Environmental Quality Act (CEQA) as amended (Public Resources Code §§ 21000 et seq.) and CEQA Guidelines (California Code of Regulations §§ 15000 et seq.).

According to the CEQA Guidelines, Section 15132, the FEIR shall consist of:

- (a) The Draft Environmental Impact Report (DEIR) or a revision of the Draft;
- (b) Comments and recommendations received on the DEIR either verbatim or in summary;
- (c) A list of persons, organizations, and public agencies comments on the DEIR;
- (d) The responses of the Lead Agency to significant environmental points raised in the review and consultation process; and
- (e) Any other information added by the Lead Agency.

This document contains responses to comments received on the DEIR for the Multiple-Campus Modernization/Interim Housing Project during the public review period, which began February 23, 2018, and closed April 9, 2018. This document has been prepared in accordance with CEQA and the CEQA Guidelines and represents the independent judgment of the Lead Agency, the Ocean View School District of Orange County (District or OVSD). This document and the circulated DEIR comprise the FEIR, in accordance with CEQA Guidelines, Section 15132.

1.2 FORMAT OF THE FEIR

This document is organized as follows:

Section 1, Introduction. This section describes CEQA requirements and content of this FEIR.

Section 2, Response to Comments. This section provides a list of agencies and interested persons commenting on the DEIR; copies of comment letters received during the public review period, and individual responses to written comments. To facilitate review of the responses, each comment letter has been reproduced and assigned a number (A1 through A5 for letters received from agencies and organizations). Individual comments have been numbered for each letter and the letter is followed by responses with references to the corresponding comment number.

1. Introduction

Section 3. Revisions to the Draft EIR. This section contains revisions to the DEIR text and figures as a result of the comments received by agencies and interested persons as described in Section 2, and/or errors and omissions discovered subsequent to release of the DEIR for public review.

The responses to comments contain material and revisions that will be added to the text of the FEIR. OVSD staff has reviewed this material and determined that none of this material constitutes the type of significant new information that requires recirculation of the DEIR for further public comment under CEQA Guidelines Section 15088.5. None of this new material indicates that the project will result in a significant new environmental impact not previously disclosed in the DEIR. Additionally, none of this material indicates that there would be a substantial increase in the severity of a previously identified environmental impact that will not be mitigated, or that there would be any of the other circumstances requiring recirculation described in Section 15088.5.

1.3 CEQA REQUIREMENTS REGARDING COMMENTS AND RESPONSES

CEQA Guidelines Section 15204 (a) outlines parameters for submitting comments and reminds persons and public agencies that the focus of review and comment of DEIRs should be “on the sufficiency of the document in identifying and analyzing possible impacts on the environment and ways in which significant effects of the project might be avoided or mitigated. Comments are most helpful when they suggest additional specific alternatives or mitigation measures that would provide better ways to avoid or mitigate the significant environmental effects. At the same time, reviewers should be aware that the adequacy of an EIR is determined in terms of what is reasonably feasible. ...CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commenters. When responding to comments, lead agencies need only respond to significant environmental issues and do not need to provide all information requested by reviewers, as long as a good faith effort at full disclosure is made in the EIR.”

CEQA Guidelines Section 15204 (c) further advises, “Reviewers should explain the basis for their comments, and should submit data or references offering facts, reasonable assumptions based on facts, or expert opinion supported by facts in support of the comments. Pursuant to Section 15064, an effect shall not be considered significant in the absence of substantial evidence.” Section 15204 (d) also states, “Each responsible agency and trustee agency shall focus its comments on environmental information germane to that agency’s statutory responsibility.” Section 15204 (e) states, “This section shall not be used to restrict the ability of reviewers to comment on the general adequacy of a document or of the lead agency to reject comments not focused as recommended by this section.”

In accordance with CEQA, Public Resources Code Section 21092.5, copies of the written responses to public agencies will be forwarded to those agencies at least 10 days prior to certifying the environmental impact report. The responses will be forwarded with copies of this FEIR, as permitted by CEQA, and will conform to the legal standards established for response to comments on DEIRs.

2. Response to Comments

Section 15088 of the CEQA Guidelines requires the Lead Agency (OVSD) to evaluate comments on environmental issues received from public agencies and interested parties who reviewed the DEIR and prepare written responses.

This section provides all written responses received on the DEIR and the OVSD's responses to each comment.

Comment letters and specific comments are given letters and numbers for reference purposes. Where sections of the DEIR are excerpted in this document, the sections are shown indented. Changes to the DEIR text are shown in underlined text for additions and ~~strikeout~~ for deletions.

The following is a list of agencies and persons that submitted comments on the DEIR during the public review period.

Number Reference	Commenting Person/Agency	Date of Comment	Page No.
Agencies & Organizations			
A1	Office of Planning and Research	Date	2-3
A2	Department of Toxic Substances Control	March 20, 2018	2-7
A3	City of Fountain Valley	April 2, 2018	2-15
A4	Orange County Transportation Authority	April 6, 2018	2-19
A5	Orange County Public Works	April 5, 2018	2-23

2. Response to Comments

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2. Response to Comments

LETTER A1 – Office of Planning and Research (1 page[s])

4/9/2018

CEQAnet - Multiple-Campus Modernization/Interim Housing Project

A1



Multiple-Campus Modernization/Interim Housing Project

SCH Number: 2017111086

Document Type: EIR - Draft EIR

Project Lead Agency: Ocean View School District

Project Description

OVSD proposes to modernize 7 ES and 4 MS, while providing interim housing at 2 ES during construction. The modernization would involve student safety items such as campus security including camera systems, security fencing, emergency systems, fire-life-safety items, as well as plumbing, infrastructure, educational technology, playground equipment, and play areas including asphalt/concrete. No permanent buildings would be demolished or constructed, and none of the modernizations would increase capacity at any of the schools.

Contact Information

Primary Contact

Michael Conry
Ocean View School District
714-847-2551 x1413
17200 Pinehurst Lane
Huntington Beach, CA 92647

Project Location

County: Orange
City: Huntington Beach
Region:
Cross Streets: Juliette Low Dr/Sher Ln and Landau Ln/Royal
Latitude/Longitude: 33° 43' 19.22" / 117° 58' 42.1" [Map](#)
Parcel No: 142-111-04, 107-552-10
Township: 5S
Range: 11W
Section: 24
Base: SB
Other Location Info:

Proximity To

Highways: I-405
Airports:
Railways:
Waterways: E. Garden Grove Channel, Santa Ana River
Schools: VAR
Land Use:

Development Type

Educational (Interim housing and school modernization)

Local Action

Site Plan

Project Issues

Agricultural Land, Air Quality, Archaeologic-Historic, Biological Resources, Coastal Zone, Drainage/Absorption, Flood Plain/Flooding, Forest Land/Fire Hazard, Geologic/Seismic, Landuse, Minerals, Noise, Population/Housing Balance, Public Services, Recreation/Parks, Schools/Universities, Septic System, Sewer Capacity, Soil Erosion/Compaction/Grading, Solid Waste, Toxic/Hazardous, Traffic/Circulation, Vegetation, Water Quality, Water Supply, Wetland/Riparian

Reviewing Agencies (Agencies in **Bold Type** submitted comment letters to the State Clearinghouse)

Resources Agency, Department of Fish and Wildlife, Region 5; Department of Parks and Recreation; Department of Water Resources; California Highway Patrol; Caltrans, District 12; Regional Water Quality Control Board, Region 8; **Department of Toxic Substances Control**; Native American Heritage Commission

Date Received: 2/23/2018 **Start of Review:** 2/23/2018 **End of Review:** 4/9/2018

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<http://www.ceqanet.ca.gov/DocDescription.asp?DocPK=722998>

1/1

2. Response to Comments

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2. Response to Comments

A1. Response to Comments from Scott Morgan, California Office of Planning and Research, dated April 9, 2018.

A1-1 This letter acknowledges the receipt of the Multiple-Campus Modernization/Interim Housing Project Draft EIR in compliance with State Clearinghouse Guidelines. No response is necessary.

2. Response to Comments

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2. Response to Comments

LETTER A2 – Department of Toxic Substances Control (4 page[s])



Department of Toxic Substances Control

Barbara A. Lee, Director
5796 Corporate Avenue
Cypress, California 90630



Edmund G. Brown Jr.
Governor

A2

March 20, 2018

Dr. Michael Conroy, Ed.D.
Deputy Superintendent
Administrative Services
Ocean View School District of Orange County
17200 Pinehurst Lane
Huntington Beach, California 92647
mconroy@ovsd.org

ENVIRONMENTAL IMPACT REPORT (EIR) FOR MULTIPLE-CAMPUS
MODERNIZATION/INTERIM HOUSING PROJECT, OCEAN VIEW SCHOOL
DISTRICT OF ORANGE COUNTY (SCH# 2017111086)

Dear Mr. Conroy:

The Department of Toxic Substances Control (DTSC) has reviewed the subject EIR. The following project description is stated in the EIR: "The District proposes to modernize 11 campuses—7 elementary schools and 4 middle schools. Students from 6 elementary schools and 4 middle schools would temporarily transfer either to the Sun View ES or Pleasant View/OVPP during modernization construction. The 7th elementary school, Harbour View ES, would be modernized, but would not need to transfer students off campus during construction." The EIR further states, "Most of campus modernizations would include: student safety improvements, such as camera systems and security fencing for campus security, emergency systems, and fire-life-safety items; heating, ventilation, and air conditioning (HVAC) systems; plumbing and other infrastructure improvements; educational technology; and play areas, including asphalt/concrete."

A2-1

Based on the review of the submitted document, DTSC has the following comments:

1. The EIR should identify and determine whether current or historic uses at the project site may have resulted in any release of hazardous wastes/substances. A Phase I Environmental Site Assessment is necessary to identify any recognized environmental conditions. DTSC recommends environmental review under the DTSC school program oversight to ensure the school is safe for students and staff.

A2-2

2. Response to Comments

Dr. Michael Conroy, Ed.D.
March 20, 2018
Page 2

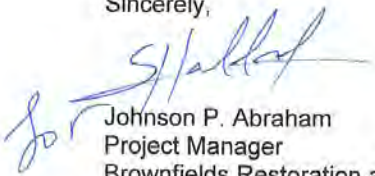
- | | |
|--|------|
| 2. If there are any recognized environmental conditions in the project area, then proper investigation, sampling and remedial actions overseen by the appropriate regulatory agencies should be conducted prior to the new development or any construction. | A2-3 |
| 3. If the project plans include discharging wastewater to a storm drain, you may be required to obtain an NPDES permit from the overseeing Regional Water Quality Control Board (RWQCB). | A2-4 |
| 4. If the proposed project involves the demolition of existing structures, lead-based paints or products, mercury, and asbestos containing materials (ACMs) should be addressed in accordance with all applicable and relevant laws and regulations. | A2-5 |
| 5. If the site was used for agricultural or related activities, residual pesticides may be present in onsite soil. DTSC recommends investigation and mitigation, as necessary, to address potential impact to human health and environment from residual pesticides. | A2-6 |
| 6. DTSC recommends evaluation, proper investigation and mitigation, if necessary, of onsite areas with current or historic PCB-containing transformers. | A2-7 |
| 7. If the project development involves soil export/import, proper evaluation is required. If soil contamination is suspected or observed in the project area, then excavated soil should be sampled prior to export/disposal. If the soil is contaminated, it should be disposed of properly in accordance with all applicable and relevant laws and regulations. In addition, if imported soil was used as backfill onsite and/or backfill soil will be imported, DTSC recommends proper evaluation/sampling as necessary to ensure the backfill material is free of contamination. | A2-8 |
| 8. If during construction/demolition of the project, soil and/or groundwater contamination is suspected, construction/demolition in the area should cease and appropriate health and safety procedures should be implemented. If it is determined that contaminated soil and/or groundwater exist, the EIR should identify how any required investigation and/or remediation will be conducted and the appropriate government agency to provide regulatory oversight. | A2-9 |

2. Response to Comments

Dr. Michael Conroy, Ed.D.
March 20, 2018
Page 3

If you have any questions regarding this letter, please contact me at (714) 484-5380 or by email at Johnson.Abraham@dtsc.ca.gov.

Sincerely,



Johnson P. Abraham
Project Manager
Brownfields Restoration and School Evaluation Branch
Site Mitigation and Restoration Program – Cypress

kl/sh/ja

cc: Governor's Office of Planning and Research (via e-mail)
State Clearinghouse
P.O. Box 3044
Sacramento, California 95812-3044
State.clearinghouse@opr.ca.gov

Mr. Dave Kereazis (via e-mail)
Office of Planning & Environmental Analysis
Department of Toxic Substances Control
Dave.Kereazis@dtsc.ca.gov

Mr. Shahir Haddad, Unit Chief (via e-mail)
Brownfields Restoration and School Evaluation Branch
Site Mitigation and Restoration Program – Cypress
Shahir.Haddad@dtsc.ca.gov

CEQA# 2017111086

2. Response to Comments

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2. Response to Comments

A2. Response to Comments Johnson P. Abram, Project Manager, Brownfields Restoration and School Evaluation Branch, Site Mitigation and Restoration Program, Cypress, Department of Toxic Substances Control dated March 20, 2018.

A2-1 The comment describes the Proposed Project. No response is necessary.

A2-2 Section 3.8, Hazards and Hazardous Materials, of the Initial Study/Notice of Preparation (IS/NOP), contained as Appendix A of the DEIR provides discussion on known releases that have occurred on or in the immediate area of, the modernization and interim housing schools. No known releases of any hazardous substances are reported to have occurred on the modernization and interim housing schools. The following databases were reviewed:

- California Regional Water Quality Control Board. 2018. Geotracker Sites and Facilities.
- California Department of Toxic Substances Control. 2018. EnviroStor.
- Environmental Protection Agency. 2018. Envirofacts.

These databases identify LUST cleanup site, cleanup program sites, military cleanup sites, DTSC cleanup sites, waste discharge requirements (WDR) sites, permitted USTs, DTSC hazardous waste sites, land disposal sites, RCRA, Superfund Enterprise Management System (SEMS) sites, and National Priority List (NPL) and Proposed NPL sites.

As discussed in the IS/NOP, a significant amount of hazardous materials would not be routinely transported, used, or disposed of in conjunction with the Proposed Project during construction and operation. Chemicals and hazardous substances to be used in the science classes of the elementary and middle school programs would be of negligible quantities under proper supervision. Maintenance of the facility would likely require the use of cleaners, solvents, paints, and other janitorial products that are potentially hazardous. However, these materials would be utilized in relatively small quantities and would be stored in compliance with established state and federal requirements. These materials would be used in accordance with normal operational safety practices, as employed at other school facilities within the OVSD service boundaries. The interim housing sites are already operating as an elementary school and preparatory schools and no conditions have been identified in the records search that would warrant preparation of a Phase I Environment Site Assessment. There is no substantial evidence that would warrant preparation of a Phase I Environmental Site Assessment.

A2-3 See Response A1-2. No recognized environmental conditions have been identified in the project area that would require sampling and remedial actions.

2. Response to Comments

- A2-4 The interim housing sites and the modernization sites are already operating as school facilities and connected to municipal sewer systems. The Proposed Project would be connected to the existing sewer systems and no wastewater would be discharged to a storm drain requiring a National Pollutant Discharge Elimination System permit from Regional Water Quality Control Board.
- A2-5 Asbestos is regulated as a hazardous air pollutant under the Clean Air Act and is also regulated as a potential worker safety hazard under the authority of the Occupational Safety and Health Administration (OSHA). Several regulations and guidelines pertain to abatement of and protection from exposure to asbestos-containing materials (ACM) and lead-based paint (LBP). Any Project-related demolition activities that have the potential to expose construction workers and/or the public to ACMs or LBP will be required to be conducted in accordance with applicable regulations. DEIR Section 1.7, *Areas of Controversy*, states that the Proposed Project may encounter ACMs and LBP during modernization. However, because the District is required to implement regulatory requirements outlined in the Title 8, CCR Subchapter 4 (Construction Safety Orders), Section 1529 (pertaining to asbestos) and Section 1532.1 (pertaining to lead-based paint), and Title 29 CFR 1926, Subpart Z and Title 40 CFR 61, Subpart M (pertaining to asbestos) and Title 29 CFR 1926, Subpart D (pertaining to lead) to ensure that all removal and disturbance of ACM and LBP and subsequent waste disposal are performed in accordance with these rules and regulations provide exposure limits, exposure monitoring, respiratory protection and good working practice by trained workers, no further discussions were deemed necessary. In California, ACM and LBP abatement must be performed and monitored by contractors with appropriate certification from the California Department of Health Services. California HSC Sections 17920.10 and 105255 require lead to be contained during demolition activities. Any modernization activities that have the potential to expose construction workers and/or the public to ACMs will be conducted in accordance with applicable regulations, including but not limited to the California Health and Safety Code, Section 39650 et seq.; California Code of Regulations, Title 8, Section 1529; and California Occupational Safety and Health Administration regulations in the California Code of Regulations, Title 8, Section 1529, Asbestos. Additionally, students would not be present on campus during modernization and the interim housing constructions. All construction work concerning ACMs would be performed in accordance with all applicable and relevant laws and regulations.
- A2-6 The interim housing sites where new portable buildings would be installed are underlain by approximately 3 feet of artificial fill materials. Soil borings were performed as part of the Geotechnical Exploration Reports included as Appendix A to this Final EIR. The interim housing sites are already developed and operating as schools and impacts from past agricultural residual pesticides uses would not affect Proposed Project.
- A2-7 As stated in DEIR Section 1.7, *Areas of Controversy*, campus modernizations at each school will generally include student safety items such as campus security including camera

2. Response to Comments

systems, security fencing, emergency systems, fire-life-safety items, HVAC systems, as well as plumbing, infrastructure, educational technology, and play areas including asphalt/concrete pavement. Therefore, no PCB-containing transformers are anticipated to be impacted by the Proposed Project. However, in the event that any current or historic PCB-containing transformers are identified during project implementation, the District will coordinate with Southern California Edison so that they can be managed and disposed of as hazardous waste in accordance with applicable federal, state and local laws and regulations to minimize exposure. No additional significant impacts are identified and no further response is necessary.

- A2-8 Comment noted. Export and import of soils will be properly evaluated as required. If soil contamination suspected or observed in the project area, then excavated soils will be sampled by a licensed environmental professional and disposed of properly in accordance with all applicable and relevant laws and regulations. If any soil import becomes necessary, proper evaluation and/or sampling will be conducted to ensure that soil is free of contamination and appropriate for use. It is anticipated that the onsite soils, less any construction debris or organic matter, will be used in required fills. Any soils to be placed as fills, from onsite or imported, will be required to be reviewed and tested by a licensed environmental professional. The conclusion of the EIR would not change and no further response is necessary.
- A2-9 Comment noted. There is no substantial evidence to suggest that the Project Site has been impacted by contamination. Therefore, the EIR determined that potential impacts from contaminated soils and/or groundwater would not be significant. However, as commented, if during construction/demolition of the Proposed Project, soil and/or groundwater contamination is suspected, construction/demolition in the area will be ceased and depending on the nature of the release and the media impacted, one of the following agencies will be contacted: the Orange County Environmental Health Division, the Regional Water Quality Control Board, Santa Ana Region, or the Department of Toxic Substances Control. The conclusion of the EIR would not change and no further response is necessary.

2. Response to Comments

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2. Response to Comments

LETTER A3– City of Fountain Valley (1 page[s])

A3



CITY OF FOUNTAIN VALLEY

PLANNING DEPARTMENT

10200 SLATER AVENUE • FOUNTAIN VALLEY, CA 92708-4736 • (714) 593-4425, FAX: (714) 593-4325

April 2, 2018

Michael Conroy, Ed.D.
Deputy Superintendent, Ocean View School District
17200 Pinehurst Lane
Huntington Beach, CA 92647

SUBJECT: Draft EIR for Ocean View School District Modernization/Consolidation Project

Dear Mr. Conroy,

Thank you for the opportunity to comment on the Draft EIR for the Ocean View School District Modernization/Consolidation Project. Our understanding is that the Draft EIR for the Ocean View School District Modernization/Consolidation Project will include the modernization of up to eleven (11) campuses, including Vista View Middle School located in Fountain Valley, which requires interim housing at two other campuses.

Following our review of the Draft EIR for the Ocean View School District Modernization/Consolidation Project, we have the following comments/concerns:

1. Section 5.5.5 Page 5.5-31 – Please include the City of Fountain Valley Municipal Code, Section 6.28 Noise Control. A3-1
2. Section 5.6.5 Page 5.6-21 – City of Fountain Valley encroachment permit requirements can be found Fountain Valley Municipal Code Chapter 11.08. A3-2
3. Any improvements made in the City of Fountain Valley public right-of-way must be reviewed by the City of Fountain Valley Public Works Department prior to construction. A3-3

Once again, thank you for the opportunity to review the Draft EIR for the Ocean View School District Modernization/Consolidation Project. Should you have any questions about our comments, please don't hesitate to me at (714) 593-4431 or email at steven.ayers@fountainvalley.org.

Sincerely,

A handwritten signature in black ink, appearing to read "Steven Ayers".

Steven Ayers
Planner
City of Fountain Valley

2. Response to Comments

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2. Response to Comments

A3. Response to Comments from Steven Ayers, Planner, City of Fountain Valley, dated April 2, 2018.

- A3-1 The comment requests that the EIR include the City of Fountain Valley Municipal Code, Section 6.28 Noise Control. The City of Fountain Valley Noise Element and the Municipal Code Chapter 6.28 are discussed in page 5.5-14 of the Draft EIR. No further response is necessary.
- A3-2 The comment requests that the EIR include the City of Fountain Valley encroachment permit requirements (Fountain Valley Municipal Code Chapter 11.08). The proposed modernization at Vista View Middle School in Fountain Valley would not involve actions requiring encroachment permit from the City. No further response is necessary.
- A3-3 The comment indicates that any improvements made in the City of Fountain Valley public right-of-way must be reviewed by the City of Fountain Valley Public Works Department. Comment is noted. However, the proposed modernization at Vista View Middle School in Fountain Valley would occur within the District's property boundary and would not involve actions within the City's public right-of-way. No further response is necessary.

2. Response to Comments

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2. Response to Comments

LETTER A4 – Orange County Transportation Authority (1 page[s])

 BOARD OF DIRECTORS Lisa A. Bartlett Chair Tim Shaw Vice Chairman Laurie Davies Director Bernara Deagleize Director Andrew Da Director Lori Danchak Director Michael Hennessey Director Steve Jones Director Mark A. Murphy Director Richard Murphy Director Al Murray Director Shawn Nelson Director Miguel Pulido Director Todd Spletzer Director Michelle Steel Director Tom Tait Director Gregory T. Winterbottom Director Ryan Chamberlain Ex-Officio Member CHIEF EXECUTIVE OFFICE Darrell Johnson Chief Executive Officer	A4 RECEIVED APR 03 2018 FINANCIAL SERVICES April 6, 2018 Mr. Michael Conroy, Ed.D. Deputy Superintendent Ocean View School District 17200 Pinehurst Lane Huntington Beach, CA 92647 Subject: Notice of Availability of a Draft EIR for the Ocean View School District Multiple-Campus Modernization and Interim Housing Project Dear Mr. Conroy: The Orange County Transportation Authority (OCTA) has reviewed the Draft EIR for the Ocean View School District Multiple-Campus Modernization and Interim Housing Project. The following comments are provided for your consideration: <u>Active Transportation Comment</u> • Page 5.6-20 of the DEIR discusses the potential for students to walk or bike to the schools included in the proposed project. We recommend the proposed project evaluate the provision of bicycle and skateboard parking racks at all schools affected during the project's construction and operational phases. <u>Transit Planning Comment</u> • OCTA currently provides transit service near the project's locations. Should the project have any impacts to nearby bus stops, please coordinate with OCTA to employ measures to reduce potential transit service disruptions. We also request that the Ocean View School District keep OCTA informed with any potential bus stop interruptions or street closures that may require detours. We appreciate the opportunity to provide input on this project. Should you have any questions or need additional information, please feel free to contact me via phone at (714) 560-5907 or by email at DPhu@octa.net. Sincerely,  Dan Phu Environmental Programs Manager Orange County Transportation Authority (OCTA)
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2. Response to Comments

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2. Response to Comments

A4. **Response to Comments from Dan Phu, Environmental Programs Manager, Orange County Transportation Authority, dated April 6, 2018.**

- A4-1 The comment recommends that the Proposed Project evaluate the provision of bicycle and skateboard parking racks at all schools affected during the project's construction and operational phases. Comment is noted. The modernization schools would be closed during construction and appropriate bicycle racks would be provided in the interim housing schools as appropriate. The modernization projects would not increase the capacity of the affected schools and no additional provision of bicycle and skateboard racks are required. Provision of bicycle and skateboard parking racks would not change the conclusion of transportation and traffic impacts. No further response is necessary.
- A4-2 The comment requests that should the project have any impacts to nearby bus stops, the District coordinate with OCTA to employ measures to reduce potential transit service disruptions. The comment also requests that the District keep OCTA informed with any potential bus stop interruptions or street closures that may require detours. Comments are noted. However, the Proposed Project would occur within the boundaries of the affected schools or their immediate vicinities and considering the size and scale of the Proposed Project, no street closure would be necessary. Therefore, OCTA bus stops would not be adversely affected by the Proposed Project. However, in the event that the Proposed Project requires temporary disruption of OCTA transit service, the District will coordinate with OCTA and employ appropriate measures. Impacts to OCTA transit services would not be significant and no additional impacts have been identified that require changes to the EIR. No further response is necessary.

2. Response to Comments

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2. Response to Comments

LETTER A5 – Orange County Transportation Authority (2 page[s])

A5



April 5, 2018

NCL-17-071a

Michael Conroy, Ed.D.
Ocean View School District
17200 Pinehurst Lane
Huntington Beach, CA 92647

Subject: Draft Environmental Impact Report for the Ocean View School District Multiple-Campus Modernization/Interim Housing Project

Dear Mr. Conroy:

Thank you for the opportunity to comment on the Draft Environmental Impact Report (EIR) for the Ocean View School District Multiple-Campus Modernization/Interim Housing Project. The County of Orange offers the following comments for your consideration.

OC Public Works – Environmental Resources

1. Page 5.4-3 and 5.4-4: Although Ocean View School District (OVSD) is not subject to the requirements of the Orange County MS4 permit, it is expected to actively participate in implementing the Orange County NPDES Stormwater Program (see Finding #77 of Order No. R8-2009-0030 [NPDES No. CAS 618030] as amended by Order No. R8-2010-0062). The Orange County NPDES Stormwater Program requires consideration of water quality impacts at the earliest phases of a project typically through the submittal of a conceptual or preliminary Water Quality Management Plan (WQMP) for all priority projects if the new development creates more than 10,000 square feet or redevelopment projects that add or replace more than 5,000 square feet of impervious surface. Due to the fact that the added impervious surface through the modernization is more than 5,000 square feet and the project will likely discharge runoff to a MS4 and an Orange County Flood Control District (OCFCD) facility, a WQMP should be committed to explicitly and prepared as described in the Technical Guidance Document (TGD).
2. Page 5.4-2: The Basin Plan for Region 8 was also updated in 2016. The text should be updated accordingly.
3. Table 5.4-1 and 5.4-2: The beneficial use and 303(d) list should be referenced to the Basin Plan of the Santa Ana Regional Water Quality Control Board (Table 5.4-1) and the 2012 Integrated Report by the State Water Board (Table 5.4-2) instead of "Orange County, 2017" for the most updated and accurate information.

A5-1

A5-2

A5-3

300 N. Flower Street, Santa Ana, CA 92703
P.O. Box 4048, Santa Ana, CA 92702-4048

www.ocpublicworks.com
714.667.8800 | Info@OCPW.ocgov.com

2. Response to Comments

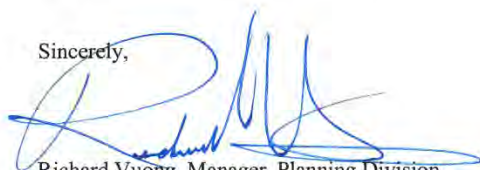
4. Page 5.4-10: The Draft EIR indicates that “Nutrients are inorganic substances only.” Nutrients generally refer to nitrogen or phosphorus in their both organic and inorganic forms that stimulate algal growth and cause eutrophication of surface water. The text should be clarified.
5. Page 5.4-10: The item “Oxygen-Demanding Substances” should be removed because the associated pollutants have been covered in previous categories.
6. Page 5.4-12: The document indicates that the County of Orange is a “permitting agency” for the Orange County MS4 permit. The Santa Ana Regional Water Quality Control Board serves this role. The text should be clarified accordingly.

OC Public Works - OC Infrastructure Programs/Flood Program Support Division

1. Page 5.4-12 states: “Implementation of Mitigation Measure HYD-2 would ensure that pre-Project conditions would be roughly the same as the post-Project conditions or the increased volume is within the limits established by the County.” Please be notified that the County has not established any limits for the increased runoff, and as indicated on page 5.4-13, the proposed improvements should not worsen existing conditions or shift flooding problems upstream or downstream of the affected schools.
2. The cities of Huntington Beach and Westminster are responsible for land use planning and developments of the College View Elementary School, Sun View Elementary School, Westmont Elementary School, and Pleasant View/Ocean View Preparatory Preschool (OVPP) within its municipal limits. Each City should review and approve the local hydrology and hydraulic analyses including the appropriate mitigation measures to minimize the adverse impacts resulting from the project.

If you have any questions regarding these comments, please contact Stella Shao at (714) 955-0651 in OC Environmental Resources; Ariel Corpuz at (714) 647-3966 or Sahar Parsi at (714) 647-3988 in Flood Program Support Division; or Ashley Brodtkin at (714) 667-8854 in OC Development Services.

Sincerely,



Richard Vuong, Manager, Planning Division
OC Public Works Service Area/OC Development Services
300 North Flower Street
Santa Ana, California 92702-4048
Richard.Vuong@ocpw.ocgov.com

cc: Stella Shao, OC Public Works – Environmental Resources
Ariel Corpuz, OC Public Works – OC Flood Programs
Sahar Parsi, OC Public Works – OC Flood Programs

2. Response to Comments

A5. Response to Comments from Richard Vuong, Manager, Planning Division, OC Public Works Service Area/OC Development Services, dated April 5, 2018.

A5-1 The comment states that although OVSD is not subject to the requirements of the Orange County MS4 permit, it is expected to actively participate in implementing the Orange County NPDES Stormwater Program, and that a WQMP should be committed to explicitly and prepared as described in the Technical Guidance Document.

Mitigation Measure HYD-2 has been incorporated, so that impacts from the increased impervious surfaces can be reduced to acceptable level. A performance standard has been established, which was modeled after the County's 2011 Model WQMP. Appendix B, Hydrology Data, shows drainage exhibit for Sun View ES and associated hydro calculations. The District will continue to coordinate with OC Public Works as appropriate for the proposed improvements.

A5-2 The comment is noted, and the text has been updated accordingly in Section 3, Revisions to the Draft EIR.

Page 5.4-2, last paragraph: The Ocean View School District (OVSD) is in the jurisdiction of the Santa Ana RWQCB, Region 8, which encompasses the Santa Ana River watershed. The Basin Plan for Region 8 was adopted in 1995 and was last updated in 2016 ~~2008 and 2011~~.

A5-3 The comment is noted, and the text has been updated accordingly in Section 3, Revisions to the Draft EIR.

Page 5.4-6, Table 5.4-1: Source: ~~Orange County 2017~~ Basin Plan of the Santa Ana Regional Water Quality Control Board 2016.

Page 5.4-7, Table 5.4-2: Source: ~~County of Orange 2017~~ 2012 Integrated Report by the State Water Board.

A5-4 The comment is noted, and the texts have been updated accordingly in Section 3, Revisions to the Draft EIR.

Page 5.4-10, 2nd paragraph: Nutrients: ~~Nutrients are inorganic substances such as~~ generally refer to nitrogen and phosphorous; the primary sources of these substances in urban runoff are fertilizers and eroded soils. Excessive discharge of nutrients to water bodies and streams causes overgrowth of aquatic plants and algae, which can lead to excessive decay of organic matter in the water, loss of oxygen in the water, and eventual death of aquatic organisms.

Page 5.4-10, 7th paragraph: ~~Oxygen-Demanding Substances:~~ ~~Microbial biodegradation of organic compounds such as proteins, carbohydrates, and fats causes increased oxygen demand in water. A second category of oxygen-demanding substances~~

2. Response to Comments

~~is chemicals, such as ammonia and hydrogen sulfide that react with dissolved oxygen in water to form other compounds. The oxygen demand of a substance can deplete dissolved oxygen in a water body and possibly result in septic conditions. A reduction of dissolved oxygen is harmful to aquatic life and can generate hazardous compounds such as hydrogen sulfides.~~

A5-5 The comment is noted, and the text has been updated accordingly in Section 3, Revisions to the Draft EIR.

Page 5.4-12, 1st paragraph: The County of Orange is an operator of the ~~permitting agency for~~ Orange County MS4 permit for the Santa Ana RWQCB and requires preparation and approval of a WQMP for new development that creates more than 10,000 square feet of impervious surface or redevelopment projects that add or replace 5,000 square feet of impervious surface.

A5-6 The comment states that the County has not established any limits for the increased runoff, and that the proposed improvement should not worsen existing conditions or shift flooding problem upstream or downstream of the affected schools. The comment is noted and the text has been revised to be consistent with page 5.4-13.

Page 5.4-12, 1st paragraph: The County of Orange is a permitting agency for Orange County MS4 permit and requires preparation and approval of a WQMP for new development that creates more than 10,000 square feet of impervious surface or redevelopment projects that add or replace 5,000 square feet of impervious surface. As a state agency, the District is not subject to the requirement of the Orange County MS4 permit. However, the District has the obligation to coordinate with the County to protect the quality of stormwater quality, therefore, is anticipated to retain onsite a specified volume of stormwater runoff to meet the County standard. Implementation of Mitigation Measure HYD-2 would ensure that ~~pre-Project conditions would be roughly the same as~~ the post-Project conditions do not worsen existing conditions or shift flooding problems upstream or downstream of the affected schools~~or the increased volume is within the limits established by the County.~~

A5-7 The comment asserts that the cities of Huntington Beach and Westminster are responsible for land use planning and developments of the College View ES, Sun View ES, Westmont ES, and Pleasant View/OVPP within its municipal limits, and each city should review and approve the local hydrology and hydraulic analyses, including the appropriate mitigation measures to minimize the adverse impacts resulting from the project. The respective cities have been properly notified of the Proposed Project and appropriate responsible and trustee agencies have been identified. No significant local impacts related to local hydrology and hydraulics have been identified and no mitigation measures are required. No further response is necessary.

3. Revisions to the Draft EIR

3.1 INTRODUCTION

This section contains revisions to the DEIR based upon (1) additional or revised information required to prepare a response to a specific comment; (2) applicable updated information that was not available at the time of DEIR publication; and/or (3) typographical errors. This section also includes additional mitigation measures to fully respond to commenter concerns as well as provide additional clarification to mitigation requirements included in the DEIR. The provision of these additional mitigation measures does not alter any impact significance conclusions as disclosed in the DEIR. Changes made to the DEIR are identified here in ~~strikeout text~~ to indicate deletions and in underlined text to signify additions.

3.2 DEIR REVISIONS IN RESPONSE TO WRITTEN COMMENTS

The following text has been revised in response to comments received on the DEIR.

Page 1-13, Section 1.8, *Summary of Environmental Impacts, Mitigation Measures, and Levels of Significance After Mitigation, Table 1-3, 5.1, Air Quality*, is hereby modified as follows per the Board's decision to only use Sun View ES as interim housing. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

Impact 5.1-3: Project-related construction activities could expose sensitive receptors to substantial pollutant concentrations.	Potentially Significant	~~AQ-1 The Ocean View School District shall include the following provisions in the construction bid contract for the interim housing improvements at Pleasant View/Ocean View Preparatory Preschool (Pleasant View/OVPP):~~ ~~The construction contractor shall limit hauling of demolition debris during Stage 1 in Phase 1 to a maximum of 17 trucks per day (34 one-way haul trips per day if 16 cubic yard trucks are used), assuming a one way haul distance of 20 miles. If the truck haul distance for export of soil from site preparation activities is greater than 20 miles one way, as identified by the contractor(s), hauling shall be restricted to no more than 680 miles per day. Demolition debris hauling operations shall not overlap with any grading operations and grading soil haul operations.~~ <u>These requirements shall be noted on all construction management plans and verified by the Ocean View School District prior to and during the demolition phases at Pleasant View/OVPP.</u>	Less Than Significant
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3. Revisions to the Draft EIR

		<u>AQ-21</u> The Ocean View School District shall include the following provisions in the construction bid contact for the improvements at Sun View Elementary School (ES). The construction contractor shall limit hauling of demolition debris during Stage 1 in Phase 1 to a maximum of 18 trucks per day (36 one-way haul trips per day if 16 cubic yard trucks are used), assuming a one-way haul distance of 20 miles. If the truck haul distance for export of soil from site preparation activities is greater than 20 miles one way, as identified by the contractor(s), hauling shall be restricted to no more than 720 miles per day. Demolition debris hauling operations shall not overlap with any grading operations and grading soil haul operations. These requirements shall be noted on all construction management plans and verified by the Ocean View School District prior to and during demolition activities at ~~Pleasant View/OVPP~~ and Sun View ES.	
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Page 1-16, Section 1.8, *Summary of Environmental Impacts, Mitigation Measures, and Levels of Significance After Mitigation*, Table 1-3, 5.4, *Hydrology and Water Quality*, is hereby modified as follows per the Board's decision to only use Sun View ES as interim housing. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

Impact 5.4-1: Proposed Project could violate water quality standards or waste discharge requirements.	Potentially Significant	HYD-1 Prior to grading of Sun View Elementary School and ~~Pleasant View/Ocean View Preparatory Preschool~~, Ocean View School District shall adhere to the National Pollutant Discharge Elimination System (NPDES) Construction General Permit Order No. 2012-0006-DWQ, Statewide General Construction Permit, by completing and filing Registration Documents with the State Water Resources Control Board, which include a Notice of Intent (NOI), a Risk Assessment, a Site Map, a Storm Water Pollution Prevention Plan (SWPPP) and associated best management practices (BMPs), an annual fee, and a signed certification statement. It requires that a SWPPP be prepared prior to the start of grading, and provisions in the SWPPP must be implemented throughout the construction period. HYD-02 Ocean View School District (OVSD) shall demonstrate that runoff discharges at Sun View Elementary School and ~~Pleasant View/Ocean View Preparatory Preschool~~ meet one of the following or equivalent design criteria: Capture and retain the volume of stormwater runoff produced from a 24-hour 85th percentile	Less Than Significant
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3. Revisions to the Draft EIR

		storm event and demonstrate that this design capture volume (DCV) is drawn down within 48 hours or less following the end of precipitation. Or • Demonstrate via use of nomographs or continuous simulation that best management practices (BMPs) will retain 80 percent of average annual runoff volume via volume-based, flow-based, or combined approaches. Or Where it is demonstrated based on substantial evidence that it is not feasible to fully infiltrate the DCV or equivalent per the listed criteria above, but i.e., partial infiltration is determined to be feasible, OVSD shall demonstrate in the site plans for Sun View Elementary School and Pleasant View/Ocean View Preparatory Preschool that the following design criteria have been incorporated: • Maximize volume and pollutant retention through the incorporation of all of the following design elements that apply: • Use of all applicable hydrologic source controls. • Use of retention compartments in BMPs, including gravel storage below the lowest point of treated discharge, amended soils, and other features designed to achieve similar processes.	
Impact 5.4-2: The Proposed Project would alter the existing drainage patterns and increase the amount of impervious surfaces on Sun View ES, Pleasant View/Ocean View Preparatory Preschool, Westmont Elementary School, and College View Elementary School.	Potentially Significant	See Mitigation Measure HYD-2.	Less Than Significant

Page 1-18, Section 1.8, *Summary of Environmental Impacts, Mitigation Measures, and Levels of Significance After Mitigation*, Table 1-3, 5.6, *Transportation and Traffic*, is hereby modified as follows per the Board's decision to only

3. Revisions to the Draft EIR

use Sun View ES as interim housing. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

Impact 5.6 3: The Proposed Project could create hazardous conditions due to increased vehicle movements near Sun View ES ~~and Pleasant View/OVPP.~~	~~Less Than Significant~~ <u>Potentially Significant</u>	~~No mitigation measures are required. See T-1.~~	~~Not applicable.~~ <u>Less Than Significant</u>
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Page 5.1-31, Section 5.1.7, *Mitigation Measures*, is hereby modified as follows per the Board's decision to only use Sun View ES as interim housing. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

~~AQ-1 The Ocean View School District shall include the following provisions in the construction bid contact for the interim housing improvements at Pleasant View/Ocean View Preparatory Preschool (Pleasant View/OVPP):~~

- ~~▪ The construction contractor shall limit hauling of demolition debris during Stage 1 in Phase 1 to a maximum of 17 trucks per day (34 one-way haul trips per day if 16 cubic yard trucks are used), assuming a one-way haul distance of 20 miles. If the truck haul distance for export of soil from site preparation activities is greater than 20 miles one way, as identified by the contractor(s), hauling shall be restricted to no more than 680 miles per day. Demolition debris hauling operations shall not overlap with any grading operations and grading soil haul operations.~~

~~These requirements shall be noted on all construction management plans and verified by the Ocean View School District prior to and during the demolition phases at Pleasant View/OVPP.~~

~~AQ-21~~ The Ocean View School District shall include the following provisions in the construction bid contact for the improvements at Sun View Elementary School (ES).

- The construction contractor shall limit hauling of demolition debris during Stage 1 in Phase 1 to a maximum of 18 trucks per day (36 one-way haul trips per day if 16 cubic yard trucks are used), assuming a one-way haul distance of 20 miles. If the truck haul distance for export of soil from site preparation activities is greater than 20 miles one way, as identified by the contractor(s), hauling shall be restricted to no more than 720 miles per day. Demolition debris hauling operations shall not overlap with any grading operations and grading soil haul operations.

3. Revisions to the Draft EIR

These requirements shall be noted on all construction management plans and verified by the Ocean View School District prior to and during demolition activities at ~~Pleasant View/OVPP~~ and Sun View ES.

Page 5.4-2, Section 5.4.1.1, *Regulatory Framework California Water Code, Section 13000 et seq*, is hereby modified as follows in response to comments. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

The Ocean View School District (OVSD) is in the jurisdiction of the Santa Ana RWQCB, Region 8, which encompasses the Santa Ana River watershed. The Basin Plan for Region 8 was adopted in 1995 and was last updated in 2016 ~~2008 and 2011~~.

Page 5.4-6, Section 5.4.1.3, *Existing Conditions, Surface Water Quality*, is hereby modified as follows in response to comment. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

Table 5.4-1 Designated Beneficial Uses of Water Bodies in Vicinity of Anaheim Bay Huntington Harbour Watershed

Water Body	Designated Beneficial Use
Anaheim Bay - Outer Bay	MUN, ¹ NAV, REC-1, REC-2, BIOL; WILD, RARE, SPWN, MAR
Anaheim Bay - Seal Beach National Wildlife Refuge	MUN, ¹ REC-1, REC-2, COMM, BIOL; WILD, RARE, SPWN, MAR, EST
Sunset Bay - Huntington Harbor	MUN, ¹ NAV, REC-1, REC-2, COMM, WILD, RARE, SPWN, MAR

Source: ~~Orange County 2017~~ Basin Plan of the Santa Ana Regional Water Quality Control Board 2016.

Notes: Municipal and Domestic Water Supply (MUN), Navigation (NAV), Water Contact Recreation (REC-1), Noncontact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Preservation of Biological Habitats of Special Significance (BIOL), Wildlife Habitat (WILD), Rare, Threatened or Endangers Species (RARE), Spawning, Reproduction and Development (SPWN), Marine Habitat (MAR), Shellfish Harvesting (SHEL), Estuarine Habitat (EST).

¹ Excepted from the municipal and domestic supply.

Page 5.4-10, Section 5.4.3, *Environmental Impacts*, Impact 5.4-1, is hereby modified as follows in response to comments. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

Nutrients: ~~Nutrients are inorganic substances such as~~ Nutrients generally refer to nitrogen and phosphorous; the primary sources of these substances in urban runoff are fertilizers and eroded soils. Excessive discharge of nutrients to water bodies and streams causes overgrowth of aquatic plants and algae, which can lead to excessive decay of organic matter in the water, loss of oxygen in the water, and eventual death of aquatic organisms.

3. Revisions to the Draft EIR

Page 5.4-10, Section 5.4.3, *Environmental Impacts*, Impact 5.4-1, is hereby modified as follows in response to comments. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

~~**Oxygen-Demanding Substances:** Microbial biodegradation of organic compounds such as proteins, carbohydrates, and fats causes increased oxygen demand in water. A second category of oxygen-demanding substances is chemicals, such as ammonia and hydrogen sulfide that react with dissolved oxygen in water to form other compounds. The oxygen demand of a substance can deplete dissolved oxygen in a water body and possibly result in septic conditions. A reduction of dissolved oxygen is harmful to aquatic life and can generate hazardous compounds such as hydrogen sulfides.~~

Page 5.4-12, Section 5.4.3, *Environmental Impacts*, Impact 5.4-1, is hereby modified as follows in response to comments. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

The County of Orange is a permitting agency for Orange County MS4 permit and requires preparation and approval of a WQMP for new development that creates more than 10,000 square feet of impervious surface or redevelopment projects that add or replace 5,000 square feet of impervious surface. As a state agency, the District is not subject to the requirement of the Orange County MS4 permit. However, the District has the obligation to coordinate with the County to protect the quality of stormwater quality, therefore, is anticipated to retain onsite a specified volume of stormwater runoff to meet the County standard. Implementation of Mitigation Measure HYD-2 would ensure that ~~pre-Project conditions would be roughly the same as the post-Project conditions~~ do not worsen existing conditions or shift flooding problems upstream or downstream of the affected schools ~~or the increased volume is within the limits established by the County.~~

Page 5.4-13, Section 5.4.3, *Environmental Impacts*, Impact 5.4-2, is hereby modified as follows to reflect the Board's decision to only use Sun View ES as interim housing site. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

Impact 5.4-2: ~~The Proposed Project would alter the existing drainage patterns and increase the amount of impervious surfaces on Sun View Elementary School, Pleasant View/Ocean View Preparatory Preschool, Westmont Elementary School, and College View Elementary School. [Thresholds HYD-3, HYD-4 and HYD-5]~~

Page 5.4-16 and 17, Section 5.4.7, *Mitigation Measures*, *Impact 5.4-1*, is hereby modified as follows to reflect the Board's decision to only use Sun View ES as interim housing. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.:

HYD-1 ~~Prior to grading of Sun View Elementary School and Pleasant View/Ocean View Preparatory Preschool, Ocean View School District shall adhere to the National Pollutant Discharge Elimination System (NPDES) Construction General Permit Order No. 2012-0006-DWQ,~~

3. Revisions to the Draft EIR

Statewide General Construction Permit, by completing and filing Registration Documents with the State Water Resources Control Board, which include a Notice of Intent (NOI), a Risk Assessment, a Site Map, a Storm Water Pollution Prevention Plan (SWPPP) and associated best management practices (BMPs), an annual fee, and a signed certification statement. It requires that a SWPPP be prepared prior to the start of grading, and provisions in the SWPPP must be implemented throughout the construction period.

HYD-2 Ocean View School District (OVSD) shall demonstrate that runoff discharges at Sun View Elementary School ~~and Pleasant View/Ocean View Preparatory Preschool~~ meet one of the following or equivalent design criteria:

- Capture and retain the volume of stormwater runoff produced from a 24-hour 85th percentile storm event and demonstrate that this design capture volume (DCV) is drawn down within 48 hours or less following the end of precipitation.

Or

- Demonstrate via use of nomographs or continuous simulation that best management practices (BMPs) will retain 80 percent of average annual runoff volume via volume-based, flow-based, or combined approaches.

Or

Where it is demonstrated based on substantial evidence that it is not feasible to fully infiltrate the DCV or equivalent per the listed criteria above, but i.e., partial infiltration is determined to be feasible, OVSD shall demonstrate in the site plans for Sun View Elementary School ~~and Pleasant View/Ocean View Preparatory Preschool~~ that the following design criteria have been incorporated:

- Maximize volume and pollutant retention through the incorporation of all of the following design elements that apply:
 - Use of all applicable hydrologic source controls.
 - Use of retention compartments in BMPs, including gravel storage below the lowest point of treated discharge, amended soils, and other features designed to achieve similar processes.

Page 5.6-18, Section 5.6.3, Environmental Impacts, Impact 5.6-3, is hereby modified as follows. The changes made to the DEIR are identified here in ~~strikeout~~ text to indicate deletions and in underlined text to signify additions.

- **Impact 5.6-3** The Proposed Project could create hazardous conditions due to increased vehicle movements near Sun View ES ~~and Pleasant View/OVPP~~.

3. Revisions to the Draft EIR

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Appendices

Appendix A. Geotechnical Exploration Reports for Interim Housing Projects

Appendices

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GEOTECHNICAL EXPLORATION REPORT
PROPOSED INTERIM HOUSING PROJECT
RELOCATABLE 84'X40' BUILDING
SUN VIEW ELEMENTARY SCHOOL
7721 JULIET LOW DRIVE
HUNTINGTON BEACH, CALIFORNIA

Prepared for:

DLR Group

1650 Spruce Street, Suite 300
Riverside, California 92507

Project No. 11766.002

November 1, 2017



Leighton Consulting, Inc.

A LEIGHTON GROUP COMPANY



Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

November 1, 2017

Project No. 11766.002

DLR Group
1650 Spruce Street, Suite 300
Riverside, California 92507

Attention: Mr. Robert Demmond

**Subject: Geotechnical Exploration Report
Proposed Interim Housing Project
Relocatable 84'x40' Building
Sun View Elementary School
7721 Juliet Low Drive
Huntington Beach, California**

Per your request and authorization, Leighton Consulting, Inc. (Leighton) is pleased to present this geotechnical exploration report for the subject project. The scope of work for this geotechnical exploration was outlined in our proposal dated October 6, 2017.

The intent of this geotechnical exploration is to evaluate the geotechnical conditions and provide geotechnical recommendations for the new permanent concrete foundation system for the proposed relocatable 84'x40' building.

Based on our exploration and analysis, the proposed improvements are considered feasible from a geotechnical standpoint. Presented in this report are findings and geotechnical recommendations to aid in the design and construction of the proposed improvements.

We appreciate this opportunity to be of service. If you have any questions regarding this report or if we can be of further service, please call us at your convenience at **(866) LEIGHTON**, directly at the phone extensions or e-mail addresses listed below.



Respectfully submitted,

LEIGHTON CONSULTING, INC.

A handwritten signature in blue ink, appearing to be "JP", representing Jeffrey M. Pflueger.

Jeffrey M. Pflueger, PG, CEG 2499
Associate Geologist
Ext 4257; jpflueger@leightongroup.com



A handwritten signature in blue ink, appearing to be "Vincent", representing Vincent P. Ip.

Vincent P. Ip, PE, GE 2522
Senior Principal Engineer
Ext 1682; vip@leightongroup.com

JMP/VPI/lr

Distribution: (1) Addressee

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Important Information About Your Geotechnical Engineering Report	Rear of Text
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APPENDICES

Appendix A – Field Exploration Logs (Current Study)
Appendix B – Laboratory Test Results (Current Study)
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Appendix D – Seismicity Data
Appendix E – Liquefaction Analysis
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1.0 INTRODUCTION

1.1 Site Description and Proposed Development

The Sun View Elementary School campus is located at 7721 Juliet Low Drive in the city of Huntington Beach, California. The school campus is bordered by Sher Lane to the west, Juliet Low Drive, a church and single-family residential properties to the south single-family and multi-family residential properties to the east, and multi-family residential properties and Sun View Park to the north.

Based on a review of historic aerial photos, the school campus area appeared to be vacant and utilized for agricultural purposes from at least 1953 until the school was initially constructed to roughly its current configuration sometime between 1963 and 1972 (NETR, 2017).

Based on review of the proposed site plan for the *Sun View Elementary School Interim Housing Project*, prepared by you, the proposed relocatable 84'x40' building will be located in the southeastern portion of the campus. We understand the proposed improvements at the school campus will be utilized for up to approximately 3 years until the school will be decommissioned.

Based on our review of the proposed site plan, the planned relocatable 84'x40' building is 3,360 square feet in size. The building will be supported by a concrete foundation system consisting of interior pad footings and perimeter strip footings. Based on the existing site conditions, we anticipate only minor grading will be required to prepare the site for the new construction.

The ground surface at the campus is relatively flat at approximate Elevation +23 feet mean sea level (msl). Review of the Newport Beach, California Quadrangle Topographic Map (USGS, 1965, Photorevised 1972) indicates sheet flow is generally toward the west.

1.2 Purpose and Scope of Exploration

The purpose of our geotechnical exploration was to evaluate the soil and groundwater conditions at the site of the planned relocatable 84'x40' building through review of available data and exploratory borings in order to provide geotechnical recommendations to aid in design and construction for the project as currently proposed.

The scope of this geotechnical exploration included the following tasks:

- *Background Review* – A background review was performed of readily available, relevant geotechnical and geological literature pertinent to the project site. References reviewed in preparation of this report are listed in Section 7.0.
- *Field Exploration* – Our field exploration was performed on October 14, 2017, and consisted of one (1) hollow-stem auger boring (designated LB-1) drilled to a depth of approximately 21½ feet below existing ground surface (bgs) at the location of the planned relocatable 84'x40' building. In addition, one (1) Cone Penetrometer Test (CPT) sounding was advanced at the site (designated CPT-1) to an approximate depth 51 feet bgs. Shear wave velocity measurements were taken at the CPT location to develop seismic design parameters. The approximate locations of the borings and CPTs are shown on Figure 2, *Exploration Location Map*. Prior to the field exploration, the borings were marked and Underground Service Alert (USA) was notified for utility clearance.

During drilling of the hollow-stem auger boring (LB-1), both bulk and drive samples were obtained for geotechnical laboratory testing. Drive samples were collected from the borings using a Modified California Ring sampler conducted in accordance with ASTM Test Method D3550. Standard Penetration Tests (SPTs) were also performed within the hollow-stem auger boring in accordance with ASTM Test Method D1586. The samplers were driven for a total penetration of 18 inches, unless practical refusal was encountered, using a 140-pound automatic hammer falling freely for 30 inches. The number of blows per 6 inches of penetration was recorded on the boring log.

The boring was logged in the field by a member of our technical staff. Each soil sample collected was reviewed and described in accordance with the Unified Soil Classification System (USCS). The samples were sealed and packaged for transportation to our laboratory. After completion of drilling, the boring (LB-1) was backfilled with soils generated during the exploration. The boring log for LB-1 is presented in Appendix A, *Field Exploration Logs*.

The CPT sounding was performed in accordance with ASTM D5778 advanced by a 30-ton CPT rig in which a standard Cone equipped with a 15 cm² tip was advanced at a constant rate of approximately 1 inch per second.

The CPT provides a continuous record of the subsurface stratigraphy via data regarding tip and sleeve resistance which is continuously recorded electronically as the probe is advanced through the subsurface stratigraphy. The recorded data is processed yielding interpretations of soil type based upon the anticipated engineering behavior of the various soil strata through which the probe penetrates. A graphical log of the interpreted soil conditions at the CPT sounding location is included in Appendix A

- **Laboratory Testing** –Laboratory tests were performed on representative soil samples to evaluate geotechnical engineering properties of subsurface materials. The following laboratory tests were performed:
 - In-situ Moisture Content and Dry Density (ASTM D2216 and ASTM D2937);
 - Sieve Analysis (ASTM D6913);
 - Atterberg Limits (ASTM D4318);
 - Expansion Index (ASTM D4829);
 - Modified Proctor Compaction Test (ASTM D1557);
 - Direct Shear (ASTM D 3080); and
 - Corrosivity (Soluble Sulfate ASTM C1580, Soluble Chloride ASTM C1411-09, pH ASTM D4972, and Resistivity ASTM G187-12a).

The in-situ moisture and density of select soil samples are shown on the borings log included in Appendix A. The results of the remaining laboratory tests are presented in Appendix B – *Laboratory Test Results*.

- **Engineering Analysis** – Geotechnical analysis was performed on the collected data to develop conclusions and recommendations for design and construction of the planned improvements.
- **Report Preparation** - This geotechnical report presents our findings, conclusions, and recommendations.

It should be noted that the recommendations in this report are subject to the limitations presented in Section 6.0 of the report.

1.3 Previous Studies

In September 2017, a limited geotechnical exploration was performed at the site by Leighton (2017) in support of the pavement design recommendations for the proposed new parking lot in the northern portion of the campus. As a part of this previous investigation, three (3) hand-stem auger borings were drilled at the site to a depth of approximately 5 feet bgs and geotechnical laboratory testing was performed on the collected samples. Copies of the boring logs and laboratory test results from our previous study (Leighton, 2017) are included in Appendix C.

2.0 GEOTECHNICAL FINDINGS

2.1 Geologic Setting

The project site is located on the lowest reach of the Santa Ana River basin within the Peninsular Ranges geomorphic province. The Peninsular Ranges geomorphic province extends southward from the Los Angeles Basin to the tip of Baja California (Yerkes et al., 1965) and is characterized by elongated northwest-trending mountain ranges separated by sediment-floored valleys. The most dominant structural features of the province are the northwest trending fault zones, most of which die out, merge with, or are terminated by the steep reverse faults at the southern margin of the Transverse Ranges geomorphic province. East of the site are the northwest-trending Santa Ana Mountains, a large range which has been uplifted on its eastern side along the Whittier-Elsinore Fault Zone, producing a tilted, irregular highland that slopes westward toward the sea.

The area south and west of the Santa Ana Mountains is generally characterized as a broad, complex, alluvial fan which receives sediments from the Santa Ana River and its tributaries draining the Santa Ana and San Bernardino Mountains. These sediments are comprised of relatively flat-lying, unconsolidated to loosely consolidated clastic deposits that are approximately 3,000 feet thick beneath the site (Sprotte et al., 1980, and Real, 1985).

2.2 Surficial Geology

The surficial deposits at the site and in the vicinity consist of Quaternary age, youthful alluvial fan deposits (alluvium) deposited by the Santa Ana River and tributaries (Morton and Miller, 2006). A map showing the mapped geologic units in the vicinity of the project site is presented as Figure 4, *Regional Geology Map*. These unconsolidated alluvial sediments are comprised of generally flat-lying, non-marine deposits of sand and minor amount of silt (Sprotte et al., 1980; and Morton and Miller, 2006). These sandy deposits are geologically youthful (Holocene age or less than 11,000 years old) and are reported to be greater than 100 feet thick beneath the site (Sprotte et al., 1980; and Real, 1985). Beneath the Holocene-aged sediments are the older semi-consolidated deposits of Pleistocene-age (11,000 to 1.6 million years) which are on the order of approximately 3,000 feet thick beneath the site (Sprotte et al., 1980; and Real, 1985).

2.3 Subsurface Soil Conditions

Based on our subsurface explorations, the site is underlain by a relatively thin veneer of artificial fill materials overlying Quaternary-age young alluvial fan deposits. The stratigraphy of the subsurface soils encountered in the subsurface explorations is presented in the boring and CPT logs (Appendix A), and a general description of the earth materials as encountered are described below:

Artificial Fill: The existing near-surface artificial fill soils encountered in our exploratory boring (LB-1) are on the order of approximately 3 feet at the explored location and consist primarily of olive brown, dry to slightly moist, silt. Localized thicker accumulations of fill materials should be anticipated during future earthwork construction. The existing artificial fill materials encountered at the site are likely associated with the existing improvements and initial development of the site. However, records documenting observation and testing during fill placement were not available for review.

Quaternary Age Young Alluvial Fan Deposits: The Quaternary age young alluvial fan deposits encountered beneath the artificial fill materials in our exploratory boring generally consist of interlayered, grayish brown to olive brown, slightly moist to wet, silty clay, clayey silt, sandy silt, silty sand and sand.

The stratigraphy of the subsurface soils encountered in the soil boring CPT is presented in the boring and CPT logs (Appendix A). The general subsurface conditions across the site are depicted on Figure 3, *Geologic Cross-Sections A-A' and B-B'*.

Based on laboratory testing performed on select soil samples collected from the subsurface explorations, a synopsis of the engineering properties of the site soils is presented in the following table:

Table 1 – Summary of Engineering Properties of Site Soils

Engineering Properties	Descriptions
In-situ Moisture	Moist to very moist for fine-grained soils and slightly moist to moist for granular soils, saturated below 17.5 feet bgs.
Plasticity	Medium
Density	Soft to very stiff for fine-grained soils and loose to medium dense for granular soils.
Swell/Expansion Potential	Susceptible to swell/expansion when subject to change in moisture.
Corrosivity	Not corrosive to concrete and embedded reinforcement but corrosive to ferrous metals.
Strength	Adequate to provide structural support for the proposed improvements.
Compressibility	Not susceptible to settlement under anticipated structural loads.
Collapse Potential	Not susceptible to collapse when subject to change in moisture.

The complete laboratory test results are included in Appendix B.

2.4 Groundwater

Groundwater was encountered during our subsurface exploration at a depth of 18 feet bgs within boring LB-1 excavated at the site. According to groundwater information obtained through the California Geological Survey (CGS) and presented in the Seismic Hazard Zone Report for the Newport Beach Quadrangle (CGS, 1997), the historically shallowest groundwater depth in the vicinity of the project site is between 5 and 10 feet bgs.

Based on the currently proposed development scheme, groundwater is not expected to pose a constraint during and after construction.

Although groundwater is not considered a constraint for the project, localized zones of perched water or elevated moisture in near-surface soils due to nearby landscaping and percolation of stormwater runoff, may be encountered during construction.

3.0 GEOLOGIC/SEISMIC HAZARDS

Geologic and seismic hazards include surface fault rupture, seismic shaking, liquefaction, seismically-induced settlement, lateral spreading, seismically-induced landslides, flooding, seismically-induced flooding, seiches and tsunamis. The following sections discuss these hazards and their potential impact at the project site.

3.1 Surface Fault Rupture

Our review of available in-house literature indicates that no known active faults have been mapped across the site, and the site is not located within a designated Alquist-Priolo Earthquake Fault Zone (CGS, 1986; Bryant and Hart, 2007). Therefore, the potential for surface fault rupture at the site is expected to be low and a surface fault rupture hazard evaluation is not mandated for this site.

The location of the closest active faults to the site was evaluated using the United States Geological Survey (USGS) Earthquake Hazards Program National Seismic Hazard Maps (USGS, 2008c). The closest active faults to the site are the Newport-Inglewood fault zone, San Joaquin Hills fault, and Puente Hills fault, located approximately 2.8 miles, 4.0 miles and 10.3 miles from the site, respectively. The San Joaquin Hills and Puente Hills faults are blind thrust faults that are concealed at depth, without the potential for surface fault rupture. The San Andreas fault, which is the largest active fault in California, is approximately 47 miles northeast of the site. Major regional faults with surface expression in proximity to the site are shown on Figure 5, *Regional Fault and Historic Seismicity Map*).

3.2 Strong Ground Shaking

The site is located within a seismically active region, as is Southern California in general. The intensity of ground shaking at a given location depends primarily upon the earthquake magnitude, the distance from the source, and the site response characteristics. For the purpose of this report, the ground motion at the site due to earthquake shaking was evaluated in terms of the code-based Maximum Considered Earthquake (MCE) response spectrum and the geometric mean Peak Ground Acceleration (PGA_M).

The code-based MCE corresponds to an earthquake with a 2% probability of exceedance in 50 years. The PGA_M for the MCE was calculated at 0.509g using the United States Geological Survey (USGS) web-based Seismic Design Maps



application (USGS, 2008a). By deaggregating the PGA_M with respect to magnitude and distance, the modal earthquake may be assumed to be a magnitude 6.9 earthquake with a distance of approximately 8.2 kilometers (5.1 miles) from the site (USGS, 2008b). The seismicity data are also included in Appendix D.

The MCE ground motion parameters at 5 percent damping are as follows:

Table 2 – 2016 CBC Code-Based Seismic Design Parameters

Categorization/Coefficients	Code-Based
Site Longitude (decimal degrees) West	-117.9932
Site Latitude (decimal degrees) North	33.7252
Site Class	E
Risk Category	III
Mapped Peak Ground Acceleration adjusted for Site Class Effects PGA_M	0.509g
Mapped Spectral Response Acceleration at 0.2s Period, S_s	1.491g
Mapped Spectral Response Acceleration at 1s Period, S_1	0.553g
Seismic Design Category ($S_1 < 0.75g$)	D
Short Period Site Coefficient at 0.2s Period, F_a	0.9
Long Period Site Coefficient at 1s Period, F_v	2.4
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS}	1.342g
Adjusted Spectral Response Acceleration at 1s Period, S_{M1}	1.328g
Design Spectral Response Acceleration at 0.2s Period, S_{DS}	0.895g
Design Spectral Response Acceleration at 1s Period, S_{D1}	0.885g

Based on shear wave velocity recorded in the field, the site is classified as a Site Class E site. Because the fundamental period of the building is expected to be less than 0.5 second, no ground response analysis is required per Section 20.3.1 of ASCE 7-10.

The seismic response spectra parameters were computed per Chapter 11 of ASCE 7-10 using the Seismic Design Map Tool available through the United States Geological Survey (USGS).

No site-specific ground motion analysis is required because structures at the site will be assigned to Seismic Design Category D based on S_1 is less than 0.75g.

3.3 Historical Seismicity

Although Southern California has been seismically active during the past 200 years, written accounts of only the strongest shocks survive the early part of this period. Early descriptions of earthquakes are rarely specific enough to allow an association with any particular fault zone. It is also not possible to precisely locate epicenters of earthquakes that have occurred prior to the twentieth century.

A search of historical earthquakes was performed using the computer program EQ Search (Blake, 2015) for the time period between 1800 and 2015. Within that time frame, 529 earthquakes between magnitude 4.0 and 9.0 were found within a 62-mile (100-kilometer) radius of the site. Of these earthquakes, the closest was an earthquake located approximately 1.8 miles (2.8 kilometers) from the site, and occurred on November 16, 1934 (Appendix D, *Seismicity Data*). Although not precisely located, the epicenter for this earthquake event is located to the north of the project site which registered magnitude 4.0 and induced an estimated peak ground acceleration (PGA) of 0.141g at the project site. The largest PGA at the site is estimated to have been roughly 0.261g from the magnitude 6.3 earthquake that occurred on March 11, 1933. There are records of three earthquakes with a magnitude 7.0 or larger within the search performed, which were all magnitude 7.0 earthquakes that occurred on December 8, 1812, September 24, 1827 and December 16, 1858. For a general view of recorded historical seismic activity see Figure 5, *Regional Fault and Historic Seismicity Map*.

Review of additional data available from the Center for Engineering Strong Motion Data (CESMD) website (<http://strongmotioncenter.org/>) indicates that the highest recorded ground acceleration in the vicinity of the project site was 0.161g for a station located approximately 1.8 miles west of the site. The recorded ground acceleration was from the magnitude 5.4 earthquake that occurred in Chino Hills on July 29, 2008. However, it should be noted that a station closer to the site (less than ½ mile west of the site) recorded a ground acceleration of 0.079 for the same earthquake.

3.4 Liquefaction Potential

The term liquefaction is generally referenced to loss of strength and stiffness in soils due to build-up of pore water pressure when subject to cyclic or monotonic loading. Both sandy and clayey soils are susceptible to loss of strength and stiffness. Because of the difference in strength characteristic and methods for evaluating strength loss potential for granular and clayey soils, the term



liquefaction is used for granular soils while cyclic softening is used for fine-grained soils (i.e. clays and plastic silts).

In general, adverse effects of liquefaction or cyclic softening include excessive ground settlement, loss of bearing support for structural foundations, and seismically induced lateral ground deformations.

As shown on the State of California Seismic Hazard Zones map for the Newport Beach Quadrangle (CGS, 1998), the project site is located within an area that has been identified by the State of California as being potentially susceptible to liquefaction (Figure 6, *Seismic Hazard Map*).

The potential for triggering liquefaction of sandy soils and cyclic softening of clayey soils at the site due to seismic loading was evaluated using the computer software CLiq (v.2.1.6.11 Geologismiki). Analysis of data obtained from the CPT performed at the site indicates multiple layers of soil beneath the site at depths between 6 and 50 feet are susceptible to liquefaction and loss of strength and stiffness when subject to the anticipated level of ground shaking at the site. The summary results are included in Appendix E, *Liquefaction Analysis*.

3.5 Seismically-Induced Settlement

Strong ground motion during earthquakes tends to rearrange looser soils particles into a more compact arrangement, especially in granular soil deposits. The cumulative effects of soil particles rearrangement during earthquake ground shaking will result in settlement. In general, a poorly graded granular deposit is more susceptible to settlement than a finer-grained or well-graded soil, and seismically induced settlement for fine-grained soil is usually less severe than for sandy soils. Using the computer software CLiq, the total seismically-induced settlement of the site soil was estimated to be on the order of 1.5 inches (see Appendix D). The differential settlement may be assumed to be one-half of the total settlement over a horizontal distance of 30 feet.

3.6 Seismically-Induced Lateral Ground Displacements

Results of the liquefaction analysis suggest that the site soils are susceptible to lateral ground displacement. Based on Youd (2011), significant deformation is not likely when the SPT blow count (i.e., N_{160-cs}) is greater than 16. By evaluating the normalized cone tip resistance with depth and converting the resistance to equivalent N_{160-cs} blow counts, liquefaction of site soils between depths of

approximately 12 feet and 40 feet may trigger lateral displacement under the design earthquake. Based on anticipated finish site grade having a ground slope on the order of approximately 0.1 percent, the site may be subjected to lateral ground displacement on the order of 3 inches.

3.7 **Seismically-Induced Landslides**

The potential for seismically induced landsliding is not considered a hazard at the site due to the lack of slopes at the site. In addition, based on the State of California Seismic Hazard Zones Map for the Newport Beach Quadrangle (CGS, 1998), the site is **not** located within an area that has been identified by the State of California as being potentially susceptible to seismically induced landslides (Figure 6, *Seismic Hazard Map*). Proposed slopes, if any, should be engineered and constructed at a gradient of 2:1 (horizontal:vertical) or flatter.

3.8 **Flooding**

According to a Federal Emergency Management Agency (FEMA) flood insurance rate map (FEMA, 2008), the Sun View Elementary School campus is located within a flood hazard area identified as “Zone A”, which is defined as areas of 1% annual chance flood with no base flood elevations determined. As shown on Figure 7, *Flood Hazard Zone Map*, the site is located within a 100-year flood hazard zone.

Earthquake-induced flooding can be caused by failure of dams or other water-retaining structures as a result of earthquakes. The project site is located within a flood impact zone from Prado Dam as indicated on Figure 8, *Dam Inundation Map*. However, due to the location and distance of the site from Prado Dam, the potential for earthquake-induced flooding to occur due to a failure of this dam is considered low. In addition, catastrophic failure of this dam is expected to be a very unlikely event in that dam safety regulations exist and are enforced by the Division of Safety of Dams, Army Corp of Engineers and Department of Water Resources. Inspectors may require dam owners to perform work, maintenance or implement controls if issues are found with the safety of the dam.

3.9 **Seiches and Tsunamis**

Seiches are large waves generated in very large enclosed bodies of water or partially enclosed arms of the sea in response to ground shaking. Tsunamis are

waves generated in large bodies of water by fault displacement or major ground movement. Based on the inland location of the project site and the lack of large enclosed water bodies nearby, seiche and tsunami risks are considered very low.

3.10 Subsidence

Subsidence is sinking of the Earth's surface in response to geologic or man-induced causes. Subsurface solution of limestone during cave formation may lead to a series of subsidence features at the ground surface, which, collectively, are termed karst topography. Since the site is not underlain by limestone, the potential for subsidence to affect the site due to this condition is not a consideration for the project.

4.0 FINDINGS AND CONCLUSIONS

No evidence of adverse geological or geotechnical hazards was noted at the site that will preclude the development of the project. Presented below is a summary of findings based upon the results of our geotechnical evaluation of the site:

- The site is not located in a designated Alquist-Priolo Earthquake Fault Zone. The nearest fault to the site with the potential for ground surface rupture is the Newport-Inglewood fault zone which is located approximately 2.8 miles from the site. The site is expected to experience moderate to strong ground shaking resulting from an earthquake from one of the major regional faults.
- The site is located in a known liquefaction hazard zone as shown on the California Seismic Hazard Zones Map for the Newport Beach Quadrangle. The impact of soil liquefaction at the site will consist of settlement and lateral spread displacement. Analysis of data obtained from our CPT indicates that the seismically-induced settlement potential is anticipated to be on the order of 1.5 inches and the lateral ground displacement potential is on the order of 3 inches.
- The site is not located within an area shown as susceptible to seismically-induced landslides as shown on the California Seismic Hazard Zones Map for the Newport Beach Quadrangle; therefore, the potential for these hazards to occur at the site is negligible.
- The onsite undisturbed soils should exhibit adequate strength when subjected to the anticipated loading of the proposed improvements.
- Based on field observations, the near surface onsite soils exhibit expansion potential when subjected to an increase in moisture.
- Concrete in contact with the near surface onsite soil is expected to have moderate exposure to water-soluble sulfates and low exposure to chloride in the soil. The onsite soil is considered corrosive to ferrous metal.
- The subsurface soils are anticipated to be readily excavated using conventional earthmoving equipment in good working condition.

5.0 DESIGN RECOMMENDATIONS

Geotechnical recommendations for the proposed development are presented in the following sections and are intended to provide sufficient geotechnical information to develop the project in general accordance with 2016 CBC requirements. The following recommendations may be superseded by more restrictive requirements of the architect, structural engineer, and local governing agencies.

The geotechnical consultant should review the grading plan, foundation plan and specifications as they become available to verify that the recommendations presented in this report have been incorporated into the plans prepared for the project.

5.1 Earthwork

We recommend all earthwork for the project be performed in accordance with the following recommendations. The General Earthwork and Grading Specifications included in Appendix F may be used as guidelines to develop the project specifications. In case of conflict the following recommendations shall supersede those provided in Appendix F.

5.1.1 Site Preparation

Prior to construction, the project areas planned for new improvements should be cleared of any existing improvements, vegetation, trash and debris, which should be properly disposed of offsite. Efforts should be made to remove or reroute any existing utility lines that interfere the proposed construction. Any resulting cavities should be properly backfilled and compacted.

5.1.2 Site Grading

A majority of the project area is covered with artificial fill (encountered up to approximately 3 feet bgs at boring location LB-1). Localized thicker accumulations of undocumented fill materials should be anticipated during future earthwork construction. To ensure removal of unsuitable materials and provide a greater uniformity in foundation support under the proposed improvements, it is recommended that all existing fill should be removed to expose suitable native soils and replaced as engineered fill. Removals should be performed such that a minimum of 1 foot of engineered fill is established below the bottom of all new foundations. Where feasible,

overexcavation and recompaction should extend a minimum horizontal distance of 1 foot from the edges of the foundations (i.e., a 1:1 projection line down from the bottom edges of the foundations).

Leighton should verify the vertical and lateral removal limits during grading as local conditions may require additional removals (i.e., encountering additional undocumented fill or other deleterious materials).

Subgrade Preparation: After completion of the overexcavations and prior to fill placement, the exposed soils should be scarified to a minimum depth of 4 inches, moisture conditioned to within 2 percentage points of the optimum moisture content and compacted to at least 90 percent relative compaction based on ASTM Test Method D 1557. Any soft or unsuitable earth materials encountered at the bottom of the excavations should be removed and replaced with compacted fill.

Fill Placement: The onsite soils, less any deleterious material (construction debris) or organic matter, can be used in required fills. Oversized material greater than 6 inches in maximum dimension should not be placed in the fill. Any soil to be placed as fill, whether onsite soils or imported material, should be reviewed and possibly tested by Leighton.

All fill soils should be placed in loose lifts not exceeding 8 inches, moisture-conditioned to within 2 percentage points of the optimum moisture content, and compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM Test Method D 1557. The optimum lift thickness to produce a uniformly compacted fill will depend on the type and size of compaction equipment used.

Any required import material should consist of non-corrosive and predominantly granular soils with an Expansion Index (EI) of 20 or less. The imported materials should contain sufficient fines (binder material) so as to result in a stable subgrade when compacted. All proposed import materials should be approved by the geotechnical engineer of record prior to being transported to the site.

Shrinkage and Bulking: The change in volume of excavated and recompacted soil varies according to soil type and location. This volume change is represented as a percentage increase (bulking) or decrease (shrinkage) in volume of fill after removal and recompaction. Field and

laboratory data used in our calculations included laboratory-measured maximum dry density for the general soil type encountered at the subject site, the measured in-place densities of near surface soils encountered and our experience. We preliminarily estimate the onsite undocumented fill and alluvial materials requiring removal and recompaction will have a shrinkage factor of approximately 10 percent during grading.

The level of fill compaction, variations in the dry density of the existing soils and other factors influence the amount of volume change. Some adjustments to earthwork volume should be anticipated during grading of the site.

5.2 Foundation Recommendations

Conventional shallow foundations will be used to support the planned relocatable 84'x40' building. Overexcavation and recompaction of the footing subgrade soil should be performed as detailed in Section 5.1. Foundation design recommendations are presented as follows:

Conventional Shallow Foundations

A conventional shallow foundation system consisting of isolated column and continuous strip footings may be used to support new structures onsite. The foundation design recommendations for working stress design are as follows:

Table 3 – Foundation Design Recommendations

	Isolated Column Foundations	Continuous Strip Foundations
Width	2 feet	1 foot
Embedment	2.0 feet	
Sustained Dead plus Live Loads		
Bearing Pressure	2,000 pounds per square foot (psf). May be increased by 250 psf per foot increase in width to a maximum of 2,800 psf and 3,000 psf for strip and isolated column footings, respectively.	
Frictional Resistance	0.4	
Passive Resistance	270 pounds per cubic foot (pcf) Maximum 3,000 psf	
Short-term Loads (i.e., Seismic and Wind)		
Bearing pressure, friction, and passive resistance can be increased by one-third for short-term loading. The passive resistance should be reduced by one-third when combined with frictional resistance to calculate total resistance where seismically induced lateral displacement potential does not exist.		

5.3 **Trench Backfill**

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1.2 and 306-1.3 of the Standard Specifications for Public Works Construction, ("Greenbook"), Latest Edition. Utility trenches can be backfilled with onsite material free of rubble, debris, organic and oversized material up to 3 inches in largest dimension. Prior to backfilling trenches, pipes should be bedded in and covered with either:

- (1) **Granular Bedding:** 1) ½-inch open grade aggregate or 2) a uniform sand material with a Sand Equivalent (SE) greater-than-or-equal-to 30, passing the No. 4 U.S. Standard Sieve (or as specified by the pipe manufacturer), water densified in place, or
- (2) **CLSM:** Controlled Low Strength Material (CLSM) conforming to Section 201-6 of the *Standard Specifications for Public Works Construction*, ("Greenbook"), latest Edition.

Pipe bedding should extend at least 4 inches below the pipeline invert and at least 12 inches over the top of the pipeline. Native and clean fill soils can be used as backfill over the pipe bedding zone, and should be placed in thin lifts, moisture conditioned above optimum, and mechanically compacted to at least 95 percent relative compaction, relative to the ASTM D1557 laboratory maximum density.

5.4 **Surface Drainage**

Positive drainage of surface water away from structures is very important. Water should not be allowed to pond adjacent to buildings. Positive drainage may be accomplished by providing drainage away from buildings a minimum of 2 percent for earthen surfaces for a lateral distance of at least five feet and further maintained by a swale or drainage path at a gradient of at least 1 percent. Where necessary, drainage paths may be shortened by the use of area drains and collector pipes. Eave gutters are recommended and should reduce water infiltration into the subgrade materials. Downspouts should be connected to appropriate outlet devices.

Irrigation of landscaping should be controlled to maintain, as much as possible, consistent moisture content sufficient to provide healthy plant growth without over watering.

5.5 Corrosion Protection Measures

A representative bulk soil sample was tested to evaluate corrosion potential to buried concrete (e.g., footings, retaining walls). The chemical analysis test results are summarized in the table below.

Table 4 – Chemical Analysis Test Results

Test Parameter	Test Results	Corrosion Potential Classification
	Borings LB-1 at 0' to 5'	
Water-Soluble Sulfate in Soil (ppm)	1,109	Corrosive to buried concrete
Water-Soluble Chloride in Soil (ppm)	362	Non-corrosive to embedded steel
pH	8.15	Slightly alkaline
Minimum Resistivity (saturated, ohm-cm)	453	Corrosive to buried metals

Based on the results of laboratory testing, common Type II cement may be used for concrete construction onsite. However, concrete exposed to recycled water should be designed using Type V cement.

Based on our laboratory testing, the onsite soil is considered corrosive to ferrous metals. A registered corrosion engineer should be consulted for mitigation measures if necessary.

5.6 Additional Geotechnical Services

The geotechnical recommendations presented in this report are based on subsurface conditions as interpreted from limited subsurface explorations, limited laboratory testing and information available at the time the report is prepared. Additional geotechnical investigation and analysis may be required based on final improvement plans. Leighton should review the site and grading plans when available and comment further on the geotechnical aspects of the project. Geotechnical observation and testing should be conducted during excavation and all phases of grading operations. Our conclusions and recommendations should be reviewed and verified by Leighton during construction and revised accordingly if geotechnical conditions encountered vary from our preliminary findings and interpretations.

Geotechnical observation and testing should be provided during the following activities:

- Grading and excavation of the site;
- During overexcavation of compressible soil;
- Subgrade preparation;
- Compaction of all fill materials;
- Utility trench backfilling and compaction;
- Footing excavation;
- Placement of asphalt concrete and/or concrete; and
- When any unusual conditions are encountered.

6.0 LIMITATIONS

This report was based solely on data obtained from a limited number of geotechnical explorations, soil samples and tests. Such information is, by necessity, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report are only valid if Leighton has the opportunity to observe subsurface conditions during grading and construction, to confirm that our preliminary data are representative for the site. Leighton should also review the construction plans and project specifications, when available, to comment on the geotechnical aspects.

This report was prepared using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. The findings, conclusion, and recommendations included in this report are considered preliminary and are subject to verification. We do not make any warranty, either expressed or implied.

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Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

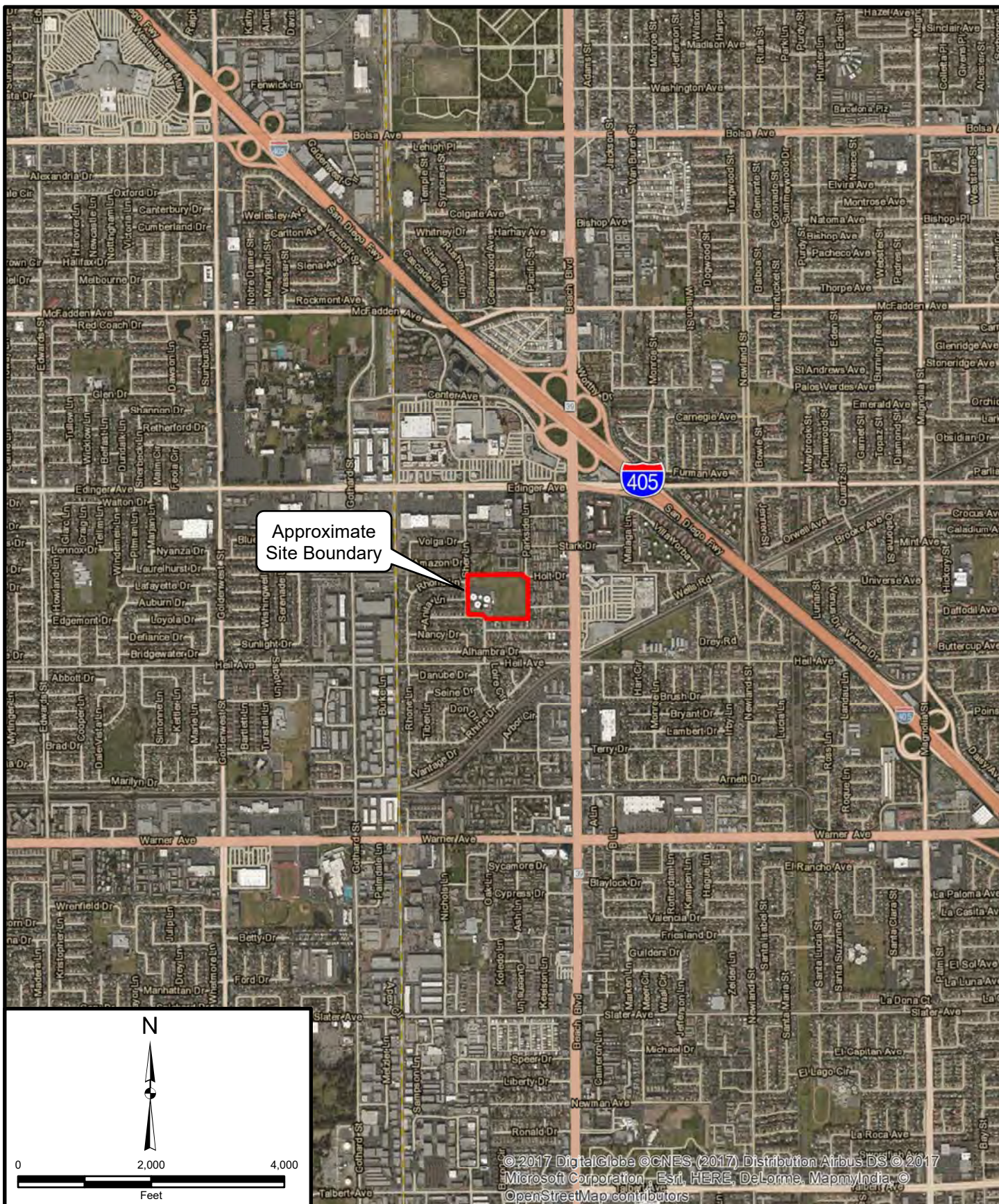
Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



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Project: 11766.002	Eng/Geol: VPI/JMP
Scale: 1" = 2,000'	Date: October 2017
Base Map: ESRI ArcGIS Online 2017 Thematic Information: Leighton Author: Leighton Geomatics (btran)	

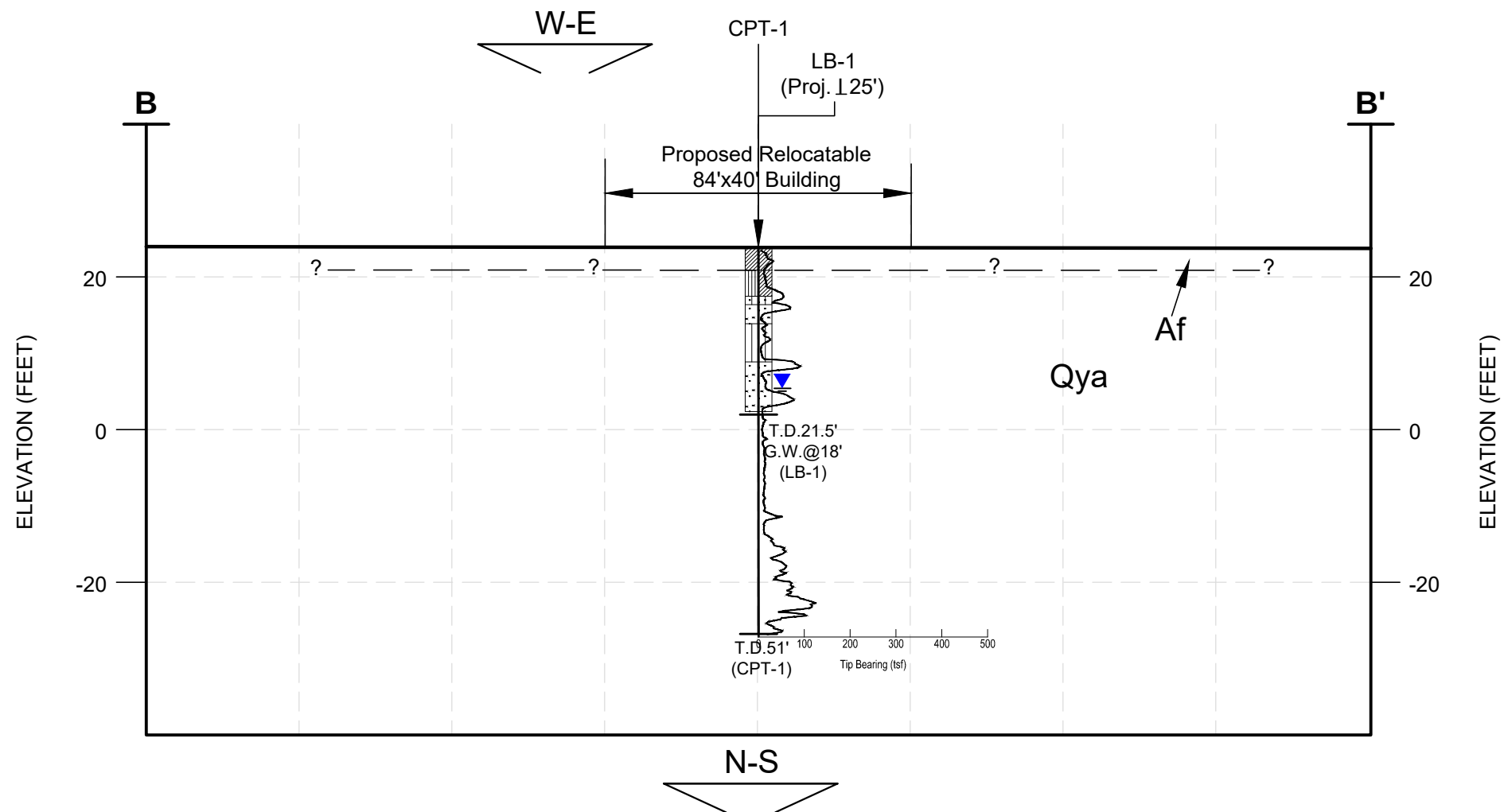
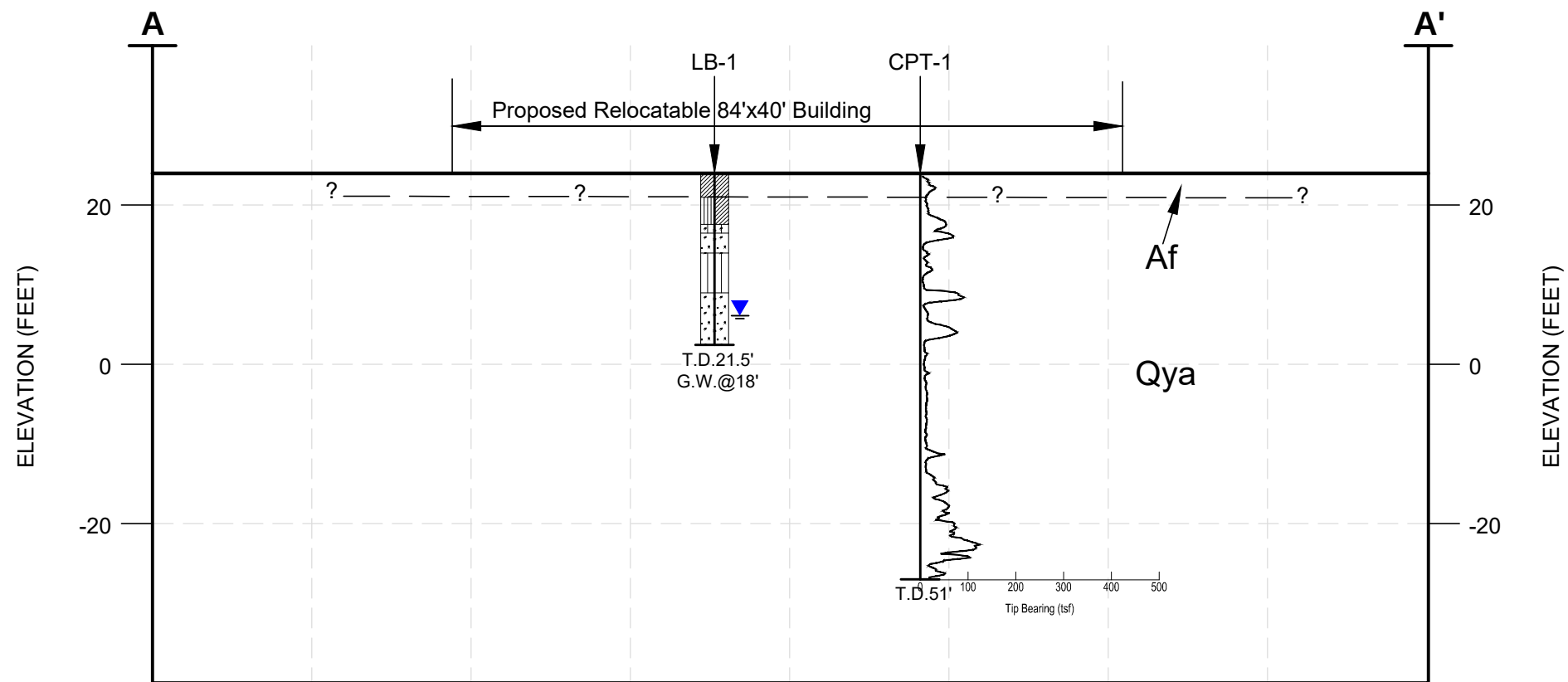
SITE LOCATION MAP

Sun View Elementary School
7721 Juliet Low Drive
Huntington Beach, California

Figure 1



Leighton



LEGEND

Af Artificial fill

Qya Quaternary age young alluvium

USCS Boring Graphics

-  CLAY (CL)
-  SILT (ML)
-  Silty CLAY (CL-ML)
-  Silty SAND (SM)
-  SAND (SP)

Tsf - Tons per square foot (CPT data)

GEOLOGIC CROSS SECTION A-A' AND B-B'

Sun View Elementary School
7721 Juliet Low Drive, Huntington Beach, California

Proj: 11766.002

Eng/Geol: VPI/JMP

Scale: 1"=20'

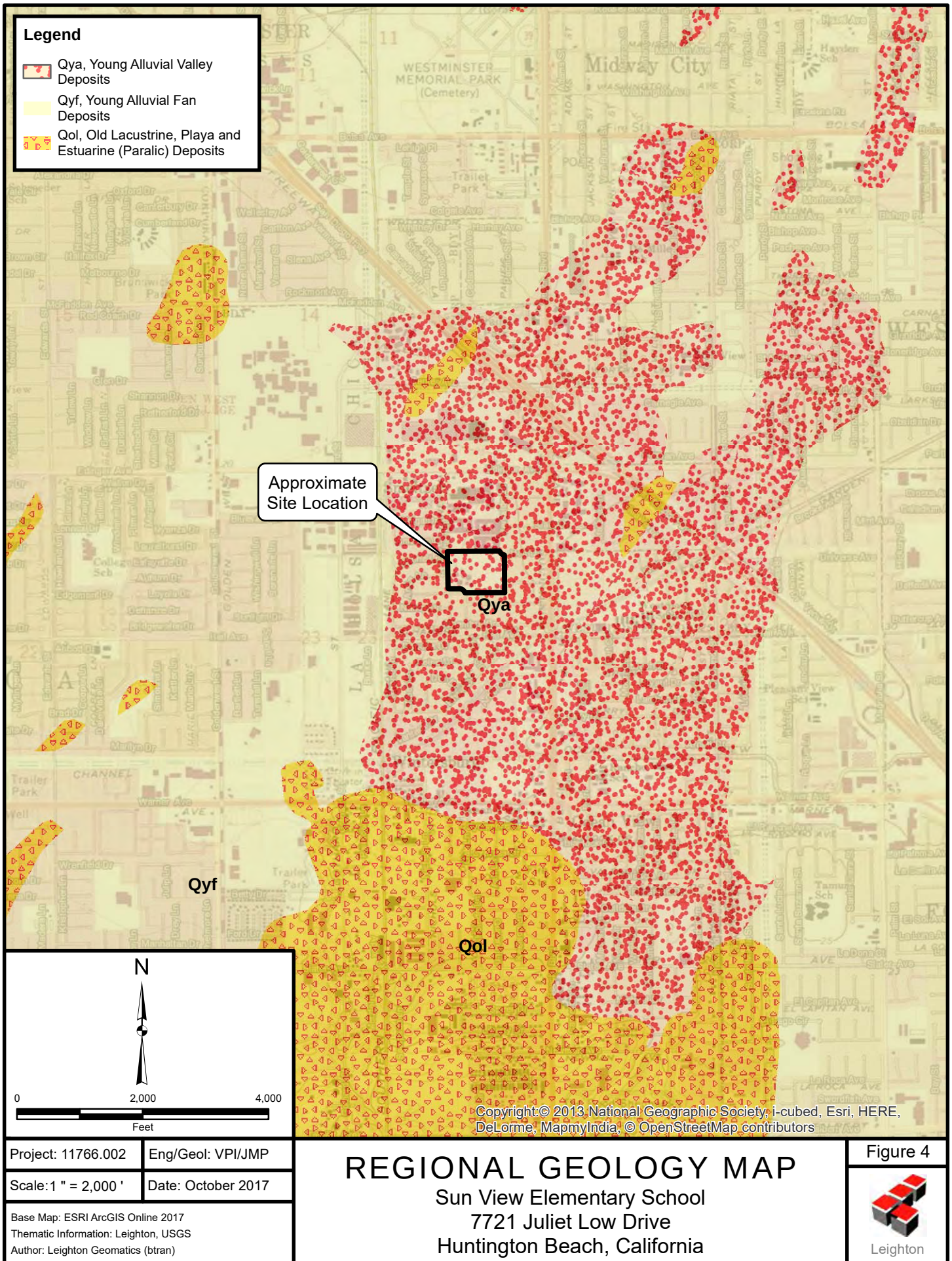
Date: October 2017

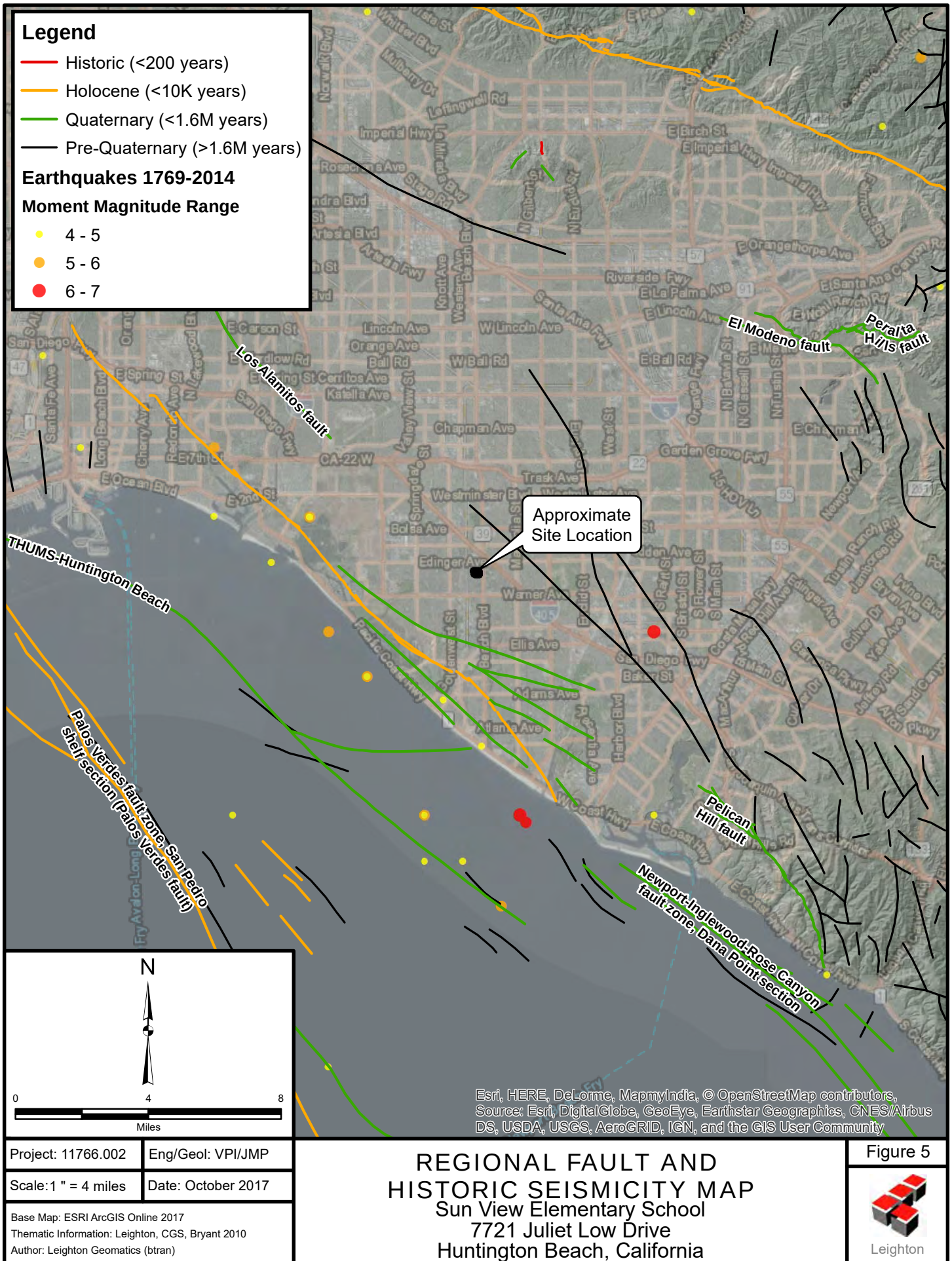
Drafted By: BOT Checked By: BOT V:\DRAFTING\11766\002\CAD\2017-10-25\11766-002_F03_CS_2017-10-31.DWG (10-31-17 9:26:26AM) Plotted by: stan

Figure 3



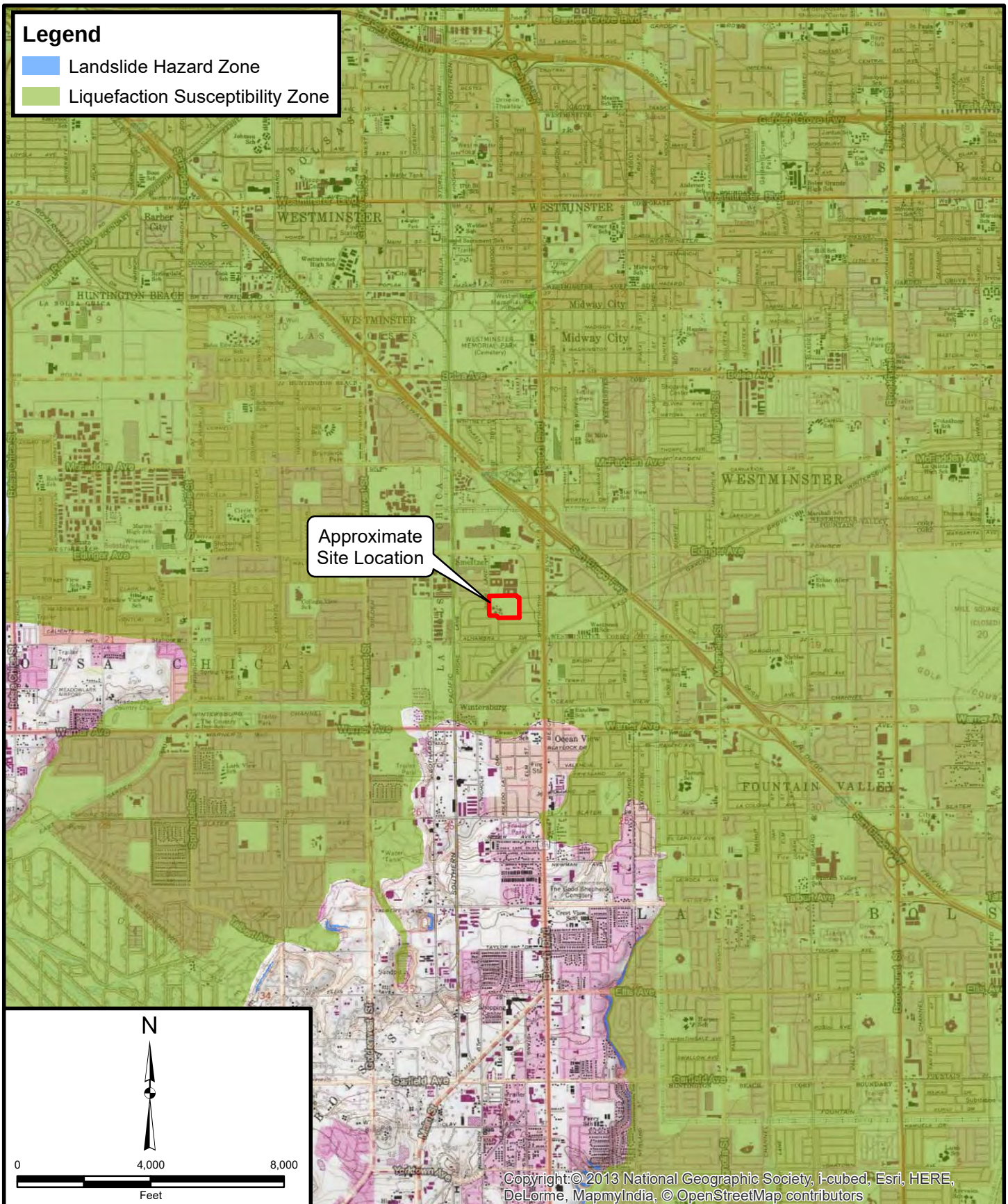
Leighton





Legend

- Landslide Hazard Zone
- Liquefaction Susceptibility Zone



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Project: 11766.002 Eng/Geol: VPI/JMP

Scale: 1" = 4,000' Date: October 2017

Base Map: ESRI ArcGIS Online 2017
Thematic Information: Leighton, CGS
Author: Leighton Geomatics (btran)

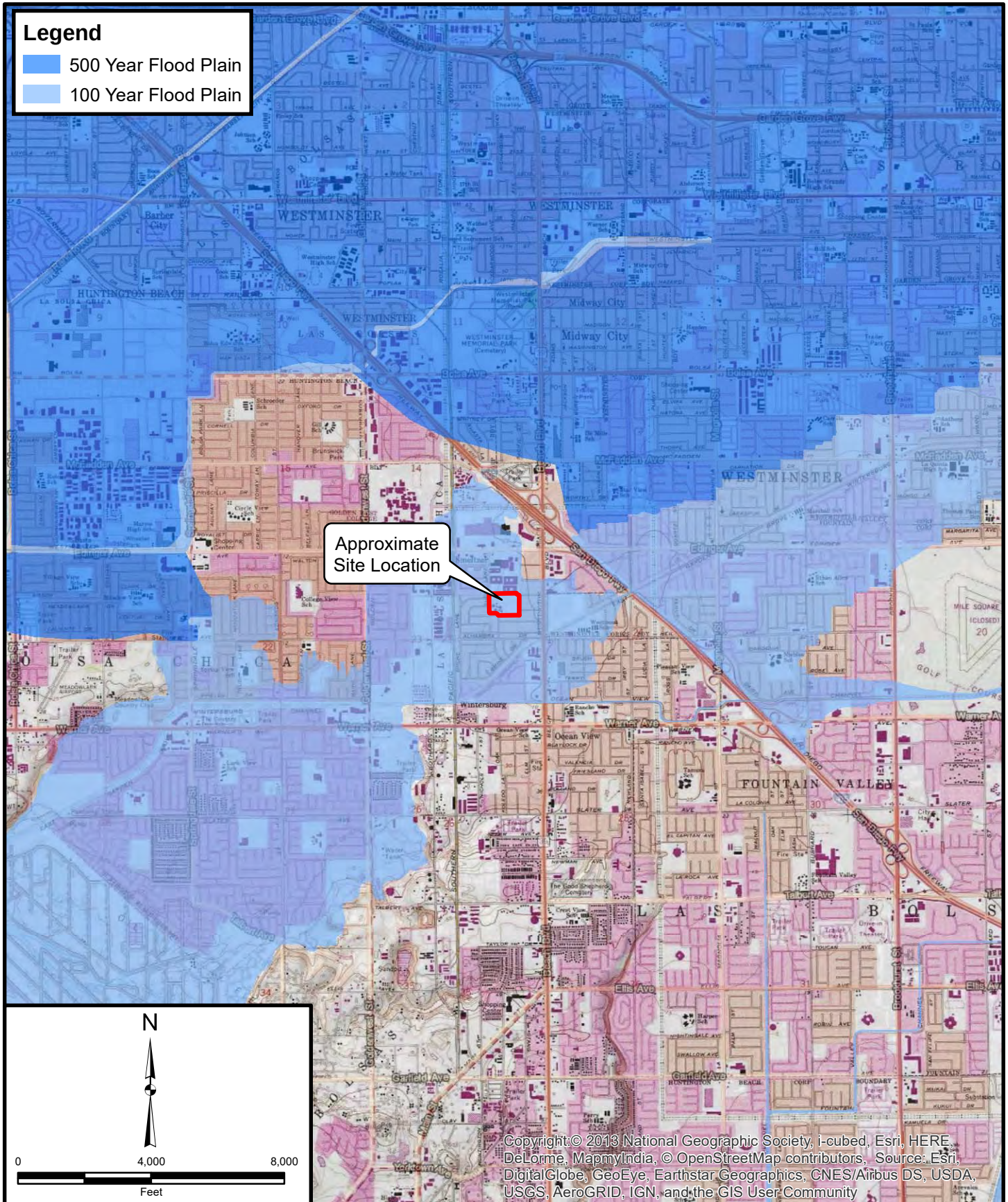
SEISMIC HAZARD MAP

Sun View Elementary School
7721 Juliet Low Drive
Huntington Beach, California

Figure 6



Leighton

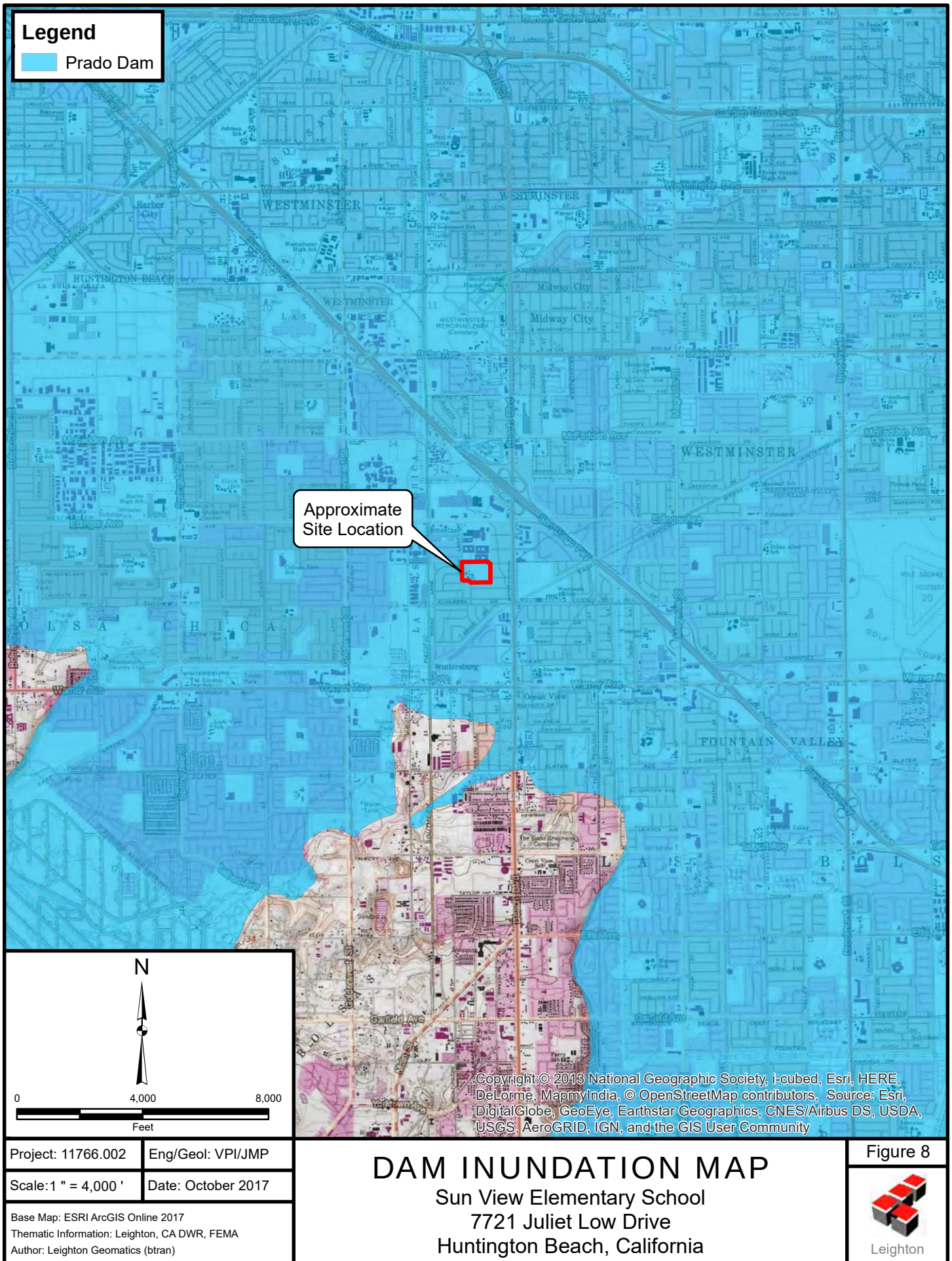


Project: 11766.002	Eng/Geol: VPI/JMP
Scale: 1" = 4,000'	Date: October 2017
Base Map: ESRI ArcGIS Online 2017 Thematic Information: Leighton, CA DWR, FEMA Author: Leighton Geomatics (btran)	

FLOOD HAZARD ZONE MAP
 Sun View Elementary School
 7721 Juliet Low Drive
 Huntington Beach, California

Figure 7

Leighton



APPENDIX A

Field Exploration Logs (Current Study)



Leighton

GEOTECHNICAL BORING LOG LB-1

Project No. 11766.002
Project SunView Elementary School
Drilling Co. Martini Drilling
Drilling Method Hollow Stem Auger - 140lb - Autohammer - 30" Drop
Location See Figure 2- Exploration Location Map

Date Drilled 10-14-17
Logged By SAM
Hole Diameter 8"
Ground Elevation 24'
Sampled By SAM

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							<i>This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.</i>	
	0			BB-1			19	CL	@Surface: Grass Artificial Fill (Af): @0': CLAY with sand, olive brown, slightly moist to dry, fine sand, some roots and organics	
	20							CL/ML	Quaternary Young Alluvium (Qya): @3': Silty CLAY to Clayey SILT, dark grayish brown, slightly moist, some CaCO ₃ deposits	
	5			R1	7 11 15	99	26		@5': Sandy Clay to Sandy SILT, dark grayish brown, very stiff, slightly moist, fine sand, some mica	
				S1	3 4 4			SM SP	@6.4': Silty SAND, dark yellowish brown, medium dense, slightly moist, fine sand, some mica (at bottom of sample in sampler shoe) @7.5': SAND, yellow brown, loose, moist, fine sand, some mica	
	15									
	10			R2	2 3 4			ML	@10': SILT, olive gray, mottled, medium stiff, moist to very moist, slight oxidation staining, some mica	
				S2	Push 1 1				@12.5': oxidation increases with depth, very soft, pinholes, organic layer @13.7': black with shiny/greasy texture, mild organic odor	
	10									
	15			R3	1 6 9			SP	@15': SAND, yellow brown, loose, moist, fine sand, grades to fine to medium sand with depth, some mica	
				S3	Push 2 3				@17.5': Saturated @18': Groundwater encountered @0730 hours	
	5									
	20			R4	5 8 9				@20': Medium dense, wet, fine sand	
	0								Total Depth of Boring: 21.5 feet bgs Groundwater encountered @18 feet bgs @0730 hours Boring backfilled with soil cuttings upon completion of drilling	
	25									
	-5									
	30									

SAMPLE TYPES:

B BULK SAMPLE
 C CORE SAMPLE
 G GRAB SAMPLE
 R RING SAMPLE
 S SPLIT SPOON SAMPLE
 T TUBE SAMPLE

TYPE OF TESTS:

-200 % FINES PASSING
 AL ATTERBERG LIMITS
 CN CONSOLIDATION
 CO COLLAPSE
 CR CORROSION
 CU UNDRAINED TRIAXIAL

DS DIRECT SHEAR
 EI EXPANSION INDEX
 H HYDROMETER
 MD MAXIMUM DENSITY
 PP POCKET PENETROMETER
 RV R VALUE

SA SIEVE ANALYSIS
 SE SAND EQUIVALENT
 SG SPECIFIC GRAVITY
 UC UNCONFINED COMPRESSIVE STRENGTH





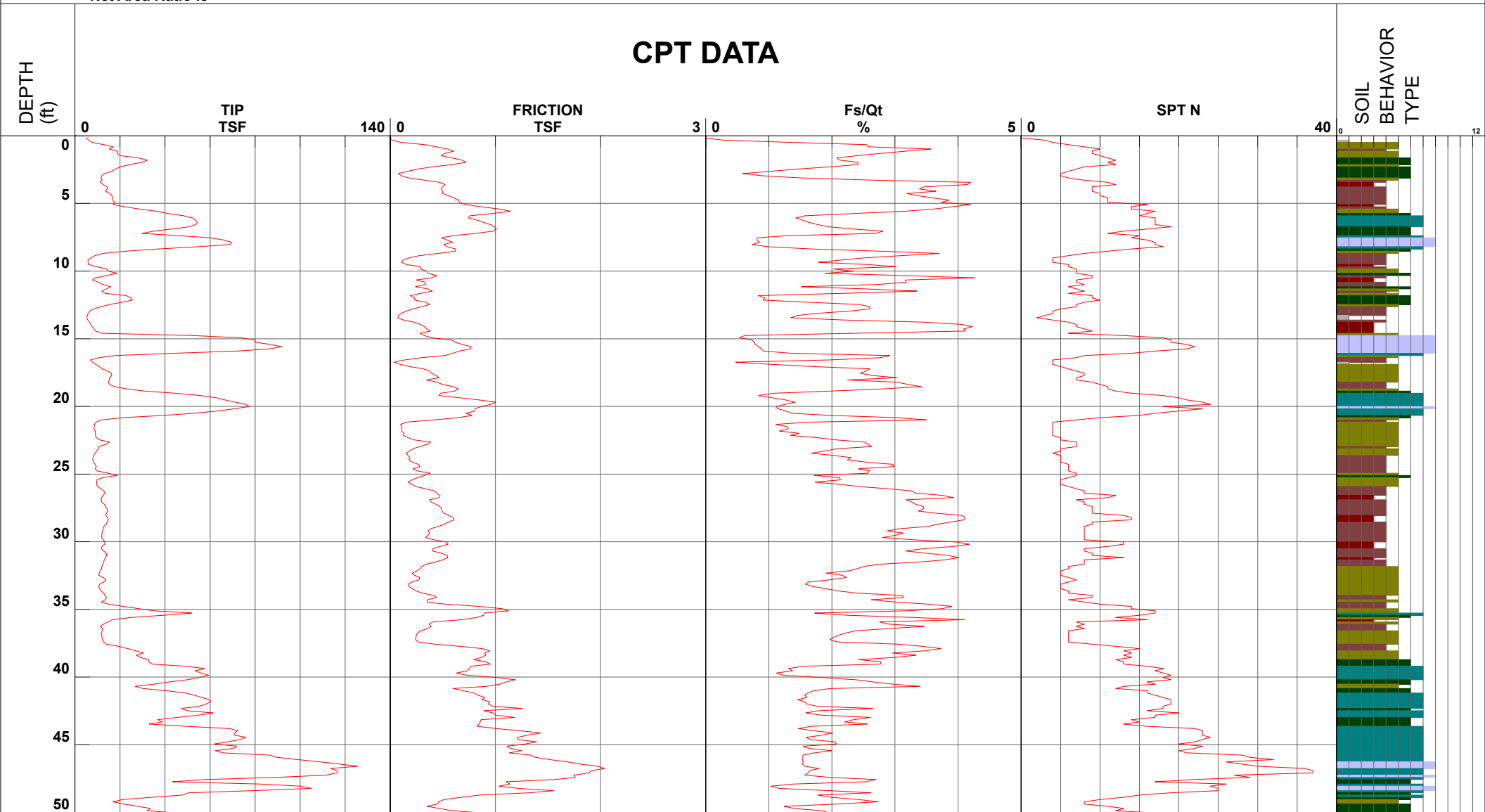
Leighton

Project Sun View Elementary
Job Number 11766.002
Hole Number CPT-01
EST GW Depth During Test

Operator RC AS
Cone Number DDG1281
Date and Time 10/14/2017 7:32:34 AM
10.00 ft

Filename SDF(104).cpt
GPS
Maximum Depth 51.02 ft

Net Area Ratio .8



- | | | | |
|------------------------------|---------------------------------|--------------------------------|------------------------------------|
| ■ 1 - sensitive fine grained | ■ 4 - silty clay to clay | ■ 7 - silty sand to sandy silt | ■ 10 - gravelly sand to sand |
| ■ 2 - organic material | ■ 5 - clayey silt to silty clay | ■ 8 - sand to silty sand | ■ 11 - very stiff fine grained (*) |
| ■ 3 - clay | ■ 6 - sandy silt to clayey silt | ■ 9 - sand | ■ 12 - sand to clayey sand (*) |

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

Sun View Elementary

Project ID: Leighton
Data File: SDF(104).cpt
CPT Date: 10/14/2017 7:32:34 AM
GW During Test: 10 ft

Page: 1
Sounding ID: CPT-01
Project No: 11766.002
Cone/Rig: DDG1281

Depth ft	qc PS tsf	qc1n PS tsf	q1ncs PS tsf	qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N1 60%	SPT R-N 60%	SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	Und Shr %	OCR -	* Fin Ic %	* Ic SBT Indx	* Nk -
0.33	6.2	10.0	30.9	6.2	0.0	0.0	0.3	silty SAND to silty CLAY	120	3.0	3	2	2	5	46	-	-	33	2.56	16
0.49	7.5	12.0	-	7.5	0.1	-0.1	1.4	clayey SILT to silty CLAY	115	2.0	6	4	3	-	-	0.5	9.9	43	2.75	15
0.66	12.9	20.6	-	12.9	0.3	0.3	2.6	clayey SILT to silty CLAY	115	2.0	10	6	6	-	-	0.9	9.9	41	2.70	15
0.82	16.9	27.1	-	16.9	0.4	-0.2	2.6	clayey SILT to silty CLAY	115	2.0	14	8	7	-	-	1.2	9.9	36	2.61	15
0.98	15.3	24.5	-	15.3	0.5	-0.2	3.6	clayey SILT to silty CLAY	115	2.0	12	8	7	-	-	1.1	9.9	42	2.74	15
1.15	19.1	30.6	-	19.1	0.6	0.0	3.2	clayey SILT to silty CLAY	115	2.0	15	10	8	-	-	1.3	9.9	37	2.63	15
1.31	18.8	30.1	99.5	18.8	0.5	-0.1	2.8	clayey SILT to silty CLAY	115	2.0	15	9	8	-	-	1.3	9.9	35	2.60	15
1.48	20.2	32.4	95.1	20.2	0.5	0.0	2.4	clayey SILT to silty CLAY	115	2.0	16	10	8	-	-	1.4	9.9	32	2.53	15
1.64	28.3	45.4	101.2	28.3	0.6	-0.2	2.1	silty SAND to sandy SILT	120	3.0	15	9	10	41	46	-	-	26	2.38	16
1.80	32.1	51.5	108.1	32.1	0.7	-0.1	2.1	silty SAND to sandy SILT	120	3.0	17	11	12	45	46	-	-	24	2.34	16
1.97	29.9	47.9	111.7	29.9	0.7	-0.2	2.4	silty SAND to sandy SILT	120	3.0	16	10	11	43	45	-	-	27	2.41	16
2.13	24.4	39.1	102.7	24.4	0.6	-0.3	2.4	silty SAND to sandy SILT	120	3.0	13	8	9	36	44	-	-	29	2.47	16
2.30	20.2	32.4	86.9	20.2	0.4	-0.3	2.0	silty SAND to sandy SILT	120	3.0	11	7	8	30	43	-	-	30	2.48	16
2.46	18.0	28.9	72.1	18.0	0.3	-0.3	1.5	silty SAND to sandy SILT	120	3.0	10	6	7	26	42	-	-	28	2.44	16
2.62	16.2	26.1	60.1	16.2	0.2	-0.3	1.0	silty SAND to sandy SILT	120	3.0	9	5	6	23	41	-	-	26	2.40	16
2.79	13.2	21.1	46.3	13.2	0.1	-0.2	0.6	silty SAND to sandy SILT	120	3.0	7	4	5	16	39	-	-	25	2.37	16
2.95	11.9	19.1	51.8	11.9	0.1	-0.2	0.9	silty SAND to sandy SILT	120	3.0	6	4	5	12	38	-	-	30	2.49	16
3.12	11.5	18.5	-	11.5	0.2	-0.2	1.5	clayey SILT to silty CLAY	115	2.0	9	6	5	-	-	0.8	9.9	36	2.62	15
3.28	12.1	19.4	-	12.1	0.3	-0.2	2.7	clayey SILT to silty CLAY	115	2.0	10	6	5	-	-	0.8	9.9	43	2.74	15
3.45	11.2	18.0	-	11.2	0.5	-0.1	4.3	silty CLAY to CLAY	115	1.5	12	7	5	-	-	0.8	9.9	52	2.89	15
3.61	12.6	20.2	-	12.6	0.5	-0.2	4.2	silty CLAY to CLAY	115	1.5	13	8	6	-	-	0.9	9.9	49	2.85	15
3.77	14.4	23.0	-	14.4	0.5	-0.3	3.5	clayey SILT to silty CLAY	115	2.0	12	7	6	-	-	1.0	9.9	43	2.75	15
3.94	14.3	23.0	-	14.3	0.5	-0.2	3.4	clayey SILT to silty CLAY	115	2.0	11	7	6	-	-	1.0	9.9	43	2.75	15
4.10	13.6	21.8	-	13.6	0.5	-0.1	3.7	silty CLAY to CLAY	115	1.5	15	9	6	-	-	0.9	9.9	45	2.79	15
4.27	15.6	25.1	-	15.6	0.5	-0.2	3.2	clayey SILT to silty CLAY	115	2.0	13	8	7	-	-	1.1	9.9	41	2.70	15
4.43	16.3	26.2	-	16.3	0.5	-0.2	3.4	clayey SILT to silty CLAY	115	2.0	13	8	7	-	-	1.1	9.9	41	2.70	15
4.59	16.9	27.1	-	16.9	0.6	-0.2	3.7	clayey SILT to silty CLAY	115	2.0	14	8	7	-	-	1.2	9.9	41	2.71	15
4.76	16.8	27.0	-	16.8	0.7	-0.2	3.9	clayey SILT to silty CLAY	115	2.0	14	8	7	-	-	1.2	9.9	42	2.73	15
4.92	17.6	28.2	-	17.6	0.7	-0.2	3.8	clayey SILT to silty CLAY	115	2.0	14	9	8	-	-	1.2	9.9	41	2.71	15
5.09	17.0	27.3	-	17.0	0.7	-0.3	4.3	silty CLAY to CLAY	115	1.5	18	11	8	-	-	1.2	9.9	43	2.76	15
5.25	21.9	35.2	-	21.9	0.9	-0.3	4.0	clayey SILT to silty CLAY	115	2.0	18	11	9	-	-	1.5	9.9	38	2.65	15
5.41	28.6	45.9	137.6	28.6	1.0	-0.3	3.7	clayey SILT to silty CLAY	115	2.0	23	14	11	-	-	2.0	9.9	33	2.54	15
5.58	36.2	58.0	141.0	36.2	1.1	-1.7	3.2	clayey SILT to silty CLAY	115	2.0	29	18	14	-	-	2.5	9.9	28	2.43	15
5.74	41.3	66.2	128.4	41.2	1.0	-3.3	2.4	silty SAND to sandy SILT	120	3.0	22	14	15	53	42	-	-	22	2.30	16
5.91	48.2	77.3	116.6	48.2	0.8	-1.0	1.6	silty SAND to sandy SILT	120	3.0	26	16	16	59	42	-	-	17	2.13	16
6.07	52.1	83.5	117.8	52.1	0.7	-0.8	1.4	silty SAND to sandy SILT	120	3.0	28	17	17	61	43	-	-	15	2.07	16
6.23	53.6	86.0	123.1	53.6	0.8	-0.8	1.5	silty SAND to sandy SILT	120	3.0	29	18	17	62	43	-	-	15	2.09	16
6.40	54.3	86.2	126.1	54.3	0.9	-0.8	1.6	silty SAND to sandy SILT	120	3.0	29	18	18	62	42	-	-	16	2.10	16
6.56	53.7	84.2	128.1	53.7	0.9	-0.9	1.8	silty SAND to sandy SILT	120	3.0	28	18	17	61	42	-	-	17	2.14	16
6.73	50.7	78.5	128.3	50.7	1.0	-1.6	2.0	silty SAND to sandy SILT	120	3.0	26	17	17	59	42	-	-	19	2.19	16
6.89	43.1	65.9	127.9	43.0	1.0	-2.4	2.4	silty SAND to sandy SILT	120	3.0	22	14	15	53	41	-	-	22	2.30	16
7.05	34.8	52.6	127.0	34.7	1.0	-4.0	2.8	clayey SILT to silty CLAY	115	2.0	26	17	12	-	-	2.4	9.9	27	2.42	15
7.22	29.9	44.6	116.4	29.8	0.8	-6.5	2.7	clayey SILT to silty CLAY	115	2.0	22	15	11	-	-	2.1	9.9	29	2.47	15
7.38	46.3	68.4	101.3	46.3	0.6	-1.5	1.3	silty SAND to sandy SILT	120	3.0	23	15	14	54	41	-	-	16	2.11	16
7.55	60.0	87.6	104.5	60.0	0.5	-0.9	0.8	clean SAND to silty SAND	125	5.0	18	12	17	63	42	-	-	11	1.90	16
7.71	66.2	95.6	111.4	66.2	0.5	-1.0	0.8	clean SAND to silty SAND	125	5.0	19	13	18	66	42	-	-	10	1.87	16
7.87	69.5	99.2	115.6	69.4	0.6	-1.0	0.9	clean SAND to silty SAND	125	5.0	20	14	19	67	43	-	-	10	1.87	16
8.04	69.0	95.7	110.9	69.0	0.5	-1.3	0.7	clean SAND to silty SAND	125	5.0	19	14	18	66	42	-	-	9	1.84	16
8.20	55.1	76.9	99.9	55.0	0.5	-1.2	1.0	clean SAND to silty SAND	125	5.0	15	11	15	58	41	-	-	13	2.00	16
8.37	37.3	51.6	97.4	37.3	0.6	-1.1	1.7	silty SAND to sandy SILT	120	3.0	17	12	11	45	39	-	-	22	2.28	16
8.53	22.5	30.8	102.2	22.5	0.6	-0.9	2.8	clayey SILT to silty CLAY	115	2.0	15	11	8	-	-	1.6	9.9	35	2.60	15
8.69	12.3	19.7	-	12.3	0.5	-1.8	3.9	silty CLAY to CLAY	115	1.5	13	8	6	-	-	0.8	7.6	48	2.84	15
8.86	8.9	14.2	-	8.9	0.3	-1.5	3.3	silty CLAY to CLAY	115	1.5	9	6	4	-	-	0.6	5.3	53	2.92	15
9.02	7.0	11.3	-	7.0	0.2	-1.9	2.7	silty CLAY to CLAY	115	1.5	8	5	4	-	-	0.5	4.0	56	2.96	15
9.19	5.8	9.3	-	5.8	0.1	-1.6	2.4	silty CLAY to CLAY	115	1.5	6	4	3	-	-	0.4	3.2	59	3.00	15
9.35	5.8	9.4	-	5.8	0.1	-1.1	2.0	silty CLAY to CLAY	115	1.5	6	4	3	-	-	0.4	3.2	56	2.96	15
9.51	6.0	9.7	-	6.0	0.2	-0.8	2.8	silty CLAY to CLAY	115	1.5	6	4	3	-	-	0.4	3.2	61	3.03	15
9.68	9.6	15.3	-	9.6	0.3	-0.6	3.2	silty CLAY to CLAY	115	1.5	10	6	5	-	-	0.6	5.2	51	2.88	15
9.84	14.0	22.5	-	13.9	0.3	-3.0	2.1	clayey SILT to silty CLAY	115	2.0	11	7	6	-	-	0.9	7.7	37	2.64	15
10.01	14.9	23.9	-	14.8	0.3	-7.0	2.4	clayey SILT to silty CLAY	115	2.0	12	7	6	-	-	1.0	8.1	38	2.65	15
10.17	18.8	23.8	78.3	18.7	0.4	-7.5	2.0	clayey SILT to silty CLAY	115	2.0	12	9	6	-	-	1.3	9.9	35	2.59	15
10.34	14.0	22.4	-	13.8	0.4	-9.0	3.3	clayey SILT to silty CLAY	115	2.0	11	7	6	-	-	0.9	7.5	44	2.76	15
10.50	9.2	14.7	-	9.0	0.4	-9.7	4.6	silty CLAY to CLAY	115	1.5	10	6	5	-	-	0.6	4.7	58	3.00	15
10.66	7.8	12.5	-	7.6	0.2	-9.4	3.4	silty CLAY to CLAY	115	1.5	8	5	4	-	-	0.5	3.9	57	2.98	15
10.83	10.4	16.7	-	10.2	0.3	-9.3	3.4	silty CLAY to CLAY	115	1.5	11	7	5	-	-	0.7	5.3	50	2.87	15
10.99	12.3	19.7	-	12.1	0.3	-9.2	2.9	clayey SILT to silty CLAY	115	2.0	10	6	5	-	-	0.8	6.3	44	2.77	15
11.16	15.8	21.9	69.5	15.7	0.2	-9.3	1.6	clayey SILT to silty CLAY	115	2.0	11	8	6	-	-	1.1	8.2	34	2.57	15
11.32	14.1	22.6	-	13.9	0.4	-9.5	2.6	clayey SILT to silty CLAY	115	2.0	11	7	6	-	-	1.0	7.2	40	2.69	15
11.48	12.0	19.2	-	11.8	0.4	-9.5	3.5	silty CLAY to CLAY	115	1.5	13	8	6	-	-	0.8	6.0	48	2.83	15
11.65	13.4	21.4	-	13.2	0.3	-9.5	2.3	clayey SILT to silty CLAY	115	2.0	11	7	6	-	-	0.9	6.7	39	2.68	15
11.81	22.8	27.8	58.3	22.6	0.2															

Sun View Elementary

Project ID: Leighton
Data File: SDF(104).cpt
CPT Date: 10/14/2017 7:32:34 AM
GW During Test: 10 ft

Page: 2
Sounding ID: CPT-01
Project No: 11766.002
Cone/Rig: DDG1281

Depth ft	qc PS	qc1n PS	qc1ncs PS	qt PS	Slv Stss tsf	pore prss (psi)	Frct Ratio %	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N1 60%	SPT R-N 60%	SPT ICN1 60%	Rel Den %	Ftn Ang deg	Und Shr	OCR -	Fin Ic SBT	IC SBT Index	Nk -
15.58	91.7	103.9	119.5	91.5	0.8	-9.1	0.8	clean SAND to silty SAND	125	5.0	21	18	19	68	42	-	-	9	1.86	16
15.75	86.3	97.4	115.1	86.1	0.8	-8.8	0.9	clean SAND to silty SAND	125	5.0	19	17	18	66	41	-	-	10	1.89	16
15.91	71.8	80.7	101.7	71.6	0.7	-8.6	0.9	clean SAND to silty SAND	125	5.0	16	14	16	60	40	-	-	12	1.97	16
16.08	43.7	49.0	88.0	43.5	0.6	-8.3	1.4	silty SAND to sandy SILT	120	3.0	16	15	11	43	37	-	-	21	2.25	16
16.24	17.7	23.5	-	17.6	0.5	-7.9	3.1	clayey SILT to silty CLAY	115	2.0	12	9	6	-	-	1.2	7.3	42	2.73	15
16.40	10.6	13.9	-	10.4	0.3	-7.4	3.0	silty CLAY to CLAY	115	1.5	9	7	4	-	-	0.7	4.2	53	2.92	15
16.57	6.8	8.9	-	6.7	0.1	-5.9	2.3	silty CLAY to CLAY	115	1.5	6	5	3	-	-	0.4	2.5	60	3.03	15
16.73	7.8	10.1	-	7.8	0.0	0.2	0.5	clayey SILT to silty CLAY	115	2.0	5	4	3	-	-	0.5	2.9	40	2.70	15
16.90	9.3	12.0	-	9.4	0.1	9.1	1.2	clayey SILT to silty CLAY	115	2.0	6	5	3	-	-	0.6	3.5	44	2.76	15
17.06	10.8	13.9	-	11.0	0.2	10.4	1.9	clayey SILT to silty CLAY	115	2.0	7	5	4	-	-	0.7	4.2	46	2.80	15
17.23	12.1	15.5	-	12.2	0.3	6.0	2.8	silty CLAY to CLAY	115	1.5	10	8	5	-	-	0.8	4.7	49	2.86	15
17.39	14.6	18.6	-	14.7	0.4	4.6	2.7	clayey SILT to silty CLAY	115	2.0	9	7	5	-	-	1.0	5.7	45	2.78	15
17.55	16.1	20.3	-	16.2	0.4	4.5	2.6	clayey SILT to silty CLAY	115	2.0	10	8	6	-	-	1.1	6.3	42	2.73	15
17.72	16.4	20.7	-	16.5	0.4	3.8	2.8	clayey SILT to silty CLAY	115	2.0	10	8	6	-	-	1.1	6.4	43	2.75	15
17.88	15.4	19.3	-	15.4	0.5	2.7	3.2	silty CLAY to CLAY	115	1.5	13	10	6	-	-	1.0	5.9	47	2.81	15
18.05	15.3	19.0	-	15.3	0.3	2.8	2.4	clayey SILT to silty CLAY	115	2.0	10	8	5	-	-	1.0	5.8	43	2.74	15
18.21	14.8	18.4	-	14.9	0.5	2.5	3.3	silty CLAY to CLAY	115	1.5	12	10	5	-	-	1.0	5.6	48	2.83	15
18.37	15.4	19.0	-	15.5	0.5	2.8	3.4	silty CLAY to CLAY	115	1.5	13	10	5	-	-	1.0	5.8	48	2.83	15
18.54	17.5	21.4	-	17.5	0.6	2.9	3.6	silty CLAY to CLAY	115	1.5	14	12	6	-	-	1.2	6.6	46	2.80	15
18.70	22.9	27.9	-	22.9	0.6	-0.6	3.0	clayey SILT to silty CLAY	115	2.0	14	11	7	-	-	1.6	8.8	38	2.65	15
18.87	31.1	33.3	90.3	31.0	0.6	-5.5	2.0	silty SAND to sandy SILT	120	3.0	11	10	8	31	35	-	-	30	2.49	16
19.03	44.6	47.6	79.4	44.4	0.5	-9.9	1.1	silty SAND to sandy SILT	120	3.0	16	15	10	42	37	-	-	19	2.20	16
19.19	55.4	59.0	81.8	55.2	0.5	-11.7	0.9	clean SAND to silty SAND	125	5.0	12	11	12	50	38	-	-	15	2.06	16
19.36	62.8	66.6	93.7	62.5	0.7	-12.4	1.1	silty SAND to sandy SILT	120	3.0	22	21	13	54	39	-	-	15	2.07	16
19.52	66.5	70.4	102.7	66.3	0.8	-12.4	1.3	silty SAND to sandy SILT	120	3.0	23	22	14	55	39	-	-	16	2.10	16
19.69	71.1	75.0	110.7	70.8	1.0	-12.3	1.4	silty SAND to sandy SILT	120	3.0	25	24	15	57	40	-	-	16	2.11	16
19.85	75.8	79.7	110.5	75.6	1.0	-12.2	1.3	silty SAND to sandy SILT	120	3.0	27	25	16	60	40	-	-	15	2.06	16
20.01	77.3	81.1	107.7	77.0	0.9	-12.2	1.1	clean SAND to silty SAND	125	5.0	16	15	16	60	40	-	-	14	2.02	16
20.18	70.8	74.1	102.4	70.7	0.8	-7.9	1.2	silty SAND to sandy SILT	120	3.0	25	24	15	57	39	-	-	15	2.06	16
20.34	63.1	65.8	99.4	62.9	0.8	-7.7	1.3	silty SAND to sandy SILT	120	3.0	22	21	14	53	39	-	-	17	2.13	16
20.51	53.0	55.1	93.2	52.8	0.7	-7.3	1.4	silty SAND to sandy SILT	120	3.0	18	18	12	47	38	-	-	19	2.21	16
20.67	39.4	40.9	97.3	39.3	0.8	-6.8	2.0	silty SAND to sandy SILT	120	3.0	14	13	10	37	36	-	-	27	2.42	16
20.83	21.3	24.2	-	21.2	0.6	-7.6	3.2	clayey SILT to silty CLAY	115	2.0	12	11	7	-	-	1.4	7.5	42	2.73	15
21.00	11.8	13.3	-	11.6	0.4	-7.1	3.9	silty CLAY to CLAY	115	1.5	9	8	4	-	-	0.8	3.9	59	3.00	15
21.16	9.4	10.5	-	9.2	0.2	-6.6	1.9	clayey SILT to silty CLAY	115	2.0	5	5	3	-	-	0.6	3.0	53	2.92	15
21.33	8.7	9.7	-	8.6	0.1	-6.2	1.3	clayey SILT to silty CLAY	115	2.0	5	4	3	-	-	0.6	2.8	51	2.88	15
21.49	8.6	9.6	-	8.5	0.1	-5.8	1.5	clayey SILT to silty CLAY	115	2.0	5	4	3	-	-	0.5	2.7	53	2.92	15
21.65	8.5	9.4	-	8.3	0.1	-5.5	1.5	clayey SILT to silty CLAY	115	2.0	5	4	3	-	-	0.5	2.6	54	2.93	15
21.82	9.0	9.9	-	9.0	0.1	-4.0	1.4	clayey SILT to silty CLAY	115	2.0	5	5	3	-	-	0.6	2.8	51	2.88	15
21.98	9.0	9.9	-	8.9	0.1	-3.8	1.7	clayey SILT to silty CLAY	115	2.0	5	5	3	-	-	0.6	2.8	54	2.93	15
22.15	9.2	10.0	-	9.1	0.1	-3.5	1.6	clayey SILT to silty CLAY	115	2.0	5	5	3	-	-	0.6	2.8	52	2.91	15
22.31	9.5	10.3	-	9.4	0.2	-3.0	2.1	silty CLAY to CLAY	115	1.5	7	6	3	-	-	0.6	2.9	55	2.95	15
22.47	11.1	12.0	-	11.0	0.2	-2.5	2.4	silty CLAY to CLAY	115	1.5	8	7	4	-	-	0.7	3.5	53	2.92	15
22.64	15.3	16.4	-	15.2	0.4	-1.9	2.8	clayey SILT to silty CLAY	115	2.0	8	8	5	-	-	1.0	5.0	48	2.83	15
22.80	13.7	14.6	-	13.6	0.4	-2.2	2.9	silty CLAY to CLAY	115	1.5	10	9	4	-	-	0.9	4.4	51	2.89	15
22.97	10.7	11.4	-	10.6	0.3	-2.0	3.0	silty CLAY to CLAY	115	1.5	8	7	4	-	-	0.7	3.3	58	3.00	15
23.13	10.4	11.1	-	10.4	0.2	-1.5	2.4	silty CLAY to CLAY	115	1.5	7	7	3	-	-	0.7	3.2	56	2.96	15
23.30	9.7	10.2	-	9.7	0.2	-1.1	2.2	silty CLAY to CLAY	115	1.5	7	6	3	-	-	0.6	2.9	57	2.97	15
23.46	9.0	9.5	-	9.0	0.2	-0.7	2.0	silty CLAY to CLAY	115	1.5	6	6	3	-	-	0.6	2.7	57	2.98	15
23.62	8.3	8.7	-	8.3	0.2	-0.3	2.4	silty CLAY to CLAY	115	1.5	6	6	3	-	-	0.5	2.4	63	3.07	15
23.79	8.0	8.4	-	8.0	0.2	0.0	2.8	silty CLAY to CLAY	115	1.5	6	5	3	-	-	0.5	2.3	66	3.11	15
23.95	7.9	8.2	-	7.9	0.2	0.3	2.7	silty CLAY to CLAY	115	1.5	5	5	3	-	-	0.5	2.2	67	3.12	15
24.12	8.2	8.5	-	8.2	0.2	0.4	3.1	silty CLAY to CLAY	115	1.5	6	5	3	-	-	0.5	2.3	68	3.13	15
24.28	9.0	9.2	-	9.0	0.3	0.6	3.5	silty CLAY to CLAY	115	1.5	6	6	3	-	-	0.6	2.6	68	3.13	15
24.44	9.5	9.7	-	9.5	0.3	0.6	3.5	silty CLAY to CLAY	115	1.5	6	6	3	-	-	0.6	2.7	66	3.10	15
24.61	8.9	9.1	-	8.9	0.2	0.1	2.9	silty CLAY to CLAY	115	1.5	6	6	3	-	-	0.6	2.5	64	3.08	15
24.77	10.0	10.1	-	10.0	0.3	1.6	3.0	silty CLAY to CLAY	115	1.5	7	7	3	-	-	0.6	2.9	62	3.05	15
24.94	14.8	14.9	-	14.8	0.4	1.6	2.9	silty CLAY to CLAY	115	1.5	10	10	4	-	-	1.0	4.4	51	2.88	15
25.10	18.8	18.9	-	18.8	0.3	0.0	1.9	clayey SILT to silty CLAY	115	2.0	9	9	5	-	-	1.3	5.7	39	2.68	15
25.26	12.3	12.4	-	12.3	0.3	-2.0	2.4	silty CLAY to CLAY	115	1.5	8	8	4	-	-	0.8	3.6	53	2.91	15
25.43	9.8	9.7	-	9.7	0.2	-1.5	2.5	silty CLAY to CLAY	115	1.5	6	7	3	-	-	0.6	2.7	60	3.02	15
25.59	9.7	9.6	-	9.7	0.2	-1.0	2.0	silty CLAY to CLAY	115	1.5	6	6	3	-	-	0.6	2.7	57	2.98	15
25.76	9.6	9.5	-	9.6	0.2	-0.7	2.5	silty CLAY to CLAY	115	1.5	6	6	3	-	-	0.6	2.7	61	3.03	15
25.92	10.0	9.9	-	10.0	0.2	-0.4	2.9	silty CLAY to CLAY	115	1.5	7	7	3	-	-	0.6	2.8	62	3.05	15
26.08	11.5	11.3	-	11.5	0.3	-0.1	3.3	silty CLAY to CLAY	115	1.5	8	8	4	-	-	0.7	3.2	61	3.03	15
26.25	12.8	12.5	-	12.8	0.4	-0.4	3.7	silty CLAY to CLAY	115	1.5	8	9	4	-	-	0.8	3.6	60	3.02	15
26.41	13.3	13.0	-	13.3	0.4	-0.9	3.8	silty CLAY to CLAY	115	1.5	9	9	4	-	-	0.9	3.8	59	3.01	15
26.58	12.4	12.1	-	12.4	0.5	-1.6	4.3	silty CLAY to CLAY	115	1.5	8	8	4	-	-	0.8	3.5	63	3.07	15
26.74	11.9	11.4	-	11.8	0.5	-1.9	4.5	silty CLAY to CLAY	115	1.5	8	8	4	-	-	0.8	3.3	66	3.10	15
26.90	11.7	11.3	-	11.7	0.4	-1.9	3.7	silty CLAY to CLAY	115	1.5	8	8	4	-	-	0.8	3.2	62	3.06	15
27.07	11.8	11.3	-	11.8	0.4	-1.8	3.8	silty CLAY to CLAY	115	1.5	8	8	4	-	-	0.8	3.2	63	3.06	15
27.23	13.1	12.4	-	13.0	0.4															

Sun View Elementary

Project ID: Leighton
Data File: SDF(104).cpt
CPT Date: 10/14/2017 7:32:34 AM
GW During Test: 10 ft

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Sounding ID: CPT-01
Project No: 11766.002
Cone/Rig: DDG1281

Depth	qc	* qc1n	* qc1n	qt	* qt	Stss	pore	Frct	Material	Unit	Qc	SPT	SPT	SPT	* Rel	* Ftn	Und	OCR	* Fin	* Ic	* SBT	* Nk
ft	PS	PS	PS	PS	PS	tsf	prss	Rato	Behavior	Wght	to	R-N1	R-N	ICN1	Den	Ang	Shr	-	1c	%	Indx	
ft	tsf	tsf	tsf	tsf	tsf	tsf	(psi)	%	Description	pcf	N	60%	60%	60%	%	deg	tsf	%	%	%	%	
31.01	14.1	12.2	-	14.0	0.5	-1.4	4.4	silty	CLAY to CLAY	115	1.5	8	9	4	-	-	0.9	3.5	63	3.07	15	
31.17	13.7	11.8	-	13.6	0.5	-1.4	4.6	silty	CLAY to CLAY	115	1.5	8	9	4	-	-	0.9	3.4	65	3.10	15	
31.33	13.1	11.3	-	13.1	0.5	-1.5	4.4	silty	CLAY to CLAY	115	1.5	8	9	4	-	-	0.8	3.2	66	3.10	15	
31.50	12.7	10.9	-	12.7	0.4	-1.0	4.0	silty	CLAY to CLAY	115	1.5	7	8	4	-	-	0.8	3.1	65	3.09	15	
31.66	12.4	10.7	-	12.4	0.3	-0.8	3.2	silty	CLAY to CLAY	115	1.5	7	8	4	-	-	0.8	3.0	62	3.05	15	
31.83	12.0	10.2	-	11.9	0.3	-0.7	3.0	silty	CLAY to CLAY	115	1.5	7	8	3	-	-	0.8	2.8	62	3.05	15	
31.99	11.9	10.1	-	11.9	0.3	-0.5	2.9	silty	CLAY to CLAY	115	1.5	7	8	3	-	-	0.8	2.8	61	3.04	15	
32.15	11.2	9.5	-	11.2	0.3	-0.3	2.7	silty	CLAY to CLAY	115	1.5	6	7	3	-	-	0.7	2.6	63	3.06	15	
32.32	10.9	9.2	-	10.9	0.2	-0.2	2.3	silty	CLAY to CLAY	115	1.5	6	7	3	-	-	0.7	2.5	61	3.04	15	
32.48	10.6	8.9	-	10.6	0.2	0.0	2.6	silty	CLAY to CLAY	115	1.5	6	7	3	-	-	0.7	2.4	64	3.08	15	
32.65	12.6	10.6	-	12.6	0.3	1.3	2.6	silty	CLAY to CLAY	115	1.5	7	8	3	-	-	0.8	3.0	59	3.00	15	
32.81	13.8	11.5	-	13.8	0.3	1.6	2.3	silty	CLAY to CLAY	115	1.5	8	9	4	-	-	0.9	3.3	54	2.94	15	
32.97	12.8	10.6	-	12.8	0.2	1.8	1.9	silty	CLAY to CLAY	115	1.5	7	9	3	-	-	0.8	3.0	54	2.93	15	
33.14	11.0	9.1	-	11.0	0.2	2.2	1.9	silty	CLAY to CLAY	115	1.5	6	7	3	-	-	0.7	2.5	58	3.00	15	
33.30	10.6	8.7	-	10.6	0.2	2.8	2.1	silty	CLAY to CLAY	115	1.5	6	7	3	-	-	0.7	2.4	61	3.03	15	
33.47	10.9	9.0	-	11.0	0.2	3.4	2.3	silty	CLAY to CLAY	115	1.5	6	7	3	-	-	0.7	2.4	62	3.04	15	
33.63	11.6	9.6	-	11.7	0.2	3.9	2.5	silty	CLAY to CLAY	115	1.5	6	8	3	-	-	0.7	2.6	61	3.04	15	
33.79	12.7	10.4	-	12.8	0.3	4.3	2.8	silty	CLAY to CLAY	115	1.5	7	8	3	-	-	0.8	2.9	60	3.03	15	
33.96	13.3	10.8	-	13.4	0.4	4.7	3.7	silty	CLAY to CLAY	115	1.5	7	9	4	-	-	0.9	3.0	64	3.08	15	
34.12	14.0	11.4	-	14.1	0.4	5.1	3.7	silty	CLAY to CLAY	115	1.5	8	9	4	-	-	0.9	3.2	62	3.05	15	
34.29	13.5	10.9	-	13.6	0.4	5.1	3.1	silty	CLAY to CLAY	115	1.5	7	9	4	-	-	0.9	3.1	61	3.03	15	
34.45	11.7	9.4	-	11.8	0.3	5.4	3.6	silty	CLAY to CLAY	115	1.5	6	8	3	-	-	0.7	2.6	68	3.13	15	
34.61	14.8	11.9	-	15.0	0.5	9.4	4.1	silty	CLAY to CLAY	115	1.5	8	10	4	-	-	1.0	3.4	63	3.07	15	
34.78	21.6	17.3	-	21.8	0.8	10.3	4.3	silty	CLAY to CLAY	115	1.5	12	14	5	-	-	1.4	5.2	54	2.93	15	
34.94	28.3	22.6	-	28.4	1.1	6.0	4.0	silty	CLAY to CLAY	115	1.5	15	19	6	-	-	1.9	6.9	47	2.82	15	
35.11	35.1	27.9	-	35.1	1.1	0.4	3.4	clayey	SILT to silty CLAY	115	2.0	14	18	7	-	-	2.4	8.7	40	2.70	15	
35.27	51.8	44.8	95.8	51.7	0.9	-4.9	1.8	silty	SAND to sandy SILT	120	3.0	15	17	10	40	35	-	-	25	2.36	16	
35.43	39.3	34.0	99.3	39.2	0.9	-9.0	2.4	clayey	SILT to silty CLAY	115	2.0	17	20	8	-	-	2.7	9.7	32	2.53	15	
35.60	25.2	19.8	-	25.0	0.8	-9.5	3.6	silty	CLAY to CLAY	115	1.5	13	17	6	-	-	1.7	6.0	48	2.83	15	
35.76	16.7	13.1	-	16.5	0.7	-9.4	4.7	silty	CLAY to CLAY	115	1.5	9	11	4	-	-	1.1	3.8	63	3.06	15	
35.93	14.7	11.5	-	14.6	0.4	-9.1	3.2	silty	CLAY to CLAY	115	1.5	8	10	4	-	-	1.0	3.3	60	3.02	15	
36.09	12.7	9.9	-	12.5	0.4	-8.9	3.5	silty	CLAY to CLAY	115	1.5	7	8	3	-	-	0.8	2.7	66	3.10	15	
36.26	11.2	8.7	-	11.0	0.4	-8.5	4.3	silty	CLAY to CLAY	115	1.5	6	7	3	-	-	0.7	2.3	74	3.21	15	
36.42	12.3	9.5	-	12.1	0.4	-8.5	3.5	silty	CLAY to CLAY	115	1.5	6	8	3	-	-	0.8	2.6	67	3.12	15	
36.58	12.1	9.3	-	11.9	0.3	-8.4	2.9	silty	CLAY to CLAY	115	1.5	6	8	3	-	-	0.8	2.5	64	3.08	15	
36.75	11.7	9.0	-	11.6	0.3	-8.2	2.7	silty	CLAY to CLAY	115	1.5	6	8	3	-	-	0.7	2.4	64	3.08	15	
36.91	11.7	9.0	-	11.6	0.2	-8.1	2.6	silty	CLAY to CLAY	115	1.5	6	8	3	-	-	0.7	2.4	64	3.07	15	
37.08	12.1	9.2	-	11.9	0.2	-8.1	2.5	silty	CLAY to CLAY	115	1.5	6	8	3	-	-	0.8	2.5	62	3.05	15	
37.24	12.1	9.2	-	12.0	0.2	-7.9	2.4	silty	CLAY to CLAY	115	1.5	6	8	3	-	-	0.8	2.5	61	3.04	15	
37.40	12.7	9.7	-	12.6	0.3	-7.8	2.5	silty	CLAY to CLAY	115	1.5	6	8	3	-	-	0.8	2.6	61	3.04	15	
37.57	14.0	10.6	-	13.8	0.4	-7.7	3.6	silty	CLAY to CLAY	115	1.5	7	9	4	-	-	0.9	2.9	64	3.08	15	
37.73	19.3	14.6	-	19.2	0.7	-6.9	3.9	silty	CLAY to CLAY	115	1.5	10	13	5	-	-	1.3	4.3	57	2.97	15	
37.90	23.4	17.6	-	23.3	0.9	-6.8	4.1	silty	CLAY to CLAY	115	1.5	12	16	5	-	-	1.6	5.3	53	2.92	15	
38.06	27.2	20.3	-	27.0	0.9	-6.9	3.8	silty	CLAY to CLAY	115	1.5	14	18	6	-	-	1.8	6.2	48	2.84	15	
38.22	30.3	22.6	-	30.2	0.9	-6.8	3.2	clayey	SILT to silty CLAY	115	2.0	11	15	6	-	-	2.0	6.9	43	2.76	15	
38.39	27.3	20.3	-	27.2	0.9	-6.8	3.6	silty	CLAY to CLAY	115	1.5	14	18	6	-	-	1.8	6.2	48	2.83	15	
38.55	29.0	21.5	-	28.9	0.9	-6.6	3.2	clayey	SILT to silty CLAY	115	2.0	11	15	6	-	-	2.0	6.6	45	2.78	15	
38.72	32.7	24.2	-	32.6	0.8	-6.7	2.6	clayey	SILT to silty CLAY	115	2.0	12	16	6	-	-	2.2	7.4	39	2.68	15	
38.88	32.9	24.2	-	32.8	0.9	-6.7	3.0	clayey	SILT to silty CLAY	115	2.0	12	16	7	-	-	2.2	7.4	41	2.71	15	
39.04	34.3	25.2	-	34.2	1.0	-6.5	3.0	clayey	SILT to silty CLAY	115	2.0	13	17	7	-	-	2.3	7.8	40	2.70	15	
39.21	49.1	40.8	88.6	49.0	0.8	-6.6	1.6	silty	SAND to sandy SILT	120	3.0	14	16	9	37	35	-	-	25	2.36	16	
39.37	57.6	47.8	87.3	57.4	0.8	-7.7	1.4	silty	SAND to sandy SILT	120	3.0	16	19	10	43	36	-	-	21	2.26	16	
39.54	53.3	44.2	86.3	53.2	0.7	-8.5	1.4	silty	SAND to sandy SILT	120	3.0	15	18	10	40	35	-	-	23	2.30	16	
39.70	56.1	46.4	81.0	55.9	0.6	-8.6	1.2	silty	SAND to sandy SILT	120	3.0	15	19	10	42	35	-	-	20	2.23	16	
39.86	59.4	49.0	85.8	59.2	0.7	-9.1	1.3	silty	SAND to sandy SILT	120	3.0	16	20	11	43	36	-	-	20	2.23	16	
40.03	55.3	45.6	99.2	55.1	1.0	-9.1	1.9	silty	SAND to sandy SILT	120	3.0	15	18	10	41	35	-	-	25	2.37	16	
40.19	49.9	41.0	109.2	49.7	1.2	-5.4	2.5	clayey	SILT to silty CLAY	115	2.0	21	25	10	-	-	3.4	9.9	30	2.48	15	
40.36	42.0	30.0	-	41.9	1.1	-3.7	2.8	clayey	SILT to silty CLAY	115	2.0	15	21	8	-	-	2.9	9.4	36	2.62	15	
40.52	35.1	25.0	-	34.9	1.0	-5.8	3.2	clayey	SILT to silty CLAY	115	2.0	12	18	7	-	-	2.4	7.7	41	2.72	15	
40.68	26.8	19.1	-	26.7	0.9	-6.1	3.7	silty	CLAY to CLAY	115	1.5	13	18	6	-	-	1.8	5.7	50	2.86	15	
40.85	30.3	21.5	-	30.2	0.6	-5.6	2.1	clayey	SILT to silty CLAY	115	2.0	11	15	6	-	-	2.0	6.5	39	2.67	15	
41.01	40.9	33.4	86.7	40.7	0.7	-5.7	1.8	silty	SAND to sandy SILT	120	3.0	11	14	8	31	33	-	-	29	2.47	16	
41.18	49.2	40.1	89.7	49.3	0.8	7.5	1.7	silty	SAND to sandy SILT	120	3.0	13	16	9	37	34	-	-	26	2.38	16	
41.34	53.0	43.1	90.8	53.0	0.8	-1.7	1.6	silty	SAND to sandy SILT	120	3.0	14	18	10	39	35	-	-	24	2.35	16	
41.50	56.1	45.6	93.6	56.0	0.9	-4.3	1.7	silty	SAND to sandy SILT	120	3.0	15	19	10	41	35	-	-	24	2.33	16	
41.67	59.8	48.5	91.9	59.7	0.9	-4.8	1.5	silty	SAND to sandy SILT	120	3.0	16	20	11	43	35	-	-	22	2.28	16	
41.83	60.3	48.8	95.2	60.2	0.9	-5.9	1.6	silty	SAND to sandy SILT	120	3.0	16	20	11	43	36	-	-	23	2.30	16	
42.00	58.1	47.0	94.7	58.0	0.9	-5.4	1.7	silty	SAND to sandy SILT	120	3.0											

Sun View Elementary

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Project No: 11766.002
Cone/Rig: DDG1281

Depth ft	qc PS tsf	qc1n PS -	q1ncs PS -	qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Rato %	Material Behavior Description	Unit Wght pcf	Qc to N	SPT R-N1 60%	SPT R-N 60%	SPT IcN1 60%	Rel Den %	Ftn Ang deg	Und Shr tsf	OCR -	Fin Ic %	IC SBT Indx	Nk -
46.43	117.8	91.4	129.2	117.9	1.8	6.3	1.6	silty SAND to sandy SILT	120	3.0	30	39	18	64	39	-	-	15	2.08	16
46.59	125.4	97.1	135.4	125.6	2.0	6.6	1.6	silty SAND to sandy SILT	120	3.0	32	42	20	66	39	-	-	15	2.06	16
46.75	113.6	87.8	133.9	113.9	2.0	13.5	1.8	silty SAND to sandy SILT	120	3.0	29	38	18	63	39	-	-	17	2.14	16
46.92	116.4	89.8	131.2	116.6	1.9	12.1	1.7	silty SAND to sandy SILT	120	3.0	30	39	18	63	39	-	-	16	2.10	16
47.08	116.3	89.7	130.5	116.4	1.9	4.7	1.7	silty SAND to sandy SILT	120	3.0	30	39	18	63	39	-	-	16	2.10	16
47.25	111.3	85.7	125.5	111.4	1.7	2.4	1.6	silty SAND to sandy SILT	120	3.0	29	37	18	62	39	-	-	16	2.11	16
47.41	89.6	68.9	122.8	89.6	1.8	-1.4	2.0	silty SAND to sandy SILT	120	3.0	23	30	15	55	37	-	-	21	2.24	16
47.57	58.0	44.5	120.6	58.0	1.6	-1.1	2.8	clayey SILT to silty CLAY	115	2.0	22	29	11	-	-	4.0	9.9	30	2.49	15
47.74	43.4	27.0	-	43.4	1.1	0.2	2.7	clayey SILT to silty CLAY	115	2.0	13	22	7	-	-	3.0	8.3	38	2.65	15
47.90	81.7	62.5	101.3	81.8	1.1	4.6	1.4	silty SAND to sandy SILT	120	3.0	21	27	13	52	37	-	-	18	2.18	16
48.07	100.2	76.5	102.3	100.1	1.0	-5.7	1.1	clean SAND to silty SAND	125	5.0	15	20	15	58	38	-	-	14	2.03	16
48.23	105.0	80.1	108.9	104.9	1.2	-5.4	1.2	silty SAND to sandy SILT	120	3.0	27	35	16	60	38	-	-	14	2.04	16
48.39	78.9	60.1	115.6	78.8	1.6	-5.0	2.0	silty SAND to sandy SILT	120	3.0	20	26	13	50	36	-	-	22	2.29	16
48.56	50.4	30.9	-	50.4	1.3	-3.9	2.8	clayey SILT to silty CLAY	115	2.0	15	25	8	-	-	3.4	9.6	36	2.61	15
48.72	47.8	36.3	91.5	47.7	0.9	-3.1	1.9	silty SAND to sandy SILT	120	3.0	12	16	9	34	33	-	-	28	2.45	16
48.89	34.0	20.7	-	33.9	0.7	-4.9	2.2	clayey SILT to silty CLAY	115	2.0	10	17	6	-	-	2.3	6.3	40	2.69	15
49.05	21.1	12.9	-	21.1	0.5	-4.1	2.8	silty CLAY to CLAY	115	1.5	9	14	4	-	-	1.4	3.7	55	2.94	15
49.22	16.8	10.2	-	16.7	0.5	-2.6	3.3	silty CLAY to CLAY	115	1.5	7	11	3	-	-	1.1	2.8	64	3.08	15
49.38	21.6	13.1	-	21.6	0.5	-1.4	2.4	silty CLAY to CLAY	115	1.5	9	14	4	-	-	1.4	3.7	52	2.90	15
49.54	27.9	16.9	-	27.9	0.3	-1.1	1.4	clayey SILT to silty CLAY	115	2.0	8	14	4	-	-	1.9	5.0	39	2.67	15
49.71	33.4	20.1	-	33.4	0.5	-0.2	1.5	clayey SILT to silty CLAY	115	2.0	10	17	5	-	-	2.2	6.1	36	2.61	15
49.87	32.2	19.3	-	32.2	0.6	0.6	2.0	clayey SILT to silty CLAY	115	2.0	10	16	5	-	-	2.2	5.8	40	2.70	15
50.04	42.2	25.3	-	42.3	0.8	1.1	2.1	clayey SILT to silty CLAY	115	2.0	13	21	6	-	-	2.9	7.8	35	2.60	15
50.20	52.9	39.7	90.0	53.0	0.9	8.0	1.7	silty SAND to sandy SILT	120	3.0	13	18	9	37	34	-	-	26	2.39	16
50.36	49.8	37.3	72.6	49.7	0.5	-5.8	1.1	silty SAND to sandy SILT	120	3.0	12	17	8	34	33	-	-	22	2.30	16
50.53	35.4	21.0	-	35.3	0.5	-8.4	1.6	clayey SILT to silty CLAY	115	2.0	11	18	5	-	-	2.4	6.4	35	2.60	15
50.69	18.6	11.0	-	18.4	0.5	-8.0	3.1	silty CLAY to CLAY	115	1.5	7	12	4	-	-	1.2	3.1	61	3.03	15

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

APPENDIX B

Laboratory Test Results (Current Study)



Leighton

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name: Sun View Elementary School Tested By: R. Manning Date: 10/17/17
 Project No.: 11766.002 Input By: J. Ward Date: 10/18/17
 Boring No.: LB-1 Depth (ft.): 0-5
 Sample No.: BB1
 Soil Identification: Very dark grayish brown lean clay with sand (CL)s

Preparation Method:

☒ Moist
☐ Dry

☒ Mechanical Ram
☐ Manual Ram

Mold Volume (ft³)

0.03330

Ram Weight = 10 lb.; Drop = 18 in.

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3735	3801	3817			
Weight of Mold (g)	1857	1857	1857			
Net Weight of Soil (g)	1878	1944	1960			
Wet Weight of Soil + Cont. (g)	479.3	481.3	489.9			
Dry Weight of Soil + Cont. (g)	434.0	425.4	423.9			
Weight of Container (g)	39.9	39.6	38.8			
Moisture Content (%)	11.49	14.49	17.14			
Wet Density (pcf)	124.3	128.7	129.8			
Dry Density (pcf)	111.5	112.4	110.8			

Maximum Dry Density (pcf)

112.5

Optimum Moisture Content (%)

14.0

PROCEDURE USED

☒ Procedure A

Soil Passing No. 4 (4.75 mm) Sieve
 Mold : 4 in. (101.6 mm) diameter
 Layers : 5 (Five)
 Blows per layer : 25 (twenty-five)
 May be used if + #4 is 20% or less

☐ Procedure B

Soil Passing 3/8 in. (9.5 mm) Sieve
 Mold : 4 in. (101.6 mm) diameter
 Layers : 5 (Five)
 Blows per layer : 25 (twenty-five)
 Use if + #4 is >20% and + 3/8 in. is 20% or less

☐ Procedure C

Soil Passing 3/4 in. (19.0 mm) Sieve
 Mold : 6 in. (152.4 mm) diameter
 Layers : 5 (Five)
 Blows per layer : 56 (fifty-six)
 Use if + 3/8 in. is >20% and + 3/4 in. is <30%

Particle-Size Distribution:

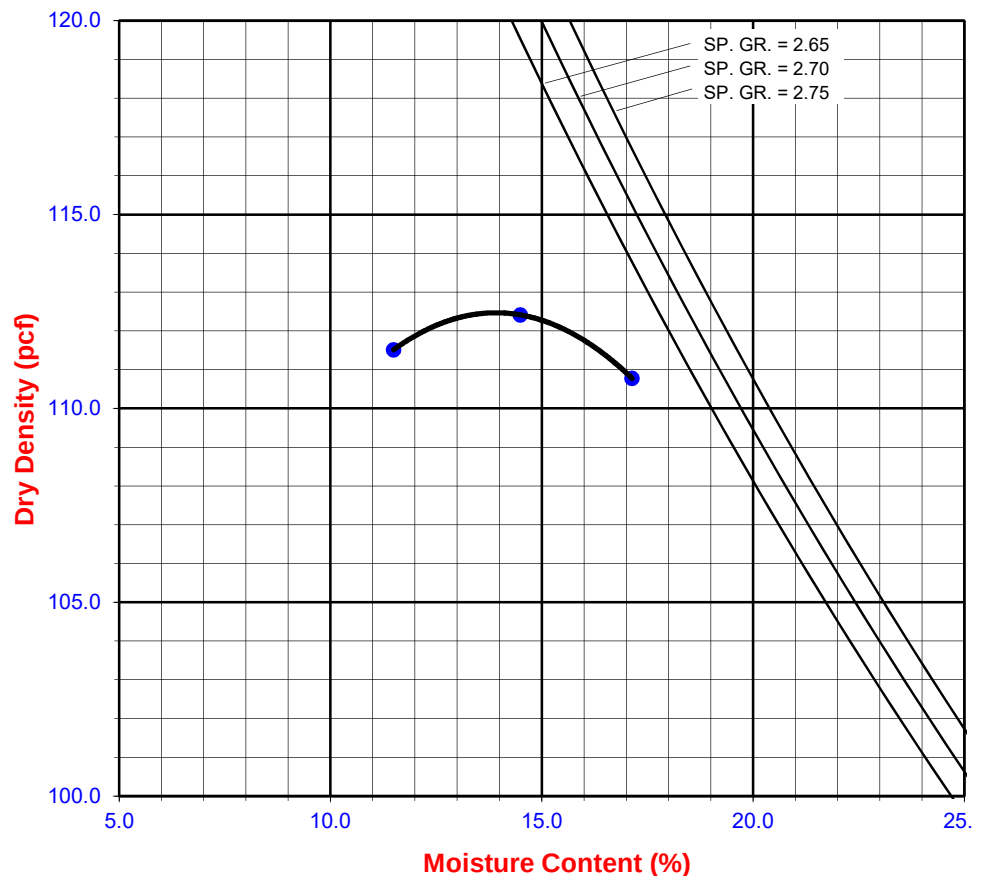
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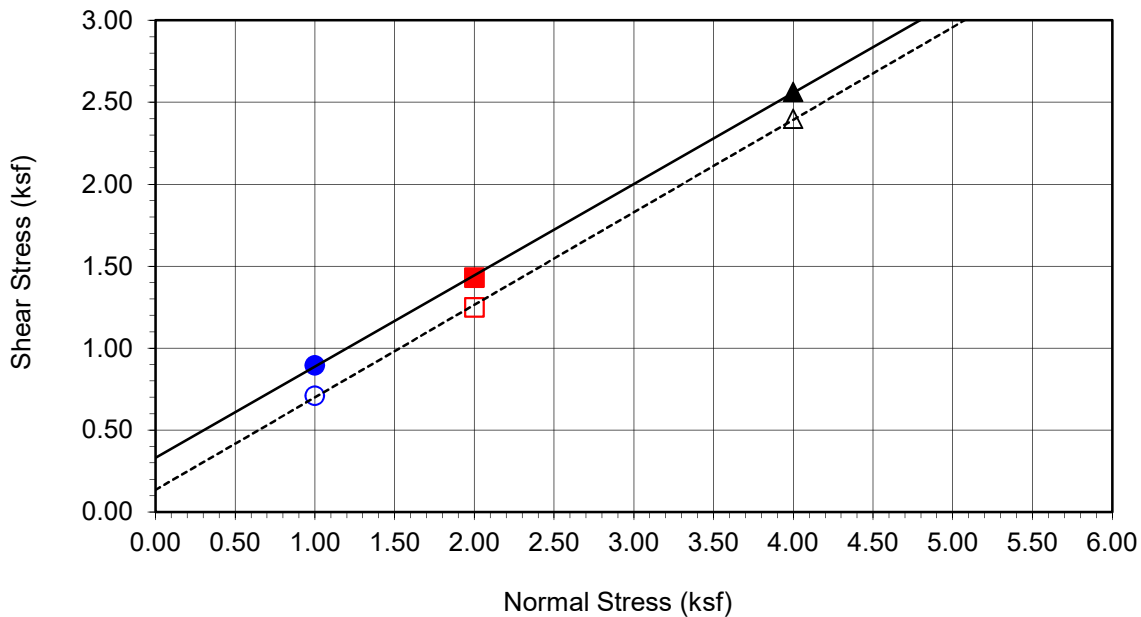
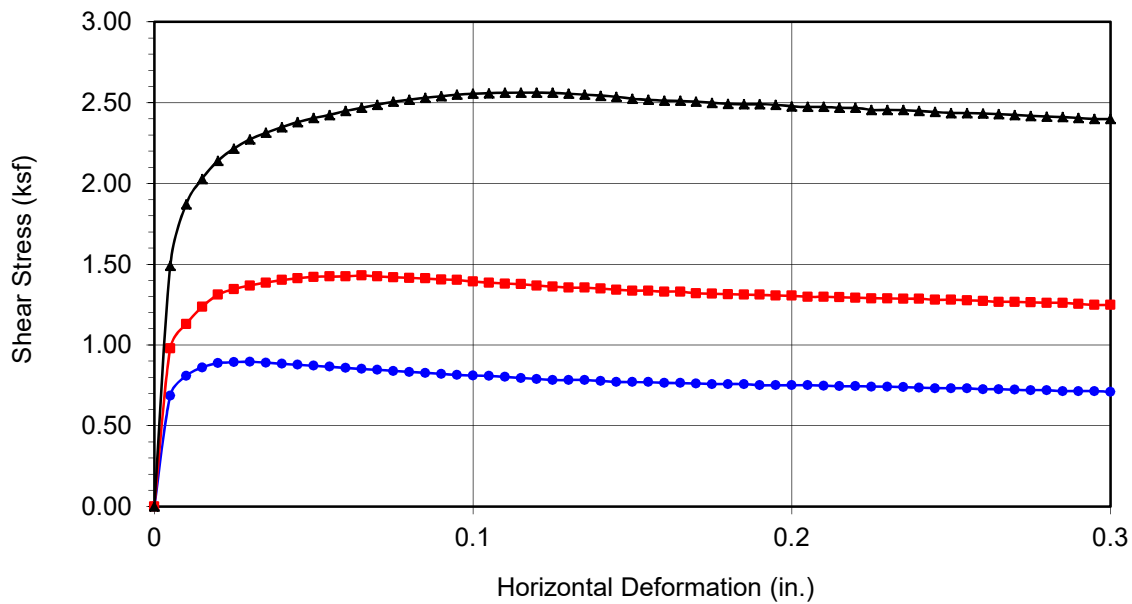
GR:SA:FI

Atterberg Limits:

37,19,18

LL,PL,PI





Boring No.	LB-1	
Sample No.	BB1	
Depth (ft)	0-5	
<u>Sample Type:</u> 90% Remold		
<u>Soil Identification:</u> Very dark grayish brown lean clay with sand (CL)s		
<u>Strength Parameters</u>		
	C (psf)	ϕ (°)
Peak	330	29
Ultimate	135	29

Normal Stress (kip/ft ²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft ²)	● 0.896	■ 1.430	▲ 2.562
Shear Stress @ End of Test (ksf)	○ 0.710	□ 1.248	△ 2.399
Deformation Rate (in./min.)	0.0500	0.0500	0.0500
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	14.27	14.27	14.27
Dry Density (pcf)	101.1	101.1	101.1
Saturation (%)	57.8	57.7	57.8
Soil Height Before Shearing (in.)	1.0167	0.9987	0.9839
Final Moisture Content (%)	25.6	24.5	23.6



Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Undrained

Project No.: 11766.002

Sun View Elementary School



EXPANSION INDEX of SOILS

ASTM D 4829

Project Name: Sun View Elementary School Tested By: S. Felter Date: 10/18/17
Project No.: 11766.002 Checked By: J. Ward Date: 10/25/17
Boring No.: LB-1 Depth (ft.): 0-5
Sample No.: BB1
Soil Identification: Very dark grayish brown lean clay with sand (CL)s

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0650
Wt. Comp. Soil + Mold (g)	553.90	411.77
Wt. of Mold (g)	190.40	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	0	0
Wet Wt. of Soil + Cont. (g)	717.50	602.17
Dry Wt. of Soil + Cont. (g)	626.70	507.82
Wt. of Container (g)	0.00	190.40
Moisture Content (%)	14.49	29.72
Wet Density (pcf)	109.6	116.6
Dry Density (pcf)	95.8	89.9
Void Ratio	0.760	0.875
Total Porosity	0.432	0.467
Pore Volume (cc)	89.4	102.9
Degree of Saturation (%) [S meas]	51.5	91.7

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
10/18/17	14:35	1.0	0	0.0710
10/18/17	14:45	1.0	10	0.0710
Add Distilled Water to the Specimen				
10/18/17	14:53	1.0	8	0.0785
10/19/17	6:46	1.0	961	0.1360
10/19/17	9:00	1.0	1095	0.1360

Expansion Index (EI _{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	65
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ATTERBERG LIMITS

ASTM D 4318

Project Name: Sun View Elementary School Tested By: R. Manning Date: 10/18/17
 Project No. : 11766.002 Input By: J. Ward Date: 10/25/17
 Boring No.: LB-1 Checked By: J. Ward
 Sample No.: BB1 Depth (ft.) 0-5
 Soil Identification: Very dark grayish brown lean clay with sand (CL)s

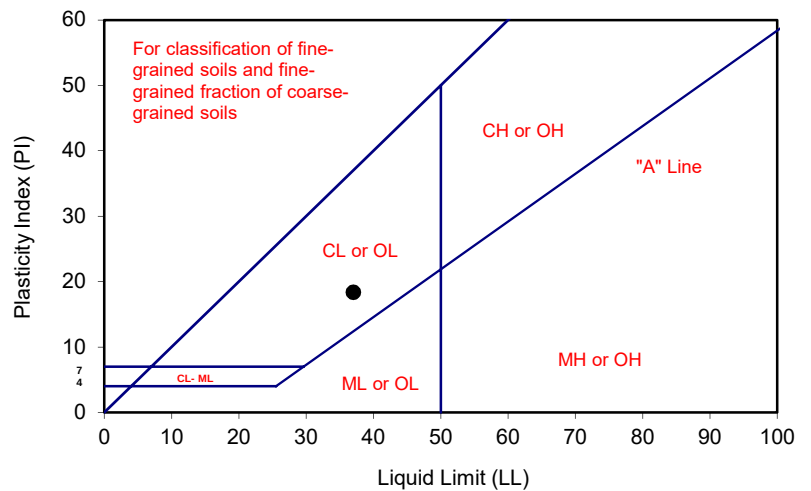
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	26	20	
Wet Wt. of Soil + Cont. (g)	13.67	13.43	24.22	23.13	24.80	
Dry Wt. of Soil + Cont. (g)	12.64	12.44	21.50	20.56	21.69	
Wt. of Container (g)	7.15	7.08	13.82	13.59	13.52	
Moisture Content (%) [Wn]	18.76	18.47	35.42	36.87	38.07	

Liquid Limit	37
Plastic Limit	19
Plasticity Index	18
Classification	CL

PI at "A" - Line = $0.73(LL-20)$ 12.41

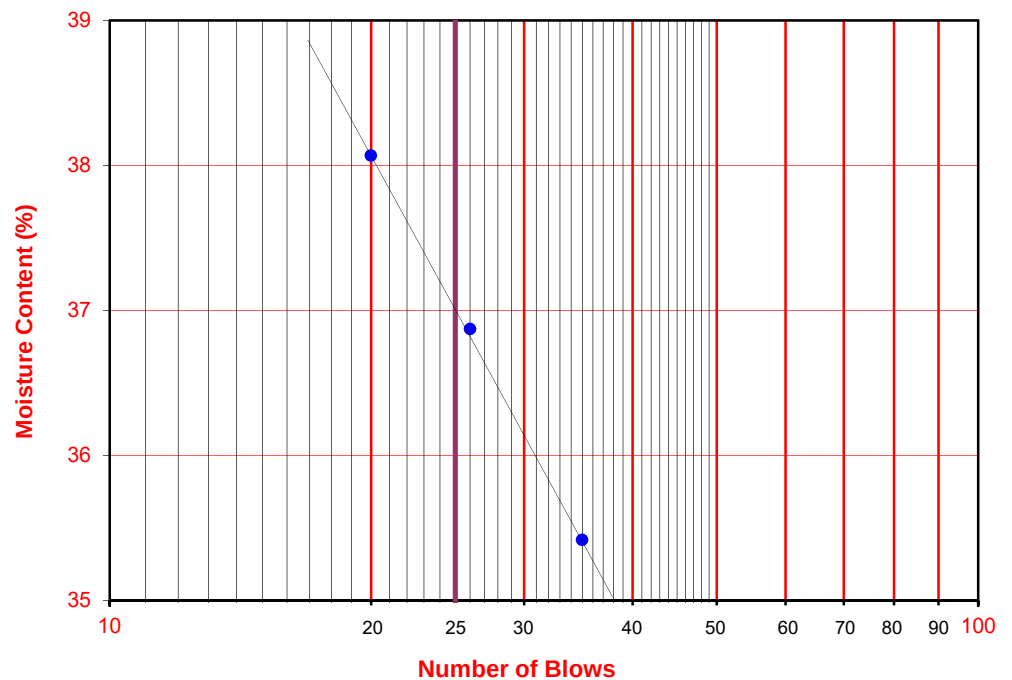
One - Point Liquid Limit Calculation

$$LL = W_n(N/25)^{0.121}$$



PROCEDURES USED

- ☐ Wet Preparation
Multipoint - Wet
- ☒ Dry Preparation
Multipoint - Dry
- ☒ Procedure A
Multipoint Test
- ☐ Procedure B
One-point Test





ATTERBERG LIMITS

ASTM D 4318

Project Name: Sun View Elementary School Tested By: R. Manning Date: 10/18/17
 Project No. : 11766.002 Input By: J. Ward Date: 10/25/17
 Boring No.: LB-1 Checked By: J. Ward
 Sample No.: R2 Depth (ft.) 10.0
 Soil Identification: Grayish brown silt (ML)

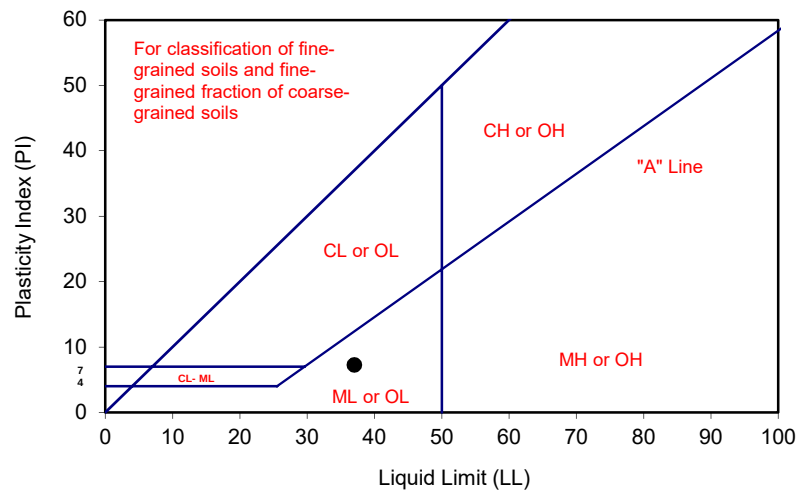
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			27	21	16	
Wet Wt. of Soil + Cont. (g)	13.87	13.20	28.12	26.23	26.66	
Dry Wt. of Soil + Cont. (g)	12.31	11.79	24.26	22.80	23.10	
Wt. of Container (g)	7.07	7.04	13.70	13.53	13.67	
Moisture Content (%) [Wn]	29.77	29.68	36.55	37.00	37.75	

Liquid Limit	37
Plastic Limit	30
Plasticity Index	7
Classification	ML

PI at "A" - Line = $0.73(LL-20)$ 12.41

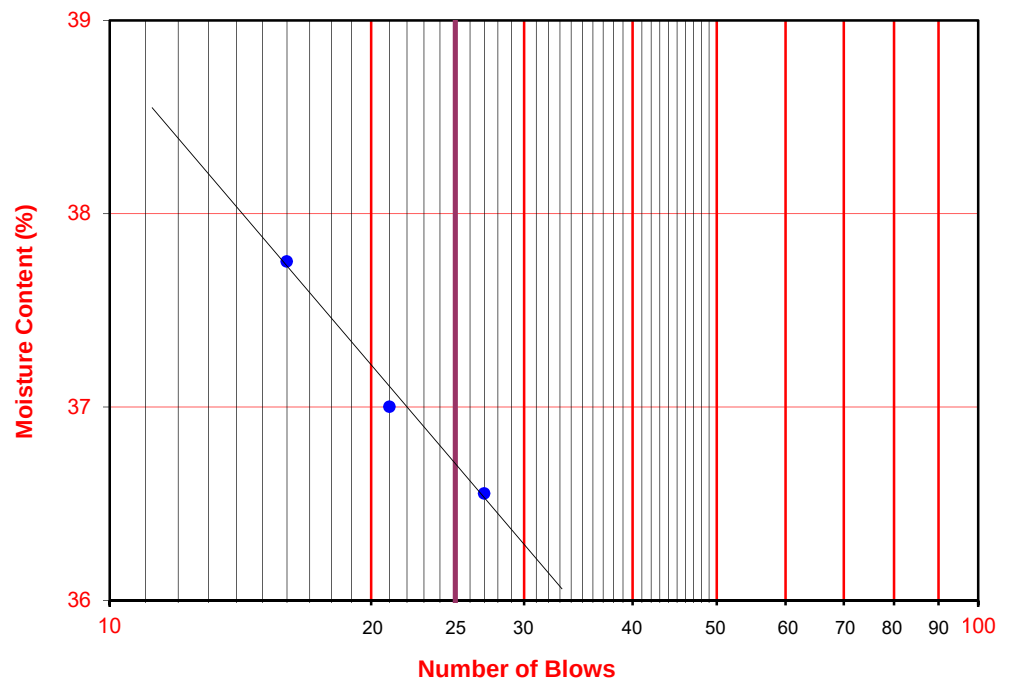
One - Point Liquid Limit Calculation

$$LL = W_n(N/25)^{0.121}$$



PROCEDURES USED

- ☐ Wet Preparation
Multipoint - Wet
- ☒ Dry Preparation
Multipoint - Dry
- ☒ Procedure A
Multipoint Test
- ☐ Procedure B
One-point Test





ATTERBERG LIMITS

ASTM D 4318

Project Name: Sun View Elementary School Tested By: R. Manning Date: 10/18/17
 Project No. : 11766.002 Input By: J. Ward Date: 10/25/17
 Boring No.: LB-1 Checked By: J. Ward
 Sample No.: S2 Depth (ft.) 12.5
 Soil Identification: Gray silt (ML)

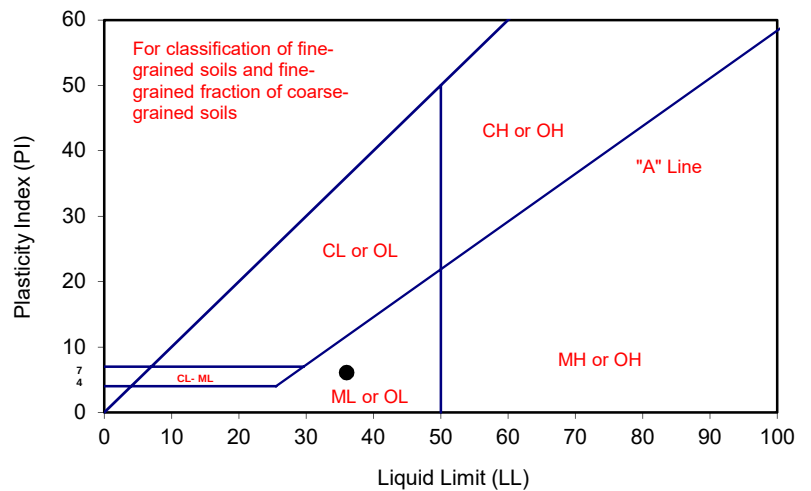
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			30	18	15	
Wet Wt. of Soil + Cont. (g)	13.89	13.27	24.45	28.70	29.00	
Dry Wt. of Soil + Cont. (g)	12.12	11.84	21.64	24.71	24.89	
Wt. of Container (g)	6.21	7.06	13.61	13.73	13.69	
Moisture Content (%) [Wn]	29.95	29.92	34.99	36.34	36.70	

Liquid Limit	36
Plastic Limit	30
Plasticity Index	6
Classification	ML

PI at "A" - Line = $0.73(LL-20)$ 11.68

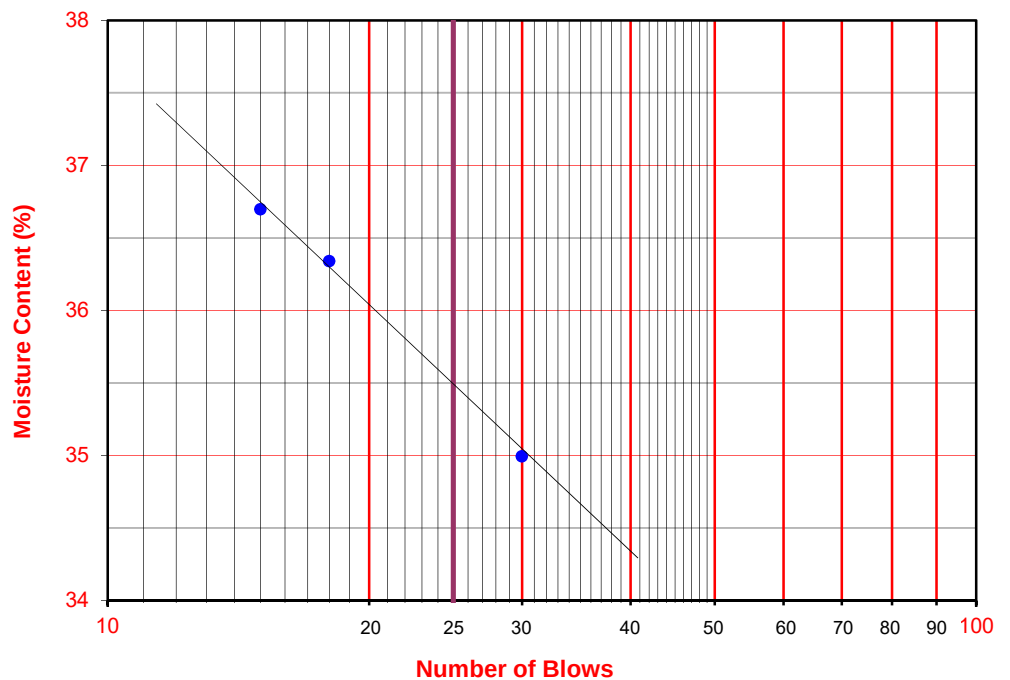
One - Point Liquid Limit Calculation

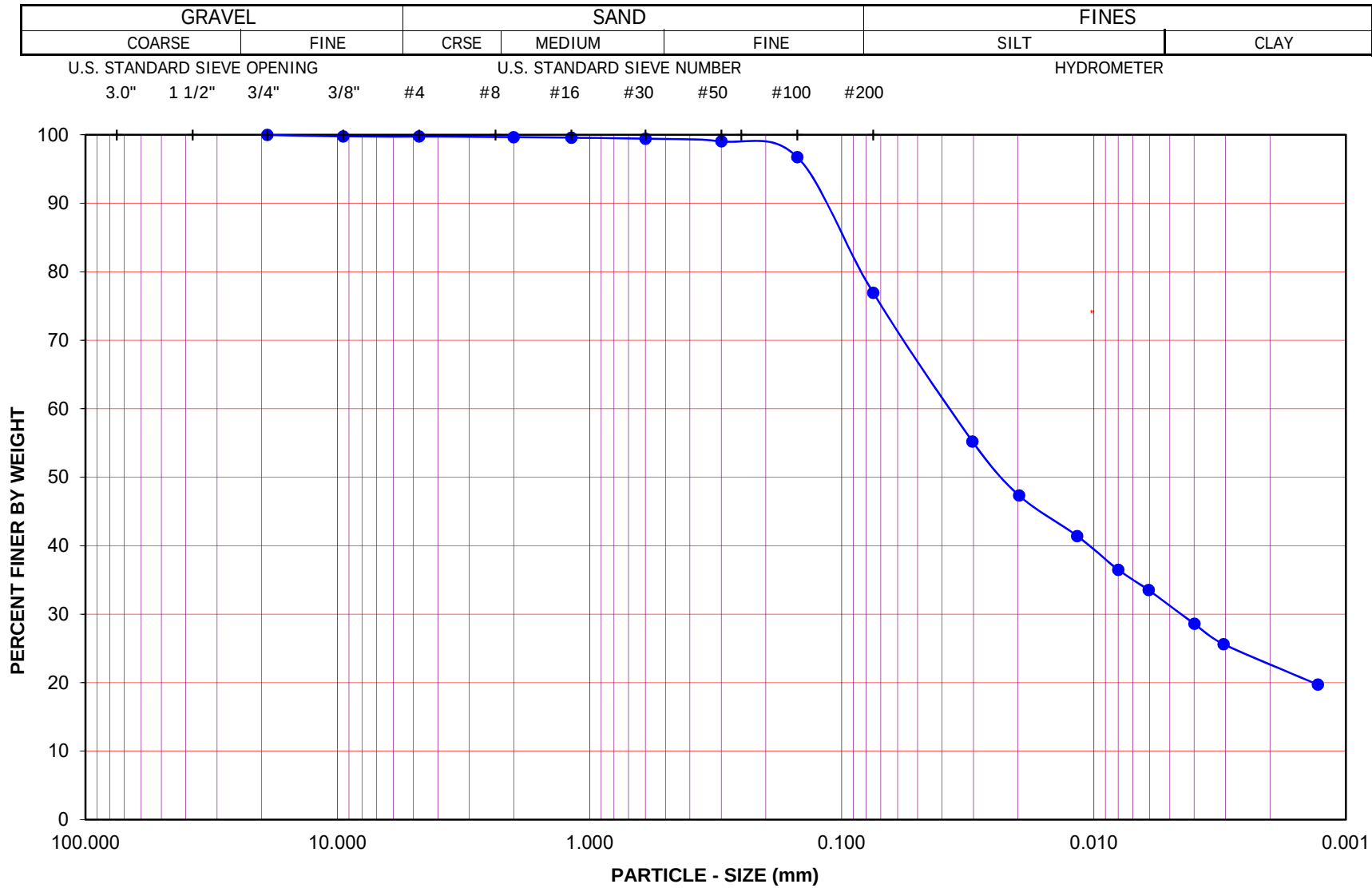
$$LL = W_n(N/25)^{0.121}$$



PROCEDURES USED

- ☐ Wet Preparation
Multipoint - Wet
- ☒ Dry Preparation
Multipoint - Dry
- ☒ Procedure A
Multipoint Test
- ☐ Procedure B
One-point Test





Project Name: Sun View Elementary School
 Project No.: 11766.002

Boring No.: LB-1 Sample No.: BB1
 Depth (feet): 0-5 Soil Type : (CL)s
 Soil Identification: Very dark grayish brown lean clay with sand (CL)s
 GR:SA:FI : (%) **0 : 23 : 77**

**PARTICLE - SIZE
DISTRIBUTION**

ASTM D 422



TESTS for SULFATE CONTENT CHLORIDE CONTENT and pH of SOILS

Project Name: Sun View Elementary School Tested By : G. Bathala Date: 10/18/17
Project No. : 11766.002 Data Input By: J. Ward Date: 10/25/17

Boring No.	LB-1			
Sample No.	BB1			
Sample Depth (ft)	0-5			
Soil Identification:	Very dark grayish brown (CL)s			
Wet Weight of Soil + Container (g)	116.94			
Dry Weight of Soil + Container (g)	116.63			
Weight of Container (g)	63.43			
Moisture Content (%)	0.58			
Weight of Soaked Soil (g)	100.14			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	14			
Crucible No.	4			
Furnace Temperature (°C)	860			
Time In / Time Out	9:00/9:45			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	21.0852			
Wt. of Crucible (g)	21.0584			
Wt. of Residue (g) (A)	0.0268			
PPM of Sulfate (A) x 41150	1102.82			
PPM of Sulfate, Dry Weight Basis	1109			

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	15			
ml of AgNO ₃ Soln. Used in Titration (C)	2.0			
PPM of Chloride (C -0.2) * 100 * 30 / B	360			
PPM of Chloride, Dry Wt. Basis	362			

pH TEST, DOT California Test 643

pH Value	8.15			
Temperature °C	20.0			



SOIL RESISTIVITY TEST

DOT CA TEST 643

Project Name: Sun View Elementary School
 Project No. : 11766.002
 Boring No.: LB-1
 Sample No. : BB1

Tested By : R. Manning Date: 10/24/17
 Data Input By: J. Ward Date: 10/25/17
 Depth (ft.) : 0-5

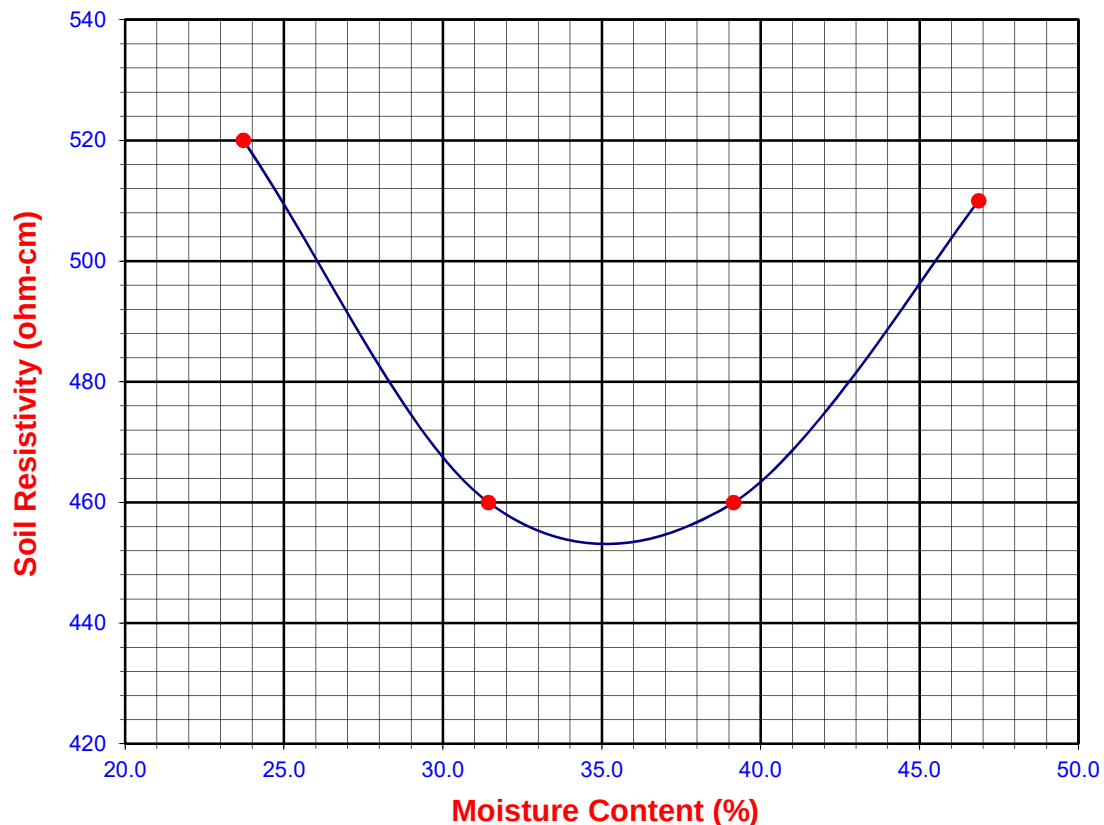
Soil Identification:* Very dark grayish brown (CL)s

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	30	23.72	520	520
2	40	31.44	460	460
3	50	39.15	460	460
4	60	46.86	510	510
5				

Moisture Content (%) (Mci)	0.58
Wet Wt. of Soil + Cont. (g)	116.94
Dry Wt. of Soil + Cont. (g)	116.63
Wt. of Container (g)	63.43
Container No.	
Initial Soil Wt. (g) (Wt)	130.40
Box Constant	1.000
$MC = (((1 + Mci / 100) \times (Wa / Wt + 1)) - 1) \times 100$	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
453	35.1	1109	362	8.15	20.0



APPENDIX C

Boring Logs and Laboratory Test Results (Leighton, 2017)



Leighton

GEOTECHNICAL BORING LOG HA-1

Project No. 11766.001
 Project Sun View Elementary School
 Drilling Co. Leighton Consulting, Inc.
 Drilling Method Hand Auger
 Location 7721 Juliette Low Drive, Huntington Beach, Ca

Date Drilled 9-11-17
 Logged By JMP
 Hole Diameter 3.5"
 Ground Elevation ~21'
 Sampled By JMP

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0	N S		BB-1			28		<i>This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.</i>	
								SP	Artificial Fill (Af) @Surface: 6" to 9" playground mulch or wood chips over 3" of SAND, light yellow brown, moist, fine sand	RV
								CL/ML	Quaternary Young Alluvium (Qya) @1': Silty CLAY to Clayey SILT, olive brown, moist, slightly oxidized, micaceous, trace fine sand	
								ML	@3': SILT, olive brown, very moist, micaceous, slightly oxidized, trace fine sand	
	5									
									Total Depth of Boring: 5 feet bgs No groundwater encountered during drilling Boring backfilled with site soils	
	10									
	15									

SAMPLE TYPES:

B BULK SAMPLE
 C CORE SAMPLE
 G GRAB SAMPLE
 R RING SAMPLE
 S SPLIT SPOON SAMPLE
 T TUBE SAMPLE

TYPE OF TESTS:

-200 % FINES PASSING
 AL ATTERBERG LIMITS
 CN CONSOLIDATION
 CO COLLAPSE
 CR CORROSION
 CU UNDRAINED TRIAXIAL

DS DIRECT SHEAR
 EI EXPANSION INDEX
 H HYDROMETER
 MD MAXIMUM DENSITY
 PP POCKET PENETROMETER
 RV R VALUE

SA SIEVE ANALYSIS
 SE SAND EQUIVALENT
 SG SPECIFIC GRAVITY
 UC UNCONFINED COMPRESSIVE STRENGTH



GEOTECHNICAL BORING LOG HA-2

Project No.	11766.001	Date Drilled	9-11-17
Project	Sun View Elementary School	Logged By	JMP
Drilling Co.	Leighton Consulting, Inc.	Hole Diameter	3.5"
Drilling Method	Hand Auger	Ground Elevation	~21'
Location	7721 Juliette Low Drive, Huntington Beach, Ca	Sampled By	JMP

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION <i>This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.</i>	Type of Tests
	0	N S		BB-1			8	ML	@surface: grass Artificial Fill (Af) @0': SILT to Clayey SILT, olive brown to gray brown, slightly moist to moist, disturbed Quaternary Young Alluvium (Qya) @0.5': SILT, olive brown, slightly moist to moist, slightly oxidized, micaceous, slightly porous @2': grades to Sandy SILT, olive brown, slightly moist to moist, fine sand, slightly oxidized, micaceous, SM @3': grades to Silty SAND, light yellow brown, slightly moist, fine sand, micaceous @4.5': moist	RV, MD
	5									
	10								Total Depth of Boring: 5 feet bgs No groundwater encountered during drilling Boring backfilled with site soils	
	15									

SAMPLE TYPES:

B BULK SAMPLE
 C CORE SAMPLE
 G GRAB SAMPLE
 R RING SAMPLE
 S SPLIT SPOON SAMPLE
 T TUBE SAMPLE

TYPE OF TESTS:

-200 % FINES PASSING
 AL ATTERBERG LIMITS
 CN CONSOLIDATION
 CO COLLAPSE
 CR CORROSION
 CU UNDRAINED TRIAXIAL

DS DIRECT SHEAR
 EI EXPANSION INDEX
 H HYDROMETER
 MD MAXIMUM DENSITY
 PP POCKET PENETROMETER
 RV R VALUE

SA SIEVE ANALYSIS
 SE SAND EQUIVALENT
 SG SPECIFIC GRAVITY
 UC UNCONFINED COMPRESSIVE STRENGTH



GEOTECHNICAL BORING LOG HA-3

Project No.	11766.001
Project	Sun View Elementary School
Drilling Co.	Leighton Consulting, Inc.
Drilling Method	Hand Auger
Location	7721 Juliette Low Drive, Huntington Beach, Ca

Date Drilled	9-11-17
Logged By	JMP
Hole Diameter	3.5"
Ground Elevation	~22'
Sampled By	JMP

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0	N S		BB-1			23	ML/SM	<i>This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.</i> @surface: grass Quaternary Young Alluvium (Qya) @0': Sandy SILT to Silty SAND, light olive brown, slightly moist, slightly cemented, fine sand, micaceous ML/CL @1.5': Clayey SILT to Silty CLAY, gray brown to dark gray brown, moist, visible porosity, trace oxidation, slight blocky structure @2.5': color transitions to olive brown ML/CL @3.5': SILT, olive brown, very moist, micaceous	RV
	5									
	10									
	15									
Total Depth of Boring: 5 feet bgs No groundwater encountered during drilling Boring backfilled with site soils										

SAMPLE TYPES:

B BULK SAMPLE

C CORE SAMPLE

G GRAB SAMPLE

R RING SAMPLE

S SPLIT SPOON SAMPLE

T TUBE SAMPLE

TYPE OF TESTS:

-200 % FINES PASSING

AL ATTERBERG LIMITS

CN CONSOLIDATION

CO COLLAPSE

CR CORROSION

CU UNDRAINED TRIAXIAL

DS DIRECT SHEAR

EI EXPANSION INDEX

H HYDROMETER

MD MAXIMUM DENSITY

PP POCKET PENETROMETER

RV R VALUE

SA SIEVE ANALYSIS

SE SAND EQUIVALENT

SG SPECIFIC GRAVITY

UC UNCONFINED COMPRESSIVE STRENGTH

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name: <u>Sun View Elementary School</u>	Tested By: <u>R. Manning</u>	Date: <u>09/12/17</u>
Project No.: <u>11766.001</u>	Input By: <u>J. Ward</u>	Date: <u>09/22/17</u>
Boring No.: <u>HA-2</u>	Depth (ft.): <u>0-5</u>	
Sample No.: <u>BB1</u>		
Soil Identification: <u>Pale olive silt (ML)</u>		

Preparation Method:

☒

Moist

☐

Dry

☒

Mechanical Ram

☐

Manual Ram

Mold Volume (ft³)

0.03330
Ram Weight = 10 lb.; Drop = 18 in.

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3730	3799	3810			
Weight of Mold (g)	1857	1857	1857			
Net Weight of Soil (g)	1873	1942	1953			
Wet Weight of Soil + Cont. (g)	396.3	371.2	413.0			
Dry Weight of Soil + Cont. (g)	355.7	327.8	355.4			
Weight of Container (g)	39.1	50.8	39.1			
Moisture Content (%)	12.82	15.67	18.21			
Wet Density (pcf)	124.0	128.6	129.3			
Dry Density (pcf)	109.9	111.2	109.4			

Maximum Dry Density (pcf)

111.0

Optimum Moisture Content (%)

15.5

PROCEDURE USED



Procedure A

Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if + #4 is 20% or less



Procedure B

Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + #4 is >20% and + 3/8 in. is 20% or less



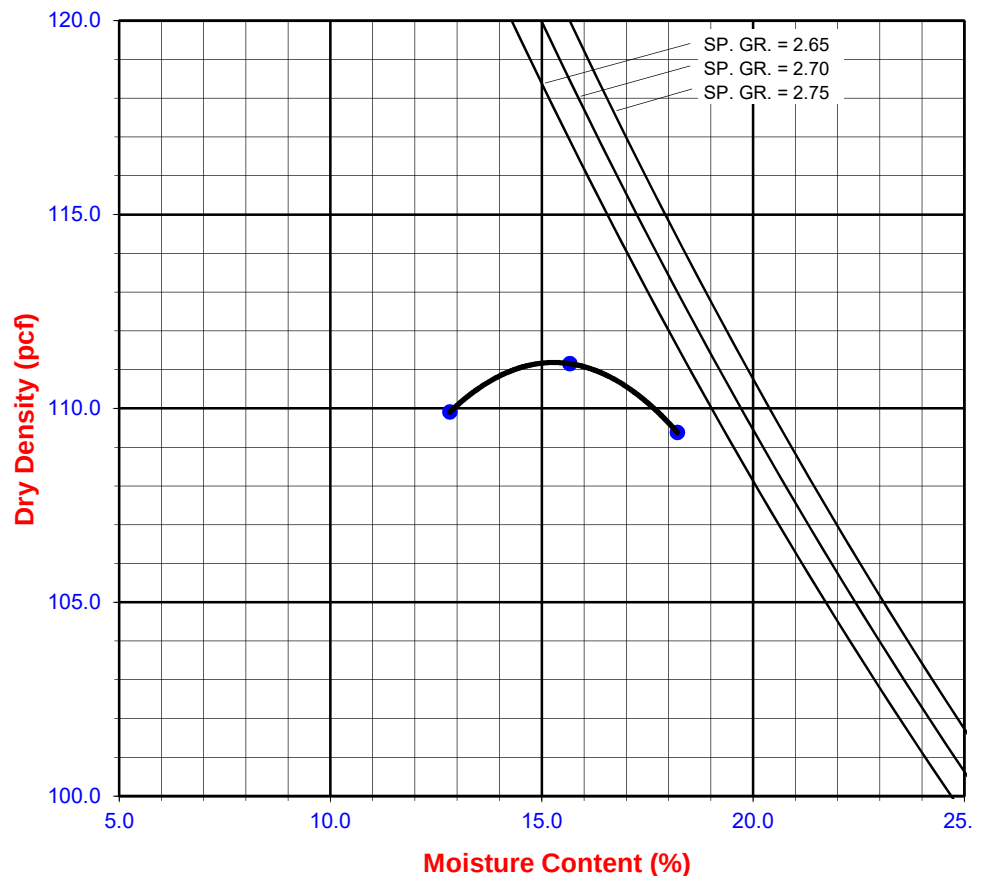
Procedure C

Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in. is >20% and + 3/4 in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI




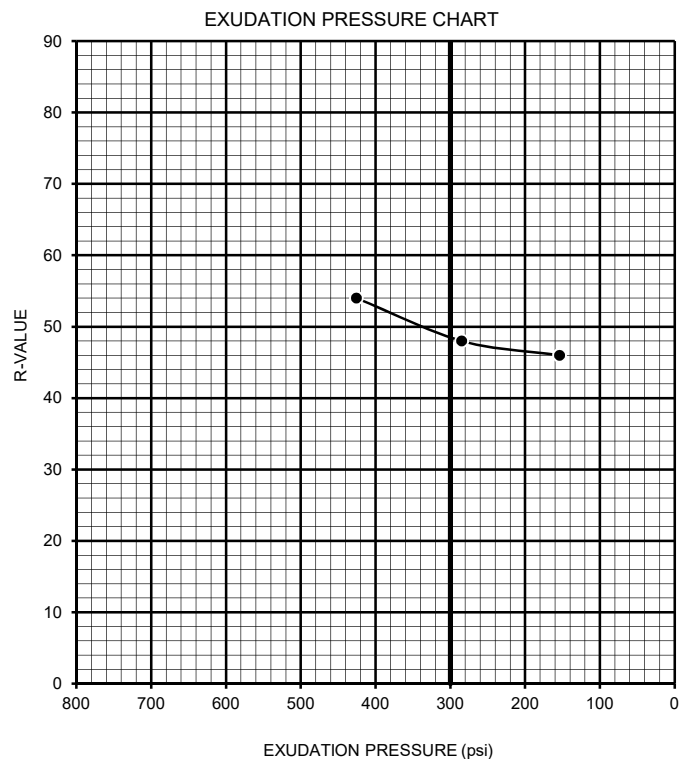
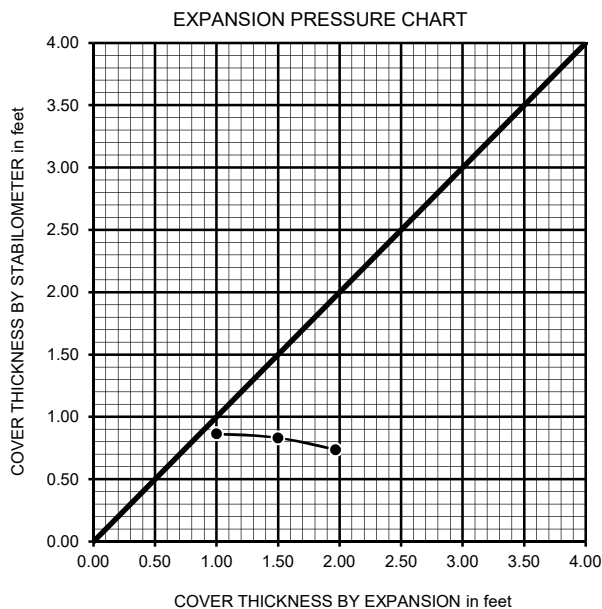
R-VALUE TEST RESULTS

DOT CA Test 301

PROJECT NAME: Sun View Elementary School PROJECT NUMBER: 11766.001
 BORING NUMBER: HA-1 DEPTH (FT.): 0-5
 SAMPLE NUMBER: BB1 TECHNICIAN: S. Felter
 SAMPLE DESCRIPTION: Olive silt (ML) DATE COMPLETED: 9/21/2017

TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	17.7	18.2	19.1
HEIGHT OF SAMPLE, Inches	2.52	2.51	2.59
DRY DENSITY, pcf	105.7	107.4	106.0
COMPACTOR PRESSURE, psi	250	150	75
EXUDATION PRESSURE, psi	425	285	154
EXPANSION, Inches x 10exp-4	59	45	30
STABILITY Ph 2,000 lbs (160 psi)	42	49	54
TURNS DISPLACEMENT	6.10	6.17	6.34
R-VALUE UNCORRECTED	54	48	29
R-VALUE CORRECTED	54	48	46

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.74	0.83	0.86
EXPANSION PRESSURE THICKNESS, ft.	1.97	1.50	1.00



R-VALUE BY EXPANSION: 46
 R-VALUE BY EXUDATION: 48
 EQUILIBRIUM R-VALUE: 46



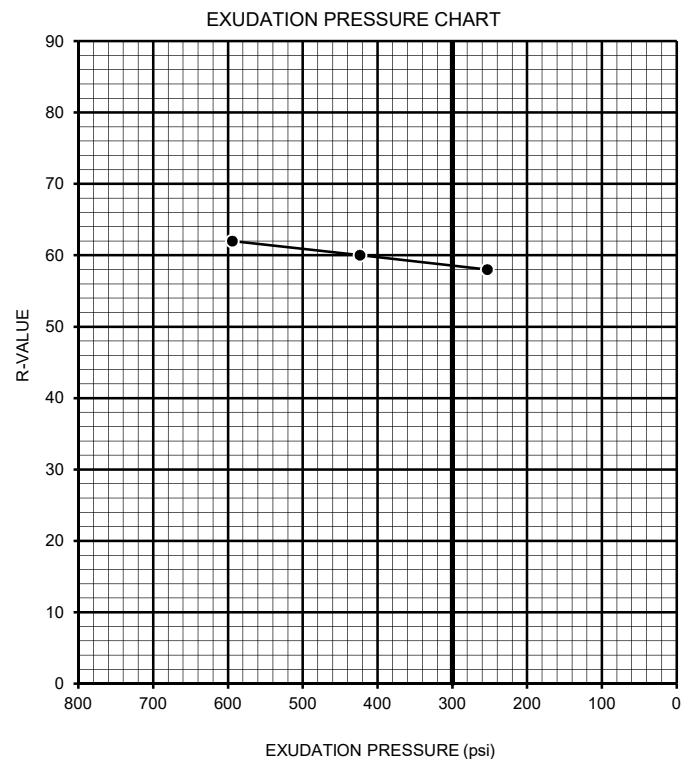
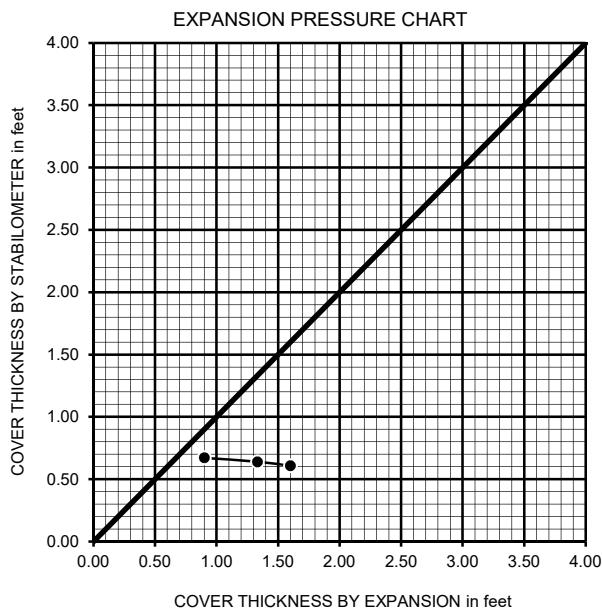
R-VALUE TEST RESULTS

DOT CA Test 301

PROJECT NAME: Sun View Elementary School PROJECT NUMBER: 11766.001
BORING NUMBER: HA-2 DEPTH (FT.): 0-5
SAMPLE NUMBER: BB1 TECHNICIAN: S. Felter
SAMPLE DESCRIPTION: Pale olive silt (ML) DATE COMPLETED: 9/21/2017

TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	16.2	16.6	17.5
HEIGHT OF SAMPLE, Inches	2.49	2.48	2.59
DRY DENSITY, pcf	107.0	107.0	106.0
COMPACTOR PRESSURE, psi	350	250	200
EXUDATION PRESSURE, psi	594	423	253
EXPANSION, Inches x 10exp-4	48	40	27
STABILITY Ph 2,000 lbs (160 psi)	33	34	38
TURNS DISPLACEMENT	6.01	6.21	6.32
R-VALUE UNCORRECTED	62	60	29
R-VALUE CORRECTED	62	60	58

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.61	0.64	0.67
EXPANSION PRESSURE THICKNESS, ft.	1.60	1.33	0.90



R-VALUE BY EXPANSION: 58
R-VALUE BY EXUDATION: 58
EQUILIBRIUM R-VALUE: 58



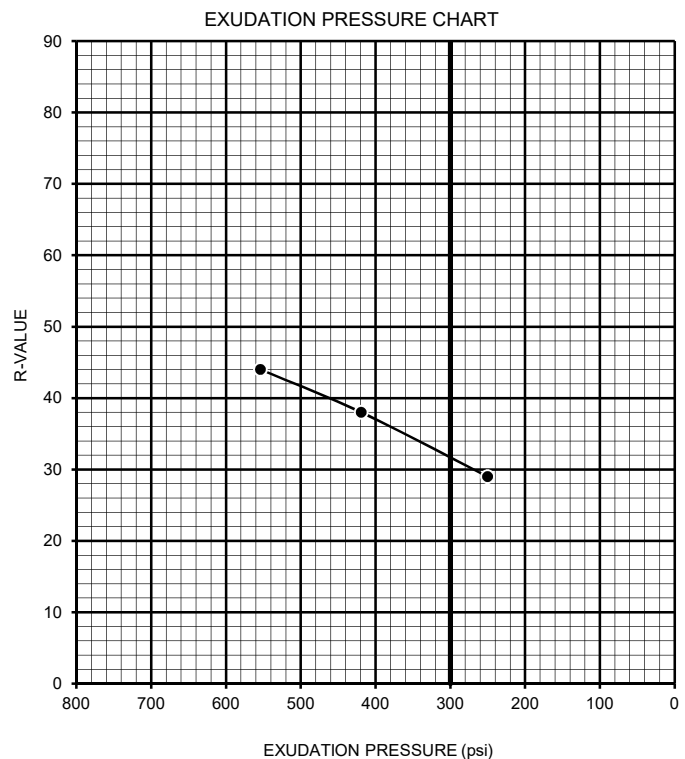
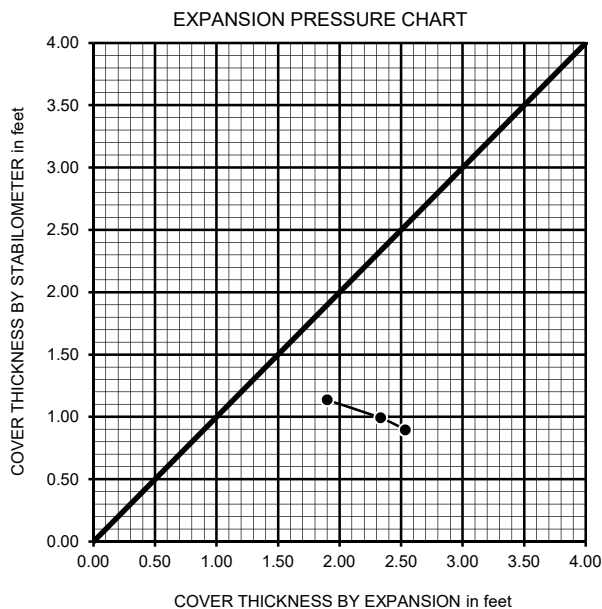
R-VALUE TEST RESULTS

DOT CA Test 301

PROJECT NAME: Sun View Elementary School PROJECT NUMBER: 11766.001
 BORING NUMBER: HA-3 DEPTH (FT.): 0-5
 SAMPLE NUMBER: BB1 TECHNICIAN: S. Felter
 SAMPLE DESCRIPTION: Olive silt (ML) DATE COMPLETED: 9/21/2017

TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	19.8	20.7	21.2
HEIGHT OF SAMPLE, Inches	2.50	2.48	2.51
DRY DENSITY, pcf	104.2	100.2	101.8
COMPACTOR PRESSURE, psi	300	200	150
EXUDATION PRESSURE, psi	554	419	250
EXPANSION, Inches x 10exp-4	76	70	57
STABILITY Ph 2,000 lbs (160 psi)	57	60	78
TURNS DISPLACEMENT	5.85	6.68	6.38
R-VALUE UNCORRECTED	44	38	29
R-VALUE CORRECTED	44	38	29

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.90	0.99	1.14
EXPANSION PRESSURE THICKNESS, ft.	2.53	2.33	1.90



R-VALUE BY EXPANSION: 18
 R-VALUE BY EXUDATION: 31
 EQUILIBRIUM R-VALUE: 18

APPENDIX D

Seismicity Data



Leighton



Design Maps Detailed Report

ASCE 7-10 Standard (33.7252°N, 117.9932°W)

Site Class E – “Soft Clay Soil”, Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_s) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From [Figure 22-1](#) ^[1]

$S_s = 1.491 \text{ g}$

From [Figure 22-2](#) ^[2]

$S_1 = 0.553 \text{ g}$

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class E, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
Any profile with more than 10 ft of soil having the characteristics:			
• Plasticity index $PI > 20$, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\bar{s}_u < 500 \text{ psf}$			
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient F_a

Site Class	Mapped MCE _R Spectral Response Acceleration Parameter at Short Period				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_s

For Site Class = E and $S_s = 1.491$ g, $F_a = 0.900$

Table 11.4-2: Site Coefficient F_v

Site Class	Mapped MCE _R Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = E and $S_1 = 0.553$ g, $F_v = 2.400$

Equation (11.4-1):

$$S_{MS} = F_a S_s = 0.900 \times 1.491 = 1.342 \text{ g}$$

Equation (11.4-2):

$$S_{M1} = F_v S_1 = 2.400 \times 0.553 = 1.328 \text{ g}$$

Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4-3):

$$S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 1.342 = 0.895 \text{ g}$$

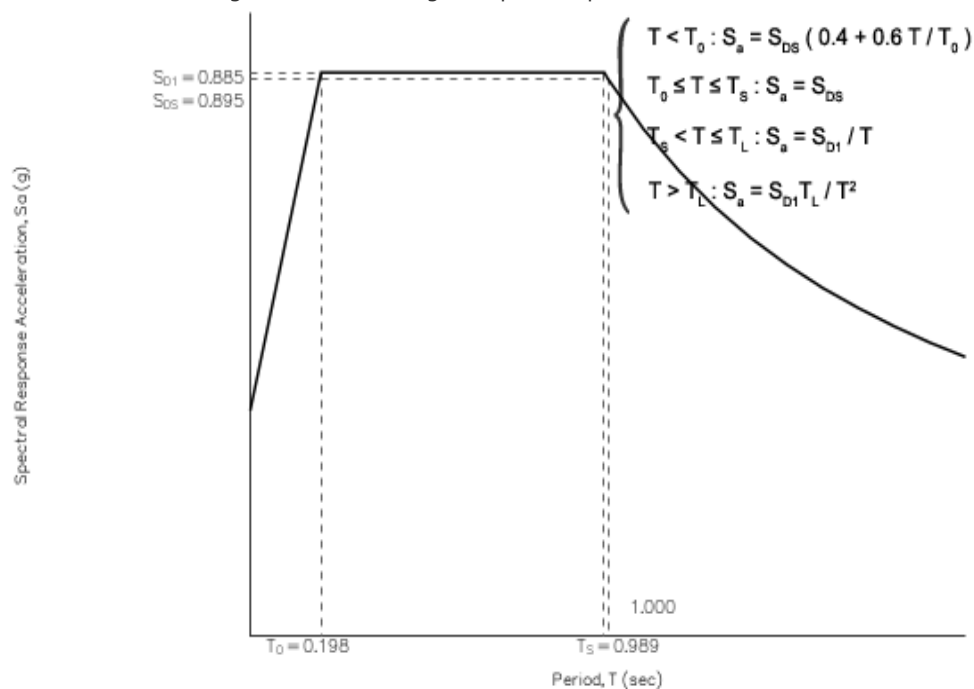
Equation (11.4-4):

$$S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 1.328 = 0.885 \text{ g}$$

Section 11.4.5 — Design Response Spectrum

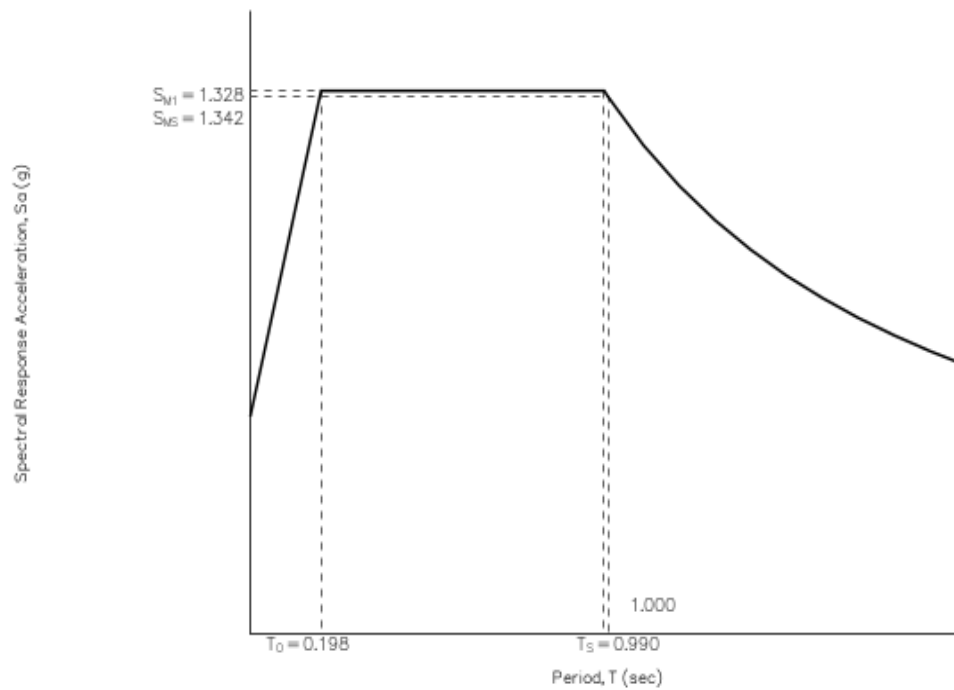
From [Figure 22-12](#)^[3] $T_L = 8 \text{ seconds}$

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From [Figure 22-7](#) ^[4]

$$PGA = 0.565$$

Equation (11.8-1):

$$PGA_M = F_{PGA} PGA = 0.900 \times 0.565 = 0.509 \text{ g}$$

Table 11.8-1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of PGA

For Site Class = E and PGA = 0.565 g, $F_{PGA} = 0.900$

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From [Figure 22-17](#) ^[5]

$$C_{RS} = 0.979$$

From [Figure 22-18](#) ^[6]

$$C_{R1} = 1.014$$

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

For Risk Category = I and $S_{DS} = 0.895 g$, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

For Risk Category = I and $S_{D1} = 0.885 g$, Seismic Design Category = D

Note: When S_1 is greater than or equal to $0.75g$, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category $\equiv$ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. Figure 22-1:
https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. Figure 22-2:
https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. Figure 22-12:
https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. Figure 22-7:
https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. Figure 22-17:
https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. Figure 22-18:
https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

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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: 11766.002

DATE: 10-24-2017

JOB NAME: Sun View

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:

MINIMUM MAGNITUDE: 4.00
MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:

SITE LATITUDE: 33.7252
SITE LONGITUDE: 117.9932

SEARCH DATES:

START DATE: 1800
END DATE: 2016

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: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]

SCOND: 0 Depth Source: A

Basement Depth: 5.00 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]
DMG	33.7500	118.0000	11/16/1934	2126 0.0	0.0	4.00	0.141	VIII	1.8(2.8)
DMG	33.6800	117.9930	11/20/1961	85334.7	4.4	4.00	0.122	VII	3.1(5.0)
DMG	33.6710	118.0120	10/20/1961	223534.2	5.6	4.10	0.118	VII	3.9(6.3)
DMG	33.6650	117.9790	10/20/1961	214240.7	7.2	4.00	0.108	VII	4.2(6.8)
DMG	33.6830	118.0500	03/11/1933	1250 0.0	0.0	4.40	0.131	VIII	4.4(7.0)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.235	IX	4.4(7.0)
DMG	33.7000	118.0670	02/08/1940	165617.0	0.0	4.00	0.104	VII	4.6(7.4)
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.186	VIII	4.6(7.4)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.186	VIII	4.6(7.4)
DMG	33.7000	118.0670	07/20/1940	4 113.0	0.0	4.00	0.104	VII	4.6(7.4)
DMG	33.6590	117.9810	10/20/1961	20 714.5	6.1	4.00	0.104	VII	4.6(7.4)
DMG	33.6540	117.9940	10/20/1961	194950.5	4.6	4.30	0.118	VII	4.9(7.9)
DMG	33.8000	118.0000	10/21/1913	938 0.0	0.0	4.00	0.098	VII	5.2(8.3)
DMG	33.7500	118.0830	03/11/1933	618 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	635 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	611 0.0	0.0	4.40	0.118	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	751 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	553 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	555 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	832 0.0	0.0	4.20	0.106	VII	5.4(8.7)
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DMG	33.7500	118.0830	03/11/1933	1025 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	1138 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	11 0 0.0	0.0	4.00	0.095	VII	5.4(8.7)
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DMG	33.7500	118.0830	03/11/1933	1045 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	1357 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	837 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/16/1933	1530 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.170	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	1141 0.0	0.0	4.20	0.106	VII	5.4(8.7)
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DMG	33.7500	118.0830	03/11/1933	23 5 0.0	0.0	4.20	0.106	VII	5.4(8.7)
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DMG	33.7500	118.0830	03/13/1933	1532 0.0	0.0	4.10	0.100	VII	5.4(8.7)

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DMG	33.7500	118.0830	03/11/1933	8 8 0.0	0.0	4.50	0.124	VII	5.4(8.7)
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DMG	33.7500	118.0830	03/11/1933	2231 0.0	0.0	4.40	0.118	VII	5.4(8.7)
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DMG	33.7500	118.0830	03/11/1933	911 0.0	0.0	4.40	0.118	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	926 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	15 2 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	1651 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	1738 0.0	0.0	4.50	0.124	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	1825 0.0	0.0	4.10	0.100	VII	5.4(8.7)

EARTHQUAKE SEARCH RESULTS

Page 2

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]
DMG	33.7500	118.0830	03/11/1933	311 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	2354 0.0	0.0	4.50	0.124	VII	5.4(8.7)
DMG	33.7500	118.0830	03/13/1933	343 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/13/1933	432 0.0	0.0	4.70	0.138	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/13/1933	617 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	034 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	439 0.0	0.0	4.90	0.153	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/13/1933	1929 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	6 1 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/14/1933	1219 0.0	0.0	4.50	0.124	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	740 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	835 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/15/1933	2 8 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/15/1933	432 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/15/1933	540 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	04/02/1933	1536 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/16/1933	1456 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/16/1933	1529 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.161	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/17/1933	1651 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/18/1933	2052 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/19/1933	2123 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/20/1933	1358 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/21/1933	326 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/23/1933	840 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/23/1933	1831 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/25/1933	1346 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/30/1933	1225 0.0	0.0	4.40	0.118	VII	5.4(8.7)
DMG	33.7500	118.0830	03/31/1933	1049 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	04/01/1933	642 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	04/02/1933	8 0 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	259 0.0	0.0	4.60	0.131	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	3 9 0.0	0.0	4.40	0.118	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	2 4 0.0	0.0	4.90	0.153	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.161	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	336 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	339 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	347 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.189	VIII	5.4(8.7)

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DMG	33.7500	118.0830	03/11/1933	436 0.0	0.0	4.60	0.131	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	440 0.0	0.0	4.70	0.138	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/14/1933	036 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	513 0.0	0.0	4.70	0.138	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	515 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/14/1933	2242 0.0	0.0	4.10	0.100	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	1547 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	258 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	227 0.0	0.0	4.60	0.131	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	3 5 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	211 0.0	0.0	4.40	0.118	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	2 5 0.0	0.0	4.30	0.112	VII	5.4(8.7)
DMG	33.7500	118.0830	03/12/1933	448 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	210 0.0	0.0	4.60	0.131	VIII	5.4(8.7)

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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]
DMG	33.7500	118.0830	03/11/1933	257 0.0	0.0	4.20	0.106	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	216 0.0	0.0	4.80	0.145	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	222 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.170	VIII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	252 0.0	0.0	4.00	0.095	VII	5.4(8.7)
DMG	33.7500	118.0830	03/11/1933	521 0.0	0.0	4.40	0.118	VII	5.4(8.7)
MGI	33.7000	117.9000	07/08/1902	945 0.0	0.0	4.00	0.093	VII	5.6(9.0)
DMG	33.7330	118.1000	03/11/1933	1350 0.0	0.0	4.40	0.109	VII	6.2(9.9)
DMG	33.7330	118.1000	03/11/1933	1447 0.0	0.0	4.40	0.109	VII	6.2(9.9)
DMG	33.7330	118.1000	03/11/1933	15 9 0.0	0.0	4.40	0.109	VII	6.2(9.9)
MGI	33.8000	117.9000	05/22/1902	740 0.0	0.0	4.30	0.092	VII	7.4(12.0)
DMG	33.6170	118.0170	03/15/1933	111332.0	0.0	4.90	0.125	VII	7.6(12.2)
DMG	33.6170	118.0170	10/02/1933	1326 1.0	0.0	4.00	0.078	VII	7.6(12.2)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.139	VIII	7.6(12.2)
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.261	IX	7.6(12.3)
DMG	33.7670	118.1170	11/04/1939	2141 0.0	0.0	4.00	0.077	VII	7.7(12.3)
DMG	33.6170	118.0330	05/21/1938	944 0.0	0.0	4.00	0.076	VII	7.8(12.6)
DMG	33.7500	118.1330	03/11/1933	11 4 0.0	0.0	4.60	0.101	VII	8.2(13.2)
DMG	33.6000	118.0000	03/11/1933	217 0.0	0.0	4.50	0.093	VII	8.6(13.9)
DMG	33.6000	118.0000	03/11/1933	231 0.0	0.0	4.40	0.088	VII	8.6(13.9)
DMG	33.6000	118.0170	12/25/1935	1715 0.0	0.0	4.50	0.092	VII	8.7(14.1)
DMG	33.7830	118.1330	01/13/1940	749 7.0	0.0	4.00	0.070	VI	9.0(14.4)
DMG	33.7830	118.1330	11/20/1933	1032 0.0	0.0	4.00	0.070	VI	9.0(14.4)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.146	VIII	9.0(14.4)
GSP	33.6200	117.9000	04/07/1989	200730.2	13.0	4.50	0.090	VII	9.0(14.5)
DMG	33.7500	118.1670	05/16/1933	205855.0	0.0	4.00	0.064	VI	10.1(16.3)
DMG	33.6170	118.1170	01/20/1934	2117 0.0	0.0	4.50	0.082	VII	10.3(16.6)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.119	VII	10.4(16.7)
DMG	33.7670	117.8170	08/22/1936	521 0.0	0.0	4.00	0.062	VI	10.5(16.9)
DMG	33.5670	117.9830	07/07/1937	1112 0.0	0.0	4.00	0.061	VI	10.9(17.6)
DMG	33.5670	117.9830	04/17/1934	1833 0.0	0.0	4.00	0.061	VI	10.9(17.6)
DMG	33.7500	118.1830	08/04/1933	41748.0	0.0	4.00	0.060	VI	11.0(17.7)
DMG	33.5610	118.0580	01/15/1937	183547.0	10.0	4.00	0.057	VI	11.9(19.2)
MGI	33.8000	117.8000	11/07/1926	1948 0.0	0.0	4.60	0.077	VII	12.2(19.7)
MGI	33.8000	117.8000	11/10/1926	1723 0.0	0.0	4.60	0.077	VII	12.2(19.7)

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MGI	33.8000	117.8000	05/19/1917	635 0.0	0.0	4.00	0.056	VI	12.2(19.7)
MGI	33.8000	117.8000	11/09/1926	1535 0.0	0.0	4.60	0.077	VII	12.2(19.7)
MGI	33.8000	117.8000	05/20/1917	945 0.0	0.0	4.00	0.056	VI	12.2(19.7)
MGI	33.8000	117.8000	11/04/1926	2238 0.0	0.0	4.60	0.077	VII	12.2(19.7)
MGI	33.8000	117.8000	05/19/1917	719 0.0	0.0	4.00	0.056	VI	12.2(19.7)
DMG	33.7830	118.2000	12/27/1939	192849.0	0.0	4.70	0.080	VII	12.5(20.1)
DMG	33.6330	118.2000	11/01/1940	20 046.0	0.0	4.00	0.052	VI	13.5(21.7)
DMG	33.9000	118.1000	07/08/1929	1646 6.7	13.0	4.70	0.075	VII	13.5(21.8)
DMG	33.6300	118.2000	09/13/1929	132338.2	0.0	4.00	0.052	VI	13.6(21.8)
DMG	33.8170	118.2170	10/22/1941	65718.5	0.0	4.90	0.080	VII	14.3(23.0)
GSG	33.9325	117.9172	03/29/2014	040942.3	4.8	5.10	0.086	VII	15.0(24.1)
DMG	33.7590	118.2530	08/31/1938	31814.2	10.0	4.50	0.063	VI	15.1(24.3)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.100	VII	15.3(24.6)
DMG	33.8670	118.2000	11/13/1933	2128 0.0	0.0	4.00	0.047	VI	15.4(24.7)
DMG	33.5170	118.1000	03/22/1941	82240.0	0.0	4.00	0.047	VI	15.6(25.1)
PAS	33.5080	118.0710	11/20/1988	53928.7	6.0	4.50	0.061	VI	15.6(25.2)
DMG	33.8670	118.2170	06/19/1944	3 6 7.0	0.0	4.40	0.056	VI	16.1(26.0)
DMG	33.8670	118.2170	06/19/1944	0 333.0	0.0	4.50	0.060	VI	16.1(26.0)

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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]
DMG	33.5450	117.8070	10/27/1969	1316 2.3	6.5	4.50	0.059	VI	16.4(26.4)
DMG	33.8540	117.7520	10/04/1961	22131.6	4.3	4.10	0.048	VI	16.4(26.5)
GSP	33.8060	117.7150	03/07/2000	002028.2	11.0	4.00	0.044	VI	16.9(27.2)
MGI	33.9000	118.2000	10/08/1927	1914 0.0	0.0	4.60	0.061	VI	16.9(27.2)
GSP	33.9040	117.7910	08/08/2012	163322.1	10.0	4.50	0.057	VI	16.9(27.3)
GSP	33.9050	117.7920	08/08/2012	062334.1	10.0	4.50	0.057	VI	16.9(27.3)
DMG	33.9670	118.0500	01/30/1941	13446.9	0.0	4.10	0.046	VI	17.0(27.4)
GSP	33.9090	117.7920	06/14/2012	031715.7	9.0	4.00	0.044	VI	17.1(27.6)
GSP	33.9070	117.7880	08/29/2012	203100.3	9.0	4.10	0.046	VI	17.2(27.7)
GSG	33.9613	117.8923	03/29/2014	213245.9	9.4	4.14	0.047	VI	17.3(27.8)
DMG	33.9500	118.1330	10/25/1933	7 046.0	0.0	4.30	0.051	VI	17.5(28.1)
PAS	33.9650	117.8860	01/01/1976	172012.9	6.2	4.20	0.048	VI	17.7(28.4)
PAS	33.5380	118.2070	05/25/1982	134430.3	13.7	4.10	0.045	VI	17.8(28.7)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.072	VI	17.9(28.8)
DMG	33.8500	118.2670	03/11/1933	629 0.0	0.0	4.40	0.052	VI	17.9(28.8)
PAS	33.4710	118.0610	02/27/1984	101815.0	6.0	4.00	0.042	VI	18.0(28.9)
GSP	33.9170	117.7760	09/03/2002	070851.9	12.0	4.80	0.064	VI	18.2(29.3)
DMG	33.8000	118.3000	11/03/1931	16 5 0.0	0.0	4.00	0.042	VI	18.3(29.5)
MGI	33.8000	118.3000	12/31/1928	1045 0.0	0.0	4.00	0.042	VI	18.3(29.5)
DMG	33.9960	117.9750	06/15/1967	458 5.5	10.0	4.10	0.043	VI	18.7(30.1)
MGI	34.0000	118.0000	05/05/1929	735 0.0	0.0	4.00	0.041	V	19.0(30.5)
MGI	34.0000	118.0000	05/05/1929	1 7 0.0	0.0	4.60	0.056	VI	19.0(30.5)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.069	VI	19.0(30.5)
GSP	33.9920	118.0820	03/16/2010	110400.2	18.0	4.40	0.050	VI	19.1(30.7)
DMG	33.9390	118.2050	01/11/1950	214135.0	0.4	4.10	0.042	VI	19.1(30.8)
GSG	33.9530	117.7610	07/29/2008	184215.7	14.0	5.30	0.076	VII	20.6(33.2)
GSP	33.9220	118.2700	10/28/2001	162745.6	21.0	4.00	0.038	V	20.9(33.6)
GSP	33.9550	117.7460	12/14/2001	120135.5	13.0	4.00	0.037	V	21.3(34.2)
DMG	33.5000	118.2500	06/18/1920	10 8 0.0	0.0	4.50	0.048	VI	21.4(34.5)
DMG	33.8830	118.3170	03/11/1933	1457 0.0	0.0	4.90	0.059	VI	21.5(34.7)
GSG	33.6580	118.3720	05/15/2013	200006.2	1.2	4.00	0.036	V	22.2(35.8)

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GSG	33.6583	118.3722	05/15/2013	200006.2	1.2	4.00	0.036	V	22.3(35.8)
MGI	34.0000	118.2000	06/26/1917	2120 0.0	0.0	4.60	0.049	VI	22.4(36.0)
MGI	34.0000	118.2000	06/26/1917	2130 0.0	0.0	4.60	0.049	VI	22.4(36.0)
MGI	34.0000	118.2000	02/13/1917	13 5 0.0	0.0	4.60	0.049	VI	22.4(36.0)
MGI	34.0000	118.2000	06/26/1917	2115 0.0	0.0	4.60	0.049	VI	22.4(36.0)
MGI	34.0000	118.2000	06/26/1917	424 0.0	0.0	4.00	0.036	V	22.4(36.0)
GSP	33.9510	117.7090	01/05/1998	181406.5	11.0	4.30	0.042	VI	22.5(36.3)
GSP	34.0200	118.1800	06/12/1989	172225.5	16.0	4.10	0.037	V	23.0(37.0)
PAS	34.0500	118.0870	10/01/1987	155953.5	10.4	4.00	0.035	V	23.1(37.1)
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.059	VI	23.1(37.3)
DMG	33.8000	117.6000	09/16/1903	1210 0.0	0.0	4.00	0.035	V	23.1(37.3)
PAS	34.0490	118.1010	10/01/1987	144541.5	13.6	4.70	0.050	VI	23.2(37.3)
PAS	34.0520	118.0900	10/01/1987	151231.8	10.8	4.70	0.050	VI	23.2(37.4)
DMG	33.5430	118.3400	09/14/1963	35116.2	2.2	4.20	0.038	V	23.6(37.9)
GSP	34.0300	118.1800	06/12/1989	165718.4	16.0	4.40	0.042	VI	23.6(38.0)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.093	VII	23.7(38.1)
PAS	34.0600	118.1000	10/01/1987	1449 5.9	11.7	4.70	0.049	VI	23.9(38.5)
T-A	34.0000	118.2500	05/04/1857	6 0 0.0	0.0	4.30	0.040	V	24.0(38.6)
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.057	VI	24.0(38.6)
T-A	34.0000	118.2500	03/26/1860	0 0 0.0	0.0	5.00	0.057	VI	24.0(38.6)
T-A	34.0000	118.2500	01/17/1857	1 0 0.0	0.0	4.30	0.040	V	24.0(38.6)
T-A	34.0000	118.2500	03/21/1880	1425 0.0	0.0	4.30	0.040	V	24.0(38.6)

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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]
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.057	VI	24.0(38.6)
T-A	34.0000	118.2500	05/02/1856	810 0.0	0.0	4.30	0.040	V	24.0(38.6)
DMG	33.6330	118.4000	10/17/1934	938 0.0	0.0	4.00	0.034	V	24.2(39.0)
PAS	34.0060	117.7390	02/18/1989	717 4.8	3.3	4.30	0.039	V	24.2(39.0)
PAS	34.0770	118.0470	02/11/1988	152555.7	12.5	4.70	0.048	VI	24.5(39.4)
DMG	33.6630	118.4130	01/08/1967	738 5.3	17.7	4.00	0.033	V	24.5(39.4)
GSP	33.9380	118.3360	05/18/2009	033936.3	13.0	4.70	0.048	VI	24.5(39.5)
DMG	33.7830	118.4170	10/14/1940	205111.0	0.0	4.00	0.033	V	24.6(39.7)
DMG	33.7830	118.4170	10/12/1940	024 0.0	0.0	4.00	0.033	V	24.6(39.7)
DMG	33.7830	118.4170	11/01/1940	725 3.0	0.0	4.00	0.033	V	24.6(39.7)
DMG	33.7830	118.4170	11/02/1940	25826.0	0.0	4.00	0.033	V	24.6(39.7)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.066	VI	24.7(39.8)
PAS	34.0760	118.0900	10/01/1987	1448 3.1	11.7	4.10	0.035	V	24.8(40.0)
DMG	33.9830	118.3000	02/11/1940	192410.0	0.0	4.00	0.033	V	25.0(40.3)
MGI	34.0000	117.7000	12/03/1929	9 5 0.0	0.0	4.00	0.033	V	25.3(40.8)
DMG	33.6820	117.5530	07/05/1938	18 655.7	10.0	4.50	0.042	VI	25.5(41.0)
MGI	34.0000	118.3000	06/30/1920	350 0.0	0.0	4.00	0.032	V	25.9(41.6)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.064	VI	25.9(41.6)
MGI	34.0000	118.3000	06/22/1920	2035 0.0	0.0	4.00	0.032	V	25.9(41.6)
MGI	34.1000	118.0000	01/27/1930	2026 0.0	0.0	4.60	0.044	VI	25.9(41.6)
DMG	33.3670	118.1500	04/16/1942	72833.0	0.0	4.00	0.032	V	26.3(42.4)
DMG	33.7670	118.4500	10/11/1940	55712.3	0.0	4.70	0.046	VI	26.4(42.5)
MGI	34.1000	118.1000	07/11/1855	415 0.0	0.0	6.30	0.105	VII	26.6(42.8)
DMG	33.7170	117.5170	06/19/1935	1117 0.0	0.0	4.00	0.031	V	27.3(44.0)
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.067	VI	27.7(44.7)
DMG	33.7170	117.5070	08/06/1938	22 056.0	10.0	4.00	0.030	V	27.9(44.9)
DMG	33.9030	118.4310	11/29/1938	192115.8	10.0	4.00	0.030	V	27.9(45.0)

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DMG	33.6320	118.4670	01/08/1967	73730.4	11.4	4.00	0.030	V	28.0(45.0)
DMG	33.7700	118.4800	04/24/1931	182754.8	0.0	4.40	0.037	V	28.1(45.2)
DMG	34.1000	117.8000	03/31/1931	2033 0.0	0.0	4.00	0.030	V	28.1(45.3)
DMG	33.9500	117.5830	04/11/1941	12024.0	0.0	4.00	0.030	V	28.2(45.3)
DMG	33.7250	117.4980	01/03/1956	02548.9	13.7	4.70	0.043	VI	28.4(45.8)
MGI	34.1000	118.2000	01/27/1860	830 0.0	0.0	4.30	0.035	V	28.5(45.8)
MGI	34.1000	118.2000	05/02/1916	1432 0.0	0.0	4.00	0.030	V	28.5(45.8)
MGI	34.1000	118.2000	04/21/1921	1538 0.0	0.0	4.00	0.030	V	28.5(45.8)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.050	VI	28.9(46.5)
MGI	33.8000	118.5000	06/18/1915	15 5 0.0	0.0	4.00	0.029	V	29.5(47.5)
DMG	33.7480	117.4790	06/22/1971	104119.0	8.0	4.20	0.032	V	29.6(47.6)
MGI	34.0000	118.4000	02/07/1927	429 0.0	0.0	4.60	0.039	V	30.1(48.4)
MGI	34.0000	118.4000	10/01/1930	040 0.0	0.0	4.60	0.039	V	30.1(48.4)
MGI	34.0000	118.4000	01/29/1927	2324 0.0	0.0	4.00	0.029	V	30.1(48.4)
MGI	34.0000	118.4000	02/22/1920	1610 0.0	0.0	4.60	0.039	V	30.1(48.4)
DMG	33.7330	117.4670	10/26/1954	162226.0	0.0	4.10	0.030	V	30.2(48.6)
GSP	33.7330	117.4660	09/02/2007	172914.0	2.0	4.70	0.041	V	30.3(48.7)
PAS	34.1490	118.1350	12/03/1988	113826.4	13.3	4.90	0.046	VI	30.4(48.9)
DMG	34.0000	118.4170	12/07/1938	338 0.0	0.0	4.00	0.028	V	30.8(49.6)
GSP	34.1100	117.7200	04/17/1990	223227.2	4.0	4.60	0.038	V	30.8(49.6)
MGI	34.1000	118.3000	07/16/1920	2022 0.0	0.0	4.60	0.038	V	31.3(50.3)
MGI	34.1000	118.3000	07/26/1920	1215 0.0	0.0	4.00	0.028	V	31.3(50.3)
MGI	34.1000	118.3000	07/16/1920	2130 0.0	0.0	4.60	0.038	V	31.3(50.3)
MGI	34.1000	118.3000	07/16/1920	2127 0.0	0.0	4.60	0.038	V	31.3(50.3)
DMG	34.1000	117.6830	01/18/1934	214 0.0	0.0	4.00	0.028	V	31.4(50.5)
DMG	34.1000	117.6830	01/09/1934	1410 0.0	0.0	4.50	0.036	V	31.4(50.5)

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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]
GSP	34.0590	118.3870	09/09/2001	235918.0	4.0	4.20	0.030	V	32.3(51.9)
T-A	34.1700	118.1700	03/07/1888	1554 0.0	0.0	4.30	0.032	V	32.3(52.0)
GSP	34.1300	117.7000	03/01/1990	003457.1	4.0	4.00	0.027	V	32.6(52.5)
PAS	34.1360	117.7090	06/26/1988	15 458.5	7.9	4.60	0.037	V	32.7(52.6)
MGI	34.2000	118.0000	01/09/1921	530 0.0	0.0	4.60	0.037	V	32.8(52.8)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.050	VI	33.2(53.4)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.058	VI	33.2(53.4)
DMG	34.2000	117.9000	07/13/1935	105416.5	0.0	4.70	0.038	V	33.2(53.4)
GSP	34.1500	117.7200	03/01/1990	032303.0	11.0	4.70	0.038	V	33.2(53.5)
GSP	34.1400	117.6900	03/02/1990	172625.4	6.0	4.60	0.036	V	33.5(53.9)
DMG	34.0000	117.5000	07/03/1908	1255 0.0	0.0	4.00	0.026	V	34.0(54.8)
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.126	VIII	34.0(54.8)
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.074	VII	34.1(54.9)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.044	VI	34.1(54.9)
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.00	0.044	VI	34.1(54.9)
DMG	34.0000	118.5000	03/06/1918	1820 0.0	0.0	4.00	0.026	V	34.7(55.8)
DMG	34.0000	118.5000	06/22/1920	248 0.0	0.0	4.90	0.041	V	34.7(55.8)
DMG	34.0000	118.5000	11/08/1914	1140 0.0	0.0	4.50	0.033	V	34.7(55.8)
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.043	VI	34.7(55.8)
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.043	VI	34.7(55.8)
MGI	34.0000	118.5000	06/23/1920	1220 0.0	0.0	4.00	0.026	V	34.7(55.8)
MGI	34.0000	118.5000	03/08/1918	1230 0.0	0.0	4.00	0.026	V	34.7(55.8)
DMG	33.8330	117.4000	06/05/1940	82727.0	0.0	4.00	0.025	V	34.8(56.1)

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GSP	34.2500	117.9900	06/28/1991	170055.5	9.0	4.30	0.029	V	36.2(58.3)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.051	VI	37.1(59.6)
T-A	34.0000	117.4200	09/10/1920	1415 0.0	0.0	4.30	0.028	V	37.9(61.1)
T-A	34.0000	117.4200	04/12/1888	1315 0.0	0.0	4.30	0.028	V	37.9(61.1)
GSG	34.0958	118.4912	06/02/2014	023643.9	4.4	4.16	0.026	V	38.3(61.7)
DMG	33.9330	117.3670	10/24/1943	02921.0	0.0	4.00	0.024	IV	38.7(62.2)
PAS	33.9190	118.6270	01/19/1989	65328.8	11.9	5.00	0.040	V	38.7(62.3)
DMG	34.1270	117.5210	12/27/1938	10 928.6	10.0	4.00	0.023	IV	38.7(62.4)
MGI	34.0000	117.4000	05/22/1907	652 0.0	0.0	4.60	0.032	V	38.9(62.7)
DMG	34.1830	117.5830	10/03/1948	24628.0	0.0	4.00	0.023	IV	39.4(63.4)
DMG	34.1400	117.5150	01/01/1965	8 418.0	5.9	4.40	0.028	V	39.6(63.8)
DMG	33.9500	118.6320	08/31/1930	04036.0	0.0	5.20	0.043	VI	39.8(64.0)
GSG	34.1347	118.4858	03/17/2014	132536.9	9.9	4.39	0.028	V	39.9(64.3)
DMG	34.1160	117.4750	06/28/1960	20 048.0	12.0	4.10	0.024	V	40.1(64.6)
DMG	34.1240	117.4800	05/15/1955	17 326.0	7.6	4.00	0.023	IV	40.3(64.8)
DMG	34.1670	117.5330	03/01/1948	81213.0	0.0	4.70	0.033	V	40.3(64.9)
DMG	34.1830	117.5480	09/01/1937	163533.5	10.0	4.50	0.029	V	40.6(65.3)
PAS	33.9330	118.6690	10/17/1979	205237.3	5.5	4.20	0.025	V	41.3(66.5)
GSP	34.1390	117.4650	03/09/2008	092232.1	3.0	4.00	0.022	IV	41.6(67.0)
DMG	34.1120	117.4260	03/19/1937	12338.4	10.0	4.00	0.022	IV	42.1(67.7)
GSP	34.1250	117.4380	01/06/2005	143527.7	4.0	4.40	0.027	V	42.1(67.8)
PAS	34.1350	117.4480	01/08/1983	71930.4	4.6	4.10	0.023	IV	42.1(67.8)
PAS	33.9440	118.6810	01/01/1979	231438.9	11.3	5.00	0.037	V	42.2(68.0)
DMG	34.0330	117.3500	04/18/1940	184343.9	0.0	4.40	0.027	V	42.6(68.5)
GSG	34.1430	117.4425	01/15/2014	093518.9	3.6	4.43	0.027	V	42.7(68.8)
DMG	34.2110	117.5300	09/01/1937	1348 8.2	10.0	4.50	0.028	V	42.8(68.8)
PAS	34.2110	117.5300	10/19/1979	122237.8	4.9	4.10	0.023	IV	42.8(68.8)
DMG	34.1320	117.4260	04/15/1965	20 833.3	5.5	4.50	0.028	V	42.9(69.1)
DMG	34.2000	117.5000	06/14/1892	1325 0.0	0.0	4.90	0.035	V	43.3(69.6)
DMG	34.0330	117.3170	09/03/1935	647 0.0	0.0	4.50	0.028	V	44.2(71.1)

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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]
GSP	34.2310	118.4750	03/20/1994	212012.3	13.0	5.30	0.042	VI	44.5(71.6)
DMG	34.0000	117.2830	11/07/1939	1852 8.4	0.0	4.70	0.030	V	44.9(72.3)
GSP	34.2150	118.5100	01/19/1994	140914.8	17.0	4.50	0.027	V	44.9(72.3)
USG	34.1390	117.3860	02/21/1987	231530.1	2.6	4.07	0.022	IV	45.0(72.4)
GSP	34.2450	118.4710	01/18/1994	155144.9	12.0	4.00	0.021	IV	45.1(72.6)
GSP	34.2840	118.4040	01/14/2001	022614.1	8.0	4.30	0.024	V	45.2(72.7)
GSP	34.2930	118.3890	12/06/1994	034834.5	9.0	4.50	0.027	V	45.3(72.9)
DMG	34.2170	117.4670	03/25/1941	234341.0	0.0	4.00	0.021	IV	45.4(73.0)
GSP	34.2890	118.4030	01/14/2001	025053.7	8.0	4.00	0.021	IV	45.4(73.1)
DMG	33.9960	117.2700	02/17/1952	123658.3	16.0	4.50	0.027	V	45.5(73.2)
DMG	34.2680	118.4450	08/30/1964	225737.1	15.4	4.00	0.021	IV	45.5(73.3)
DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.059	VI	45.6(73.4)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.043	VI	45.7(73.5)
GSP	34.2130	118.5370	01/17/1994	123055.4	18.0	6.70	0.086	VII	45.9(73.8)
DMG	34.2810	117.5520	09/13/1970	44748.6	8.0	4.40	0.025	V	45.9(73.9)
DMG	34.1180	117.3410	09/22/1951	82239.1	11.9	4.30	0.024	V	46.2(74.3)
DMG	34.2670	117.5180	09/12/1970	141011.2	8.0	4.10	0.022	IV	46.2(74.4)
DMG	33.7380	117.1870	04/27/1962	91232.1	5.7	4.10	0.022	IV	46.3(74.5)
DMG	34.3350	118.3310	02/09/1971	155820.7	14.2	4.80	0.031	V	46.3(74.5)

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GSP	34.3120	118.3930	05/25/1994	125657.1	7.0	4.40	0.025	V	46.5(74.9)
DMG	34.3390	118.3320	02/09/1971	141612.9	11.1	4.10	0.021	IV	46.6(75.0)
GSP	34.3110	118.3980	06/15/1994	055948.6	7.0	4.20	0.023	IV	46.6(75.0)
DMG	34.0000	117.2500	11/01/1932	445 0.0	0.0	4.00	0.020	IV	46.6(75.1)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.067	VI	46.6(75.1)
DMG	34.1270	117.3380	02/23/1936	222042.7	10.0	4.50	0.026	V	46.7(75.1)
DMG	34.3040	117.5700	05/05/1969	16 2 9.6	8.8	4.40	0.025	V	46.7(75.2)
GSB	34.2990	118.4280	01/23/1994	085508.7	6.0	4.20	0.023	IV	46.8(75.3)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.058	VI	47.1(75.8)
GSP	34.2990	118.4390	02/03/1994	162335.4	8.0	4.20	0.022	IV	47.1(75.8)
GSP	34.1900	117.3900	12/28/1989	094108.1	15.0	4.50	0.026	V	47.1(75.9)
DMG	34.1400	117.3390	02/26/1936	93327.6	10.0	4.00	0.020	IV	47.2(75.9)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.044	VI	47.2(76.0)
GSP	34.2870	118.4660	01/19/1994	071406.2	11.0	4.00	0.020	IV	47.3(76.1)
MGI	34.1000	117.3000	12/27/1901	11 0 0.0	0.0	4.60	0.028	V	47.4(76.3)
DMG	34.1000	117.3000	02/16/1931	1327 0.0	0.0	4.00	0.020	IV	47.4(76.3)
MGI	34.1000	117.3000	11/22/1911	257 0.0	0.0	4.00	0.020	IV	47.4(76.3)
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.040	V	47.4(76.3)
DMG	34.3610	118.3060	02/09/1971	141021.5	5.0	4.70	0.029	V	47.4(76.3)
GSP	34.1070	117.3040	01/09/2009	034946.3	14.0	4.50	0.026	V	47.5(76.4)
PAS	34.0230	117.2450	10/02/1985	234412.4	15.2	4.80	0.031	V	47.6(76.5)
GSP	34.2920	118.4660	01/19/1994	144635.2	6.0	4.00	0.020	IV	47.6(76.6)
GSP	34.2970	118.4580	01/21/1994	185344.6	7.0	4.30	0.023	IV	47.6(76.6)
GSP	34.3010	118.4520	01/21/1994	185244.2	7.0	4.30	0.023	IV	47.6(76.7)
DMG	34.2960	118.4640	03/30/1971	85443.3	2.6	4.10	0.021	IV	47.7(76.8)
GSP	34.0470	117.2550	02/21/2000	134943.1	15.0	4.50	0.026	V	47.8(76.9)
GSP	34.2910	118.4760	02/06/1994	131926.9	11.0	4.10	0.021	IV	47.8(77.0)
PAS	33.0330	117.9440	02/22/1983	21830.4	10.0	4.30	0.023	IV	47.9(77.0)
DMG	34.4000	117.8000	02/24/1946	6 752.0	0.0	4.10	0.021	IV	47.9(77.1)
DMG	34.3700	118.3020	02/10/1971	31212.0	0.8	4.00	0.020	IV	47.9(77.1)
DMG	34.3680	118.3140	04/25/1971	1448 6.5	-2.0	4.00	0.020	IV	48.0(77.3)
GSP	34.2280	118.5730	01/17/1994	175608.2	19.0	4.60	0.027	V	48.0(77.3)
GSB	34.3000	118.4660	01/21/1994	183915.3	10.0	4.70	0.029	V	48.0(77.3)
DMG	34.3080	118.4540	02/09/1971	144346.7	6.2	5.20	0.037	V	48.1(77.4)

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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]
GSP	34.2610	118.5340	01/17/1994	123939.8	14.0	4.50	0.026	V	48.2(77.6)
GSP	34.2540	118.5450	01/17/1994	130627.9	0.0	4.60	0.027	V	48.3(77.7)
GSP	34.3110	118.4560	01/17/1994	193534.3	2.0	4.00	0.020	IV	48.3(77.8)
GSP	34.0240	117.2300	03/11/1998	121851.8	14.0	4.50	0.026	V	48.4(77.8)
GSP	34.1680	117.3370	06/28/1997	214525.1	9.0	4.20	0.022	IV	48.4(78.0)
GSP	34.3040	118.4730	01/17/1994	150703.2	2.0	4.20	0.022	IV	48.5(78.0)
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.096	VII	48.7(78.3)
GSP	34.3170	118.4550	01/17/1994	132644.7	2.0	4.70	0.028	V	48.7(78.3)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.073	VII	48.7(78.4)
DMG	34.2730	118.5320	06/21/1971	16 1 8.5	4.1	4.00	0.020	IV	48.8(78.5)
GSB	34.3100	118.4740	01/21/1994	184228.8	7.0	4.20	0.022	IV	48.9(78.6)
DMG	34.2860	118.5150	03/31/1971	145222.5	2.1	4.60	0.027	V	48.9(78.7)
GSP	34.2180	118.6070	01/18/1994	113509.9	12.0	4.20	0.022	IV	48.9(78.7)
GSP	34.3740	117.6490	08/20/1998	234958.4	9.0	4.40	0.024	V	48.9(78.7)
DMG	34.0430	117.2280	04/03/1939	25044.7	10.0	4.00	0.020	IV	49.0(78.9)

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GSP	34.3310	118.4420	01/17/1994	141430.3	1.0	4.50	0.025	V	49.1(79.0)
T-A	34.0800	117.2500	10/07/1869	0 0 0.0	0.0	4.30	0.023	IV	49.1(79.1)
DMG	34.2840	118.5280	04/02/1971	54025.0	3.0	4.00	0.020	IV	49.2(79.3)
T-A	34.1700	117.3200	12/02/1859	2210 0.0	0.0	4.30	0.023	IV	49.3(79.3)
DMG	34.3570	118.4060	02/09/1971	141950.2	11.8	4.00	0.019	IV	49.6(79.8)
USG	33.0170	117.8170	07/16/1986	1247 3.7	10.0	4.11	0.020	IV	49.9(80.4)
USG	33.0170	117.8170	07/14/1986	11112.6	10.0	4.12	0.021	IV	49.9(80.4)
GSP	34.3850	117.6350	10/16/2007	085344.1	8.0	4.20	0.021	IV	49.9(80.4)
GSP	34.2740	118.5630	01/27/1994	171958.8	14.0	4.60	0.026	V	50.0(80.5)
DMG	34.2650	118.5770	04/15/1971	111432.0	4.2	4.20	0.021	IV	50.1(80.6)
GSP	34.2690	118.5760	01/17/1994	125546.8	16.0	4.10	0.020	IV	50.2(80.8)
DMG	34.3870	118.3640	02/09/1971	143917.8	-1.6	4.00	0.019	IV	50.4(81.1)
GSP	34.0050	117.1800	02/13/2010	213906.6	8.0	4.10	0.020	IV	50.5(81.2)
GSG	34.3340	118.4840	01/17/1994	223152.1	10.0	4.20	0.021	IV	50.5(81.3)
GSP	34.3390	118.4750	09/01/2011	204708.0	7.0	4.20	0.021	IV	50.6(81.4)
DMG	34.3530	118.4560	03/07/1971	13340.5	3.3	4.50	0.025	V	50.8(81.7)
DMG	34.3960	118.3660	02/10/1971	173855.1	6.2	4.20	0.021	IV	51.0(82.0)
DMG	34.4110	118.3290	02/10/1971	5 636.0	4.7	4.30	0.022	IV	51.1(82.2)
DMG	33.7000	117.1000	06/11/1902	245 0.0	0.0	4.50	0.025	V	51.3(82.6)
PAS	32.9900	117.8490	07/13/1986	14 133.0	12.0	4.60	0.026	V	51.4(82.8)
MGI	34.2000	117.3000	04/13/1913	1045 0.0	0.0	4.00	0.019	IV	51.5(82.8)
GSB	34.3010	118.5650	01/17/1994	204602.4	9.0	5.20	0.035	V	51.5(82.9)
DMG	34.3560	118.4740	03/25/1971	2254 9.9	4.6	4.20	0.021	IV	51.5(82.9)
GSP	34.3570	118.4800	02/25/1994	125912.6	1.0	4.10	0.020	IV	51.8(83.3)
PAS	32.9860	117.8440	10/01/1986	201218.6	6.0	4.00	0.019	IV	51.8(83.3)
GSP	34.2780	118.6110	01/29/1994	121656.4	2.0	4.30	0.022	IV	52.0(83.7)
GSP	32.9850	117.8180	06/21/1995	211736.2	6.0	4.30	0.022	IV	52.1(83.8)
DMG	34.3610	118.4870	02/10/1971	143526.7	4.4	4.20	0.021	IV	52.2(84.0)
GSB	34.3190	118.5580	01/18/1994	132444.1	1.0	4.50	0.024	V	52.2(84.0)
GSP	34.3050	118.5790	01/29/1994	112036.0	1.0	5.10	0.033	V	52.2(84.0)
DMG	34.3920	118.4270	02/21/1971	71511.7	7.2	4.50	0.024	V	52.3(84.2)
MGI	34.1000	117.2000	04/23/1923	2113 0.0	0.0	4.00	0.019	IV	52.3(84.2)
PAS	34.3800	118.4590	08/12/1977	21926.1	9.5	4.50	0.024	V	52.5(84.4)
DMG	34.3990	118.4190	02/10/1971	134953.7	9.7	4.30	0.022	IV	52.5(84.5)
PAS	32.9710	117.8700	07/13/1986	1347 8.2	6.0	5.30	0.037	V	52.6(84.6)
DMG	34.3840	118.4550	02/10/1971	113134.6	6.0	4.20	0.021	IV	52.6(84.6)
DMG	34.3000	118.6000	04/04/1893	1940 0.0	0.0	6.00	0.053	VI	52.7(84.9)
DMG	34.4110	118.4010	02/09/1971	14 154.0	8.0	4.20	0.021	IV	52.8(84.9)

EARTHQUAKE SEARCH RESULTS

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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]
DMG	34.4110	118.4010	02/09/1971	14 8 4.0	8.0	4.00	0.018	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 150.0	8.0	4.50	0.024	V	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 230.0	8.0	4.30	0.022	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 041.8	8.4	6.40	0.066	VI	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 159.0	8.0	4.10	0.019	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 550.0	8.0	4.10	0.019	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 745.0	8.0	4.50	0.024	V	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 133.0	8.0	4.20	0.021	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 346.0	8.0	4.10	0.019	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	141028.0	8.0	5.30	0.037	V	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 140.0	8.0	4.10	0.019	IV	52.8(84.9)

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DMG	34.4110	118.4010	02/09/1971	14 8 7.0	8.0	4.20	0.021	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 710.0	8.0	4.00	0.018	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 838.0	8.0	4.50	0.024	V	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 444.0	8.0	4.10	0.019	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 1 8.0	8.0	5.80	0.048	VI	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 244.0	8.0	5.80	0.048	VI	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 541.0	8.0	4.10	0.019	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 325.0	8.0	4.40	0.023	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 730.0	8.0	4.00	0.018	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 4 7.0	8.0	4.10	0.019	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 2 3.0	8.0	4.10	0.019	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 231.0	8.0	4.70	0.027	V	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 446.0	8.0	4.20	0.021	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 439.0	8.0	4.10	0.019	IV	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 853.0	8.0	4.60	0.025	V	52.8(84.9)
DMG	34.4110	118.4010	02/09/1971	14 434.0	8.0	4.20	0.021	IV	52.8(84.9)
GSB	34.2850	118.6240	01/17/1994	135602.4	19.0	4.70	0.027	V	52.9(85.1)
DMG	34.3970	118.4390	02/21/1971	55052.6	6.9	4.70	0.027	V	52.9(85.2)
DMG	34.1000	118.8000	05/10/1911	1340 0.0	0.0	4.00	0.018	IV	53.0(85.3)
GSP	32.9700	117.8100	04/04/1990	085439.3	6.0	4.00	0.018	IV	53.2(85.6)
GSP	34.3740	118.4950	01/28/1994	200953.4	0.0	4.20	0.020	IV	53.2(85.6)
DMG	34.4310	118.3690	08/14/1974	144555.2	8.2	4.20	0.020	IV	53.3(85.7)
PAS	32.9700	117.8030	07/14/1986	03246.2	10.0	4.00	0.018	IV	53.3(85.7)
GSB	34.3450	118.5520	01/24/1994	041518.8	6.0	4.80	0.028	V	53.4(86.0)
GSP	34.3000	118.6200	08/09/2007	075849.0	4.0	4.40	0.023	IV	53.5(86.1)
DMG	34.3990	118.4730	03/09/1974	05431.9	24.4	4.70	0.026	V	54.0(86.9)
DMG	34.4260	118.4140	02/10/1971	518 7.2	5.8	4.50	0.024	IV	54.0(87.0)
DMG	34.4330	118.3980	02/09/1971	144017.4	-2.0	4.10	0.019	IV	54.1(87.0)
DMG	34.4280	118.4130	04/01/1971	15 3 3.6	8.0	4.10	0.019	IV	54.1(87.1)
PAS	32.9450	117.8310	07/29/1986	81741.8	10.0	4.10	0.019	IV	54.7(88.0)
GSB	34.3600	118.5710	01/19/1994	044048.0	2.0	4.50	0.023	IV	54.9(88.3)
GSP	33.9530	117.0760	09/14/2011	144451.0	16.0	4.10	0.019	IV	54.9(88.3)
PAS	32.9450	117.8060	09/07/1984	11 313.4	6.0	4.30	0.021	IV	54.9(88.4)
T-A	33.5000	117.0700	12/29/1880	7 0 0.0	0.0	4.30	0.021	IV	55.3(89.0)
GSB	34.3330	118.6230	01/18/1994	072356.0	14.0	4.30	0.021	IV	55.3(89.0)
PAS	32.9330	117.8410	07/29/1986	81741.6	10.0	4.30	0.021	IV	55.4(89.1)
GSP	34.3790	118.5610	01/18/1994	152346.9	7.0	4.80	0.027	V	55.6(89.5)
GSP	34.3790	118.5630	01/18/1994	003935.0	7.0	4.40	0.022	IV	55.7(89.6)
PAS	32.9470	117.7360	01/15/1989	153955.2	6.0	4.20	0.020	IV	55.7(89.7)
DMG	34.4460	118.4360	02/10/1971	185441.7	8.1	4.20	0.020	IV	55.8(89.9)
DMG	34.5190	118.1980	08/23/1952	10 9 7.1	13.1	5.00	0.030	V	56.0(90.2)
GSP	34.0690	118.8820	05/02/2009	011113.7	14.0	4.40	0.022	IV	56.2(90.4)

EARTHQUAKE SEARCH RESULTS

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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]
PAS	34.4630	118.4090	09/24/1977	212824.3	5.0	4.20	0.020	IV	56.2(90.5)
DMG	34.4570	118.4270	02/09/1971	161926.5	-1.0	4.20	0.020	IV	56.3(90.6)
DMG	34.3440	118.6360	02/09/1971	143436.1	-2.0	4.90	0.028	V	56.4(90.7)
GSP	34.3620	118.6150	03/20/1996	073759.8	13.0	4.10	0.018	IV	56.6(91.0)
GSB	34.3580	118.6220	01/18/1994	040126.8	1.0	4.50	0.023	IV	56.6(91.1)
GSP	34.3590	118.6290	01/24/1994	055024.3	12.0	4.30	0.020	IV	56.9(91.6)
GSP	32.9000	118.0070	06/20/2009	010030.6	14.0	4.10	0.018	IV	57.0(91.7)

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GSP	34.3630	118.6270	01/24/1994	055421.1	10.0	4.20	0.019	IV	57.0	(91.8)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.076	VII	57.0	(91.8)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.029	V	57.0	(91.8)
GSG	34.4080	118.5590	01/17/1994	200205.4	0.0	4.00	0.017	IV	57.2	(92.0)
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.062	VI	57.2	(92.1)
PAS	34.3470	118.6560	04/08/1976	152138.1	14.5	4.60	0.024	IV	57.3	(92.2)
GSP	34.0490	118.9150	02/19/1995	212418.1	15.0	4.30	0.020	IV	57.4	(92.3)
GSP	33.9320	117.0230	01/16/2010	120325.7	13.0	4.30	0.020	IV	57.4	(92.4)
GSP	34.3740	118.6220	01/17/1994	155410.8	12.0	4.80	0.026	V	57.4	(92.4)
GSB	34.3430	118.6660	01/17/1994	234925.4	8.0	4.30	0.020	IV	57.5	(92.5)
GSP	34.3780	118.6180	01/19/1994	211144.9	11.0	5.10	0.031	V	57.5	(92.6)
GSP	34.3680	118.6370	01/17/1994	194353.4	13.0	4.10	0.018	IV	57.7	(92.8)
DMG	34.0170	117.0500	02/19/1940	12 655.7	0.0	4.60	0.024	IV	57.7	(92.9)
GSG	34.3040	118.7220	01/17/1994	221922.3	10.0	4.00	0.017	IV	57.8	(93.0)
DMG	34.3800	118.6230	10/29/1936	223536.1	10.0	4.00	0.017	IV	57.8	(93.0)
GSP	34.3260	118.6980	01/17/1994	233330.7	9.0	5.60	0.040	V	57.9	(93.1)
GSP	34.3610	118.6570	01/29/2002	055328.9	14.0	4.20	0.019	IV	58.0	(93.4)
GSP	34.3970	118.6090	07/22/1999	095724.0	11.0	4.00	0.017	IV	58.2	(93.7)
DMG	34.5650	118.1130	02/28/1969	45612.4	5.3	4.30	0.020	IV	58.4	(94.0)
GSP	34.3040	118.7370	01/19/1994	091310.9	13.0	4.10	0.018	IV	58.4	(94.0)
GSP	34.3770	118.6490	04/27/1997	110928.4	15.0	4.80	0.026	V	58.6	(94.3)
GSP	34.3690	118.6720	04/26/1997	103730.7	16.0	5.10	0.030	V	59.0	(95.0)
DMG	33.5000	117.0000	08/08/1925	1013 0.0	0.0	4.50	0.022	IV	59.2	(95.2)
DMG	34.0170	118.9670	04/16/1948	222624.0	0.0	4.70	0.024	V	59.3	(95.5)
PAS	33.6300	119.0200	10/23/1981	172816.9	12.0	4.60	0.023	IV	59.4	(95.5)
GSP	34.3540	118.7040	05/01/1996	194956.4	14.0	4.10	0.018	IV	59.5	(95.7)
GSP	34.0540	117.0300	06/27/2005	221733.6	12.0	4.00	0.017	IV	59.7	(96.1)
DMG	34.0000	117.0000	06/30/1923	022 0.0	0.0	4.50	0.022	IV	60.0	(96.6)
PAS	34.0540	118.9640	04/13/1982	11 212.2	16.6	4.00	0.017	IV	60.1	(96.7)
GSP	34.3650	118.7080	01/19/1994	044314.5	12.0	4.10	0.018	IV	60.2	(96.9)
GSP	34.3940	118.6690	06/26/1995	084028.9	13.0	5.00	0.028	V	60.2	(96.9)
GSP	34.3770	118.6980	01/18/1994	004308.9	11.0	5.20	0.031	V	60.4	(97.2)
PAS	34.0160	118.9880	10/26/1984	172043.5	13.3	4.60	0.023	IV	60.5	(97.3)
DMG	34.4850	118.5210	07/16/1965	74622.4	15.1	4.00	0.017	IV	60.5	(97.4)
GSP	34.1920	117.0950	04/06/1994	190104.1	7.0	4.80	0.025	V	60.7	(97.7)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.048	VI	60.7	(97.8)
DMG	34.0000	119.0000	09/24/1827	4 0 0.0	0.0	7.00	0.081	VII	60.8	(97.8)
MGI	34.0000	119.0000	12/14/1912	0 0 0.0	0.0	5.70	0.041	V	60.8	(97.8)
GSP	34.0580	117.0100	06/16/2005	205326.0	11.0	4.90	0.027	V	60.9	(97.9)
GSB	34.3790	118.7110	01/19/1994	210928.6	14.0	5.50	0.036	V	61.0	(98.2)
DMG	32.8670	118.2500	02/13/1952	151337.0	0.0	4.70	0.024	IV	61.1	(98.3)
GSP	33.6920	119.0580	05/30/2012	051400.8	16.0	4.00	0.016	IV	61.2	(98.5)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.028	V	61.4	(98.7)
PAS	33.6370	119.0560	10/23/1981	191552.5	6.3	4.60	0.023	IV	61.4	(98.7)
GSP	33.5150	119.0330	08/24/2010	054216.9	16.0	4.00	0.016	IV	61.5	(99.0)

-END OF SEARCH- 529 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2016

LENGTH OF SEARCH TIME: 217 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 1.8 MILES (2.8 km) AWAY.

11766.002 EQSearch

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.0

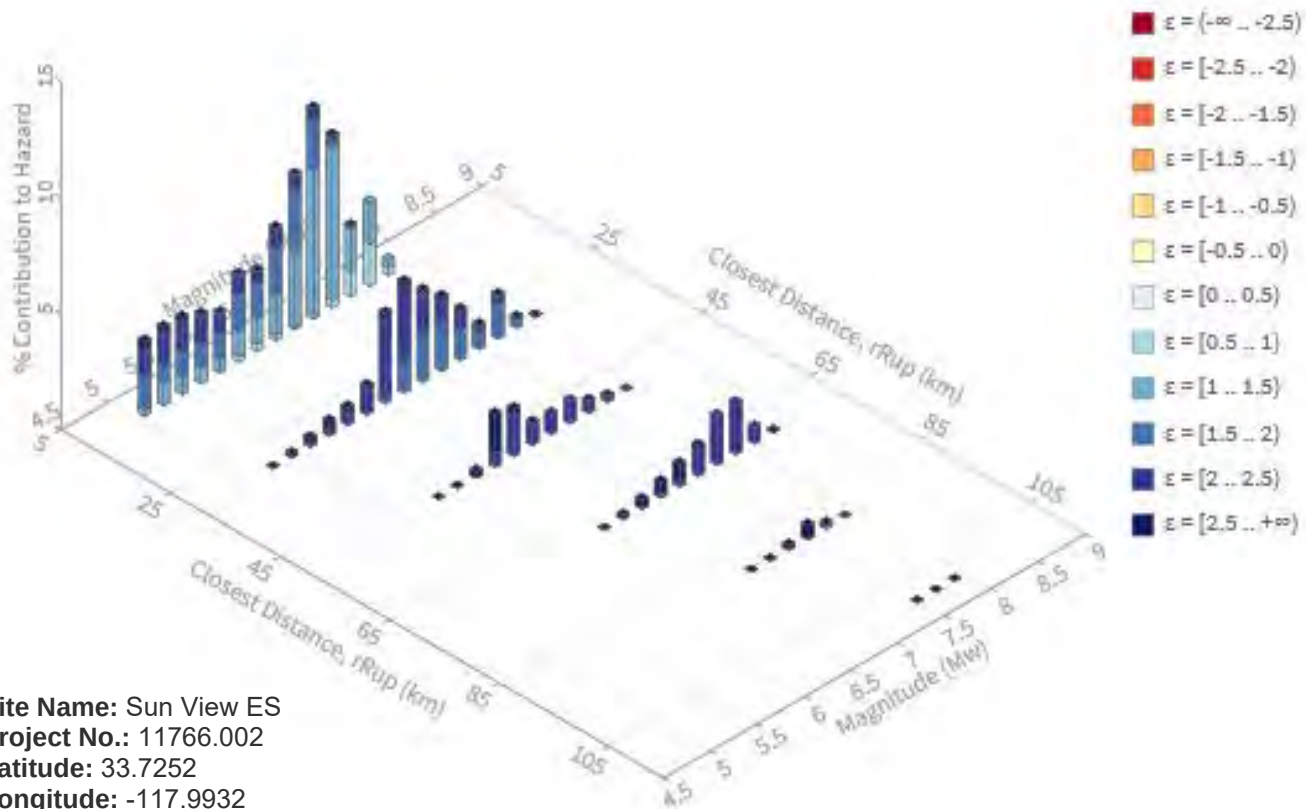
LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.261 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:

a-value= 3.496
b-value= 0.786
beta-value= 1.810

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	529	2.44907
4.5	203	0.93981
5.0	72	0.33333
5.5	26	0.12037
6.0	16	0.07407
6.5	6	0.02778
7.0	3	0.01389



Site Name: Sun View ES
Project No.: 11766.002
Latitude: 33.7252
Longitude: -117.9932
Edition: Dynamic, Conterminous U.S. 2008 (v3.3.1)
Site Class: D/E Boundary, 180 m/s

Summary Statistics for, Deaggregation: Total

Deaggregation targets
 Return period: 2475 yrs
 Exceedance rate: 0.0004040404 yr⁻¹
 PGA Ground Motion: 0.56735231g

Recovered targets
 Return period: 3057.5382 yrs
 Exceedance rate: 0.00032706051 yr⁻¹

Totals
 Binned: 100 %
 Residual: 0 %
 Trace: 0.04 %

Mean (for all sources)
 r: 23.17 km
 m: 6.7
 ε₀: 1.84 σ

Mode (largest r-m bin)
 r: 8.23 km
 m: 6.9
 ε₀: 1.39 σ
 Contribution: 9.03 %

Mode (largest ε₀ bin)
 r: 5.34 km
 m: 7.09
 ε₀: 1.23 σ
 Contribution: 6.59 %

Discretization
 r: min = 0.0, max = 1000.0, Δ = 20.0 km
 m: min = 4.4, max = 9.4, Δ = 0.2
 ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys
 ε0: [-∞ .. -2.5)
 ε1: [-2.5 .. -2.0)
 ε2: [-2.0 .. -1.5)
 ε3: [-1.5 .. -1.0)
 ε4: [-1.0 .. -0.5)
 ε5: [-0.5 .. 0.0)
 ε6: [0.0 .. 0.5)
 ε7: [0.5 .. 1.0)
 ε8: [1.0 .. 1.5)
 ε9: [1.5 .. 2.0)
 ε10: [2.0 .. 2.5)
 ε11: [2.5 .. +∞)

APPENDIX E

Liquefaction Analysis



Leighton

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Strength loss data report	47

LIQUEFACTION ANALYSIS REPORT

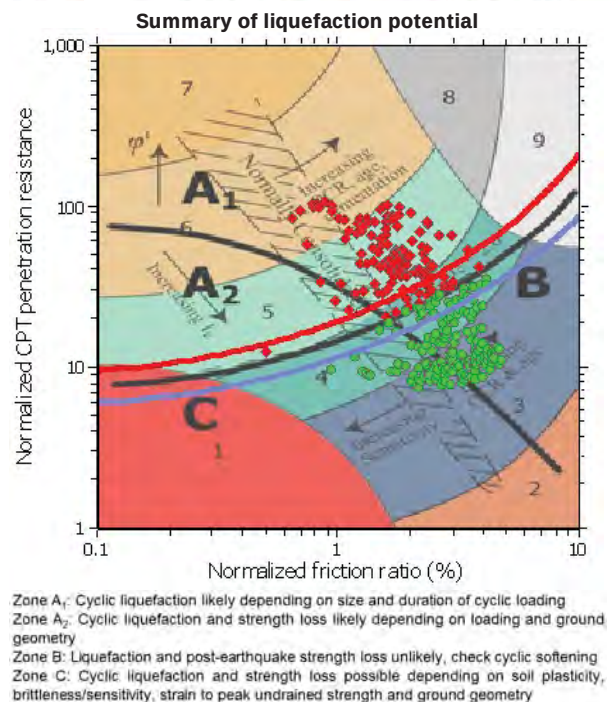
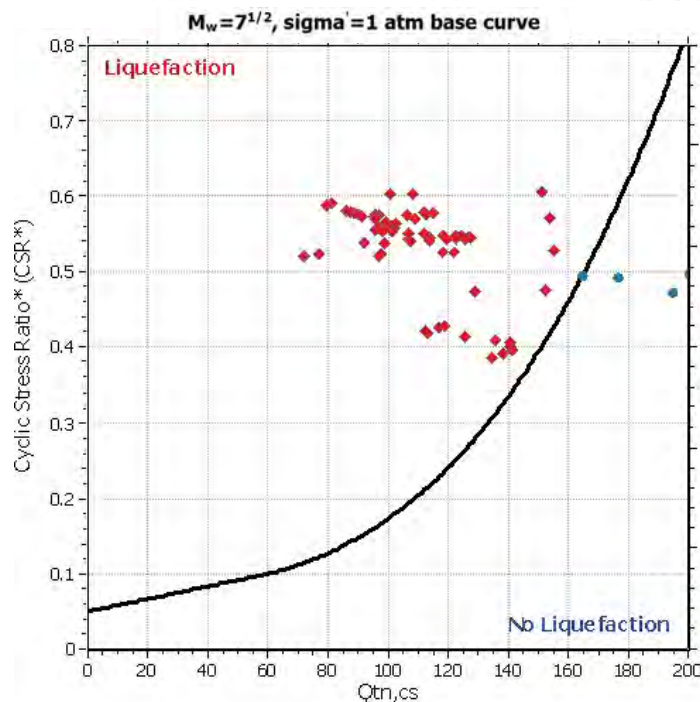
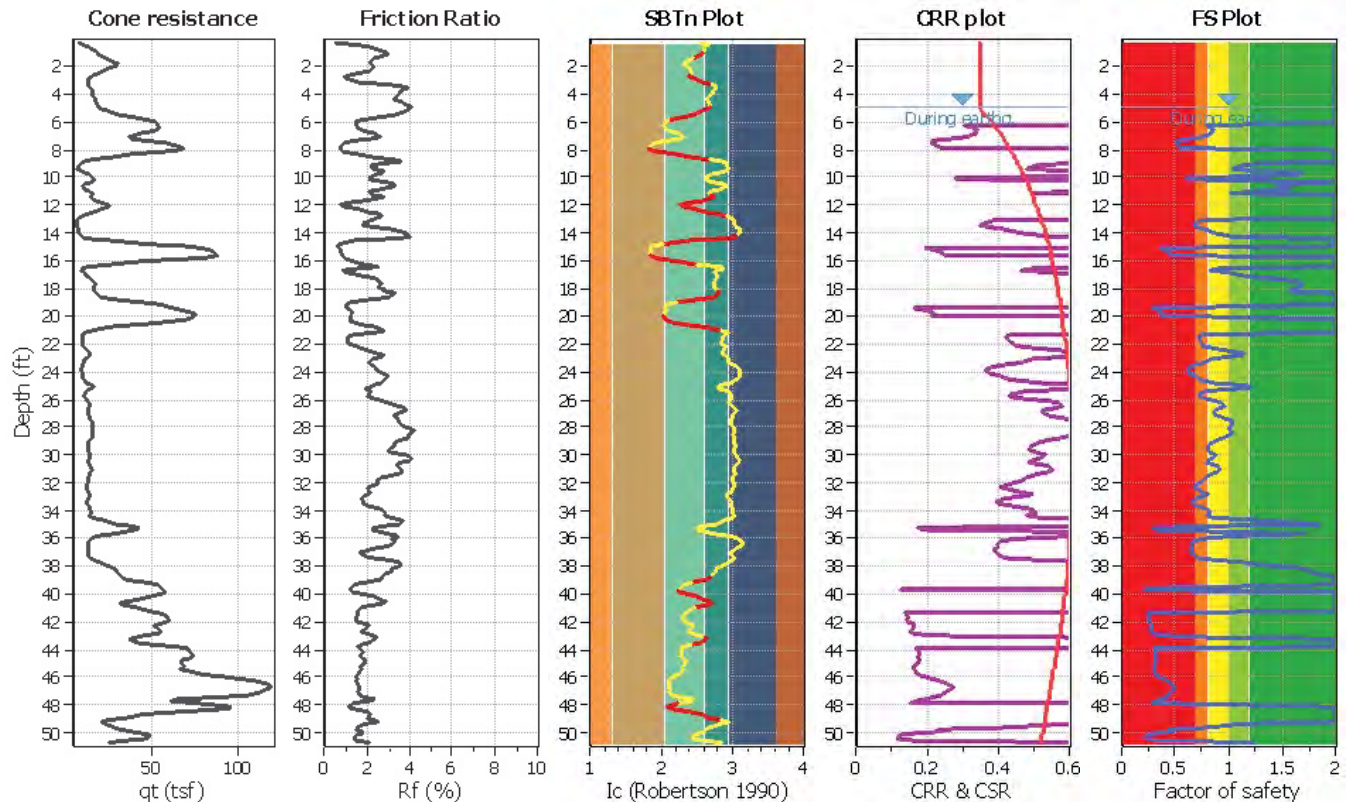
Project title :

Location :

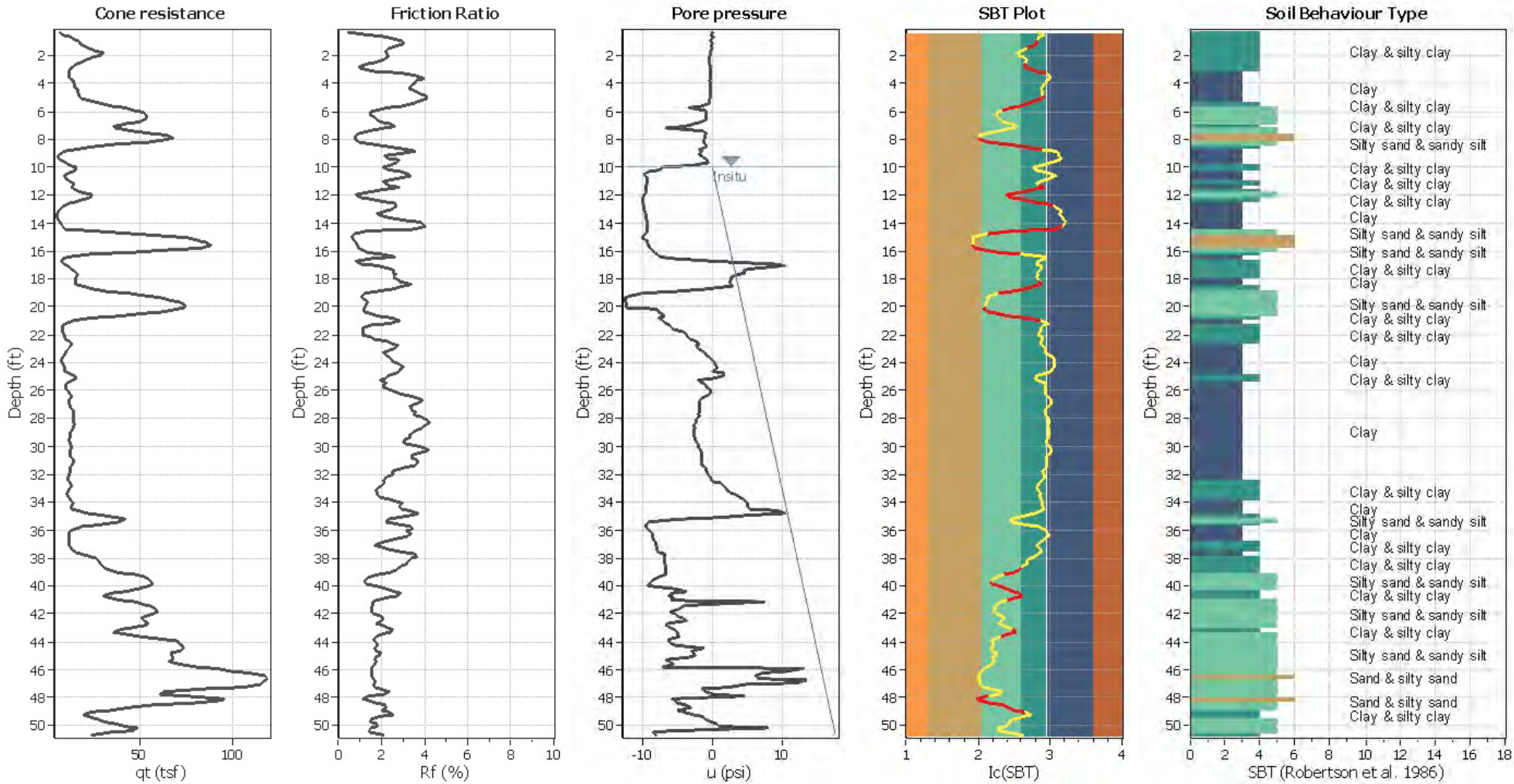
CPT file : CPT-01

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	10.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	applied:	All soils
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude M_w :	6.90	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	60.00 ft
Peak ground acceleration:	0.51	Unit weight calculation:	Based on SBT	K_0 applied:	No	MSF method:	Method based



CPT basic interpretation plo



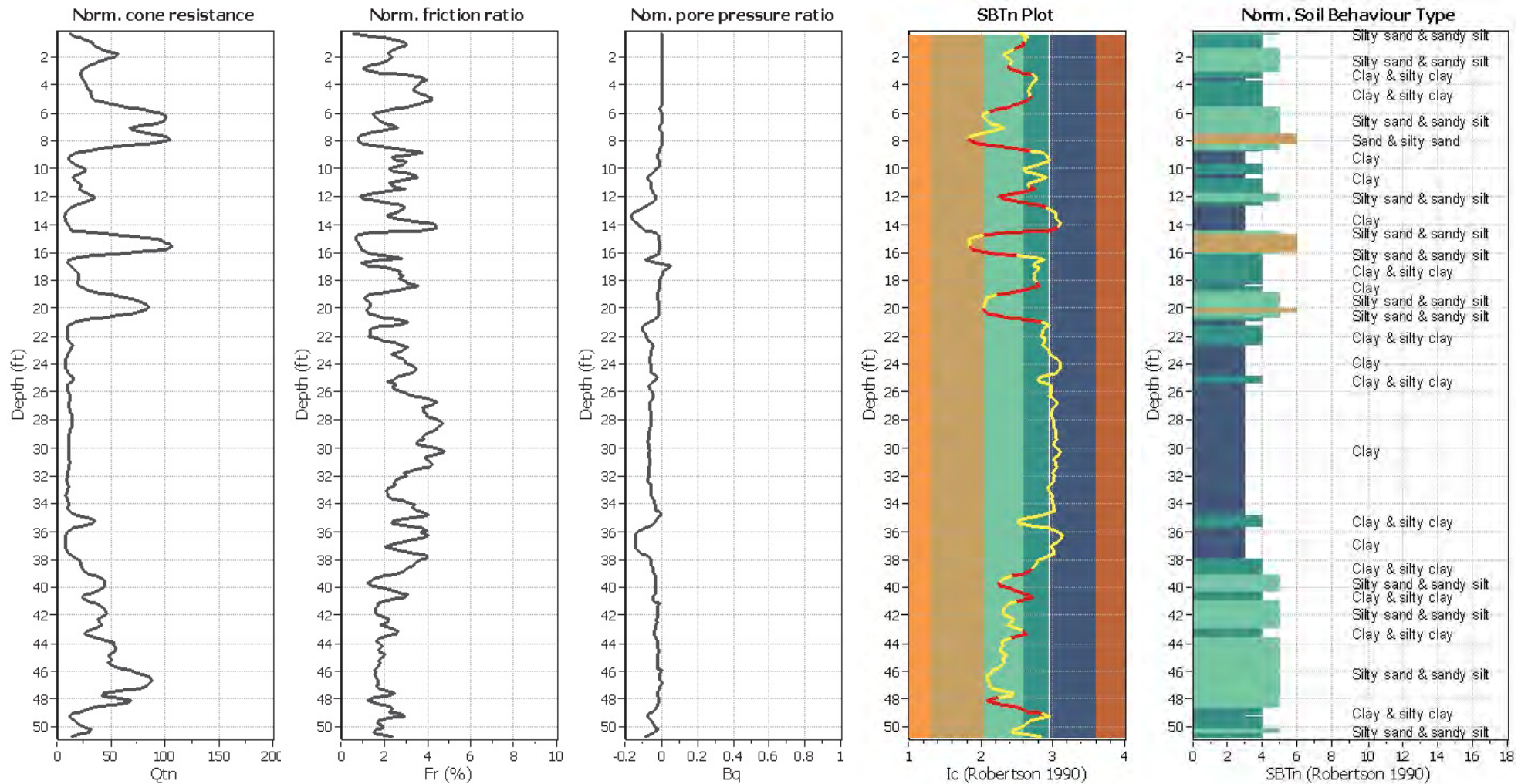
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	No
Earthquake magnitude M _w :	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.51	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

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 (normaliz



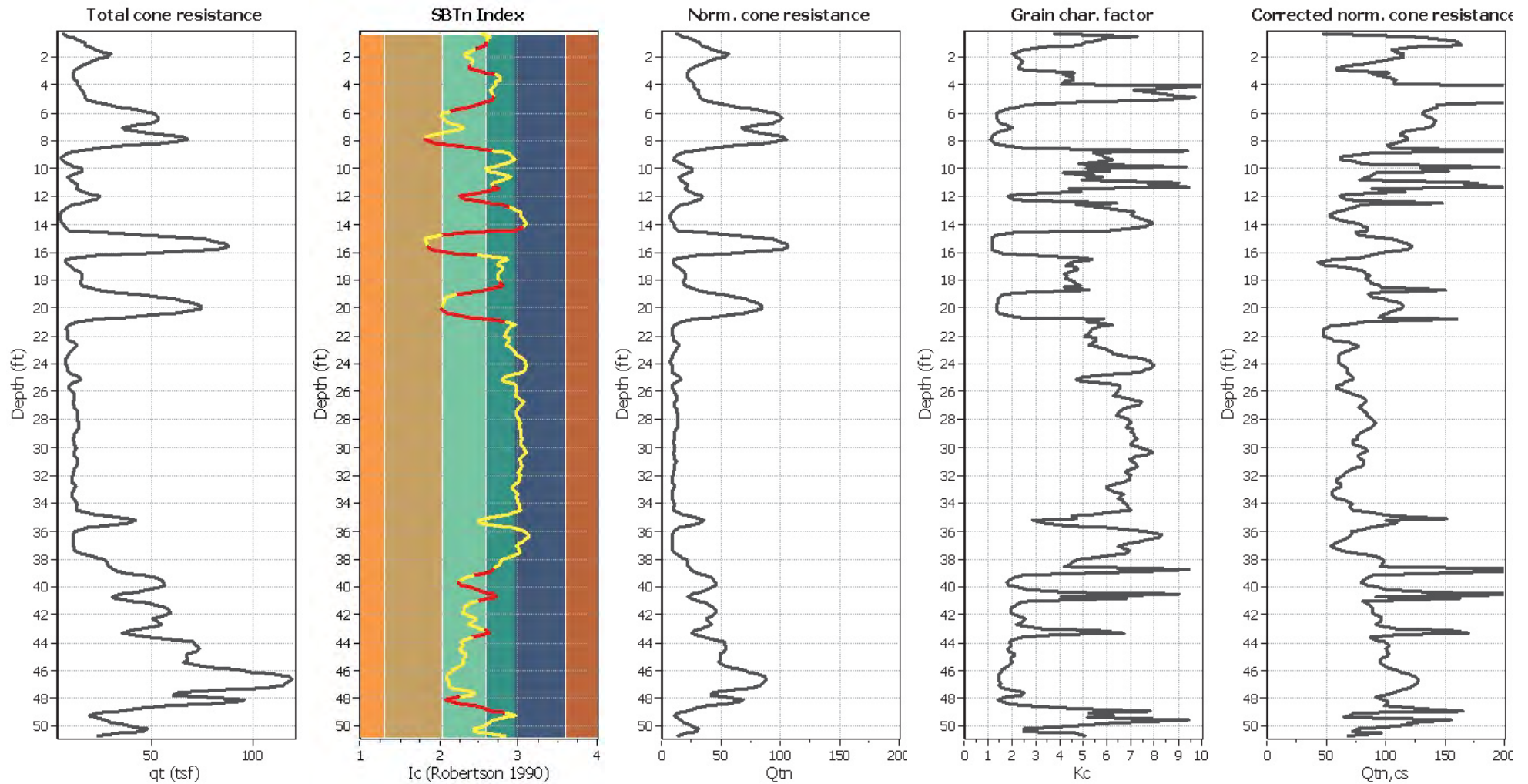
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	No
Earthquake magnitude M _w :	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.51	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

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

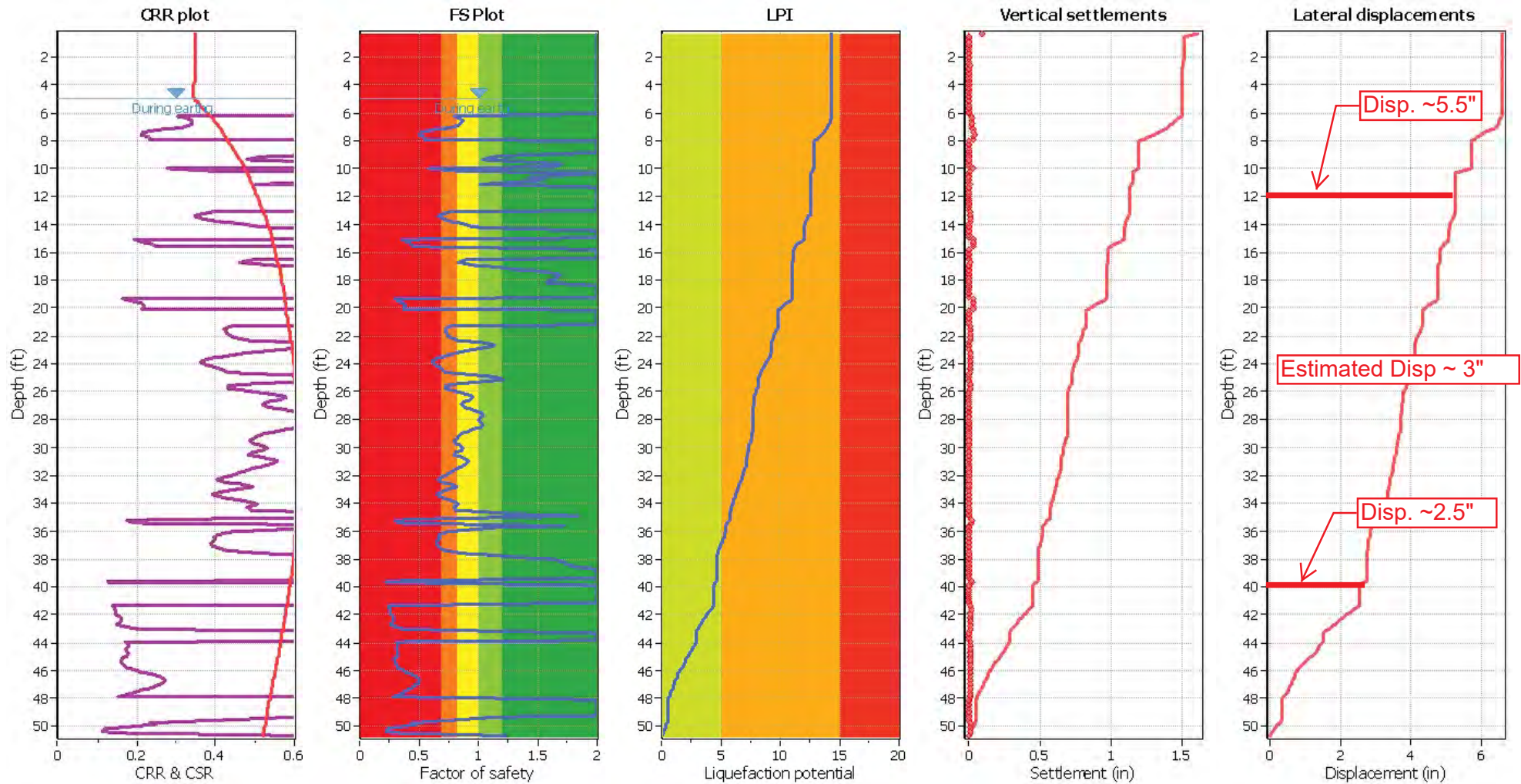
Liquefaction analysis overall plots (intermediate res)



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	No
Earthquake magnitude M _w :	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.51	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (earthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_0 applied:	No
Earthquake magnitude M_w :	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.51	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

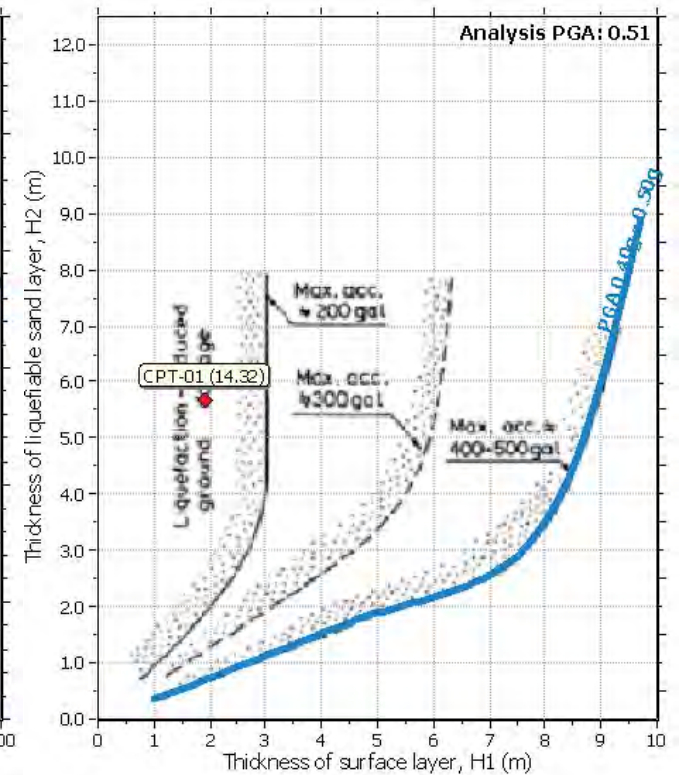
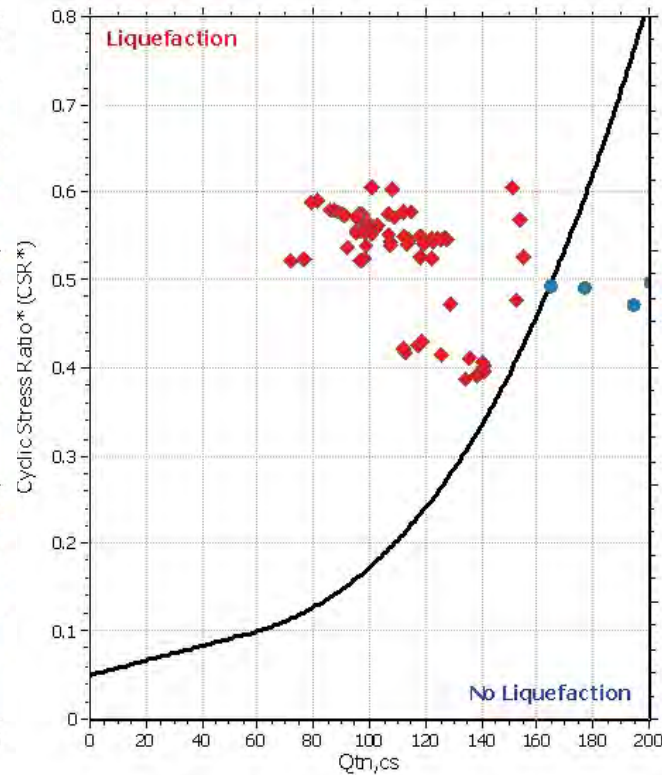
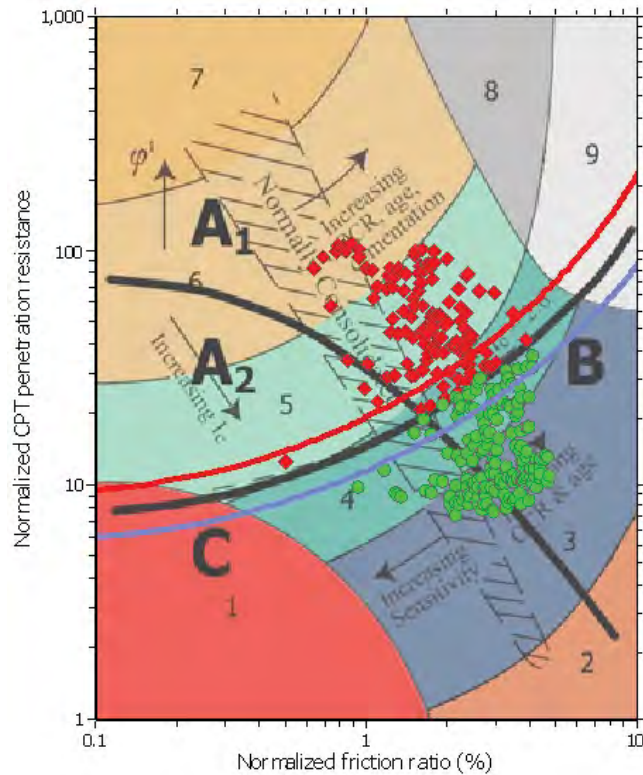
F.S. color scheme

Red	Almost certain it will liquefy
Orange	Very likely to liquefy
Yellow	Liquefaction and no liq. are equally likely
Light green	Unlike to liquefy
Dark green	Almost certain it will not liquefy

LPI color scheme

Red	Very high risk
Orange	High risk
Yellow	Low risk

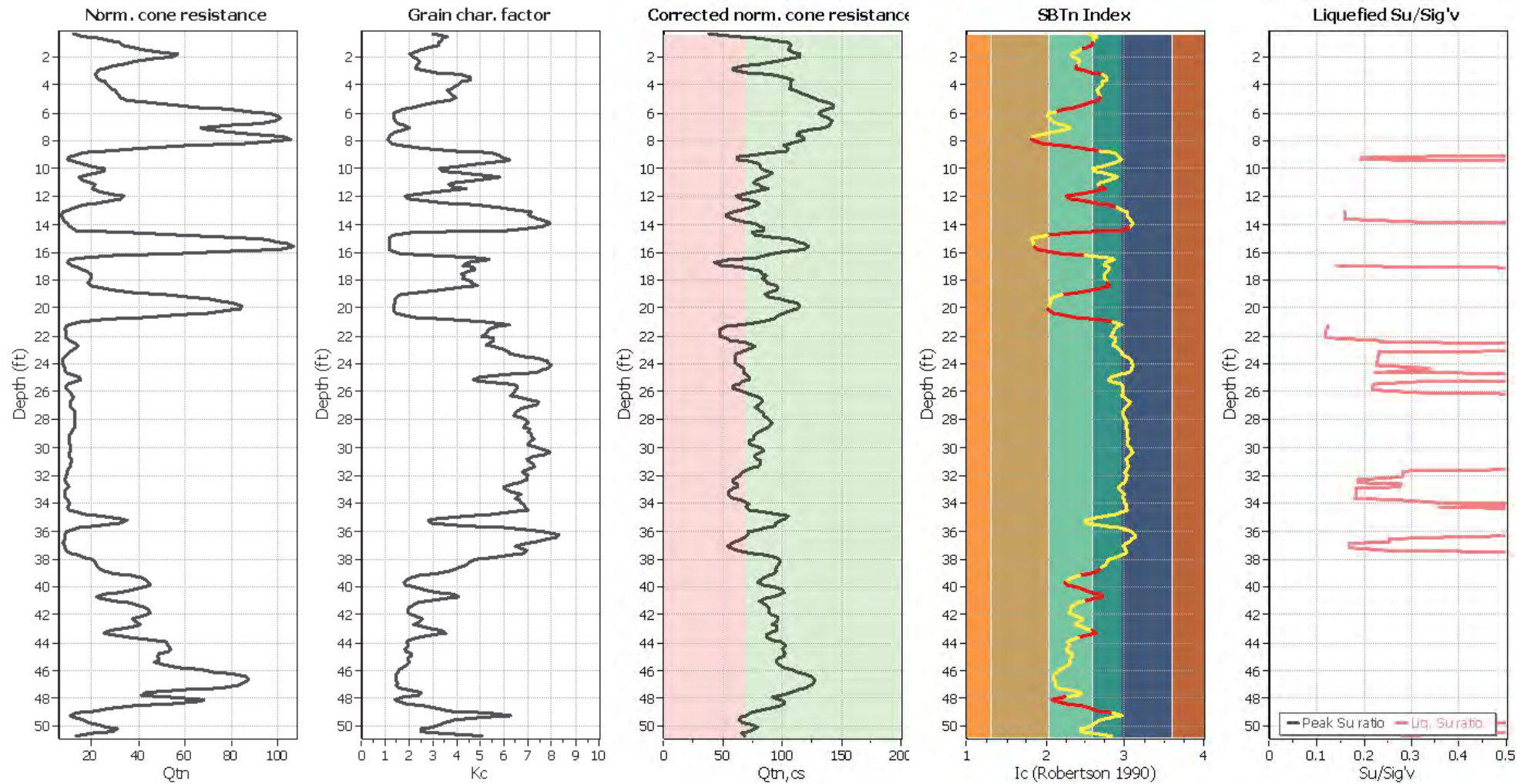
Liquefaction analysis summary plo



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_0 applied:	No
Earthquake magnitude M_w :	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.51	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_0 applied:	No
Earthquake magnitude M_w :	6.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.51	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	10.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Transition layer No	Number of points	Depth	SBT _n number	SBT _n description
Transition layer 1	4	Start depth: 1.15 (ft)	4	Clay & silty clay
		End depth: 1.64 (ft)	5	Silty sand & sandy silt
Transition layer 2	5	Start depth: 2.79 (ft)	5	Silty sand & sandy silt
		End depth: 3.45 (ft)	4	Clay & silty clay
Transition layer 3	7	Start depth: 5.09 (ft)	4	Clay & silty clay
		End depth: 6.07 (ft)	5	Silty sand & sandy silt
Transition layer 4	6	Start depth: 8.04 (ft)	6	Sand & silty sand
		End depth: 8.86 (ft)	3	Clay
Transition layer 5	4	Start depth: 11.48 (ft)	4	Clay & silty clay
		End depth: 11.98 (ft)	5	Silty sand & sandy silt
Transition layer 6	7	Start depth: 11.98 (ft)	5	Silty sand & sandy silt
		End depth: 12.96 (ft)	3	Clay
Transition layer 7	4	Start depth: 14.44 (ft)	3	Clay
		End depth: 14.93 (ft)	6	Sand & silty sand
Transition layer 8	5	Start depth: 15.75 (ft)	6	Sand & silty sand
		End depth: 16.40 (ft)	4	Clay & silty clay
Transition layer 9	6	Start depth: 18.37 (ft)	3	Clay
		End depth: 19.19 (ft)	5	Silty sand & sandy silt
Transition layer 10	7	Start depth: 20.18 (ft)	6	Sand & silty sand
		End depth: 21.16 (ft)	3	Clay
Transition layer 11	4	Start depth: 38.88 (ft)	4	Clay & silty clay
		End depth: 39.37 (ft)	5	Silty sand & sandy silt
Transition layer 12	5	Start depth: 39.86 (ft)	5	Silty sand & sandy silt
		End depth: 40.52 (ft)	4	Clay & silty clay
Transition layer 13	4	Start depth: 40.68 (ft)	4	Clay & silty clay
		End depth: 41.18 (ft)	5	Silty sand & sandy silt
Transition layer 14	4	Start depth: 43.31 (ft)	4	Clay & silty clay
		End depth: 43.80 (ft)	5	Silty sand & sandy silt
Transition layer 15	8	Start depth: 48.07 (ft)	5	Silty sand & sandy silt
		End depth: 49.22 (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	6.20	0.00	0.00	32.77	90.00
2	0.49	7.50	0.10	-0.10	37.67	100.85
3	0.66	12.90	0.30	0.30	35.93	106.75
4	0.82	16.90	0.40	-0.20	35.55	110.18
5	0.98	15.30	0.50	-0.20	34.76	112.12
6	1.15	19.10	0.60	0.00	34.58	112.68
7	1.31	18.80	0.50	-0.10	32.04	112.90
8	1.48	20.20	0.50	0.00	28.07	113.26
9	1.64	28.30	0.60	-0.20	24.93	114.56
10	1.80	32.10	0.70	-0.10	23.42	115.61
11	1.97	29.90	0.70	-0.20	24.47	115.50
12	2.13	24.40	0.60	-0.30	26.24	113.95
13	2.30	20.20	0.40	-0.30	27.56	111.56
14	2.46	18.00	0.30	-0.30	27.06	108.53
15	2.62	16.20	0.20	-0.30	26.37	105.23
16	2.79	13.20	0.10	-0.20	25.97	101.92
17	2.95	11.90	0.10	-0.20	29.03	101.63
18	3.12	11.50	0.20	-0.20	34.21	104.52
19	3.28	12.10	0.30	-0.20	41.56	108.21
20	3.45	11.20	0.50	-0.10	44.49	110.21
21	3.61	12.60	0.50	-0.20	44.62	111.40
22	3.77	14.40	0.50	-0.30	41.95	111.59
23	3.94	14.30	0.50	-0.20	41.17	111.65
24	4.10	13.60	0.50	-0.10	40.26	111.72
25	4.27	15.60	0.50	-0.20	38.81	111.83
26	4.43	16.30	0.50	-0.20	37.54	112.47
27	4.59	16.90	0.60	-0.20	38.53	113.40
28	4.76	16.80	0.70	-0.20	39.31	114.23
29	4.92	17.60	0.70	-0.20	40.03	114.59
30	5.09	17.00	0.70	-0.30	38.39	115.49
31	5.25	21.90	0.90	-0.30	34.72	116.82
32	5.41	28.60	1.00	-0.30	29.61	118.47
33	5.58	36.20	1.10	-1.70	24.85	119.21
34	5.74	41.30	1.00	-3.30	20.21	119.13
35	5.91	48.20	0.80	-1.00	16.32	118.34
36	6.07	52.10	0.70	-0.80	14.06	117.93
37	6.23	53.60	0.80	-0.80	13.74	118.34
38	6.40	54.30	0.90	-0.80	14.25	118.95
39	6.56	53.70	0.90	-0.90	15.24	119.44
40	6.73	50.70	1.00	-1.60	16.96	119.52
41	6.89	43.10	1.00	-2.40	20.12	119.44
42	7.05	34.80	1.00	-4.00	23.34	118.50
43	7.22	29.90	0.80	-6.50	20.96	117.44
44	7.38	46.30	0.60	-1.50	15.32	116.23
45	7.55	60.00	0.50	-0.90	10.76	115.55
46	7.71	66.20	0.50	-1.00	9.21	115.86
47	7.87	69.50	0.60	-1.00	8.74	115.97
48	8.04	69.00	0.50	-1.30	9.52	115.83

:: Field input data :: (continued)						
Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	8.20	55.10	0.50	-1.20	12.09	115.39
50	8.37	37.30	0.60	-1.10	18.22	115.01
51	8.53	22.50	0.60	-0.90	28.26	113.87
52	8.69	12.30	0.50	-1.80	39.74	111.22
53	8.86	8.90	0.30	-1.50	50.41	107.69
54	9.02	7.00	0.20	-1.90	52.71	103.31
55	9.19	5.80	0.10	-1.60	52.86	99.97
56	9.35	5.80	0.10	-1.10	55.21	99.84
57	9.51	6.00	0.20	-0.80	53.61	103.28
58	9.68	9.60	0.30	-0.60	46.35	106.18
59	9.84	14.00	0.30	-3.00	39.71	107.68
60	10.01	14.90	0.30	-7.00	34.98	108.97
61	10.17	18.80	0.40	-7.50	36.28	109.66
62	10.34	14.00	0.40	-9.00	41.43	109.98
63	10.50	9.20	0.40	-9.70	49.41	107.90
64	10.66	7.80	0.20	-9.40	52.60	106.82
65	10.83	10.40	0.30	-9.30	47.05	106.22
66	10.99	12.30	0.30	-9.20	39.43	106.80
67	11.16	15.80	0.20	-9.30	38.17	107.89
68	11.32	14.10	0.40	-9.50	39.82	108.64
69	11.48	12.00	0.40	-9.50	43.12	109.19
70	11.65	13.40	0.30	-9.50	34.58	108.21
71	11.81	22.80	0.20	-9.40	26.04	106.95
72	11.98	24.80	0.20	-9.80	20.93	106.27
73	12.14	25.50	0.20	-9.90	22.72	107.33
74	12.30	20.90	0.30	-9.90	28.35	108.82
75	12.47	15.30	0.40	-9.90	36.69	108.95
76	12.63	11.40	0.30	-9.90	45.38	107.42
77	12.80	8.30	0.20	-9.80	52.53	104.88
78	12.96	6.60	0.20	-9.80	57.46	101.83
79	13.12	5.90	0.10	-9.70	60.84	99.84
80	13.29	5.50	0.10	-9.60	60.13	97.55
81	13.45	5.30	0.10	-9.50	60.88	97.52
82	13.62	5.70	0.10	-9.40	62.75	99.77
83	13.78	6.50	0.20	-9.30	65.02	102.98
84	13.94	7.10	0.30	-9.30	65.52	105.33
85	14.11	7.70	0.30	-9.20	63.68	106.41
86	14.27	8.40	0.30	-9.20	61.64	107.39
87	14.44	9.20	0.40	-9.20	54.54	107.79
88	14.60	12.10	0.30	-9.20	25.97	110.03
89	14.76	52.40	0.30	-9.60	13.65	111.56
90	14.93	73.50	0.40	-9.90	9.36	114.46
91	15.09	79.90	0.60	-9.90	8.82	116.29
92	15.26	80.30	0.60	-9.30	9.07	117.68
93	15.42	86.70	0.70	-9.20	9.05	118.53
94	15.58	91.70	0.80	-9.10	9.30	119.25
95	15.75	86.30	0.80	-8.80	10.12	119.11
96	15.91	71.80	0.70	-8.60	12.72	117.92

:: Field input data :: (continued)						
Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	16.08	43.70	0.60	-8.30	18.95	115.78
98	16.24	17.70	0.50	-7.90	30.85	112.43
99	16.40	10.60	0.30	-7.40	48.20	107.44
100	16.57	6.80	0.10	-5.90	49.73	100.70
101	16.73	7.80	0.00	0.20	43.56	95.52
102	16.90	9.30	0.10	9.10	42.28	98.89
103	17.06	10.80	0.20	10.40	45.51	104.31
104	17.23	12.10	0.30	6.00	45.73	107.64
105	17.39	14.60	0.40	4.60	44.06	109.43
106	17.55	16.10	0.40	4.50	42.13	110.29
107	17.72	16.40	0.40	3.80	42.80	110.92
108	17.88	15.40	0.50	2.70	42.38	110.29
109	18.05	15.30	0.30	2.80	44.83	110.79
110	18.21	14.80	0.50	2.50	44.94	110.79
111	18.37	15.40	0.50	2.80	46.45	112.42
112	18.54	17.50	0.60	2.90	42.02	113.25
113	18.70	22.90	0.60	-0.60	35.09	114.27
114	18.87	31.10	0.60	-5.50	25.88	114.63
115	19.03	44.60	0.50	-9.90	19.08	114.88
116	19.19	55.40	0.50	-11.70	15.51	115.85
117	19.36	62.80	0.70	-12.40	14.55	117.35
118	19.52	66.50	0.80	-12.40	14.87	119.18
119	19.69	71.10	1.00	-12.30	14.70	120.16
120	19.85	75.80	1.00	-12.20	14.16	120.54
121	20.01	77.30	0.90	-12.20	13.67	120.01
122	20.18	70.80	0.80	-7.90	14.10	119.31
123	20.34	63.10	0.80	-7.70	15.63	118.40
124	20.51	53.00	0.70	-7.30	19.21	117.95
125	20.67	39.40	0.80	-6.80	25.37	116.52
126	20.83	21.30	0.60	-7.60	35.97	114.29
127	21.00	11.80	0.40	-7.10	48.82	110.01
128	21.16	9.40	0.20	-6.60	55.19	105.21
129	21.33	8.70	0.10	-6.20	52.08	100.84
130	21.49	8.60	0.10	-5.80	49.95	98.65
131	21.65	8.50	0.10	-5.50	49.54	98.68
132	21.82	9.00	0.10	-4.00	49.01	98.72
133	21.98	9.00	0.10	-3.80	48.05	98.79
134	22.15	9.20	0.10	-3.50	50.96	100.94
135	22.31	9.50	0.20	-3.00	51.01	102.75
136	22.47	11.10	0.20	-2.50	50.16	106.65
137	22.64	15.30	0.40	-1.90	49.16	108.55
138	22.80	13.70	0.40	-2.20	51.10	109.22
139	22.97	10.70	0.30	-2.00	53.58	107.43
140	23.13	10.40	0.20	-1.50	55.09	105.30
141	23.30	9.70	0.20	-1.10	55.37	104.03
142	23.46	9.00	0.20	-0.70	58.94	103.85
143	23.62	8.30	0.20	-0.30	62.22	103.69
144	23.79	8.00	0.20	0.00	64.60	103.59

:: Field input data :: (continued)						
Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	23.95	7.90	0.20	0.30	64.94	103.58
146	24.12	8.20	0.20	0.40	65.66	104.81
147	24.28	9.00	0.30	0.60	64.99	105.93
148	24.44	9.50	0.30	0.60	63.83	106.00
149	24.61	8.90	0.20	0.10	62.17	106.09
150	24.77	10.00	0.30	1.60	56.20	107.36
151	24.94	14.80	0.40	1.60	47.24	108.76
152	25.10	18.80	0.30	0.00	45.45	108.89
153	25.26	12.30	0.30	-2.00	46.85	106.97
154	25.43	9.80	0.20	-1.50	55.49	105.38
155	25.59	9.70	0.20	-1.00	57.27	104.03
156	25.76	9.60	0.20	-0.70	57.06	104.05
157	25.92	10.00	0.20	-0.40	56.82	105.33
158	26.08	11.50	0.30	-0.10	56.49	107.40
159	26.25	12.80	0.40	-0.40	55.80	109.10
160	26.41	13.30	0.40	-0.90	57.73	110.37
161	26.58	12.40	0.50	-1.60	60.32	110.86
162	26.74	11.90	0.50	-1.90	62.57	110.75
163	26.90	11.70	0.40	-1.90	62.16	110.17
164	27.07	11.80	0.40	-1.80	59.26	109.66
165	27.23	13.10	0.40	-1.90	58.43	110.37
166	27.40	13.60	0.50	-1.90	57.08	111.06
167	27.56	14.20	0.50	-1.80	56.78	111.65
168	27.72	14.60	0.50	-2.00	56.48	111.68
169	27.89	14.00	0.50	-1.90	58.30	112.12
170	28.05	13.70	0.60	-2.30	59.64	112.56
171	28.22	14.50	0.60	-2.20	59.96	113.02
172	28.38	14.80	0.60	-2.40	59.44	113.06
173	28.54	14.30	0.60	-2.60	59.16	112.60
174	28.71	13.90	0.50	-2.50	60.31	112.05
175	28.87	12.90	0.50	-2.70	60.14	110.96
176	29.04	12.50	0.40	-2.70	60.93	110.32
177	29.20	12.30	0.40	-2.60	60.79	109.67
178	29.36	12.00	0.40	-2.50	61.58	109.64
179	29.53	12.00	0.40	-2.40	60.70	108.98
180	29.69	11.90	0.30	-2.20	60.02	109.02
181	29.86	12.60	0.40	-2.10	59.98	109.74
182	30.02	13.30	0.50	-2.00	62.49	111.46
183	30.19	13.20	0.60	-1.60	64.61	111.89
184	30.35	12.00	0.50	-1.70	65.51	111.32
185	30.51	11.80	0.40	-1.50	63.63	110.24
186	30.68	12.70	0.40	-1.50	61.25	110.37
187	30.84	13.90	0.50	-1.40	59.89	111.05
188	31.01	14.10	0.50	-1.40	60.10	111.62
189	31.17	13.70	0.50	-1.40	61.15	111.57
190	31.33	13.10	0.50	-1.50	61.70	110.98
191	31.50	12.70	0.40	-1.00	60.69	109.77
192	31.66	12.40	0.30	-0.80	59.06	108.36

:: Field input data :: (continued)						
Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	31.83	12.00	0.30	-0.70	58.46	107.54
194	31.99	11.90	0.30	-0.50	60.19	107.46
195	32.15	11.20	0.30	-0.30	59.90	106.52
196	32.32	10.90	0.20	-0.20	59.76	105.45
197	32.48	10.60	0.20	0.00	57.82	105.55
198	32.65	12.60	0.30	1.30	56.17	106.73
199	32.81	13.80	0.30	1.60	53.63	106.87
200	32.97	12.80	0.20	1.80	53.58	105.79
201	33.14	11.00	0.20	2.20	55.43	104.45
202	33.30	10.60	0.20	2.80	58.17	104.32
203	33.47	10.90	0.20	3.40	57.38	104.36
204	33.63	11.60	0.20	3.90	56.91	105.64
205	33.79	12.70	0.30	4.30	57.87	107.64
206	33.96	13.30	0.40	4.70	58.37	109.26
207	34.12	14.00	0.40	5.10	59.01	109.95
208	34.29	13.50	0.40	5.10	59.53	109.21
209	34.45	11.70	0.30	5.40	60.10	109.90
210	34.61	14.80	0.50	9.40	56.53	112.46
211	34.78	21.60	0.80	10.30	50.84	116.14
212	34.94	28.30	1.10	6.00	44.00	118.43
213	35.11	35.10	1.10	0.40	34.29	119.41
214	35.27	51.80	0.90	-4.90	30.79	119.14
215	35.43	39.30	0.90	-9.00	31.91	118.14
216	35.60	25.20	0.80	-9.50	42.84	116.67
217	35.76	16.70	0.70	-9.40	53.69	114.08
218	35.93	14.70	0.40	-9.10	61.23	111.73
219	36.09	12.70	0.40	-8.90	64.02	109.77
220	36.26	11.20	0.40	-8.50	67.55	109.62
221	36.42	12.30	0.40	-8.50	66.95	108.94
222	36.58	12.10	0.30	-8.40	64.60	108.28
223	36.75	11.70	0.30	-8.20	61.77	106.60
224	36.91	11.70	0.20	-8.10	59.72	105.63
225	37.08	12.10	0.20	-8.10	56.93	104.53
226	37.24	12.10	0.20	-7.90	58.02	105.72
227	37.40	12.70	0.30	-7.80	59.65	107.68
228	37.57	14.00	0.40	-7.70	58.92	111.34
229	37.73	19.30	0.70	-6.90	55.53	114.46
230	37.90	23.40	0.90	-6.80	50.43	116.61
231	38.06	27.20	0.90	-6.90	45.89	117.53
232	38.22	30.30	0.90	-6.80	44.16	117.64
233	38.39	27.30	0.90	-6.80	43.45	117.69
234	38.55	29.00	0.90	-6.60	41.94	117.48
235	38.72	32.70	0.80	-6.70	39.82	117.63
236	38.88	32.90	0.90	-6.70	38.54	118.04
237	39.04	34.30	1.00	-6.50	33.61	118.42
238	39.21	49.10	0.80	-6.60	27.56	118.61
239	39.37	57.60	0.80	-7.70	23.02	118.02
240	39.54	53.30	0.70	-8.50	21.16	117.46

:: Field input data :: (continued)						
Point ID	Depth (ft)	q_c (tsf)	f_s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	39.70	56.10	0.60	-8.60	20.51	117.13
242	39.86	59.40	0.70	-9.10	21.59	118.18
243	40.03	55.30	1.00	-9.10	24.93	119.79
244	40.19	49.90	1.20	-5.40	29.51	120.46
245	40.36	42.00	1.10	-3.70	34.01	120.10
246	40.52	35.10	1.00	-5.80	39.41	118.91
247	40.68	26.80	0.90	-6.10	41.04	117.29
248	40.85	30.30	0.60	-5.60	37.15	116.50
249	41.01	40.90	0.70	-5.70	30.07	116.67
250	41.18	49.20	0.80	7.50	26.32	117.75
251	41.34	53.00	0.80	-1.70	24.62	118.61
252	41.50	56.10	0.90	-4.30	23.47	119.05
253	41.67	59.80	0.90	-4.80	22.87	119.43
254	41.83	60.30	0.90	-5.90	22.64	119.46
255	42.00	58.10	0.90	-5.40	23.72	119.66
256	42.16	55.10	1.00	-4.90	27.28	120.45
257	42.32	47.40	1.30	-4.40	28.83	120.32
258	42.49	49.70	0.90	-3.70	27.75	120.42
259	42.65	61.40	1.00	-6.30	25.46	119.80
260	42.82	54.60	1.00	-6.50	27.37	120.46
261	42.98	45.30	1.20	-5.90	31.82	119.82
262	43.15	36.80	0.90	-5.30	35.35	119.28
263	43.31	38.70	0.90	-5.00	37.01	117.97
264	43.47	33.00	0.80	-5.00	32.95	117.95
265	43.64	49.40	0.80	-4.70	26.98	118.78
266	43.80	68.70	1.00	-6.20	22.61	120.39
267	43.97	72.20	1.20	-6.10	21.96	121.99
268	44.13	71.00	1.40	-5.70	22.59	122.60
269	44.29	71.00	1.30	-5.30	22.21	122.64
270	44.46	75.90	1.20	-1.20	21.44	122.28
271	44.62	73.30	1.20	-2.90	22.11	122.44
272	44.79	67.70	1.40	-2.70	24.08	122.47
273	44.95	62.00	1.30	-2.40	24.01	122.26
274	45.11	71.90	1.10	-2.90	22.83	121.69
275	45.28	70.30	1.10	-6.60	22.53	121.48
276	45.44	62.30	1.20	-6.10	23.33	121.41
277	45.61	65.80	1.10	-5.60	22.04	122.02
278	45.77	86.60	1.30	-7.10	19.81	122.71
279	45.93	89.60	1.40	13.10	17.98	123.76
280	46.10	99.00	1.50	10.60	17.23	124.61
281	46.26	108.90	1.70	7.20	16.20	125.44
282	46.43	117.80	1.80	6.30	15.57	126.33
283	46.59	125.40	2.00	6.60	15.83	126.75
284	46.75	113.60	2.00	13.50	16.09	126.87
285	46.92	116.40	1.90	12.10	16.48	126.68
286	47.08	116.30	1.90	4.70	16.15	126.27
287	47.25	111.30	1.70	2.40	17.68	125.94
288	47.41	89.60	1.80	-1.40	21.69	125.03

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	47.57	58.00	1.60	-1.10	28.19	123.37
290	47.74	43.40	1.10	0.20	27.31	122.03
291	47.90	81.70	1.10	4.60	20.21	121.28
292	48.07	100.20	1.00	-5.70	15.39	122.09
293	48.23	105.00	1.20	-5.40	16.85	123.10
294	48.39	78.90	1.60	-5.00	21.96	123.18
295	48.56	50.40	1.30	-3.90	28.53	121.95
296	48.72	47.80	0.90	-3.10	34.03	119.25
297	48.89	34.00	0.70	-4.90	38.23	116.28
298	49.05	21.10	0.50	-4.10	49.21	113.86
299	49.22	16.80	0.50	-2.60	55.54	112.48
300	49.38	21.60	0.50	-1.40	48.69	111.70
301	49.54	27.90	0.30	-1.10	39.82	112.25
302	49.71	33.40	0.50	-0.20	36.50	113.08
303	49.87	32.20	0.60	0.60	35.55	115.67
304	50.04	42.20	0.80	1.10	32.56	117.47
305	50.20	52.90	0.90	8.00	28.17	117.46
306	50.36	49.80	0.50	-5.80	27.99	116.27
307	50.53	35.40	0.50	-8.40	34.20	113.84
308	50.69	18.60	0.50	-8.00	47.81	112.96

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	0.01	0.00	0.01	1.00	0.332	1.24	0.268	1.00	1.30	2.000	No
2	0.49	0.02	0.00	0.02	1.00	0.332	1.24	0.268	1.00	1.30	2.000	No
3	0.66	0.03	0.00	0.03	1.00	0.332	1.24	0.268	1.00	1.30	2.000	No
4	0.82	0.04	0.00	0.04	1.00	0.331	1.24	0.268	1.00	1.30	2.000	No
5	0.98	0.05	0.00	0.05	1.00	0.331	1.24	0.268	1.00	1.30	2.000	No
6	1.15	0.06	0.00	0.06	1.00	0.331	1.24	0.268	1.00	1.30	2.000	Yes
7	1.31	0.07	0.00	0.07	1.00	0.331	1.24	0.268	1.00	1.30	2.000	Yes
8	1.48	0.08	0.00	0.08	1.00	0.331	1.24	0.267	1.00	1.30	2.000	Yes
9	1.64	0.09	0.00	0.09	1.00	0.331	1.24	0.267	1.00	1.30	2.000	Yes
10	1.80	0.10	0.00	0.10	1.00	0.331	1.24	0.267	1.00	1.30	2.000	No
11	1.97	0.11	0.00	0.11	1.00	0.331	1.24	0.267	1.00	1.30	2.000	No
12	2.13	0.12	0.00	0.12	1.00	0.331	1.24	0.267	1.00	1.30	2.000	No
13	2.30	0.12	0.00	0.12	1.00	0.330	1.24	0.267	1.00	1.30	2.000	No
14	2.46	0.13	0.00	0.13	1.00	0.330	1.24	0.267	1.00	1.30	2.000	No
15	2.62	0.14	0.00	0.14	1.00	0.330	1.24	0.267	1.00	1.30	2.000	No
16	2.79	0.15	0.00	0.15	1.00	0.330	1.24	0.267	1.00	1.30	2.000	Yes
17	2.95	0.16	0.00	0.16	1.00	0.330	1.24	0.267	1.00	1.30	2.000	Yes
18	3.12	0.17	0.00	0.17	0.99	0.330	1.24	0.266	1.00	1.30	2.000	Yes
19	3.28	0.18	0.00	0.18	0.99	0.330	1.24	0.266	1.00	1.30	2.000	Yes
20	3.45	0.19	0.00	0.19	0.99	0.329	1.24	0.266	1.00	1.30	2.000	Yes
21	3.61	0.19	0.00	0.19	0.99	0.329	1.24	0.266	1.00	1.30	2.000	No
22	3.77	0.20	0.00	0.20	0.99	0.329	1.24	0.266	1.00	1.30	2.000	No
23	3.94	0.21	0.00	0.21	0.99	0.329	1.24	0.266	1.00	1.30	2.000	No
24	4.10	0.22	0.00	0.22	0.99	0.329	1.24	0.266	1.00	1.30	2.000	No
25	4.27	0.23	0.00	0.23	0.99	0.329	1.24	0.266	1.00	1.30	2.000	No
26	4.43	0.24	0.00	0.24	0.99	0.329	1.24	0.266	1.00	1.30	2.000	No
27	4.59	0.25	0.00	0.25	0.99	0.329	1.24	0.266	1.00	1.30	2.000	No
28	4.76	0.26	0.00	0.26	0.99	0.328	1.24	0.265	1.00	1.30	2.000	No
29	4.92	0.27	0.00	0.27	0.99	0.328	1.24	0.265	1.00	1.30	2.000	No
30	5.09	0.28	0.00	0.28	0.99	0.332	1.24	0.268	1.00	1.30	2.000	Yes
31	5.25	0.29	0.01	0.28	0.99	0.337	1.24	0.272	1.00	1.30	2.000	Yes
32	5.41	0.30	0.01	0.28	0.99	0.343	1.24	0.277	1.00	1.30	2.000	Yes
33	5.58	0.31	0.02	0.29	0.99	0.348	1.24	0.281	1.00	1.30	2.000	Yes
34	5.74	0.32	0.02	0.29	0.99	0.353	1.24	0.286	1.00	1.30	2.000	Yes
35	5.91	0.33	0.03	0.30	0.99	0.359	1.24	0.290	1.00	1.30	2.000	Yes
36	6.07	0.34	0.03	0.30	0.99	0.364	1.24	0.294	1.00	1.30	2.000	Yes
37	6.23	0.35	0.04	0.31	0.99	0.368	1.24	0.298	1.00	1.30	0.387	No
38	6.40	0.36	0.04	0.31	0.99	0.373	1.24	0.301	1.00	1.30	0.392	No
39	6.56	0.37	0.05	0.32	0.99	0.377	1.24	0.305	1.00	1.30	0.396	No
40	6.73	0.38	0.05	0.32	0.99	0.382	1.24	0.309	1.00	1.30	0.401	No
41	6.89	0.39	0.06	0.33	0.99	0.386	1.24	0.312	1.00	1.30	0.405	No
42	7.05	0.39	0.06	0.33	0.99	0.390	1.24	0.315	1.00	1.30	0.410	No
43	7.22	0.40	0.07	0.34	0.99	0.394	1.24	0.318	1.00	1.30	0.414	No
44	7.38	0.41	0.07	0.34	0.98	0.398	1.24	0.322	1.00	1.30	0.418	No
45	7.55	0.42	0.08	0.34	0.98	0.402	1.24	0.325	1.00	1.30	0.422	No
46	7.71	0.43	0.08	0.35	0.98	0.405	1.24	0.328	1.00	1.30	0.426	No
47	7.87	0.44	0.09	0.35	0.98	0.409	1.24	0.330	1.00	1.30	0.430	No
48	8.04	0.45	0.09	0.36	0.98	0.413	1.24	0.333	1.00	1.30	2.000	Yes

:: 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	0.46	0.10	0.36	0.98	0.416	1.24	0.336	1.00	1.30	2.000	Yes
50	8.37	0.47	0.11	0.37	0.98	0.419	1.24	0.339	1.00	1.30	2.000	Yes
51	8.53	0.48	0.11	0.37	0.98	0.423	1.24	0.341	1.00	1.30	2.000	Yes
52	8.69	0.49	0.12	0.37	0.98	0.426	1.24	0.344	1.00	1.30	2.000	Yes
53	8.86	0.50	0.12	0.38	0.98	0.429	1.24	0.347	1.00	1.30	2.000	Yes
54	9.02	0.51	0.13	0.38	0.98	0.432	1.24	0.349	1.00	1.30	0.454	No
55	9.19	0.51	0.13	0.38	0.98	0.436	1.24	0.352	1.00	1.30	0.458	No
56	9.35	0.52	0.14	0.39	0.98	0.439	1.24	0.355	1.00	1.30	0.461	No
57	9.51	0.53	0.14	0.39	0.98	0.442	1.24	0.357	1.00	1.30	0.464	No
58	9.68	0.54	0.15	0.39	0.98	0.445	1.24	0.360	1.00	1.30	0.468	No
59	9.84	0.55	0.15	0.40	0.98	0.448	1.24	0.362	1.00	1.30	0.471	No
60	10.01	0.56	0.16	0.40	0.98	0.451	1.24	0.364	1.00	1.30	0.474	No
61	10.17	0.57	0.16	0.41	0.98	0.454	1.24	0.366	1.00	1.30	0.476	No
62	10.34	0.58	0.17	0.41	0.98	0.456	1.24	0.369	1.00	1.30	0.479	No
63	10.50	0.58	0.17	0.41	0.98	0.459	1.24	0.371	1.00	1.30	0.482	No
64	10.66	0.59	0.18	0.42	0.98	0.461	1.24	0.373	1.00	1.30	0.485	No
65	10.83	0.60	0.18	0.42	0.98	0.464	1.24	0.375	1.00	1.30	0.488	No
66	10.99	0.61	0.19	0.42	0.98	0.467	1.24	0.377	1.00	1.30	0.490	No
67	11.16	0.62	0.19	0.43	0.98	0.469	1.24	0.379	1.00	1.30	0.493	No
68	11.32	0.63	0.20	0.43	0.98	0.472	1.24	0.381	1.00	1.30	0.495	No
69	11.48	0.64	0.20	0.44	0.98	0.474	1.24	0.383	1.00	1.30	2.000	Yes
70	11.65	0.65	0.21	0.44	0.98	0.476	1.24	0.385	1.00	1.30	2.000	Yes
71	11.81	0.66	0.21	0.44	0.98	0.478	1.24	0.387	1.00	1.30	2.000	Yes
72	11.98	0.66	0.22	0.45	0.97	0.481	1.24	0.389	1.00	1.30	2.000	Yes
73	12.14	0.67	0.22	0.45	0.97	0.483	1.24	0.390	1.00	1.30	2.000	Yes
74	12.30	0.68	0.23	0.45	0.97	0.485	1.24	0.392	1.00	1.30	2.000	Yes
75	12.47	0.69	0.23	0.46	0.97	0.487	1.24	0.394	1.00	1.30	2.000	Yes
76	12.63	0.70	0.24	0.46	0.97	0.489	1.24	0.395	1.00	1.30	2.000	Yes
77	12.80	0.71	0.24	0.47	0.97	0.491	1.24	0.397	1.00	1.30	2.000	Yes
78	12.96	0.72	0.25	0.47	0.97	0.494	1.24	0.399	1.00	1.30	2.000	Yes
79	13.12	0.72	0.25	0.47	0.97	0.496	1.24	0.401	1.00	1.30	0.521	No
80	13.29	0.73	0.26	0.47	0.97	0.498	1.24	0.402	1.00	1.30	0.523	No
81	13.45	0.74	0.26	0.48	0.97	0.500	1.24	0.404	1.00	1.30	0.526	No
82	13.62	0.75	0.27	0.48	0.97	0.502	1.24	0.406	1.00	1.30	0.528	No
83	13.78	0.76	0.27	0.48	0.97	0.504	1.24	0.408	1.00	1.30	0.530	No
84	13.94	0.77	0.28	0.49	0.97	0.506	1.24	0.409	1.00	1.30	0.532	No
85	14.11	0.77	0.28	0.49	0.97	0.508	1.24	0.411	1.00	1.30	0.534	No
86	14.27	0.78	0.29	0.49	0.97	0.510	1.24	0.412	1.00	1.30	0.536	No
87	14.44	0.79	0.29	0.50	0.97	0.512	1.24	0.413	1.00	1.30	2.000	Yes
88	14.60	0.80	0.30	0.50	0.97	0.513	1.24	0.415	1.00	1.30	2.000	Yes
89	14.76	0.81	0.30	0.51	0.97	0.515	1.24	0.416	1.00	1.30	2.000	Yes
90	14.93	0.82	0.31	0.51	0.97	0.516	1.24	0.417	1.00	1.30	2.000	Yes
91	15.09	0.83	0.31	0.51	0.97	0.517	1.24	0.418	1.00	1.30	0.544	No
92	15.26	0.84	0.32	0.52	0.97	0.519	1.24	0.419	1.00	1.30	0.545	No
93	15.42	0.85	0.33	0.52	0.97	0.520	1.24	0.420	1.00	1.30	0.546	No
94	15.58	0.86	0.33	0.53	0.97	0.521	1.24	0.421	1.00	1.30	0.547	No
95	15.75	0.87	0.34	0.53	0.97	0.522	1.24	0.422	1.00	1.30	2.000	Yes
96	15.91	0.88	0.34	0.54	0.97	0.523	1.24	0.423	1.00	1.30	2.000	Yes

:: 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	0.89	0.35	0.54	0.97	0.525	1.24	0.424	1.00	1.30	2.000	Yes
98	16.24	0.90	0.35	0.55	0.97	0.526	1.24	0.425	1.00	1.30	2.000	Yes
99	16.40	0.91	0.36	0.55	0.97	0.527	1.24	0.426	1.00	1.30	2.000	Yes
100	16.57	0.91	0.36	0.55	0.97	0.529	1.24	0.427	1.00	1.30	0.556	No
101	16.73	0.92	0.37	0.56	0.96	0.530	1.24	0.429	1.00	1.30	0.557	No
102	16.90	0.93	0.37	0.56	0.96	0.532	1.24	0.430	1.00	1.30	0.559	No
103	17.06	0.94	0.38	0.56	0.96	0.534	1.24	0.431	1.00	1.30	0.560	No
104	17.23	0.95	0.38	0.57	0.96	0.535	1.24	0.432	1.00	1.30	0.562	No
105	17.39	0.96	0.39	0.57	0.96	0.536	1.24	0.433	1.00	1.30	0.563	No
106	17.55	0.97	0.39	0.57	0.96	0.537	1.24	0.434	1.00	1.30	0.564	No
107	17.72	0.97	0.40	0.58	0.96	0.538	1.24	0.435	1.00	1.30	0.565	No
108	17.88	0.98	0.40	0.58	0.96	0.539	1.24	0.436	1.00	1.30	0.567	No
109	18.05	0.99	0.41	0.59	0.96	0.540	1.24	0.437	1.00	1.30	0.568	No
110	18.21	1.00	0.41	0.59	0.96	0.542	1.24	0.438	1.00	1.30	0.569	No
111	18.37	1.01	0.42	0.59	0.96	0.542	1.24	0.438	1.00	1.30	2.000	Yes
112	18.54	1.02	0.42	0.60	0.96	0.543	1.24	0.439	1.00	1.30	2.000	Yes
113	18.70	1.03	0.43	0.60	0.96	0.544	1.24	0.440	1.00	1.30	2.000	Yes
114	18.87	1.04	0.43	0.61	0.96	0.545	1.24	0.441	1.00	1.30	2.000	Yes
115	19.03	1.05	0.44	0.61	0.96	0.546	1.24	0.441	1.00	1.30	2.000	Yes
116	19.19	1.06	0.44	0.61	0.96	0.547	1.24	0.442	1.00	1.30	2.000	Yes
117	19.36	1.07	0.45	0.62	0.96	0.548	1.24	0.442	1.00	1.30	0.575	No
118	19.52	1.08	0.45	0.62	0.96	0.548	1.24	0.443	1.00	1.30	0.576	No
119	19.69	1.09	0.46	0.63	0.96	0.549	1.24	0.444	1.00	1.30	0.577	No
120	19.85	1.10	0.46	0.63	0.96	0.549	1.24	0.444	1.00	1.30	0.577	No
121	20.01	1.11	0.47	0.64	0.96	0.550	1.24	0.444	1.00	1.30	0.578	No
122	20.18	1.12	0.47	0.64	0.96	0.551	1.24	0.445	1.00	1.30	2.000	Yes
123	20.34	1.13	0.48	0.65	0.96	0.551	1.24	0.445	1.00	1.30	2.000	Yes
124	20.51	1.14	0.48	0.65	0.96	0.552	1.24	0.446	1.00	1.30	2.000	Yes
125	20.67	1.15	0.49	0.66	0.96	0.552	1.24	0.446	1.00	1.30	2.000	Yes
126	20.83	1.15	0.49	0.66	0.95	0.553	1.24	0.447	1.00	1.30	2.000	Yes
127	21.00	1.16	0.50	0.66	0.95	0.554	1.24	0.448	1.00	1.30	2.000	Yes
128	21.16	1.17	0.50	0.67	0.95	0.555	1.24	0.448	1.00	1.30	2.000	Yes
129	21.33	1.18	0.51	0.67	0.95	0.556	1.24	0.449	1.00	1.30	0.584	No
130	21.49	1.19	0.51	0.67	0.95	0.557	1.24	0.450	1.00	1.30	0.585	No
131	21.65	1.20	0.52	0.68	0.95	0.558	1.24	0.451	1.00	1.30	0.586	No
132	21.82	1.21	0.52	0.68	0.95	0.559	1.24	0.452	1.00	1.30	0.587	No
133	21.98	1.21	0.53	0.68	0.95	0.560	1.24	0.453	1.00	1.30	0.588	No
134	22.15	1.22	0.54	0.69	0.95	0.561	1.24	0.453	1.00	1.30	0.589	No
135	22.31	1.23	0.54	0.69	0.95	0.562	1.24	0.454	1.00	1.30	0.590	No
136	22.47	1.24	0.55	0.69	0.95	0.563	1.24	0.455	1.00	1.30	0.591	No
137	22.64	1.25	0.55	0.70	0.95	0.563	1.24	0.455	1.00	1.30	0.592	No
138	22.80	1.26	0.56	0.70	0.95	0.564	1.24	0.456	1.00	1.30	0.592	No
139	22.97	1.27	0.56	0.70	0.95	0.565	1.24	0.456	1.00	1.30	0.593	No
140	23.13	1.27	0.57	0.71	0.95	0.565	1.24	0.457	1.00	1.30	0.594	No
141	23.30	1.28	0.57	0.71	0.95	0.566	1.24	0.457	1.00	1.30	0.595	No
142	23.46	1.29	0.58	0.72	0.95	0.567	1.24	0.458	1.00	1.30	0.595	No
143	23.62	1.30	0.58	0.72	0.95	0.568	1.24	0.459	1.00	1.30	0.596	No
144	23.79	1.31	0.59	0.72	0.95	0.568	1.24	0.459	1.00	1.30	0.597	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	1.32	0.59	0.73	0.95	0.569	1.24	0.460	1.00	1.30	0.598	No
146	24.12	1.33	0.60	0.73	0.94	0.570	1.24	0.460	1.00	1.30	0.598	No
147	24.28	1.33	0.60	0.73	0.94	0.570	1.24	0.461	1.00	1.30	0.599	No
148	24.44	1.34	0.61	0.74	0.94	0.571	1.24	0.461	1.00	1.30	0.600	No
149	24.61	1.35	0.61	0.74	0.94	0.571	1.24	0.462	1.00	1.30	0.600	No
150	24.77	1.36	0.62	0.74	0.94	0.572	1.24	0.462	1.00	1.30	0.601	No
151	24.94	1.37	0.62	0.75	0.94	0.572	1.24	0.463	1.00	1.30	0.601	No
152	25.10	1.38	0.63	0.75	0.94	0.573	1.24	0.463	1.00	1.30	0.602	No
153	25.26	1.39	0.63	0.75	0.94	0.573	1.24	0.463	1.00	1.30	0.602	No
154	25.43	1.40	0.64	0.76	0.94	0.574	1.24	0.464	1.00	1.30	0.603	No
155	25.59	1.40	0.64	0.76	0.94	0.574	1.24	0.464	1.00	1.30	0.603	No
156	25.76	1.41	0.65	0.76	0.94	0.575	1.24	0.465	1.00	1.30	0.604	No
157	25.92	1.42	0.65	0.77	0.94	0.575	1.24	0.465	1.00	1.30	0.604	No
158	26.08	1.43	0.66	0.77	0.94	0.576	1.24	0.465	1.00	1.30	0.605	No
159	26.25	1.44	0.66	0.78	0.94	0.576	1.24	0.466	1.00	1.30	0.605	No
160	26.41	1.45	0.67	0.78	0.94	0.577	1.24	0.466	1.00	1.30	0.606	No
161	26.58	1.46	0.67	0.78	0.94	0.577	1.24	0.466	1.00	1.30	0.606	No
162	26.74	1.47	0.68	0.79	0.94	0.577	1.24	0.466	1.00	1.30	0.606	No
163	26.90	1.47	0.68	0.79	0.93	0.577	1.24	0.467	1.00	1.30	0.606	No
164	27.07	1.48	0.69	0.80	0.93	0.578	1.24	0.467	1.00	1.30	0.607	No
165	27.23	1.49	0.69	0.80	0.93	0.578	1.24	0.467	1.00	1.30	0.607	No
166	27.40	1.50	0.70	0.80	0.93	0.578	1.24	0.467	1.00	1.30	0.607	No
167	27.56	1.51	0.70	0.81	0.93	0.578	1.24	0.467	1.00	1.30	0.607	No
168	27.72	1.52	0.71	0.81	0.93	0.578	1.24	0.467	1.00	1.30	0.608	No
169	27.89	1.53	0.71	0.82	0.93	0.579	1.24	0.468	1.00	1.30	0.608	No
170	28.05	1.54	0.72	0.82	0.93	0.579	1.24	0.468	1.00	1.30	0.608	No
171	28.22	1.55	0.72	0.82	0.93	0.579	1.24	0.468	1.00	1.30	0.608	No
172	28.38	1.56	0.73	0.83	0.93	0.579	1.24	0.468	1.00	1.30	0.608	No
173	28.54	1.57	0.73	0.83	0.93	0.579	1.24	0.468	1.00	1.30	0.608	No
174	28.71	1.58	0.74	0.84	0.93	0.579	1.24	0.468	1.00	1.30	0.608	No
175	28.87	1.58	0.74	0.84	0.93	0.579	1.24	0.468	1.00	1.30	0.608	No
176	29.04	1.59	0.75	0.84	0.93	0.579	1.24	0.468	1.00	1.30	0.609	No
177	29.20	1.60	0.76	0.85	0.92	0.579	1.24	0.468	1.00	1.30	0.609	No
178	29.36	1.61	0.76	0.85	0.92	0.579	1.24	0.468	1.00	1.30	0.609	No
179	29.53	1.62	0.77	0.86	0.92	0.580	1.24	0.468	1.00	1.30	0.609	No
180	29.69	1.63	0.77	0.86	0.92	0.580	1.24	0.468	1.00	1.30	0.609	No
181	29.86	1.64	0.78	0.86	0.92	0.580	1.24	0.469	1.00	1.30	0.609	No
182	30.02	1.65	0.78	0.87	0.92	0.580	1.24	0.469	1.00	1.30	0.609	No
183	30.19	1.66	0.79	0.87	0.92	0.580	1.24	0.469	1.00	1.30	0.609	No
184	30.35	1.67	0.79	0.88	0.92	0.580	1.24	0.468	1.00	1.30	0.609	No
185	30.51	1.68	0.80	0.88	0.92	0.580	1.24	0.468	1.00	1.30	0.609	No
186	30.68	1.68	0.80	0.88	0.92	0.580	1.24	0.468	1.00	1.30	0.609	No
187	30.84	1.69	0.81	0.89	0.92	0.580	1.24	0.468	1.00	1.30	0.609	No
188	31.01	1.70	0.81	0.89	0.92	0.580	1.24	0.468	1.00	1.30	0.609	No
189	31.17	1.71	0.82	0.90	0.91	0.580	1.24	0.468	1.00	1.30	0.609	No
190	31.33	1.72	0.82	0.90	0.91	0.580	1.24	0.468	1.00	1.30	0.609	No
191	31.50	1.73	0.83	0.90	0.91	0.579	1.24	0.468	1.00	1.30	0.609	No
192	31.66	1.74	0.83	0.91	0.91	0.579	1.24	0.468	1.00	1.30	0.609	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	1.75	0.84	0.91	0.91	0.579	1.24	0.468	1.00	1.30	0.609	No
194	31.99	1.76	0.84	0.91	0.91	0.579	1.24	0.468	1.00	1.30	0.609	No
195	32.15	1.76	0.85	0.92	0.91	0.579	1.24	0.468	1.00	1.30	0.609	No
196	32.32	1.77	0.85	0.92	0.91	0.579	1.24	0.468	1.00	1.30	0.609	No
197	32.48	1.78	0.86	0.92	0.91	0.579	1.24	0.468	1.00	1.30	0.609	No
198	32.65	1.79	0.86	0.93	0.91	0.579	1.24	0.468	1.00	1.30	0.608	No
199	32.81	1.80	0.87	0.93	0.90	0.579	1.24	0.468	1.00	1.30	0.608	No
200	32.97	1.81	0.87	0.94	0.90	0.579	1.24	0.468	1.00	1.30	0.608	No
201	33.14	1.82	0.88	0.94	0.90	0.579	1.24	0.468	1.00	1.30	0.608	No
202	33.30	1.83	0.88	0.94	0.90	0.579	1.24	0.468	1.00	1.30	0.608	No
203	33.47	1.83	0.89	0.95	0.90	0.579	1.24	0.468	1.00	1.30	0.608	No
204	33.63	1.84	0.89	0.95	0.90	0.579	1.24	0.468	1.00	1.30	0.608	No
205	33.79	1.85	0.90	0.95	0.90	0.579	1.24	0.468	1.00	1.30	0.608	No
206	33.96	1.86	0.90	0.96	0.90	0.578	1.24	0.467	1.00	1.30	0.608	No
207	34.12	1.87	0.91	0.96	0.90	0.578	1.24	0.467	1.00	1.30	0.607	No
208	34.29	1.88	0.91	0.97	0.90	0.578	1.24	0.467	1.00	1.30	0.607	No
209	34.45	1.89	0.92	0.97	0.89	0.578	1.24	0.467	1.00	1.30	0.607	No
210	34.61	1.90	0.92	0.97	0.89	0.577	1.24	0.467	1.00	1.30	0.606	No
211	34.78	1.91	0.93	0.98	0.89	0.577	1.24	0.466	1.00	1.30	0.606	No
212	34.94	1.92	0.93	0.98	0.89	0.576	1.24	0.466	1.00	1.30	0.605	No
213	35.11	1.93	0.94	0.99	0.89	0.576	1.24	0.465	1.00	1.30	0.605	No
214	35.27	1.94	0.94	0.99	0.89	0.575	1.24	0.465	1.00	1.30	0.604	No
215	35.43	1.95	0.95	1.00	0.89	0.575	1.24	0.464	1.00	1.30	0.604	No
216	35.60	1.96	0.95	1.00	0.89	0.574	1.24	0.464	1.00	1.30	0.603	No
217	35.76	1.96	0.96	1.00	0.89	0.574	1.24	0.464	1.00	1.30	0.603	No
218	35.93	1.97	0.97	1.01	0.88	0.573	1.24	0.463	1.00	1.30	0.602	No
219	36.09	1.98	0.97	1.01	0.88	0.573	1.24	0.463	1.00	1.30	0.602	No
220	36.26	1.99	0.98	1.02	0.88	0.573	1.24	0.463	1.00	1.30	0.602	No
221	36.42	2.00	0.98	1.02	0.88	0.572	1.24	0.462	1.00	1.30	0.601	No
222	36.58	2.01	0.99	1.02	0.88	0.572	1.24	0.462	1.00	1.30	0.601	No
223	36.75	2.02	0.99	1.03	0.88	0.571	1.24	0.462	1.00	1.30	0.600	No
224	36.91	2.03	1.00	1.03	0.88	0.571	1.24	0.462	1.00	1.30	0.600	No
225	37.08	2.04	1.00	1.03	0.88	0.571	1.24	0.461	1.00	1.30	0.600	No
226	37.24	2.04	1.01	1.04	0.87	0.570	1.24	0.461	1.00	1.30	0.599	No
227	37.40	2.05	1.01	1.04	0.87	0.570	1.24	0.461	1.00	1.30	0.599	No
228	37.57	2.06	1.02	1.05	0.87	0.570	1.24	0.460	1.00	1.30	0.598	No
229	37.73	2.07	1.02	1.05	0.87	0.569	1.24	0.460	1.00	1.30	0.598	No
230	37.90	2.08	1.03	1.05	0.87	0.568	1.24	0.459	1.00	1.30	0.597	No
231	38.06	2.09	1.03	1.06	0.87	0.568	1.24	0.459	1.00	1.30	0.596	No
232	38.22	2.10	1.04	1.06	0.87	0.567	1.24	0.458	1.00	1.30	0.596	No
233	38.39	2.11	1.04	1.07	0.86	0.566	1.24	0.458	1.00	1.30	0.595	No
234	38.55	2.12	1.05	1.07	0.86	0.566	1.24	0.457	1.00	1.30	0.594	No
235	38.72	2.13	1.05	1.08	0.86	0.565	1.24	0.456	1.00	1.30	0.593	No
236	38.88	2.14	1.06	1.08	0.86	0.564	1.24	0.456	1.00	1.30	2.000	Yes
237	39.04	2.15	1.06	1.09	0.86	0.563	1.24	0.455	1.00	1.30	2.000	Yes
238	39.21	2.16	1.07	1.09	0.86	0.563	1.24	0.455	1.00	1.30	2.000	Yes
239	39.37	2.17	1.07	1.10	0.86	0.562	1.24	0.454	1.00	1.30	2.000	Yes
240	39.54	2.18	1.08	1.10	0.86	0.561	1.24	0.453	1.00	1.30	0.589	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	2.19	1.08	1.10	0.85	0.560	1.24	0.453	1.00	1.30	0.589	No
242	39.86	2.20	1.09	1.11	0.85	0.560	1.24	0.452	1.00	1.30	2.000	Yes
243	40.03	2.21	1.09	1.11	0.85	0.559	1.24	0.452	1.00	1.30	2.000	Yes
244	40.19	2.22	1.10	1.12	0.85	0.558	1.24	0.451	1.00	1.30	2.000	Yes
245	40.36	2.23	1.10	1.12	0.85	0.557	1.24	0.450	1.00	1.30	2.000	Yes
246	40.52	2.24	1.11	1.13	0.85	0.556	1.24	0.449	1.00	1.30	2.000	Yes
247	40.68	2.25	1.11	1.13	0.84	0.555	1.24	0.449	1.00	1.30	2.000	Yes
248	40.85	2.26	1.12	1.14	0.84	0.555	1.24	0.448	1.00	1.30	2.000	Yes
249	41.01	2.26	1.12	1.14	0.84	0.554	1.24	0.448	1.00	1.30	2.000	Yes
250	41.18	2.27	1.13	1.15	0.84	0.553	1.24	0.447	1.00	1.30	2.000	Yes
251	41.34	2.28	1.13	1.15	0.84	0.552	1.24	0.446	1.00	1.30	0.580	No
252	41.50	2.29	1.14	1.16	0.84	0.551	1.24	0.446	1.00	1.30	0.579	No
253	41.67	2.30	1.14	1.16	0.84	0.550	1.24	0.445	1.00	1.30	0.578	No
254	41.83	2.31	1.15	1.16	0.83	0.550	1.24	0.444	1.00	1.30	0.577	No
255	42.00	2.32	1.15	1.17	0.83	0.549	1.24	0.443	1.00	1.30	0.576	No
256	42.16	2.33	1.16	1.17	0.83	0.548	1.24	0.443	1.00	1.30	0.575	No
257	42.32	2.34	1.16	1.18	0.83	0.547	1.24	0.442	1.00	1.30	0.574	No
258	42.49	2.35	1.17	1.18	0.83	0.546	1.24	0.441	1.00	1.30	0.573	No
259	42.65	2.36	1.17	1.19	0.83	0.545	1.24	0.440	1.00	1.30	0.572	No
260	42.82	2.37	1.18	1.19	0.83	0.544	1.24	0.440	1.00	1.30	0.571	No
261	42.98	2.38	1.18	1.20	0.82	0.543	1.24	0.439	1.00	1.30	0.570	No
262	43.15	2.39	1.19	1.20	0.82	0.542	1.24	0.438	1.00	1.30	0.569	No
263	43.31	2.40	1.20	1.21	0.82	0.541	1.24	0.437	1.00	1.30	2.000	Yes
264	43.47	2.41	1.20	1.21	0.82	0.540	1.24	0.437	1.00	1.30	2.000	Yes
265	43.64	2.42	1.21	1.22	0.82	0.539	1.24	0.436	1.00	1.30	2.000	Yes
266	43.80	2.43	1.21	1.22	0.82	0.538	1.24	0.435	1.00	1.30	2.000	Yes
267	43.97	2.44	1.22	1.23	0.81	0.537	1.24	0.434	1.00	1.30	0.565	No
268	44.13	2.45	1.22	1.23	0.81	0.536	1.24	0.433	1.00	1.30	0.563	No
269	44.29	2.46	1.23	1.24	0.81	0.535	1.24	0.433	1.00	1.30	0.562	No
270	44.46	2.47	1.23	1.24	0.81	0.534	1.24	0.432	1.00	1.30	0.561	No
271	44.62	2.48	1.24	1.25	0.81	0.533	1.24	0.431	1.00	1.30	0.560	No
272	44.79	2.49	1.24	1.25	0.81	0.532	1.24	0.430	1.00	1.30	0.559	No
273	44.95	2.50	1.25	1.26	0.80	0.531	1.24	0.429	1.00	1.30	0.558	No
274	45.11	2.51	1.25	1.26	0.80	0.530	1.24	0.428	1.00	1.30	0.557	No
275	45.28	2.52	1.26	1.27	0.80	0.529	1.24	0.428	1.00	1.30	0.556	No
276	45.44	2.53	1.26	1.27	0.80	0.528	1.24	0.427	1.00	1.30	0.555	No
277	45.61	2.54	1.27	1.27	0.80	0.527	1.24	0.426	1.00	1.30	0.554	No
278	45.77	2.55	1.27	1.28	0.80	0.526	1.24	0.425	1.00	1.30	0.553	No
279	45.93	2.56	1.28	1.28	0.79	0.525	1.24	0.424	1.00	1.30	0.552	No
280	46.10	2.57	1.28	1.29	0.79	0.524	1.24	0.423	1.00	1.30	0.550	No
281	46.26	2.58	1.29	1.29	0.79	0.523	1.24	0.422	1.00	1.30	0.549	No
282	46.43	2.59	1.29	1.30	0.79	0.522	1.24	0.422	1.00	1.30	0.548	No
283	46.59	2.60	1.30	1.31	0.79	0.521	1.24	0.421	1.00	1.30	0.547	No
284	46.75	2.61	1.30	1.31	0.79	0.519	1.24	0.420	1.00	1.30	0.546	No
285	46.92	2.62	1.31	1.32	0.78	0.518	1.24	0.419	1.00	1.30	0.544	No
286	47.08	2.63	1.31	1.32	0.78	0.517	1.24	0.418	1.00	1.30	0.543	No
287	47.25	2.64	1.32	1.33	0.78	0.516	1.24	0.417	1.00	1.30	0.542	No
288	47.41	2.65	1.32	1.33	0.78	0.515	1.24	0.416	1.00	1.30	0.541	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	2.66	1.33	1.34	0.78	0.514	1.24	0.415	1.00	1.30	0.540	No
290	47.74	2.68	1.33	1.34	0.78	0.513	1.24	0.414	1.00	1.30	0.539	No
291	47.90	2.68	1.34	1.35	0.77	0.512	1.24	0.414	1.00	1.30	0.538	No
292	48.07	2.70	1.34	1.35	0.77	0.511	1.24	0.413	1.00	1.30	2.000	Yes
293	48.23	2.71	1.35	1.36	0.77	0.510	1.24	0.412	1.00	1.30	2.000	Yes
294	48.39	2.71	1.35	1.36	0.77	0.509	1.24	0.411	1.00	1.30	2.000	Yes
295	48.56	2.73	1.36	1.37	0.77	0.507	1.24	0.410	1.00	1.30	2.000	Yes
296	48.72	2.73	1.36	1.37	0.77	0.506	1.24	0.409	1.00	1.30	2.000	Yes
297	48.89	2.74	1.37	1.38	0.76	0.505	1.24	0.408	1.00	1.30	2.000	Yes
298	49.05	2.75	1.37	1.38	0.76	0.505	1.24	0.408	1.00	1.30	2.000	Yes
299	49.22	2.76	1.38	1.38	0.76	0.504	1.24	0.407	1.00	1.30	2.000	Yes
300	49.38	2.77	1.38	1.39	0.76	0.503	1.24	0.406	1.00	1.30	0.528	No
301	49.54	2.78	1.39	1.39	0.76	0.502	1.24	0.405	1.00	1.30	0.527	No
302	49.71	2.79	1.39	1.40	0.76	0.501	1.24	0.405	1.00	1.30	0.526	No
303	49.87	2.80	1.40	1.40	0.75	0.500	1.24	0.404	1.00	1.30	0.525	No
304	50.04	2.81	1.41	1.40	0.75	0.499	1.24	0.403	1.00	1.30	0.524	No
305	50.20	2.82	1.41	1.41	0.75	0.498	1.24	0.402	1.00	1.30	0.523	No
306	50.36	2.83	1.42	1.41	0.75	0.497	1.24	0.402	1.00	1.30	0.522	No
307	50.53	2.84	1.42	1.42	0.75	0.496	1.24	0.401	1.00	1.30	0.521	No
308	50.69	2.85	1.43	1.42	0.75	0.495	1.24	0.400	1.00	1.30	0.520	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	6.63	2.55	0.50	0.82	12.51	3.80	47.49	4.000	No	No	2.00
2	0.49	8.87	2.65	1.51	0.86	16.72	7.27	121.61	4.000	No	No	2.00
3	0.66	12.43	2.61	2.15	0.85	23.44	5.83	136.60	4.000	No	No	2.00
4	0.82	15.03	2.60	2.67	0.84	28.34	5.55	157.28	4.000	No	No	2.00
5	0.98	17.10	2.59	2.93	0.84	32.22	4.99	160.88	4.000	No	No	2.00
6	1.15	17.73	2.58	3.02	0.84	33.40	4.87	162.84	4.000	Yes	No	2.00
7	1.31	19.37	2.53	2.76	0.82	36.48	3.42	124.88	4.000	Yes	No	2.00
8	1.48	22.43	2.44	2.39	0.78	42.25	2.48	104.91	4.000	Yes	No	2.00
9	1.64	26.87	2.36	2.24	0.75	50.61	2.17	109.72	4.000	Yes	No	2.00
10	1.80	30.10	2.32	2.22	0.74	56.71	2.03	115.00	4.000	No	No	2.00
11	1.97	28.80	2.35	2.32	0.75	54.23	2.12	115.21	4.000	No	No	2.00
12	2.13	24.83	2.40	2.29	0.77	46.71	2.30	107.21	4.000	No	No	2.00
13	2.30	20.86	2.43	2.09	0.78	39.20	2.43	95.22	4.000	No	No	2.00
14	2.46	18.13	2.42	1.67	0.78	34.01	2.38	80.90	4.000	No	No	2.00
15	2.62	15.80	2.40	1.28	0.77	29.59	2.31	68.29	4.000	No	No	2.00
16	2.79	13.76	2.39	0.98	0.77	25.73	2.27	58.38	4.000	Yes	No	2.00
17	2.95	12.20	2.46	1.11	0.80	22.75	2.59	58.82	4.000	Yes	No	2.00
18	3.12	11.83	2.58	1.71	0.84	22.04	4.64	102.31	4.000	Yes	No	2.00
19	3.28	11.60	2.72	2.92	0.89	21.59	4.15	89.55	4.000	Yes	Yes	2.00
20	3.45	11.96	2.77	3.68	0.92	22.26	4.57	101.63	4.000	Yes	Yes	2.00
21	3.61	12.73	2.78	3.99	0.92	23.69	4.58	108.60	4.000	No	Yes	2.00
22	3.77	13.76	2.73	3.69	0.90	25.63	4.20	107.73	4.000	No	Yes	2.00
23	3.94	14.10	2.71	3.60	0.89	26.24	4.09	107.45	4.000	No	Yes	2.00
24	4.10	14.50	2.70	3.50	0.89	26.98	9.95	268.52	4.000	No	No	2.00
25	4.27	15.16	2.67	3.35	0.88	28.23	8.38	236.44	4.000	No	No	2.00
26	4.43	16.26	2.64	3.33	0.87	30.29	7.16	216.97	4.000	No	No	2.00
27	4.59	16.66	2.66	3.66	0.88	31.03	8.09	250.92	4.000	No	No	2.00
28	4.76	17.10	2.68	3.96	0.88	31.83	8.90	283.17	4.000	No	No	2.00
29	4.92	17.13	2.69	4.15	0.89	31.87	9.68	308.62	4.000	No	No	2.00
30	5.09	18.83	2.66	4.13	0.88	35.07	7.95	278.74	4.000	Yes	No	2.00
31	5.25	22.50	2.59	3.90	0.85	41.98	4.97	208.69	4.000	Yes	No	2.00
32	5.41	28.89	2.48	3.50	0.81	54.04	2.65	143.13	4.000	Yes	No	2.00
33	5.58	35.34	2.36	2.95	0.76	66.22	2.16	143.05	4.000	Yes	No	2.00
34	5.74	41.87	2.24	2.33	0.72	78.54	1.76	138.11	4.000	Yes	No	2.00
35	5.91	47.18	2.12	1.78	0.67	88.55	1.49	131.56	4.000	Yes	No	2.00
36	6.07	51.29	2.04	1.50	0.64	96.31	1.36	130.60	4.000	Yes	No	2.00
37	6.23	53.32	2.03	1.51	0.64	100.13	1.34	134.14	0.304	No	No	0.79
38	6.40	53.85	2.05	1.62	0.65	101.12	1.37	138.18	0.325	No	No	0.83
39	6.56	52.88	2.08	1.78	0.66	99.27	1.42	141.09	0.341	No	No	0.86
40	6.73	49.14	2.14	1.98	0.68	92.18	1.53	140.70	0.339	No	No	0.85
41	6.89	42.83	2.23	2.36	0.72	80.22	1.75	140.52	0.338	No	No	0.83
42	7.05	35.87	2.32	2.63	0.75	67.06	2.02	135.52	0.311	No	No	0.76
43	7.22	36.94	2.26	2.19	0.73	69.06	1.82	125.57	0.264	No	No	0.64
44	7.38	45.36	2.08	1.41	0.66	79.27	1.43	113.04	0.214	No	No	0.51
45	7.55	57.48	1.92	0.93	0.60	93.35	1.20	112.33	0.212	No	No	0.50
46	7.71	65.22	1.85	0.82	0.57	102.35	1.14	117.16	0.230	No	No	0.54
47	7.87	68.22	1.83	0.79	0.57	105.07	1.13	118.53	0.235	No	No	0.55
48	8.04	64.52	1.86	0.83	0.58	99.23	1.16	114.71	4.000	Yes	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q_t (tsf)	I_c	F_r (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
49	8.20	53.78	1.97	1.00	0.62	84.41	1.26	106.34	4.000	Yes	No	2.00
50	8.37	38.28	2.18	1.50	0.70	63.05	1.61	101.60	4.000	Yes	No	2.00
51	8.53	24.02	2.44	2.41	0.80	42.01	2.50	105.16	4.000	Yes	No	2.00
52	8.69	14.55	2.69	3.32	0.90	26.54	9.36	248.59	4.000	Yes	No	2.00
53	8.86	9.38	2.87	3.76	0.97	16.78	5.45	91.47	4.000	Yes	Yes	2.00
54	9.02	7.21	2.91	2.98	0.98	12.67	5.81	73.62	0.604	No	Yes	1.33
55	9.19	6.18	2.91	2.35	0.98	10.70	5.83	62.45	0.511	No	Yes	1.12
56	9.35	5.85	2.95	2.50	1.00	10.07	6.21	62.53	0.480	No	Yes	1.04
57	9.51	7.12	2.93	3.03	0.99	12.32	5.95	73.34	0.588	No	Yes	1.27
58	9.68	9.85	2.81	2.87	0.95	16.60	4.84	80.31	0.792	No	Yes	1.69
59	9.84	12.78	2.69	2.45	0.90	20.88	9.33	194.83	0.768	No	No	1.63
60	10.01	15.82	2.59	2.18	0.86	25.07	5.15	129.01	0.280	No	No	0.59
61	10.17	15.79	2.62	2.41	0.87	25.03	6.10	152.60	0.410	No	No	0.86
62	10.34	13.87	2.72	3.01	0.91	22.26	4.13	91.96	1.062	No	Yes	2.00
63	10.50	10.20	2.86	3.47	0.97	16.54	5.30	87.59	0.789	No	Yes	1.64
64	10.66	9.00	2.91	3.57	0.99	14.54	5.79	84.26	0.694	No	Yes	1.43
65	10.83	10.03	2.82	2.83	0.95	15.88	4.94	78.48	0.758	No	Yes	1.55
66	10.99	12.70	2.68	2.21	0.90	19.62	9.02	176.99	0.596	No	No	1.22
67	11.16	13.93	2.66	2.25	0.89	21.36	7.74	165.31	0.500	No	No	1.01
68	11.32	13.83	2.69	2.52	0.90	21.22	9.45	200.52	4.000	No	No	2.00
69	11.48	13.03	2.75	2.96	0.93	20.07	4.37	87.67	4.000	Yes	Yes	2.00
70	11.65	15.93	2.58	1.96	0.86	23.72	4.88	115.71	4.000	Yes	No	2.00
71	11.81	20.20	2.39	1.19	0.79	28.94	2.28	65.86	4.000	Yes	No	2.00
72	11.98	24.23	2.26	0.85	0.74	33.74	1.82	61.27	4.000	Yes	No	2.00
73	12.14	23.59	2.31	1.02	0.76	33.02	1.97	64.92	4.000	Yes	No	2.00
74	12.30	20.42	2.45	1.52	0.81	29.17	2.51	73.28	4.000	Yes	No	2.00
75	12.47	15.72	2.63	2.22	0.88	22.95	6.43	147.51	4.000	Yes	No	2.00
76	12.63	11.52	2.79	2.77	0.94	17.00	4.69	79.79	4.000	Yes	Yes	2.00
77	12.80	8.63	2.91	2.95	0.99	12.66	5.78	73.21	4.000	Yes	Yes	2.00
78	12.96	6.79	2.98	2.74	1.00	9.73	6.58	64.01	4.000	Yes	Yes	2.00
79	13.12	5.86	3.03	2.60	1.00	8.19	7.14	58.44	0.391	No	Yes	0.75
80	13.29	5.43	3.02	2.13	1.00	7.45	7.02	52.29	0.355	No	Yes	0.68
81	13.45	5.36	3.04	2.16	1.00	7.30	7.14	52.17	0.348	No	Yes	0.66
82	13.62	5.70	3.06	2.69	1.00	7.78	7.46	58.03	0.371	No	Yes	0.70
83	13.78	6.30	3.09	3.61	1.00	8.67	7.85	68.01	0.413	No	Yes	0.78
84	13.94	6.97	3.10	4.30	1.00	9.65	7.93	76.54	0.460	No	Yes	0.87
85	14.11	7.60	3.08	4.40	1.00	10.56	7.62	80.42	0.504	No	Yes	0.94
86	14.27	8.30	3.05	4.43	1.00	11.56	7.27	84.07	0.552	No	Yes	1.03
87	14.44	9.77	2.94	3.71	1.00	13.72	6.10	83.73	4.000	Yes	Yes	2.00
88	14.60	24.43	2.39	1.41	0.79	32.53	2.27	73.79	4.000	Yes	No	2.00
89	14.76	45.86	2.03	0.74	0.65	57.84	1.33	77.21	4.000	Yes	No	2.00
90	14.93	68.46	1.86	0.64	0.59	83.93	1.15	96.51	4.000	Yes	No	2.00
91	15.09	77.76	1.83	0.69	0.58	94.71	1.13	107.10	0.194	No	No	0.36
92	15.26	82.16	1.84	0.78	0.58	99.92	1.14	113.86	0.217	No	No	0.40
93	15.42	86.10	1.84	0.82	0.58	104.33	1.14	118.82	0.236	No	No	0.43
94	15.58	88.10	1.85	0.88	0.59	106.56	1.15	122.32	0.250	No	No	0.46
95	15.75	83.14	1.89	0.93	0.60	100.66	1.18	118.62	4.000	Yes	No	2.00
96	15.91	67.14	1.99	1.06	0.64	82.12	1.29	105.88	4.000	Yes	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q_t (tsf)	I_c	F_r (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
97	16.08	44.28	2.20	1.38	0.72	55.34	1.66	92.06	4.000	Yes	No	2.00
98	16.24	23.89	2.50	2.03	0.84	30.64	2.87	88.03	4.000	Yes	No	2.00
99	16.40	11.60	2.84	2.81	0.96	14.94	5.11	76.39	4.000	Yes	Yes	2.00
100	16.57	8.34	2.86	1.80	0.97	10.36	5.35	55.42	0.494	No	Yes	0.89
101	16.73	7.98	2.76	0.94	0.93	9.67	4.43	42.84	0.461	No	Yes	0.83
102	16.90	9.39	2.73	1.18	0.93	11.50	4.25	48.89	0.549	No	Yes	0.98
103	17.06	10.86	2.79	2.02	0.95	13.54	4.71	63.80	0.646	No	Yes	1.15
104	17.23	12.60	2.80	2.57	0.95	15.83	4.74	75.13	0.755	No	Yes	1.34
105	17.39	14.34	2.77	2.74	0.94	18.02	4.50	81.14	0.860	No	Yes	1.53
106	17.55	15.76	2.73	2.70	0.93	19.73	4.23	83.42	0.941	No	Yes	1.67
107	17.72	16.02	2.74	2.88	0.93	19.99	4.32	86.41	0.954	No	Yes	1.69
108	17.88	15.74	2.74	2.71	0.93	19.50	4.26	83.15	0.930	No	Yes	1.64
109	18.05	15.21	2.78	3.05	0.94	18.79	4.61	86.71	0.896	No	Yes	1.58
110	18.21	15.21	2.78	3.05	0.95	18.69	4.63	86.56	0.892	No	Yes	1.57
111	18.37	15.94	2.81	3.57	0.96	19.62	4.85	95.18	4.000	Yes	Yes	2.00
112	18.54	18.62	2.73	3.22	0.93	22.77	4.21	95.94	4.000	Yes	Yes	2.00
113	18.70	23.82	2.59	2.63	0.87	28.84	5.22	150.52	4.000	Yes	No	2.00
114	18.87	32.79	2.39	1.78	0.80	38.95	2.26	88.04	4.000	Yes	No	2.00
115	19.03	43.57	2.20	1.25	0.73	50.77	1.67	84.94	4.000	Yes	No	2.00
116	19.19	54.10	2.09	1.07	0.68	62.24	1.44	89.43	4.000	Yes	No	2.00
117	19.36	61.39	2.06	1.11	0.67	70.22	1.38	97.06	0.165	No	No	0.29
118	19.52	66.62	2.07	1.27	0.67	76.10	1.40	106.54	0.192	No	No	0.33
119	19.69	70.96	2.06	1.34	0.67	80.73	1.39	112.27	0.212	No	No	0.37
120	19.85	74.56	2.04	1.32	0.67	84.37	1.36	114.87	0.221	No	No	0.38
121	20.01	74.48	2.03	1.23	0.66	83.79	1.34	111.92	0.210	No	No	0.36
122	20.18	70.27	2.04	1.21	0.67	78.79	1.36	107.03	4.000	Yes	No	2.00
123	20.34	62.19	2.09	1.26	0.69	69.70	1.44	100.67	4.000	Yes	No	2.00
124	20.51	51.73	2.21	1.52	0.73	58.19	1.68	97.94	4.000	Yes	No	2.00
125	20.67	37.80	2.37	1.91	0.79	42.71	2.21	94.39	4.000	Yes	No	2.00
126	20.83	24.06	2.61	2.62	0.88	27.22	5.86	159.55	4.000	Yes	No	2.00
127	21.00	14.06	2.85	3.10	0.97	15.61	5.21	81.31	4.000	Yes	Yes	2.00
128	21.16	9.87	2.95	2.68	1.00	10.55	6.21	65.50	4.000	Yes	Yes	2.00
129	21.33	8.81	2.90	1.75	0.99	9.21	5.71	52.59	0.439	No	Yes	0.75
130	21.49	8.52	2.87	1.36	0.98	8.79	5.38	47.26	0.419	No	Yes	0.72
131	21.65	8.63	2.86	1.35	0.98	8.87	5.32	47.18	0.423	No	Yes	0.72
132	21.82	8.77	2.85	1.32	0.98	8.99	5.24	47.09	0.429	No	Yes	0.73
133	21.98	9.01	2.84	1.28	0.97	9.23	5.09	46.98	0.440	No	Yes	0.75
134	22.15	9.18	2.88	1.67	0.99	9.43	5.54	52.19	0.450	No	Yes	0.76
135	22.31	9.89	2.88	1.92	0.99	10.21	5.54	56.64	0.487	No	Yes	0.83
136	22.47	11.93	2.87	2.49	0.98	12.55	5.41	67.91	0.598	No	Yes	1.01
137	22.64	13.33	2.85	2.76	0.98	14.10	5.26	74.15	0.673	No	Yes	1.14
138	22.80	13.20	2.89	3.07	0.99	13.91	5.56	77.34	0.664	No	Yes	1.12
139	22.97	11.57	2.93	2.91	1.00	11.97	5.95	71.23	0.571	No	Yes	0.96
140	23.13	10.24	2.95	2.60	1.00	10.38	6.19	64.26	0.495	No	Yes	0.83
141	23.30	9.68	2.95	2.38	1.00	9.68	6.23	60.37	0.462	No	Yes	0.78
142	23.46	8.99	3.01	2.60	1.00	8.84	6.82	60.28	0.422	No	Yes	0.71
143	23.62	8.43	3.05	2.81	1.00	8.15	7.37	60.08	0.389	No	Yes	0.65
144	23.79	8.07	3.09	2.96	1.00	7.70	7.78	59.86	0.367	No	Yes	0.62

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q_t (tsf)	I_c	F_r (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
145	23.95	8.04	3.09	2.98	1.00	7.63	7.83	59.75	0.364	No	Yes	0.61
146	24.12	8.37	3.10	3.31	1.00	7.97	7.96	63.40	0.380	No	Yes	0.63
147	24.28	8.91	3.09	3.52	1.00	8.53	7.84	66.88	0.407	No	Yes	0.68
148	24.44	9.14	3.08	3.42	1.00	8.74	7.64	66.84	0.417	No	Yes	0.70
149	24.61	9.48	3.05	3.28	1.00	9.08	7.36	66.80	0.433	No	Yes	0.72
150	24.77	11.25	2.97	3.03	1.00	11.00	6.37	70.06	0.525	No	Yes	0.87
151	24.94	14.55	2.82	2.53	0.97	14.52	4.97	72.17	0.693	No	Yes	1.15
152	25.10	15.30	2.79	2.39	0.96	15.25	4.70	71.73	0.727	No	Yes	1.21
153	25.26	13.62	2.81	2.18	0.97	13.37	4.91	65.65	0.638	No	Yes	1.06
154	25.43	10.58	2.95	2.54	1.00	10.05	6.26	62.85	0.479	No	Yes	0.80
155	25.59	9.68	2.98	2.42	1.00	9.03	6.54	59.09	0.431	No	Yes	0.71
156	25.76	9.76	2.98	2.40	1.00	9.06	6.51	59.00	0.432	No	Yes	0.72
157	25.92	10.36	2.98	2.61	1.00	9.67	6.47	62.59	0.461	No	Yes	0.76
158	26.08	11.43	2.97	3.00	1.00	10.78	6.42	69.16	0.514	No	Yes	0.85
159	26.25	12.53	2.96	3.31	1.00	11.90	6.31	75.03	0.568	No	Yes	0.94
160	26.41	12.82	2.99	3.81	1.00	12.15	6.62	80.47	0.580	No	Yes	0.96
161	26.58	12.51	3.03	4.22	1.00	11.76	7.05	82.94	0.561	No	Yes	0.93
162	26.74	11.97	3.06	4.44	1.00	11.14	7.43	82.73	0.531	No	Yes	0.88
163	26.90	11.77	3.05	4.21	1.00	10.87	7.36	79.99	0.518	No	Yes	0.85
164	27.07	12.17	3.01	3.74	1.00	11.23	6.87	77.21	0.536	No	Yes	0.88
165	27.23	12.81	3.00	3.83	1.00	11.84	6.73	79.76	0.565	No	Yes	0.93
166	27.40	13.61	2.98	3.86	1.00	12.62	6.51	82.17	0.602	No	Yes	0.99
167	27.56	14.11	2.97	3.97	1.00	13.07	6.46	84.51	0.624	No	Yes	1.03
168	27.72	14.24	2.97	3.93	1.00	13.15	6.41	84.35	0.627	No	Yes	1.03
169	27.89	14.07	3.00	4.25	1.00	12.91	6.71	86.65	0.616	No	Yes	1.01
170	28.05	14.04	3.02	4.53	1.00	12.81	6.94	88.85	0.611	No	Yes	1.01
171	28.22	14.30	3.02	4.71	1.00	13.01	6.99	90.95	0.621	No	Yes	1.02
172	28.38	14.50	3.01	4.64	1.00	13.15	6.90	90.79	0.627	No	Yes	1.03
173	28.54	14.30	3.01	4.45	1.00	12.89	6.86	88.35	0.615	No	Yes	1.01
174	28.71	13.66	3.03	4.41	1.00	12.18	7.05	85.86	0.581	No	Yes	0.96
175	28.87	13.06	3.02	4.07	1.00	11.52	7.02	80.88	0.550	No	Yes	0.90
176	29.04	12.53	3.04	3.96	1.00	10.93	7.15	78.19	0.522	No	Yes	0.86
177	29.20	12.23	3.03	3.76	1.00	10.59	7.13	75.45	0.505	No	Yes	0.83
178	29.36	12.06	3.05	3.83	1.00	10.37	7.26	75.31	0.495	No	Yes	0.81
179	29.53	11.93	3.03	3.56	1.00	10.19	7.11	72.51	0.486	No	Yes	0.80
180	29.69	12.13	3.02	3.49	1.00	10.35	7.00	72.41	0.494	No	Yes	0.81
181	29.86	12.57	3.02	3.66	1.00	10.72	6.99	74.98	0.511	No	Yes	0.84
182	30.02	13.01	3.06	4.40	1.00	11.10	7.41	82.30	0.529	No	Yes	0.87
183	30.19	12.81	3.09	4.78	1.00	10.85	7.78	84.40	0.518	No	Yes	0.85
184	30.35	12.31	3.10	4.70	1.00	10.32	7.93	81.86	0.492	No	Yes	0.81
185	30.51	12.14	3.07	4.14	1.00	10.11	7.61	76.95	0.482	No	Yes	0.79
186	30.68	12.78	3.04	3.91	1.00	10.67	7.20	76.91	0.509	No	Yes	0.84
187	30.84	13.55	3.02	3.94	1.00	11.36	6.98	79.28	0.542	No	Yes	0.89
188	31.01	13.88	3.02	4.11	1.00	11.63	7.01	81.53	0.555	No	Yes	0.91
189	31.17	13.61	3.04	4.20	1.00	11.32	7.19	81.38	0.540	No	Yes	0.89
190	31.33	13.15	3.05	4.08	1.00	10.83	7.28	78.86	0.517	No	Yes	0.85
191	31.50	12.72	3.03	3.64	1.00	10.37	7.11	73.77	0.495	No	Yes	0.81
192	31.66	12.35	3.01	3.14	1.00	9.99	6.84	68.31	0.476	No	Yes	0.78

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q_t (tsf)	I_c	F_r (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
193	31.83	12.09	3.00	2.90	1.00	9.70	6.74	65.35	0.462	No	Yes	0.76
194	31.99	11.69	3.03	3.02	1.00	9.28	7.03	65.24	0.443	No	Yes	0.73
195	32.15	11.33	3.02	2.79	1.00	8.91	6.98	62.15	0.425	No	Yes	0.70
196	32.32	10.90	3.02	2.56	1.00	8.47	6.96	58.89	0.404	No	Yes	0.66
197	32.48	11.37	2.99	2.43	1.00	8.87	6.63	58.85	0.423	No	Yes	0.70
198	32.65	12.35	2.97	2.53	1.00	9.73	6.36	61.93	0.464	No	Yes	0.76
199	32.81	13.09	2.93	2.36	1.00	10.37	5.96	61.79	0.495	No	Yes	0.81
200	32.97	12.56	2.93	2.17	1.00	9.85	5.95	58.58	0.470	No	Yes	0.77
201	33.14	11.50	2.95	2.07	1.00	8.84	6.24	55.19	0.422	No	Yes	0.69
202	33.30	10.87	3.00	2.21	1.00	8.24	6.69	55.11	0.393	No	Yes	0.65
203	33.47	11.08	2.98	2.16	1.00	8.39	6.56	55.06	0.400	No	Yes	0.66
204	33.63	11.79	2.98	2.35	1.00	8.99	6.49	58.34	0.429	No	Yes	0.71
205	33.79	12.60	2.99	2.79	1.00	9.68	6.64	64.33	0.462	No	Yes	0.76
206	33.96	13.40	3.00	3.18	1.00	10.37	6.72	69.70	0.494	No	Yes	0.81
207	34.12	13.67	3.01	3.39	1.00	10.56	6.83	72.16	0.504	No	Yes	0.83
208	34.29	13.14	3.02	3.26	1.00	10.05	6.92	69.50	0.479	No	Yes	0.79
209	34.45	13.43	3.02	3.47	1.00	10.26	7.01	71.94	0.489	No	Yes	0.81
210	34.61	16.15	2.97	3.74	1.00	12.63	6.42	81.13	0.602	No	Yes	0.99
211	34.78	21.69	2.88	4.04	1.00	17.45	5.52	96.29	0.833	No	Yes	1.37
212	34.94	28.41	2.76	3.77	0.96	23.36	4.49	104.97	1.114	No	Yes	1.84
213	35.11	38.41	2.58	2.83	0.89	32.20	4.69	151.05	0.401	No	No	0.66
214	35.27	42.00	2.50	2.41	0.86	35.32	2.85	100.59	0.175	No	No	0.29
215	35.43	38.65	2.53	2.36	0.87	32.23	3.36	108.24	0.198	No	No	0.33
216	35.60	26.93	2.74	3.20	0.95	21.69	4.33	93.90	1.035	No	Yes	1.72
217	35.76	18.73	2.93	3.78	1.00	14.45	5.97	86.20	0.689	No	Yes	1.14
218	35.93	14.57	3.04	3.97	1.00	10.81	7.20	77.87	0.516	No	Yes	0.86
219	36.09	12.74	3.08	3.72	1.00	9.21	7.68	70.66	0.439	No	Yes	0.73
220	36.26	11.94	3.13	4.02	1.00	8.49	8.29	70.31	0.405	No	Yes	0.67
221	36.42	11.74	3.12	3.76	1.00	8.28	8.18	67.78	0.395	No	Yes	0.66
222	36.58	11.91	3.09	3.37	1.00	8.39	7.78	65.26	0.400	No	Yes	0.67
223	36.75	11.71	3.05	2.75	1.00	8.19	7.29	59.74	0.391	No	Yes	0.65
224	36.91	11.72	3.02	2.41	1.00	8.16	6.95	56.72	0.389	No	Yes	0.65
225	37.08	11.85	2.98	2.04	1.00	8.24	6.49	53.48	0.393	No	Yes	0.66
226	37.24	12.19	2.99	2.30	1.00	8.49	6.67	56.63	0.405	No	Yes	0.68
227	37.40	12.82	3.02	2.79	1.00	8.99	6.94	62.37	0.429	No	Yes	0.72
228	37.57	15.23	3.01	3.55	1.00	10.95	6.82	74.65	0.522	No	Yes	0.87
229	37.73	18.80	2.96	3.99	1.00	13.87	6.26	86.81	0.661	No	Yes	1.11
230	37.90	23.20	2.87	3.95	1.00	17.44	5.45	95.15	0.832	No	Yes	1.39
231	38.06	26.87	2.80	3.63	0.97	20.46	4.77	97.61	0.976	No	Yes	1.64
232	38.22	28.17	2.77	3.45	0.96	21.49	4.52	97.08	1.025	No	Yes	1.72
233	38.39	28.77	2.76	3.38	0.96	21.91	4.42	96.75	1.045	No	Yes	1.76
234	38.55	29.57	2.73	3.16	0.95	22.52	4.20	94.60	1.074	No	Yes	1.81
235	38.72	31.44	2.69	2.96	0.93	24.01	9.45	226.92	4.000	No	No	2.00
236	38.88	33.20	2.66	2.90	0.92	25.40	8.10	205.78	4.000	Yes	No	2.00
237	39.04	38.67	2.56	2.46	0.89	29.94	4.27	127.92	4.000	Yes	No	2.00
238	39.21	46.90	2.43	1.94	0.83	36.87	2.43	89.57	4.000	Yes	No	2.00
239	39.37	53.22	2.31	1.50	0.79	42.25	1.99	84.17	4.000	Yes	No	2.00
240	39.54	55.55	2.26	1.31	0.77	44.18	1.83	81.05	0.130	No	No	0.22

:: 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	56.14	2.24	1.24	0.76	44.60	1.78	79.46	0.127	No	No	0.22
242	39.86	56.80	2.27	1.40	0.78	44.92	1.87	83.98	4.000	Yes	No	2.00
243	40.03	54.75	2.36	1.84	0.81	42.83	2.17	92.84	4.000	Yes	No	2.00
244	40.19	48.98	2.47	2.35	0.85	37.71	2.64	99.48	4.000	Yes	No	2.00
245	40.36	42.26	2.57	2.75	0.89	31.95	4.51	144.19	4.000	Yes	No	2.00
246	40.52	34.56	2.68	3.09	0.93	25.51	9.00	229.49	4.000	Yes	No	2.00
247	40.68	30.65	2.71	2.93	0.94	22.29	4.08	90.88	4.000	Yes	Yes	2.00
248	40.85	32.58	2.64	2.42	0.92	23.86	6.82	162.63	4.000	Yes	No	2.00
249	41.01	40.12	2.49	1.85	0.86	30.03	2.70	81.06	4.000	Yes	No	2.00
250	41.18	47.70	2.40	1.69	0.83	36.18	2.30	83.31	4.000	Yes	No	2.00
251	41.34	52.77	2.36	1.65	0.81	40.23	2.14	86.03	0.139	No	No	0.24
252	41.50	56.25	2.33	1.61	0.80	42.97	2.03	87.34	0.142	No	No	0.25
253	41.67	58.66	2.31	1.60	0.79	44.81	1.98	88.69	0.145	No	No	0.25
254	41.83	59.32	2.30	1.58	0.79	45.23	1.96	88.59	0.145	No	No	0.25
255	42.00	57.76	2.33	1.68	0.80	43.74	2.06	89.89	0.148	No	No	0.26
256	42.16	53.46	2.42	2.09	0.84	39.92	2.40	95.84	0.162	No	No	0.28
257	42.32	50.67	2.46	2.21	0.85	37.50	2.56	96.13	0.163	No	No	0.28
258	42.49	52.76	2.43	2.12	0.84	39.08	2.45	95.69	0.161	No	No	0.28
259	42.65	55.15	2.38	1.83	0.82	41.01	2.22	90.99	0.150	No	No	0.26
260	42.82	53.68	2.42	2.08	0.84	39.56	2.41	95.34	0.161	No	No	0.28
261	42.98	45.48	2.53	2.40	0.88	32.82	3.32	108.85	0.200	No	No	0.35
262	43.15	40.19	2.60	2.65	0.90	28.49	5.40	153.99	0.420	No	No	0.74
263	43.31	36.09	2.63	2.57	0.92	25.24	6.70	168.99	4.000	Yes	No	2.00
264	43.47	40.30	2.55	2.20	0.89	28.53	3.89	111.11	4.000	Yes	No	2.00
265	43.64	50.29	2.41	1.81	0.83	36.41	2.37	86.31	4.000	Yes	No	2.00
266	43.80	63.35	2.30	1.64	0.79	46.73	1.96	91.44	4.000	Yes	No	2.00
267	43.97	70.55	2.28	1.76	0.79	52.18	1.90	99.19	0.171	No	No	0.30
268	44.13	71.32	2.30	1.89	0.79	52.52	1.96	102.69	0.181	No	No	0.32
269	44.29	72.57	2.29	1.85	0.79	53.38	1.92	102.60	0.180	No	No	0.32
270	44.46	73.35	2.27	1.74	0.78	53.93	1.86	100.15	0.173	No	No	0.31
271	44.62	72.27	2.29	1.82	0.79	52.84	1.91	101.13	0.176	No	No	0.31
272	44.79	67.63	2.34	2.00	0.81	48.90	2.09	102.12	0.179	No	No	0.32
273	44.95	67.16	2.34	1.96	0.81	48.42	2.08	100.77	0.175	No	No	0.31
274	45.11	68.01	2.31	1.78	0.80	49.08	1.98	96.96	0.165	No	No	0.30
275	45.28	68.09	2.30	1.73	0.79	49.03	1.95	95.60	0.161	No	No	0.29
276	45.44	66.05	2.32	1.78	0.80	47.25	2.02	95.43	0.161	No	No	0.29
277	45.61	71.48	2.29	1.74	0.79	51.34	1.91	97.92	0.167	No	No	0.30
278	45.77	80.67	2.22	1.62	0.77	58.45	1.73	100.96	0.176	No	No	0.32
279	45.93	91.81	2.17	1.57	0.74	67.03	1.59	106.89	0.194	No	No	0.35
280	46.10	99.31	2.15	1.58	0.74	72.65	1.54	112.17	0.211	No	No	0.38
281	46.26	108.68	2.11	1.57	0.72	79.79	1.48	117.98	0.233	No	No	0.42
282	46.43	117.46	2.09	1.60	0.72	86.36	1.44	124.43	0.259	No	No	0.47
283	46.59	119.06	2.10	1.66	0.72	87.24	1.46	127.01	0.271	No	No	0.49
284	46.75	118.62	2.11	1.70	0.72	86.58	1.47	127.43	0.272	No	No	0.50
285	46.92	115.58	2.12	1.71	0.73	83.94	1.50	125.56	0.264	No	No	0.49
286	47.08	114.76	2.11	1.64	0.72	83.22	1.48	122.77	0.252	No	No	0.46
287	47.25	105.76	2.16	1.75	0.74	75.84	1.57	119.40	0.238	No	No	0.44
288	47.41	86.30	2.28	2.03	0.79	60.43	1.88	113.51	0.216	No	No	0.40

:: 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
289	47.57	63.66	2.44	2.46	0.85	43.00	2.50	107.33	0.195	No	No	0.36
290	47.74	61.05	2.42	2.17	0.84	41.15	2.40	98.93	0.170	No	No	0.32
291	47.90	75.10	2.24	1.47	0.77	52.19	1.76	91.78	0.152	No	No	0.28
292	48.07	95.60	2.09	1.18	0.72	68.15	1.43	97.44	4.000	Yes	No	2.00
293	48.23	94.62	2.13	1.38	0.73	66.83	1.52	101.55	4.000	Yes	No	2.00
294	48.39	78.03	2.28	1.81	0.79	53.50	1.90	101.69	4.000	Yes	No	2.00
295	48.56	58.98	2.45	2.25	0.86	38.94	2.53	98.57	4.000	Yes	No	2.00
296	48.72	44.01	2.57	2.34	0.90	28.02	4.52	126.77	4.000	Yes	No	2.00
297	48.89	34.24	2.66	2.22	0.93	21.07	7.80	164.33	4.000	Yes	No	2.00
298	49.05	23.91	2.85	2.68	1.00	13.78	5.27	72.56	4.000	Yes	Yes	2.00
299	49.22	19.79	2.96	2.94	1.00	11.06	6.26	69.26	4.000	Yes	Yes	2.00
300	49.38	22.08	2.85	2.24	1.00	12.50	5.19	64.88	0.596	No	Yes	1.13
301	49.54	27.62	2.69	1.74	0.95	16.37	9.45	154.72	0.424	No	No	0.81
302	49.71	31.16	2.62	1.64	0.92	18.83	6.28	118.20	0.234	No	No	0.44
303	49.87	35.94	2.60	1.91	0.92	22.00	5.55	122.05	0.249	No	No	0.47
304	50.04	42.48	2.54	1.93	0.89	26.50	3.69	97.68	0.167	No	No	0.32
305	50.20	48.32	2.44	1.61	0.85	30.76	2.49	76.72	0.122	No	No	0.23
306	50.36	46.00	2.44	1.47	0.85	29.14	2.47	72.11	0.115	No	No	0.22
307	50.53	34.49	2.58	1.58	0.91	20.88	4.63	96.72	0.164	No	No	0.32
308	50.69	24.08	2.83	2.35	1.00	13.46	5.05	68.01	0.642	No	Yes	1.23

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	0.79	0.21	9.05	0.16	0.09	6.40	0.83	0.17	9.02	0.17	0.08
6.56	0.86	0.14	9.00	0.16	0.06	6.73	0.85	0.15	8.97	0.17	0.07
6.89	0.83	0.17	8.95	0.16	0.07	7.05	0.76	0.24	8.93	0.16	0.10
7.22	0.64	0.36	8.90	0.17	0.17	7.38	0.51	0.49	8.88	0.16	0.21
7.55	0.50	0.50	8.85	0.17	0.23	7.71	0.54	0.46	8.82	0.16	0.20
7.87	0.55	0.45	8.80	0.16	0.19	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	1.33	0.00	8.63	0.16	0.00
9.19	1.12	0.00	8.60	0.17	0.00	9.35	1.04	0.00	8.58	0.16	0.00
9.51	1.27	0.00	8.55	0.16	0.00	9.68	1.69	0.00	8.52	0.17	0.00
9.84	1.63	0.00	8.50	0.16	0.00	10.01	0.59	0.41	8.47	0.17	0.18
10.17	0.86	0.14	8.45	0.16	0.06	10.34	2.00	0.00	8.42	0.17	0.00
10.50	1.64	0.00	8.40	0.16	0.00	10.66	1.43	0.00	8.38	0.16	0.00
10.83	1.55	0.00	8.35	0.17	0.00	10.99	1.22	0.00	8.33	0.16	0.00
11.16	1.01	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	0.75	0.25	8.00	0.16	0.10	13.29	0.68	0.32	7.97	0.17	0.13
13.45	0.66	0.34	7.95	0.16	0.13	13.62	0.70	0.30	7.92	0.17	0.12
13.78	0.78	0.22	7.90	0.16	0.08	13.94	0.87	0.13	7.88	0.16	0.05
14.11	0.94	0.06	7.85	0.17	0.02	14.27	1.03	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	0.36	0.64	7.70	0.16	0.24	15.26	0.40	0.60	7.67	0.17	0.24
15.42	0.43	0.57	7.65	0.16	0.21	15.58	0.46	0.54	7.63	0.16	0.20
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	0.89	0.11	7.47	0.17	0.04
16.73	0.83	0.17	7.45	0.16	0.06	16.90	0.98	0.02	7.42	0.17	0.01
17.06	1.15	0.00	7.40	0.16	0.00	17.23	1.34	0.00	7.37	0.17	0.00
17.39	1.53	0.00	7.35	0.16	0.00	17.55	1.67	0.00	7.33	0.16	0.00
17.72	1.69	0.00	7.30	0.17	0.00	17.88	1.64	0.00	7.28	0.16	0.00
18.05	1.58	0.00	7.25	0.17	0.00	18.21	1.57	0.00	7.22	0.16	0.00
18.37	2.00	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	0.29	0.71	7.05	0.17	0.26	19.52	0.33	0.67	7.03	0.16	0.23
19.69	0.37	0.63	7.00	0.17	0.23	19.85	0.38	0.62	6.97	0.16	0.21
20.01	0.36	0.64	6.95	0.16	0.22	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	0.75	0.25	6.75	0.17	0.09	21.49	0.72	0.28	6.72	0.16	0.09
21.65	0.72	0.28	6.70	0.16	0.09	21.82	0.73	0.27	6.67	0.17	0.09
21.98	0.75	0.25	6.65	0.16	0.08	22.15	0.76	0.24	6.62	0.17	0.08
22.31	0.83	0.17	6.60	0.16	0.06	22.47	1.01	0.00	6.58	0.16	0.00
22.64	1.14	0.00	6.55	0.17	0.00	22.80	1.12	0.00	6.53	0.16	0.00
22.97	0.96	0.04	6.50	0.17	0.01	23.13	0.83	0.17	6.47	0.16	0.05
23.30	0.78	0.22	6.45	0.17	0.07	23.46	0.71	0.29	6.42	0.16	0.09
23.62	0.65	0.35	6.40	0.16	0.11	23.79	0.62	0.38	6.37	0.17	0.13
23.95	0.61	0.39	6.35	0.16	0.12	24.12	0.63	0.37	6.32	0.17	0.12
24.28	0.68	0.32	6.30	0.16	0.10	24.44	0.70	0.30	6.28	0.16	0.09
24.61	0.72	0.28	6.25	0.17	0.09	24.77	0.87	0.13	6.23	0.16	0.04
24.94	1.15	0.00	6.20	0.17	0.00	25.10	1.21	0.00	6.17	0.16	0.00
25.26	1.06	0.00	6.15	0.16	0.00	25.43	0.80	0.20	6.12	0.17	0.07
25.59	0.71	0.29	6.10	0.16	0.09	25.76	0.72	0.28	6.07	0.17	0.09
25.92	0.76	0.24	6.05	0.16	0.07	26.08	0.85	0.15	6.03	0.16	0.04
26.25	0.94	0.06	6.00	0.17	0.02	26.41	0.96	0.04	5.98	0.16	0.01
26.58	0.93	0.07	5.95	0.17	0.02	26.74	0.88	0.12	5.92	0.16	0.04
26.90	0.85	0.15	5.90	0.16	0.04	27.07	0.88	0.12	5.87	0.17	0.04
27.23	0.93	0.07	5.85	0.16	0.02	27.40	0.99	0.01	5.82	0.17	0.00
27.56	1.03	0.00	5.80	0.16	0.00	27.72	1.03	0.00	5.78	0.16	0.00
27.89	1.01	0.00	5.75	0.17	0.00	28.05	1.01	0.00	5.73	0.16	0.00
28.22	1.02	0.00	5.70	0.17	0.00	28.38	1.03	0.00	5.67	0.16	0.00
28.54	1.01	0.00	5.65	0.16	0.00	28.71	0.96	0.04	5.62	0.17	0.01
28.87	0.90	0.10	5.60	0.16	0.03	29.04	0.86	0.14	5.57	0.17	0.04
29.20	0.83	0.17	5.55	0.16	0.05	29.36	0.81	0.19	5.53	0.16	0.05
29.53	0.80	0.20	5.50	0.17	0.06	29.69	0.81	0.19	5.48	0.16	0.05
29.86	0.84	0.16	5.45	0.17	0.05	30.02	0.87	0.13	5.42	0.16	0.03
30.19	0.85	0.15	5.40	0.17	0.04	30.35	0.81	0.19	5.37	0.16	0.05
30.51	0.79	0.21	5.35	0.16	0.05	30.68	0.84	0.16	5.32	0.17	0.05
30.84	0.89	0.11	5.30	0.16	0.03	31.01	0.91	0.09	5.27	0.17	0.02
31.17	0.89	0.11	5.25	0.16	0.03	31.33	0.85	0.15	5.23	0.16	0.04
31.50	0.81	0.19	5.20	0.17	0.05	31.66	0.78	0.22	5.18	0.16	0.05

:: 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	0.76	0.24	5.15	0.17	0.06	31.99	0.73	0.27	5.12	0.16	0.07
32.15	0.70	0.30	5.10	0.16	0.08	32.32	0.66	0.34	5.07	0.17	0.09
32.48	0.70	0.30	5.05	0.16	0.08	32.65	0.76	0.24	5.02	0.17	0.06
32.81	0.81	0.19	5.00	0.16	0.05	32.97	0.77	0.23	4.98	0.16	0.06
33.14	0.69	0.31	4.95	0.17	0.08	33.30	0.65	0.35	4.93	0.16	0.09
33.47	0.66	0.34	4.90	0.17	0.09	33.63	0.71	0.29	4.87	0.16	0.07
33.79	0.76	0.24	4.85	0.16	0.06	33.96	0.81	0.19	4.82	0.17	0.05
34.12	0.83	0.17	4.80	0.16	0.04	34.29	0.79	0.21	4.77	0.17	0.05
34.45	0.81	0.19	4.75	0.16	0.04	34.61	0.99	0.01	4.73	0.16	0.00
34.78	1.37	0.00	4.70	0.17	0.00	34.94	1.84	0.00	4.68	0.16	0.00
35.11	0.66	0.34	4.65	0.17	0.08	35.27	0.29	0.71	4.62	0.16	0.16
35.43	0.33	0.67	4.60	0.16	0.15	35.60	1.72	0.00	4.57	0.17	0.00
35.76	1.14	0.00	4.55	0.16	0.00	35.93	0.86	0.14	4.52	0.17	0.03
36.09	0.73	0.27	4.50	0.16	0.06	36.26	0.67	0.33	4.47	0.17	0.08
36.42	0.66	0.34	4.45	0.16	0.07	36.58	0.67	0.33	4.43	0.16	0.07
36.75	0.65	0.35	4.40	0.17	0.08	36.91	0.65	0.35	4.37	0.16	0.07
37.08	0.66	0.34	4.35	0.17	0.08	37.24	0.68	0.32	4.32	0.16	0.07
37.40	0.72	0.28	4.30	0.16	0.06	37.57	0.87	0.13	4.27	0.17	0.03
37.73	1.11	0.00	4.25	0.16	0.00	37.90	1.39	0.00	4.22	0.17	0.00
38.06	1.64	0.00	4.20	0.16	0.00	38.22	1.72	0.00	4.18	0.16	0.00
38.39	1.76	0.00	4.15	0.17	0.00	38.55	1.81	0.00	4.12	0.16	0.00
38.72	2.00	0.00	4.10	0.17	0.00	38.88	2.00	0.00	4.07	0.16	0.00
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	0.22	0.78	3.97	0.17	0.16
39.70	0.22	0.78	3.95	0.16	0.15	39.86	2.00	0.00	3.93	0.16	0.00
40.03	2.00	0.00	3.90	0.17	0.00	40.19	2.00	0.00	3.88	0.16	0.00
40.36	2.00	0.00	3.85	0.17	0.00	40.52	2.00	0.00	3.82	0.16	0.00
40.68	2.00	0.00	3.80	0.16	0.00	40.85	2.00	0.00	3.77	0.17	0.00
41.01	2.00	0.00	3.75	0.16	0.00	41.18	2.00	0.00	3.72	0.17	0.00
41.34	0.24	0.76	3.70	0.16	0.14	41.50	0.25	0.75	3.68	0.16	0.14
41.67	0.25	0.75	3.65	0.17	0.14	41.83	0.25	0.75	3.63	0.16	0.13
42.00	0.26	0.74	3.60	0.17	0.14	42.16	0.28	0.72	3.57	0.16	0.13
42.32	0.28	0.72	3.55	0.16	0.12	42.49	0.28	0.72	3.52	0.17	0.13
42.65	0.26	0.74	3.50	0.16	0.13	42.82	0.28	0.72	3.47	0.17	0.13
42.98	0.35	0.65	3.45	0.16	0.11	43.15	0.74	0.26	3.42	0.17	0.05
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	0.30	0.70	3.30	0.17	0.12	44.13	0.32	0.68	3.27	0.16	0.11
44.29	0.32	0.68	3.25	0.16	0.11	44.46	0.31	0.69	3.22	0.17	0.12
44.62	0.31	0.69	3.20	0.16	0.11	44.79	0.32	0.68	3.17	0.17	0.11
44.95	0.31	0.69	3.15	0.16	0.11	45.11	0.30	0.70	3.13	0.16	0.11
45.28	0.29	0.71	3.10	0.17	0.11	45.44	0.29	0.71	3.07	0.16	0.11
45.61	0.30	0.70	3.05	0.17	0.11	45.77	0.32	0.68	3.02	0.16	0.10
45.93	0.35	0.65	3.00	0.16	0.09	46.10	0.38	0.62	2.97	0.17	0.09
46.26	0.42	0.58	2.95	0.16	0.08	46.43	0.47	0.53	2.92	0.17	0.08
46.59	0.49	0.51	2.90	0.16	0.07	46.75	0.50	0.50	2.88	0.16	0.07
46.92	0.49	0.51	2.85	0.17	0.08	47.08	0.46	0.54	2.83	0.16	0.07
47.25	0.44	0.56	2.80	0.17	0.08	47.41	0.40	0.60	2.77	0.16	0.08

:: 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	0.36	0.64	2.75	0.16	0.09	47.74	0.32	0.68	2.72	0.17	0.10
47.90	0.28	0.72	2.70	0.16	0.09	48.07	2.00	0.00	2.67	0.17	0.00
48.23	2.00	0.00	2.65	0.16	0.00	48.39	2.00	0.00	2.63	0.16	0.00
48.56	2.00	0.00	2.60	0.17	0.00	48.72	2.00	0.00	2.58	0.16	0.00
48.89	2.00	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	1.13	0.00	2.47	0.16	0.00
49.54	0.81	0.19	2.45	0.16	0.02	49.71	0.44	0.56	2.42	0.17	0.07
49.87	0.47	0.53	2.40	0.16	0.06	50.04	0.32	0.68	2.37	0.17	0.08
50.20	0.23	0.77	2.35	0.16	0.09	50.36	0.22	0.78	2.33	0.16	0.09
50.53	0.32	0.68	2.30	0.17	0.08	50.69	1.23	0.00	2.27	0.16	0.00

Overall liquefaction potential: 14.32

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

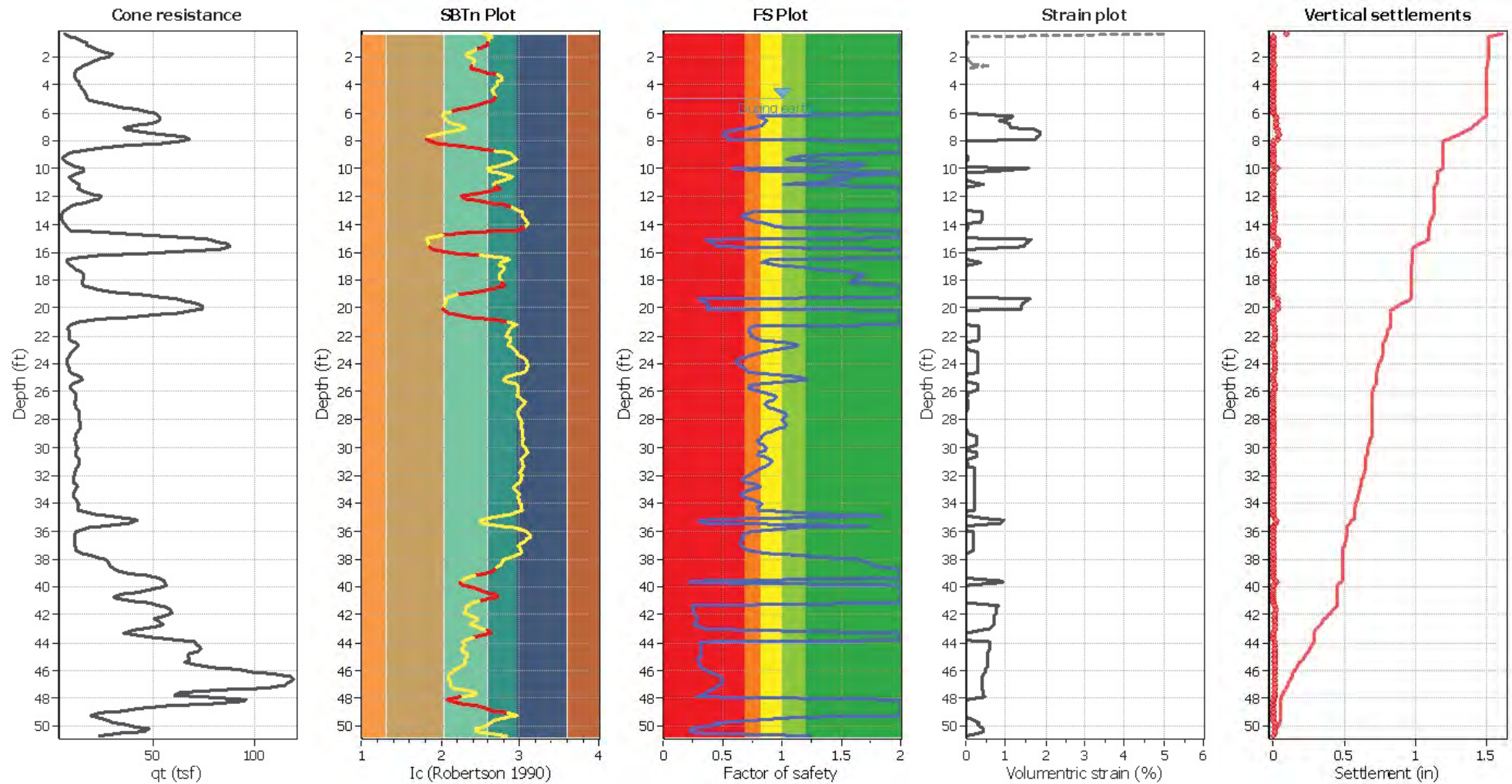
F_L: 1 - FS

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_c : 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
 Volumetric strain: Post-liquefaction volumetric 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	2.55	3.01	12.51	37.65	10	402.4	27	0.35	8137.227	18877.00	10.08	4.97	0.095
0.49	2.65	3.62	16.72	60.57	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
0.66	2.61	3.40	23.44	79.66	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
0.82	2.60	3.35	28.34	94.97	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
0.98	2.59	3.25	32.22	104.78	28	663.2	166	0.35	0.068	0.05	10.08	0.04	0.001
1.15	2.58	3.23	33.40	107.89	0	0.0	0	0.35	0.000	0.00	10.85	0.00	0.000
1.31	2.53	2.92	36.48	106.69	0	0.0	0	0.35	0.000	0.00	10.85	0.00	0.000
1.48	2.44	2.48	42.25	104.91	0	0.0	0	0.35	0.000	0.00	10.85	0.00	0.000
1.64	2.36	2.17	50.61	109.72	0	0.0	0	0.35	0.000	0.00	10.85	0.00	0.000
1.80	2.32	2.03	56.71	115.00	27	744.5	301	0.35	0.030	0.02	10.08	0.02	0.000
1.97	2.35	2.12	54.23	115.21	28	740.8	312	0.35	0.032	0.02	10.08	0.02	0.000
2.13	2.40	2.30	46.71	107.21	26	707.2	292	0.35	0.046	0.03	10.08	0.03	0.001
2.30	2.43	2.43	39.20	95.22	24	661.1	260	0.35	0.084	0.07	10.08	0.06	0.001
2.46	2.42	2.38	34.01	80.90	20	611.2	224	0.35	0.195	0.19	10.08	0.16	0.003
2.62	2.40	2.31	29.59	68.29	17	564.0	190	0.35	0.562	0.69	10.08	0.55	0.011
2.79	2.39	2.27	25.73	58.38	0	0.0	0	0.35	0.000	0.00	10.85	0.00	0.000
2.95	2.46	2.59	22.75	58.82	0	0.0	0	0.35	0.000	0.00	10.85	0.00	0.000
3.12	2.58	3.19	22.04	70.21	0	0.0	0	0.35	0.000	0.00	10.85	0.00	0.000
3.28	2.72	4.15	21.59	89.55	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
3.45	2.77	4.57	22.26	101.63	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
3.61	2.78	4.58	23.69	108.60	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
3.77	2.73	4.20	25.63	107.73	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
3.94	2.71	4.09	26.24	107.45	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
4.10	2.70	3.97	26.98	107.11	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
4.27	2.67	3.77	28.23	106.54	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
4.43	2.64	3.61	30.29	109.24	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
4.59	2.66	3.74	31.03	115.91	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
4.76	2.68	3.84	31.83	122.26	0	0.0	0	0.35	0.000	0.00	0.00	0.00	0.000
4.92	2.69	3.94	31.87	125.50	0	0.0	0	0.34	0.000	0.00	0.00	0.00	0.000
Total estimated settlement: 0.11													

:: 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	278.74	2.00	0.00	0.91	0.00	5.25	208.69	2.00	0.00	0.91	0.00
5.41	143.13	2.00	0.00	0.91	0.00	5.58	143.05	2.00	0.00	0.91	0.00
5.74	138.11	2.00	0.00	0.90	0.00	5.91	131.56	2.00	0.00	0.90	0.00
6.07	130.60	2.00	0.00	0.90	0.00	6.23	134.14	0.79	1.18	0.89	0.02
6.40	138.18	0.83	1.13	0.89	0.02	6.56	141.09	0.86	0.84	0.89	0.02
6.73	140.70	0.85	1.09	0.89	0.02	6.89	140.52	0.83	1.09	0.88	0.02
7.05	135.52	0.76	1.15	0.88	0.02	7.22	125.57	0.64	1.70	0.88	0.03
7.38	113.04	0.51	1.85	0.87	0.04	7.55	112.33	0.50	1.85	0.87	0.04
7.71	117.16	0.54	1.78	0.87	0.03	7.87	118.53	0.55	1.76	0.87	0.03
8.04	114.71	2.00	0.00	0.86	0.00	8.20	106.34	2.00	0.00	0.86	0.00
8.37	101.60	2.00	0.00	0.86	0.00	8.53	105.16	2.00	0.00	0.86	0.00
8.69	248.59	2.00	0.00	0.85	0.00	8.86	91.47	2.00	0.00	0.85	0.00
9.02	73.62	1.33	0.01	0.85	0.00	9.19	62.45	1.12	0.03	0.84	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	62.53	1.04	0.04	0.84	0.00	9.51	73.34	1.27	0.02	0.84	0.00
9.68	80.31	1.69	0.00	0.84	0.00	9.84	194.83	1.63	0.00	0.83	0.00
10.01	129.01	0.59	1.57	0.83	0.03	10.17	152.60	0.86	0.69	0.83	0.01
10.34	91.96	2.00	0.00	0.82	0.00	10.50	87.59	1.64	0.00	0.82	0.00
10.66	84.26	1.43	0.01	0.82	0.00	10.83	78.48	1.55	0.01	0.82	0.00
10.99	176.99	1.22	0.22	0.81	0.00	11.16	165.31	1.01	0.45	0.81	0.01
11.32	200.52	2.00	0.00	0.81	0.00	11.48	87.67	2.00	0.00	0.81	0.00
11.65	115.71	2.00	0.00	0.80	0.00	11.81	65.86	2.00	0.00	0.80	0.00
11.98	61.27	2.00	0.00	0.80	0.00	12.14	64.92	2.00	0.00	0.79	0.00
12.30	73.28	2.00	0.00	0.79	0.00	12.47	147.51	2.00	0.00	0.79	0.00
12.63	79.79	2.00	0.00	0.79	0.00	12.80	73.21	2.00	0.00	0.78	0.00
12.96	64.01	2.00	0.00	0.78	0.00	13.12	58.44	0.75	0.39	0.78	0.01
13.29	52.29	0.68	0.39	0.77	0.01	13.45	52.17	0.66	0.39	0.77	0.01
13.62	58.03	0.70	0.38	0.77	0.01	13.78	68.01	0.78	0.38	0.77	0.01
13.94	76.54	0.87	0.05	0.76	0.00	14.11	80.42	0.94	0.03	0.76	0.00
14.27	84.07	1.03	0.02	0.76	0.00	14.44	83.73	2.00	0.00	0.76	0.00
14.60	73.79	2.00	0.00	0.75	0.00	14.76	77.21	2.00	0.00	0.75	0.00
14.93	96.51	2.00	0.00	0.75	0.00	15.09	107.10	0.36	1.64	0.74	0.03
15.26	113.86	0.40	1.56	0.74	0.03	15.42	118.82	0.43	1.50	0.74	0.03
15.58	122.32	0.46	1.46	0.74	0.03	15.75	118.62	2.00	0.00	0.73	0.00
15.91	105.88	2.00	0.00	0.73	0.00	16.08	92.06	2.00	0.00	0.73	0.00
16.24	88.03	2.00	0.00	0.72	0.00	16.40	76.39	2.00	0.00	0.72	0.00
16.57	55.42	0.89	0.04	0.72	0.00	16.73	42.84	0.83	0.36	0.72	0.01
16.90	48.89	0.98	0.02	0.71	0.00	17.06	63.80	1.15	0.01	0.71	0.00
17.23	75.13	1.34	0.01	0.71	0.00	17.39	81.14	1.53	0.00	0.71	0.00
17.55	83.42	1.67	0.00	0.70	0.00	17.72	86.41	1.69	0.00	0.70	0.00
17.88	83.15	1.64	0.00	0.70	0.00	18.05	86.71	1.58	0.00	0.69	0.00
18.21	86.56	1.57	0.00	0.69	0.00	18.37	95.18	2.00	0.00	0.69	0.00
18.54	95.94	2.00	0.00	0.69	0.00	18.70	150.52	2.00	0.00	0.68	0.00
18.87	88.04	2.00	0.00	0.68	0.00	19.03	84.94	2.00	0.00	0.68	0.00
19.19	89.43	2.00	0.00	0.67	0.00	19.36	97.06	0.29	1.61	0.67	0.03
19.52	106.54	0.33	1.48	0.67	0.03	19.69	112.27	0.37	1.42	0.67	0.03
19.85	114.87	0.38	1.38	0.66	0.03	20.01	111.92	0.36	1.41	0.66	0.03
20.18	107.03	2.00	0.00	0.66	0.00	20.34	100.67	2.00	0.00	0.66	0.00
20.51	97.94	2.00	0.00	0.65	0.00	20.67	94.39	2.00	0.00	0.65	0.00
20.83	159.55	2.00	0.00	0.65	0.00	21.00	81.31	2.00	0.00	0.64	0.00
21.16	65.50	2.00	0.00	0.64	0.00	21.33	52.59	0.75	0.32	0.64	0.01
21.49	47.26	0.72	0.32	0.64	0.01	21.65	47.18	0.72	0.32	0.63	0.01
21.82	47.09	0.73	0.32	0.63	0.01	21.98	46.98	0.75	0.31	0.63	0.01
22.15	52.19	0.76	0.31	0.62	0.01	22.31	56.64	0.83	0.31	0.62	0.01
22.47	67.91	1.01	0.02	0.62	0.00	22.64	74.15	1.14	0.01	0.62	0.00
22.80	77.34	1.12	0.01	0.61	0.00	22.97	71.23	0.96	0.02	0.61	0.00
23.13	64.26	0.83	0.30	0.61	0.01	23.30	60.37	0.78	0.30	0.61	0.01
23.46	60.28	0.71	0.30	0.60	0.01	23.62	60.08	0.65	0.30	0.60	0.01
23.79	59.86	0.62	0.30	0.60	0.01	23.95	59.75	0.61	0.30	0.59	0.01
24.12	63.40	0.63	0.30	0.59	0.01	24.28	66.88	0.68	0.29	0.59	0.01
24.44	66.84	0.70	0.29	0.59	0.01	24.61	66.80	0.72	0.29	0.58	0.01
24.77	70.06	0.87	0.03	0.58	0.00	24.94	72.17	1.15	0.01	0.58	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	71.73	1.21	0.01	0.57	0.00	25.26	65.65	1.06	0.01	0.57	0.00
25.43	62.85	0.80	0.28	0.57	0.01	25.59	59.09	0.71	0.28	0.57	0.01
25.76	59.00	0.72	0.28	0.56	0.01	25.92	62.59	0.76	0.28	0.56	0.01
26.08	69.16	0.85	0.03	0.56	0.00	26.25	75.03	0.94	0.02	0.56	0.00
26.41	80.47	0.96	0.02	0.55	0.00	26.58	82.94	0.93	0.02	0.55	0.00
26.74	82.73	0.88	0.02	0.55	0.00	26.90	79.99	0.85	0.03	0.54	0.00
27.07	77.21	0.88	0.02	0.54	0.00	27.23	79.76	0.93	0.02	0.54	0.00
27.40	82.17	0.99	0.01	0.54	0.00	27.56	84.51	1.03	0.01	0.53	0.00
27.72	84.35	1.03	0.01	0.53	0.00	27.89	86.65	1.01	0.01	0.53	0.00
28.05	88.85	1.01	0.01	0.52	0.00	28.22	90.95	1.02	0.01	0.52	0.00
28.38	90.79	1.03	0.01	0.52	0.00	28.54	88.35	1.01	0.01	0.52	0.00
28.71	85.86	0.96	0.02	0.51	0.00	28.87	80.88	0.90	0.02	0.51	0.00
29.04	78.19	0.86	0.02	0.51	0.00	29.20	75.45	0.83	0.25	0.51	0.00
29.36	75.31	0.81	0.25	0.50	0.00	29.53	72.51	0.80	0.25	0.50	0.01
29.69	72.41	0.81	0.25	0.50	0.00	29.86	74.98	0.84	0.25	0.49	0.01
30.02	82.30	0.87	0.02	0.49	0.00	30.19	84.40	0.85	0.02	0.49	0.00
30.35	81.86	0.81	0.24	0.49	0.00	30.51	76.95	0.79	0.24	0.48	0.00
30.68	76.91	0.84	0.24	0.48	0.00	30.84	79.28	0.89	0.02	0.48	0.00
31.01	81.53	0.91	0.02	0.47	0.00	31.17	81.38	0.89	0.02	0.47	0.00
31.33	78.86	0.85	0.02	0.47	0.00	31.50	73.77	0.81	0.23	0.47	0.00
31.66	68.31	0.78	0.23	0.46	0.00	31.83	65.35	0.76	0.23	0.46	0.00
31.99	65.24	0.73	0.23	0.46	0.00	32.15	62.15	0.70	0.23	0.46	0.00
32.32	58.89	0.66	0.23	0.45	0.00	32.48	58.85	0.70	0.22	0.45	0.00
32.65	61.93	0.76	0.22	0.45	0.00	32.81	61.79	0.81	0.22	0.44	0.00
32.97	58.58	0.77	0.22	0.44	0.00	33.14	55.19	0.69	0.22	0.44	0.00
33.30	55.11	0.65	0.22	0.44	0.00	33.47	55.06	0.66	0.22	0.43	0.00
33.63	58.34	0.71	0.21	0.43	0.00	33.79	64.33	0.76	0.21	0.43	0.00
33.96	69.70	0.81	0.21	0.42	0.00	34.12	72.16	0.83	0.21	0.42	0.00
34.29	69.50	0.79	0.21	0.42	0.00	34.45	71.94	0.81	0.21	0.42	0.00
34.61	81.13	0.99	0.01	0.41	0.00	34.78	96.29	1.37	0.00	0.41	0.00
34.94	104.97	1.84	0.00	0.41	0.00	35.11	151.05	0.66	0.55	0.40	0.01
35.27	100.59	0.29	0.94	0.40	0.02	35.43	108.24	0.33	0.87	0.40	0.02
35.60	93.90	1.72	0.00	0.40	0.00	35.76	86.20	1.14	0.01	0.39	0.00
35.93	77.87	0.86	0.02	0.39	0.00	36.09	70.66	0.73	0.19	0.39	0.00
36.26	70.31	0.67	0.19	0.39	0.00	36.42	67.78	0.66	0.19	0.38	0.00
36.58	65.26	0.67	0.19	0.38	0.00	36.75	59.74	0.65	0.19	0.38	0.00
36.91	56.72	0.65	0.19	0.37	0.00	37.08	53.48	0.66	0.19	0.37	0.00
37.24	56.63	0.68	0.18	0.37	0.00	37.40	62.37	0.72	0.18	0.37	0.00
37.57	74.65	0.87	0.02	0.36	0.00	37.73	86.81	1.11	0.01	0.36	0.00
37.90	95.15	1.39	0.00	0.36	0.00	38.06	97.61	1.64	0.00	0.35	0.00
38.22	97.08	1.72	0.00	0.35	0.00	38.39	96.75	1.76	0.00	0.35	0.00
38.55	94.60	1.81	0.00	0.35	0.00	38.72	226.92	2.00	0.00	0.34	0.00
38.88	205.78	2.00	0.00	0.34	0.00	39.04	127.92	2.00	0.00	0.34	0.00
39.21	89.57	2.00	0.00	0.34	0.00	39.37	84.17	2.00	0.00	0.33	0.00
39.54	81.05	0.22	0.92	0.33	0.02	39.70	79.46	0.22	0.92	0.33	0.02
39.86	83.98	2.00	0.00	0.32	0.00	40.03	92.84	2.00	0.00	0.32	0.00
40.19	99.48	2.00	0.00	0.32	0.00	40.36	144.19	2.00	0.00	0.32	0.00
40.52	229.49	2.00	0.00	0.31	0.00	40.68	90.88	2.00	0.00	0.31	0.00

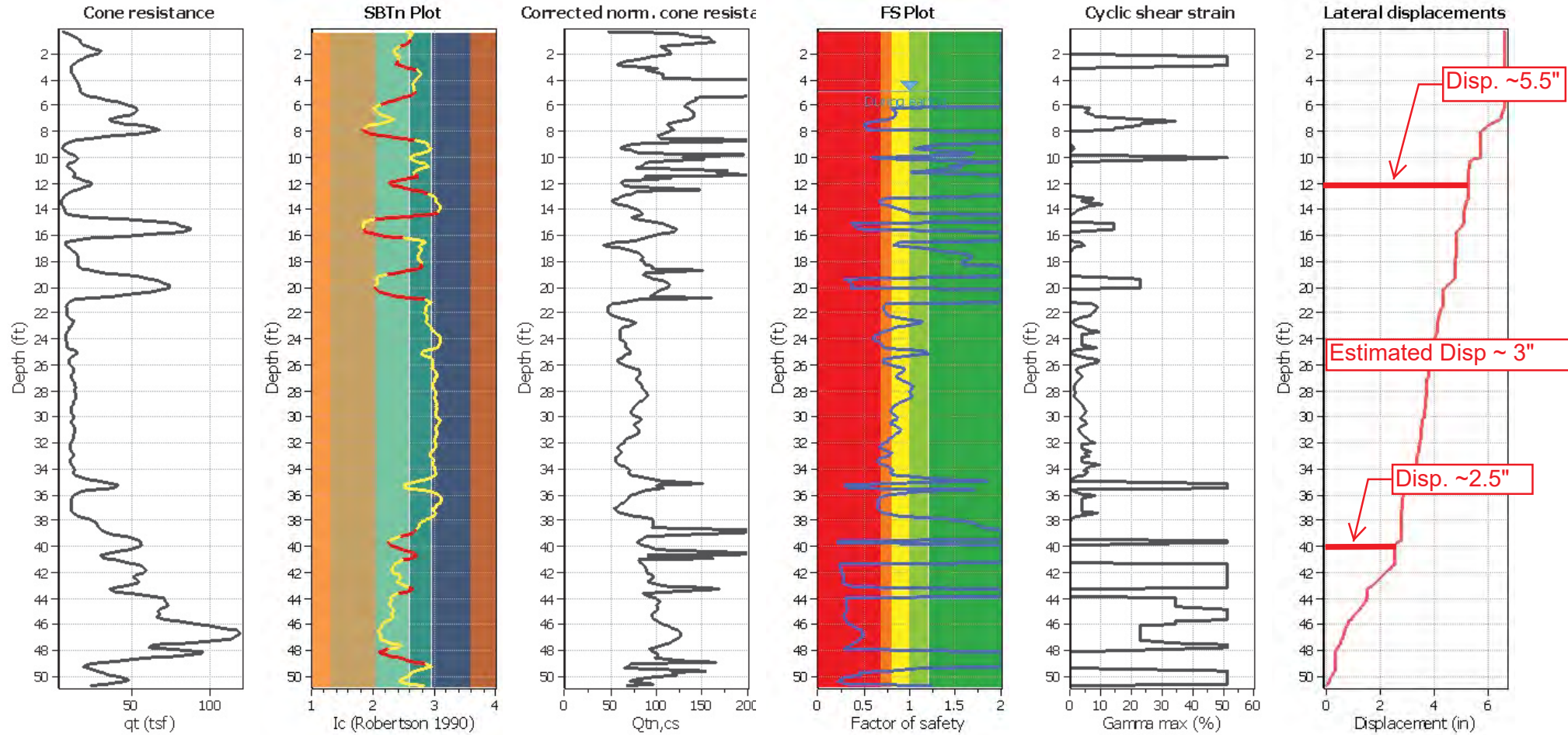
:: Post-earthquake settlement due to soil liquefaction :: (continued)											
Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$Q_{tn,cs}$	FS	e_v (%)	DF	Settlement (in)
40.85	162.63	2.00	0.00	0.31	0.00	41.01	81.06	2.00	0.00	0.30	0.00
41.18	83.31	2.00	0.00	0.30	0.00	41.34	86.03	0.24	0.79	0.30	0.02
41.50	87.34	0.25	0.77	0.30	0.01	41.67	88.69	0.25	0.76	0.29	0.02
41.83	88.59	0.25	0.75	0.29	0.01	42.00	89.89	0.26	0.73	0.29	0.01
42.16	95.84	0.28	0.69	0.29	0.01	42.32	96.13	0.28	0.68	0.28	0.01
42.49	95.69	0.28	0.68	0.28	0.01	42.65	90.99	0.26	0.70	0.28	0.01
42.82	95.34	0.28	0.67	0.27	0.01	42.98	108.85	0.35	0.59	0.27	0.01
43.15	153.99	0.74	0.36	0.27	0.01	43.31	168.99	2.00	0.00	0.27	0.00
43.47	111.11	2.00	0.00	0.26	0.00	43.64	86.31	2.00	0.00	0.26	0.00
43.80	91.44	2.00	0.00	0.26	0.00	43.97	99.19	0.30	0.60	0.25	0.01
44.13	102.69	0.32	0.58	0.25	0.01	44.29	102.60	0.32	0.57	0.25	0.01
44.46	100.15	0.31	0.58	0.25	0.01	44.62	101.13	0.31	0.56	0.24	0.01
44.79	102.12	0.32	0.55	0.24	0.01	44.95	100.77	0.31	0.55	0.24	0.01
45.11	96.96	0.30	0.56	0.24	0.01	45.28	95.60	0.29	0.56	0.23	0.01
45.44	95.43	0.29	0.56	0.23	0.01	45.61	97.92	0.30	0.54	0.23	0.01
45.77	100.96	0.32	0.52	0.22	0.01	45.93	106.89	0.35	0.49	0.22	0.01
46.10	112.17	0.38	0.46	0.22	0.01	46.26	117.98	0.42	0.44	0.22	0.01
46.43	124.43	0.47	0.42	0.21	0.01	46.59	127.01	0.49	0.40	0.21	0.01
46.75	127.43	0.50	0.40	0.21	0.01	46.92	125.56	0.49	0.40	0.20	0.01
47.08	122.77	0.46	0.40	0.20	0.01	47.25	119.40	0.44	0.40	0.20	0.01
47.41	113.51	0.40	0.41	0.20	0.01	47.57	107.33	0.36	0.43	0.19	0.01
47.74	98.93	0.32	0.45	0.19	0.01	47.90	91.78	0.28	0.47	0.19	0.01
48.07	97.44	2.00	0.00	0.19	0.00	48.23	101.55	2.00	0.00	0.18	0.00
48.39	101.69	2.00	0.00	0.18	0.00	48.56	98.57	2.00	0.00	0.18	0.00
48.72	126.77	2.00	0.00	0.17	0.00	48.89	164.33	2.00	0.00	0.17	0.00
49.05	72.56	2.00	0.00	0.17	0.00	49.22	69.26	2.00	0.00	0.17	0.00
49.38	64.88	1.13	0.00	0.16	0.00	49.54	154.72	0.81	0.17	0.16	0.00
49.71	118.20	0.44	0.32	0.16	0.01	49.87	122.05	0.47	0.31	0.15	0.01
50.04	97.68	0.32	0.36	0.15	0.01	50.20	76.72	0.23	0.43	0.15	0.01
50.36	72.11	0.22	0.45	0.15	0.01	50.53	96.72	0.32	0.34	0.14	0.01
50.69	68.01	1.23	0.00	0.14	0.00						
Total estimated settlement: 1.50											

Abbreviations

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

Estimation of post-earthquake lateral Displacements

Geometric parameters: Gently sloping ground without free face (Slope 0.10 %)

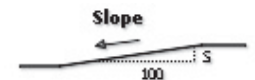


Abbreviations

q_c : Total cone resistance (cone resistance q_c corrected for pore water effects)
 I_c : Soil Behaviour Type Index
 $Q_{tn,cs}$: Equivalent clean sand normalized CPT total cone resistance

F.S.: Factor of safety
 γ_{max} : Maximum cyclic shear strain
 LDI: Lateral displacement index

Surface condition



:: Lateral displacement index calculation ::								
Depth (ft)	q_t (tsf)	Q_{tn}	R_f (%)	$Q_{tn,cs}$	FS	D_r	Gamma_{max} (%)	Lat. disp. (in)
5.09	18.83	35.07	4.07	278.74	2.00	32.41	0.00	0.00
5.25	22.50	41.98	3.85	208.69	2.00	38.35	0.00	0.00
5.41	28.89	54.04	3.46	143.13	2.00	46.69	0.00	0.00
5.58	35.34	66.22	2.92	143.05	2.00	53.40	0.00	0.00
5.74	41.87	78.54	2.31	138.11	2.00	59.03	0.00	0.00
5.91	47.18	88.55	1.77	131.56	2.00	62.99	0.00	0.00
6.07	51.29	96.31	1.49	130.60	2.00	65.76	0.00	0.00
6.23	53.32	100.13	1.50	134.14	0.79	67.04	6.39	0.03
6.40	53.85	101.12	1.61	138.18	0.83	67.37	5.48	0.03
6.56	52.88	99.27	1.76	141.09	0.86	66.76	4.94	0.03
6.73	49.14	92.18	1.97	140.70	0.85	64.31	7.53	0.04
6.89	42.83	80.22	2.33	140.52	0.83	59.73	7.99	0.04
7.05	35.87	67.06	2.60	135.52	0.76	53.81	24.30	0.12
7.22	36.94	69.06	2.17	125.57	0.64	54.78	34.10	0.18
7.38	45.36	79.27	1.40	113.04	0.51	59.33	22.70	0.11
7.55	57.48	93.35	0.93	112.33	0.50	64.73	22.70	0.12
7.71	65.22	102.35	0.82	117.16	0.54	67.77	14.50	0.07
7.87	68.22	105.07	0.78	118.53	0.55	68.63	14.50	0.07
8.04	64.52	99.23	0.83	114.71	2.00	66.75	0.00	0.00
8.20	53.78	84.41	0.99	106.34	2.00	61.40	0.00	0.00
8.37	38.28	63.05	1.48	101.60	2.00	51.77	0.00	0.00
8.53	24.02	42.01	2.36	105.16	2.00	38.38	0.00	0.00
8.69	14.55	26.54	3.21	248.59	2.00	23.22	0.00	0.00
8.86	9.38	16.78	3.56	91.47	2.00	8.08	0.07	0.00
9.02	7.21	12.67	2.77	73.62	1.33	0.00	0.49	0.00
9.19	6.18	10.70	2.16	62.45	1.12	0.00	1.16	0.01
9.35	5.85	10.07	2.28	62.53	1.04	0.00	1.62	0.01
9.51	7.12	12.32	2.81	73.34	1.27	0.00	0.62	0.00
9.68	9.85	16.60	2.71	80.31	1.69	7.73	0.14	0.00
9.84	12.78	20.88	2.35	194.83	1.63	15.29	0.00	0.00
10.01	15.82	25.07	2.11	129.01	0.59	21.34	51.20	0.26
10.17	15.79	25.03	2.32	152.60	0.86	21.28	38.10	0.18
10.34	13.87	22.26	2.88	91.96	2.00	17.42	0.05	0.00
10.50	10.20	16.54	3.27	87.59	1.64	7.60	0.17	0.00
10.66	9.00	14.54	3.33	84.26	1.43	3.36	0.32	0.00
10.83	10.03	15.88	2.66	78.48	1.55	6.27	0.21	0.00
10.99	12.70	19.62	2.10	176.99	1.22	13.24	0.00	0.00
11.16	13.93	21.36	2.15	165.31	1.01	16.05	0.00	0.00
11.32	13.83	21.22	2.41	200.52	2.00	15.83	0.00	0.00
11.48	13.03	20.07	2.81	87.67	2.00	13.99	0.06	0.00
11.65	15.93	23.72	1.88	115.71	2.00	19.51	0.00	0.00
11.81	20.20	28.94	1.16	65.86	2.00	26.07	0.00	0.00
11.98	24.23	33.74	0.83	61.27	2.00	31.14	0.00	0.00
12.14	23.59	33.02	0.99	64.92	2.00	30.43	0.00	0.00
12.30	20.42	29.17	1.47	73.28	2.00	26.33	0.00	0.00
12.47	15.72	22.95	2.12	147.51	2.00	18.42	0.00	0.00
12.63	11.52	17.00	2.60	79.79	2.00	8.51	0.07	0.00
12.80	8.63	12.66	2.71	73.21	2.00	0.00	0.08	0.00

:: Estimation of post-earthquake lateral Displacements :: (continued)								
Depth (ft)	q_t (tsf)	Q_{tn}	R_f (%)	$Q_{tn,cs}$	FS	D_r	Gamma_{max} (%)	Lat. disp. (in)
12.96	6.79	9.73	2.45	64.01	2.00	0.00	0.09	0.00
13.12	5.86	8.19	2.28	58.44	0.75	0.00	7.65	0.03
13.29	5.43	7.45	1.84	52.29	0.68	0.00	4.00	0.02
13.45	5.36	7.30	1.86	52.17	0.66	0.00	4.00	0.02
13.62	5.70	7.78	2.34	58.03	0.70	0.00	10.42	0.05
13.78	6.30	8.67	3.18	68.01	0.78	0.00	6.26	0.03
13.94	6.97	9.65	3.83	76.54	0.87	0.00	3.76	0.02
14.11	7.60	10.56	3.95	80.42	0.94	0.00	2.45	0.01
14.27	8.30	11.56	4.02	84.07	1.03	0.00	1.59	0.01
14.44	9.77	13.72	3.41	83.73	2.00	1.45	0.08	0.00
14.60	24.43	32.53	1.36	73.79	2.00	29.93	0.00	0.00
14.76	45.86	57.84	0.73	77.21	2.00	48.93	0.00	0.00
14.93	68.46	83.93	0.63	96.51	2.00	61.22	0.00	0.00
15.09	77.76	94.71	0.69	107.10	0.36	65.21	14.50	0.06
15.26	82.16	99.92	0.77	113.86	0.40	66.97	14.50	0.07
15.42	86.10	104.33	0.81	118.82	0.43	68.40	14.50	0.06
15.58	88.10	106.56	0.87	122.32	0.46	69.10	14.50	0.06
15.75	83.14	100.66	0.92	118.62	2.00	67.22	0.00	0.00
15.91	67.14	82.12	1.04	105.88	2.00	60.50	0.00	0.00
16.08	44.28	55.34	1.35	92.06	2.00	47.47	0.00	0.00
16.24	23.89	30.64	1.95	88.03	2.00	27.95	0.00	0.00
16.40	11.60	14.94	2.59	76.39	2.00	4.25	0.07	0.00
16.57	8.34	10.36	1.60	55.42	0.89	0.00	3.21	0.01
16.73	7.98	9.67	0.84	42.84	0.83	0.00	4.58	0.02
16.90	9.39	11.50	1.06	48.89	0.98	0.00	1.97	0.01
17.06	10.86	13.54	1.84	63.80	1.15	0.99	0.89	0.00
17.23	12.60	15.83	2.38	75.13	1.34	6.17	0.41	0.00
17.39	14.34	18.02	2.56	81.14	1.53	10.44	0.21	0.00
17.55	15.76	19.73	2.54	83.42	1.67	13.43	0.13	0.00
17.72	16.02	19.99	2.71	86.41	1.69	13.86	0.13	0.00
17.88	15.74	19.50	2.54	83.15	1.64	13.04	0.15	0.00
18.05	15.21	18.79	2.85	86.71	1.58	11.82	0.18	0.00
18.21	15.21	18.69	2.85	86.56	1.57	11.65	0.18	0.00
18.37	15.94	19.62	3.35	95.18	2.00	13.24	0.06	0.00
18.54	18.62	22.77	3.04	95.94	2.00	18.17	0.05	0.00
18.70	23.82	28.84	2.52	150.52	2.00	25.96	0.00	0.00
18.87	32.79	38.95	1.73	88.04	2.00	35.88	0.00	0.00
19.03	43.57	50.77	1.22	84.94	2.00	44.63	0.00	0.00
19.19	54.10	62.24	1.05	89.43	2.00	51.35	0.00	0.00
19.36	61.39	70.22	1.09	97.06	0.29	55.33	22.70	0.09
19.52	66.62	76.10	1.25	106.54	0.33	57.99	22.70	0.09
19.69	70.96	80.73	1.32	112.27	0.37	59.93	22.70	0.09
19.85	74.56	84.37	1.30	114.87	0.38	61.39	22.70	0.09
20.01	74.48	83.79	1.21	111.92	0.36	61.16	22.70	0.09
20.18	70.27	78.79	1.19	107.03	2.00	59.13	0.00	0.00
20.34	62.19	69.70	1.23	100.67	2.00	55.09	0.00	0.00
20.51	51.73	58.19	1.48	97.94	2.00	49.13	0.00	0.00
20.67	37.80	42.71	1.85	94.39	2.00	38.92	0.00	0.00

:: Estimation of post-earthquake lateral Displacements :: (continued)								
Depth (ft)	q_t (tsf)	Q_{tn}	R_f (%)	$Q_{tn,cs}$	FS	D_r	Gamma_{max} (%)	Lat. disp. (in)
20.83	24.06	27.22	2.49	159.55	2.00	24.05	0.00	0.00
21.00	14.06	15.61	2.84	81.31	2.00	5.71	0.07	0.00
21.16	9.87	10.55	2.36	65.50	2.00	0.00	0.09	0.00
21.33	8.81	9.21	1.51	52.59	0.75	0.00	7.15	0.03
21.49	8.52	8.79	1.17	47.26	0.72	0.00	9.07	0.03
21.65	8.63	8.87	1.16	47.18	0.72	0.00	8.72	0.03
21.82	8.77	8.99	1.14	47.09	0.73	0.00	8.23	0.03
21.98	9.01	9.23	1.11	46.98	0.75	0.00	7.31	0.03
22.15	9.18	9.43	1.45	52.19	0.76	0.00	6.64	0.03
22.31	9.89	10.21	1.69	56.64	0.83	0.00	4.50	0.02
22.47	11.93	12.55	2.24	67.91	1.01	0.00	1.64	0.01
22.64	13.33	14.10	2.50	74.15	1.14	2.34	0.92	0.00
22.80	13.20	13.91	2.78	77.34	1.12	1.90	0.98	0.00
22.97	11.57	11.97	2.59	71.23	0.96	0.00	2.10	0.01
23.13	10.24	10.38	2.28	64.26	0.83	0.00	4.27	0.01
23.30	9.68	9.68	2.07	60.37	0.78	0.00	6.06	0.02
23.46	8.99	8.84	2.22	60.28	0.71	0.00	9.52	0.03
23.62	8.43	8.15	2.37	60.08	0.65	0.00	4.00	0.01
23.79	8.07	7.70	2.48	59.86	0.62	0.00	4.00	0.01
23.95	8.04	7.63	2.49	59.75	0.61	0.00	4.00	0.01
24.12	8.37	7.97	2.79	63.40	0.63	0.00	4.00	0.01
24.28	8.91	8.53	2.99	66.88	0.68	0.00	4.00	0.01
24.44	9.14	8.74	2.92	66.84	0.70	0.00	4.00	0.01
24.61	9.48	9.08	2.81	66.80	0.72	0.00	8.67	0.03
24.77	11.25	11.00	2.67	70.06	0.87	0.00	3.38	0.01
24.94	14.55	14.52	2.29	72.17	1.15	3.31	0.85	0.00
25.10	15.30	15.25	2.18	71.73	1.21	4.93	0.67	0.00
25.26	13.62	13.37	1.96	65.65	1.06	0.58	1.30	0.00
25.43	10.58	10.05	2.21	62.85	0.80	0.00	5.36	0.02
25.59	9.68	9.03	2.07	59.09	0.71	0.00	9.10	0.03
25.76	9.76	9.06	2.05	59.00	0.72	0.00	8.98	0.03
25.92	10.36	9.67	2.25	62.59	0.76	0.00	6.54	0.02
26.08	11.43	10.78	2.62	69.16	0.85	0.00	3.85	0.01
26.25	12.53	11.90	2.93	75.03	0.94	0.00	2.37	0.01
26.41	12.82	12.15	3.38	80.47	0.96	0.00	2.13	0.01
26.58	12.51	11.76	3.73	82.94	0.93	0.00	2.51	0.01
26.74	11.97	11.14	3.90	82.73	0.88	0.00	3.31	0.01
26.90	11.77	10.87	3.68	79.99	0.85	0.00	3.74	0.01
27.07	12.17	11.23	3.29	77.21	0.88	0.00	3.18	0.01
27.23	12.81	11.84	3.38	79.76	0.93	0.00	2.45	0.01
27.40	13.61	12.62	3.43	82.17	0.99	0.00	1.79	0.01
27.56	14.11	13.07	3.54	84.51	1.03	0.00	1.50	0.00
27.72	14.24	13.15	3.51	84.35	1.03	0.04	1.46	0.00
27.89	14.07	12.91	3.79	86.65	1.01	0.00	1.61	0.01
28.05	14.04	12.81	4.04	88.85	1.01	0.00	1.67	0.01
28.22	14.30	13.01	4.20	90.95	1.02	0.00	1.54	0.00
28.38	14.50	13.15	4.14	90.79	1.03	0.05	1.47	0.00
28.54	14.30	12.89	3.96	88.35	1.01	0.00	1.62	0.00

:: Estimation of post-earthquake lateral Displacements :: (continued)								
Depth (ft)	q_t (tsf)	Q_{tn}	R_f (%)	$Q_{tn,cs}$	FS	D_r	Gamma_{max} (%)	Lat. disp. (in)
28.71	13.66	12.18	3.90	85.86	0.96	0.00	2.15	0.01
28.87	13.06	11.52	3.57	80.88	0.90	0.00	2.84	0.01
29.04	12.53	10.93	3.46	78.19	0.86	0.00	3.68	0.01
29.20	12.23	10.59	3.27	75.45	0.83	0.00	4.33	0.01
29.36	12.06	10.37	3.32	75.31	0.81	0.00	4.79	0.01
29.53	11.93	10.19	3.07	72.51	0.80	0.00	5.22	0.02
29.69	12.13	10.35	3.02	72.41	0.81	0.00	4.85	0.01
29.86	12.57	10.72	3.18	74.98	0.84	0.00	4.07	0.01
30.02	13.01	11.10	3.84	82.30	0.87	0.00	3.43	0.01
30.19	12.81	10.85	4.16	84.40	0.85	0.00	3.84	0.01
30.35	12.31	10.32	4.06	81.86	0.81	0.00	4.92	0.01
30.51	12.14	10.11	3.57	76.95	0.79	0.00	5.43	0.02
30.68	12.78	10.67	3.39	76.91	0.84	0.00	4.16	0.01
30.84	13.55	11.36	3.45	79.28	0.89	0.00	3.06	0.01
31.01	13.88	11.63	3.60	81.53	0.91	0.00	2.73	0.01
31.17	13.61	11.32	3.67	81.38	0.89	0.00	3.11	0.01
31.33	13.15	10.83	3.55	78.86	0.85	0.00	3.87	0.01
31.50	12.72	10.37	3.15	73.77	0.81	0.00	4.78	0.01
31.66	12.35	9.99	2.70	68.31	0.78	0.00	5.76	0.02
31.83	12.09	9.70	2.48	65.35	0.76	0.00	6.67	0.02
31.99	11.69	9.28	2.57	65.24	0.73	0.00	8.25	0.02
32.15	11.33	8.91	2.35	62.15	0.70	0.00	4.00	0.01
32.32	10.90	8.47	2.14	58.89	0.66	0.00	4.00	0.01
32.48	11.37	8.87	2.05	58.85	0.70	0.00	4.00	0.01
32.65	12.35	9.73	2.16	61.93	0.76	0.00	6.54	0.02
32.81	13.09	10.37	2.04	61.79	0.81	0.00	4.77	0.01
32.97	12.56	9.85	1.86	58.58	0.77	0.00	6.16	0.02
33.14	11.50	8.84	1.74	55.19	0.69	0.00	4.00	0.01
33.30	10.87	8.24	1.84	55.11	0.65	0.00	4.00	0.01
33.47	11.08	8.39	1.80	55.06	0.66	0.00	4.00	0.01
33.63	11.79	8.99	1.98	58.34	0.71	0.00	9.59	0.02
33.79	12.60	9.68	2.38	64.33	0.76	0.00	6.67	0.02
33.96	13.40	10.37	2.74	69.70	0.81	0.00	4.76	0.01
34.12	13.67	10.56	2.93	72.16	0.83	0.00	4.33	0.01
34.29	13.14	10.05	2.79	69.50	0.79	0.00	5.54	0.01
34.45	13.43	10.26	2.98	71.94	0.81	0.00	4.98	0.01
34.61	16.15	12.63	3.30	81.13	0.99	0.00	1.77	0.00
34.78	21.69	17.45	3.69	96.29	1.37	9.38	0.35	0.00
34.94	28.41	23.36	3.52	104.97	1.84	19.00	0.08	0.00
35.11	38.41	32.20	2.69	151.05	0.66	29.60	51.20	0.13
35.27	42.00	35.32	2.30	100.59	0.29	32.65	51.20	0.12
35.43	38.65	32.23	2.24	108.24	0.33	29.63	51.20	0.12
35.60	26.93	21.69	2.97	93.90	1.72	16.56	0.11	0.00
35.76	18.73	14.45	3.38	86.20	1.14	3.15	0.88	0.00
35.93	14.57	10.81	3.43	77.87	0.86	0.00	3.72	0.01
36.09	12.74	9.21	3.14	70.66	0.73	0.00	8.19	0.02
36.26	11.94	8.49	3.35	70.31	0.67	0.00	4.00	0.01
36.42	11.74	8.28	3.12	67.78	0.66	0.00	4.00	0.01

:: Estimation of post-earthquake lateral Displacements :: (continued)								
Depth (ft)	q_t (tsf)	Q_{tn}	R_f (%)	$Q_{tn,cs}$	FS	D_r	Gamma_{max} (%)	Lat. disp. (in)
36.58	11.91	8.39	2.80	65.26	0.67	0.00	4.00	0.01
36.75	11.71	8.19	2.28	59.74	0.65	0.00	4.00	0.01
36.91	11.72	8.16	1.99	56.72	0.65	0.00	4.00	0.01
37.08	11.85	8.24	1.69	53.48	0.66	0.00	4.00	0.01
37.24	12.19	8.49	1.91	56.63	0.68	0.00	4.00	0.01
37.40	12.82	8.99	2.34	62.37	0.72	0.00	8.99	0.02
37.57	15.23	10.95	3.06	74.65	0.87	0.00	3.39	0.01
37.73	18.80	13.87	3.55	86.81	1.11	1.79	1.04	0.00
37.90	23.20	17.44	3.59	95.15	1.39	9.36	0.32	0.00
38.06	26.87	20.46	3.35	97.61	1.64	14.64	0.14	0.00
38.22	28.17	21.49	3.20	97.08	1.72	16.25	0.11	0.00
38.39	28.77	21.91	3.13	96.75	1.76	16.89	0.10	0.00
38.55	29.57	22.52	2.93	94.60	1.81	17.79	0.08	0.00
38.72	31.44	24.01	2.76	226.92	2.00	19.91	0.00	0.00
38.88	33.20	25.40	2.71	205.78	2.00	21.77	0.00	0.00
39.04	38.67	29.94	2.33	127.92	2.00	27.20	0.00	0.00
39.21	46.90	36.87	1.85	89.57	2.00	34.07	0.00	0.00
39.37	53.22	42.25	1.44	84.17	2.00	38.57	0.00	0.00
39.54	55.55	44.18	1.26	81.05	0.22	40.04	51.20	0.10
39.70	56.14	44.60	1.19	79.46	0.22	40.35	51.20	0.10
39.86	56.80	44.92	1.35	83.98	2.00	40.59	0.00	0.00
40.03	54.75	42.83	1.77	92.84	2.00	39.02	0.00	0.00
40.19	48.98	37.71	2.25	99.48	2.00	34.81	0.00	0.00
40.36	42.26	31.95	2.60	144.19	2.00	29.34	0.00	0.00
40.52	34.56	25.51	2.89	229.49	2.00	21.91	0.00	0.00
40.68	30.65	22.29	2.72	90.88	2.00	17.46	0.05	0.00
40.85	32.58	23.86	2.25	162.63	2.00	19.70	0.00	0.00
41.01	40.12	30.03	1.74	81.06	2.00	27.29	0.00	0.00
41.18	47.70	36.18	1.61	83.31	2.00	33.44	0.00	0.00
41.34	52.77	40.23	1.58	86.03	0.24	36.95	51.20	0.09
41.50	56.25	42.97	1.54	87.34	0.25	39.12	51.20	0.09
41.67	58.66	44.81	1.53	88.69	0.25	40.51	51.20	0.09
41.83	59.32	45.23	1.52	88.59	0.25	40.81	51.20	0.09
42.00	57.76	43.74	1.62	89.89	0.26	39.71	51.20	0.09
42.16	53.46	39.92	2.00	95.84	0.28	36.69	51.20	0.08
42.32	50.67	37.50	2.11	96.13	0.28	34.62	51.20	0.08
42.49	52.76	39.08	2.02	95.69	0.28	35.99	51.20	0.09
42.65	55.15	41.01	1.75	90.99	0.26	37.58	51.20	0.08
42.82	53.68	39.56	1.99	95.34	0.28	36.39	51.20	0.09
42.98	45.48	32.82	2.27	108.85	0.35	30.23	51.20	0.08
43.15	40.19	28.49	2.49	153.99	0.74	25.56	51.20	0.08
43.31	36.09	25.24	2.40	168.99	2.00	21.56	0.00	0.00
43.47	40.30	28.53	2.07	111.11	2.00	25.60	0.00	0.00
43.64	50.29	36.41	1.72	86.31	2.00	33.66	0.00	0.00
43.80	63.35	46.73	1.58	91.44	2.00	41.89	0.00	0.00
43.97	70.55	52.18	1.70	99.19	0.30	45.53	34.10	0.05
44.13	71.32	52.52	1.82	102.69	0.32	45.75	34.10	0.05
44.29	72.57	53.38	1.79	102.60	0.32	46.28	34.10	0.05

:: Estimation of post-earthquake lateral Displacements :: (continued)								
Depth (ft)	q_t (tsf)	Q_{tn}	R_f (%)	$Q_{tn,cs}$	FS	D_r	Gamma_{max} (%)	Lat. disp. (in)
44.46	73.35	53.93	1.68	100.15	0.31	46.62	34.10	0.05
44.62	72.27	52.84	1.75	101.13	0.31	45.95	34.10	0.05
44.79	67.63	48.90	1.92	102.12	0.32	43.39	51.20	0.08
44.95	67.16	48.42	1.89	100.77	0.31	43.06	51.20	0.07
45.11	68.01	49.08	1.72	96.96	0.30	43.51	51.20	0.07
45.28	68.09	49.03	1.66	95.60	0.29	43.48	51.20	0.07
45.44	66.05	47.25	1.72	95.43	0.29	42.26	51.20	0.07
45.61	71.48	51.34	1.68	97.92	0.30	44.99	51.20	0.07
45.77	80.67	58.45	1.57	100.96	0.32	49.27	34.10	0.04
45.93	91.81	67.03	1.52	106.89	0.35	53.79	34.10	0.04
46.10	99.31	72.65	1.54	112.17	0.38	56.45	22.70	0.03
46.26	108.68	79.79	1.53	117.98	0.42	59.55	22.70	0.03
46.43	117.46	86.36	1.56	124.43	0.47	62.16	22.70	0.03
46.59	119.06	87.24	1.62	127.01	0.49	62.49	22.70	0.03
46.75	118.62	86.58	1.66	127.43	0.50	62.24	22.70	0.03
46.92	115.58	83.94	1.67	125.56	0.49	61.22	22.70	0.03
47.08	114.76	83.22	1.60	122.77	0.46	60.94	22.70	0.03
47.25	105.76	75.84	1.70	119.40	0.44	57.87	22.70	0.03
47.41	86.30	60.43	1.97	113.51	0.40	50.37	34.10	0.04
47.57	63.66	43.00	2.36	107.33	0.36	39.15	51.20	0.06
47.74	61.05	41.15	2.07	98.93	0.32	37.69	51.20	0.06
47.90	75.10	52.19	1.42	91.78	0.28	45.53	34.10	0.04
48.07	95.60	68.15	1.15	97.44	2.00	54.34	0.00	0.00
48.23	94.62	66.83	1.34	101.55	2.00	53.70	0.00	0.00
48.39	78.03	53.50	1.75	101.69	2.00	46.35	0.00	0.00
48.56	58.98	38.94	2.15	98.57	2.00	35.87	0.00	0.00
48.72	44.01	28.02	2.20	126.77	2.00	25.01	0.00	0.00
48.89	34.24	21.07	2.04	164.33	2.00	15.60	0.00	0.00
49.05	23.91	13.78	2.37	72.56	2.00	1.58	0.08	0.00
49.22	19.79	11.06	2.53	69.26	2.00	0.00	0.09	0.00
49.38	22.08	12.50	1.96	64.88	1.13	0.00	1.01	0.00
49.54	27.62	16.37	1.57	154.72	0.81	7.28	51.20	0.05
49.71	31.16	18.83	1.50	118.20	0.44	11.89	51.20	0.05
49.87	35.94	22.00	1.76	122.05	0.47	17.02	51.20	0.05
50.04	42.48	26.50	1.80	97.68	0.32	23.17	51.20	0.05
50.20	48.32	30.76	1.52	76.72	0.23	28.09	51.20	0.04
50.36	46.00	29.14	1.38	72.11	0.22	26.30	51.20	0.04
50.53	34.49	20.88	1.45	96.72	0.32	15.29	51.20	0.04
50.69	24.08	13.46	2.08	68.01	1.23	0.80	0.65	0.00
Total estimated displacement: 6.58								

Abbreviations

q_t :	Total cone resistance
Q_{tn} :	Adjusted cone resistance to an effective overburden stress of 1 atm
R_f :	Friction ration
$Q_{tn,cs}$:	Adjusted and corrected cone resistance due to fines
FS:	Calculated factor of safety against liquefaction
D_r :	Calculated relative density
Gamma_{max} :	Calculated maximum cyclic shear strain
Lat. disp.:	Lateral displacement

:: 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	6.63	12.51	3.01	37.65	2.55	N/A	N/A
0.49	8.87	16.72	3.62	60.57	2.65	N/A	N/A
0.66	12.43	23.44	3.40	79.66	2.61	N/A	N/A
0.82	15.03	28.34	3.35	94.97	2.60	N/A	N/A
0.98	17.10	32.22	3.25	104.78	2.59	N/A	N/A
1.15	17.73	33.40	3.23	107.89	2.58	N/A	N/A
1.31	19.37	36.48	2.92	106.69	2.53	N/A	N/A
1.48	22.43	42.25	2.48	104.91	2.44	N/A	N/A
1.64	26.87	50.61	2.17	109.72	2.36	N/A	N/A
1.80	30.10	56.71	2.03	115.00	2.32	N/A	N/A
1.97	28.80	54.23	2.12	115.21	2.35	N/A	N/A
2.13	24.83	46.71	2.30	107.21	2.40	N/A	N/A
2.30	20.86	39.20	2.43	95.22	2.43	N/A	N/A
2.46	18.13	34.01	2.38	80.90	2.42	N/A	N/A
2.62	15.80	29.59	2.31	68.29	2.40	N/A	N/A
2.79	13.76	25.73	2.27	58.38	2.39	N/A	N/A
2.95	12.20	22.75	2.59	58.82	2.46	N/A	N/A
3.12	11.83	22.04	3.19	70.21	2.58	N/A	N/A
3.28	11.60	21.59	4.15	89.55	2.72	N/A	N/A
3.45	11.96	22.26	4.57	101.63	2.77	N/A	N/A
3.61	12.73	23.69	4.58	108.60	2.78	N/A	N/A
3.77	13.76	25.63	4.20	107.73	2.73	N/A	N/A
3.94	14.10	26.24	4.09	107.45	2.71	N/A	N/A
4.10	14.50	26.98	3.97	107.11	2.70	N/A	N/A
4.27	15.16	28.23	3.77	106.54	2.67	N/A	N/A
4.43	16.26	30.29	3.61	109.24	2.64	N/A	N/A
4.59	16.66	31.03	3.74	115.91	2.66	N/A	N/A
4.76	17.10	31.83	3.84	122.26	2.68	N/A	N/A
4.92	17.13	31.87	3.94	125.50	2.69	N/A	N/A
5.09	18.83	35.07	3.72	130.35	2.66	4.76	4.76
5.25	22.50	41.98	3.25	136.33	2.59	0.71	0.71
5.41	28.89	54.04	2.65	143.13	2.48	0.74	0.74
5.58	35.34	66.22	2.16	143.05	2.36	0.77	0.77
5.74	41.87	78.54	1.76	138.11	2.24	0.79	0.79
5.91	47.18	88.55	1.49	131.56	2.12	0.81	0.81
6.07	51.29	96.31	1.36	130.60	2.04	0.82	0.82
6.23	53.32	100.13	1.34	134.14	2.03	0.83	0.83
6.40	53.85	101.12	1.37	138.18	2.05	0.83	0.83
6.56	52.88	99.27	1.42	141.09	2.08	0.83	0.83
6.73	49.14	92.18	1.53	140.70	2.14	0.82	0.82
6.89	42.83	80.22	1.75	140.52	2.23	0.80	0.80
7.05	35.87	67.06	2.02	135.52	2.32	0.77	0.77
7.22	36.94	69.06	1.82	125.57	2.26	0.78	0.78
7.38	45.36	79.27	1.43	113.04	2.08	0.80	0.80
7.55	57.48	93.35	1.20	112.33	1.92	0.82	0.82
7.71	65.22	102.35	1.14	117.16	1.85	0.83	0.83
7.87	68.22	105.07	1.13	118.53	1.83	0.83	0.83
8.04	64.52	99.23	1.16	114.71	1.86	0.83	0.83

:: 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	53.78	84.41	1.26	106.34	1.97	0.80	0.80
8.37	38.28	63.05	1.61	101.60	2.18	0.76	0.76
8.53	24.02	42.01	2.50	105.16	2.44	0.71	0.71
8.69	14.55	26.54	3.90	103.51	2.69	2.05	2.05
8.86	9.38	16.78	5.45	91.47	2.87	1.27	1.27
9.02	7.21	12.67	5.81	73.62	2.91	0.95	0.95
9.19	6.18	10.70	5.83	62.45	2.91	0.19	0.79
9.35	5.85	10.07	6.21	62.53	2.95	0.19	0.73
9.51	7.12	12.32	5.95	73.34	2.93	0.89	0.89
9.68	9.85	16.60	4.84	80.31	2.81	1.23	1.23
9.84	12.78	20.88	3.90	81.32	2.69	1.59	1.59
10.01	15.82	25.07	3.28	82.23	2.59	0.65	0.65
10.17	15.79	25.03	3.44	86.17	2.62	1.94	1.94
10.34	13.87	22.26	4.13	91.96	2.72	1.68	1.68
10.50	10.20	16.54	5.30	87.59	2.86	1.21	1.21
10.66	9.00	14.54	5.79	84.26	2.91	1.05	1.05
10.83	10.03	15.88	4.94	78.48	2.82	1.17	1.17
10.99	12.70	19.62	3.86	75.67	2.68	1.49	1.49
11.16	13.93	21.36	3.69	78.79	2.66	1.63	1.63
11.32	13.83	21.22	3.91	82.95	2.69	1.60	1.60
11.48	13.03	20.07	4.37	87.67	2.75	1.50	1.50
11.65	15.93	23.72	3.23	76.63	2.58	0.64	0.64
11.81	20.20	28.94	2.28	65.86	2.39	0.13	0.67
11.98	24.23	33.74	1.82	61.27	2.26	0.10	0.68
12.14	23.59	33.02	1.97	64.92	2.31	0.12	0.68
12.30	20.42	29.17	2.51	73.28	2.45	0.67	0.67
12.47	15.72	22.95	3.50	80.22	2.63	1.75	1.75
12.63	11.52	17.00	4.69	79.79	2.79	1.25	1.25
12.80	8.63	12.66	5.78	73.21	2.91	0.91	0.91
12.96	6.79	9.73	6.58	64.01	2.98	0.32	0.70
13.12	5.86	8.19	7.14	58.44	3.03	0.16	0.58
13.29	5.43	7.45	7.02	52.29	3.02	0.16	0.53
13.45	5.36	7.30	7.14	52.17	3.04	0.16	0.52
13.62	5.70	7.78	7.46	58.03	3.06	0.16	0.56
13.78	6.30	8.67	7.85	68.01	3.09	0.31	0.62
13.94	6.97	9.65	7.93	76.54	3.10	0.69	0.69
14.11	7.60	10.56	7.62	80.42	3.08	0.75	0.75
14.27	8.30	11.56	7.27	84.07	3.05	0.83	0.83
14.44	9.77	13.72	6.10	83.73	2.94	0.98	0.98
14.60	24.43	32.53	2.27	73.79	2.39	0.68	0.68
14.76	45.86	57.84	1.33	77.21	2.03	0.75	0.75
14.93	68.46	83.93	1.15	96.51	1.86	0.80	0.80
15.09	77.76	94.71	1.13	107.10	1.83	0.82	0.82
15.26	82.16	99.92	1.14	113.86	1.84	0.83	0.83
15.42	86.10	104.33	1.14	118.82	1.84	0.83	0.83
15.58	88.10	106.56	1.15	122.32	1.85	0.84	0.84
15.75	83.14	100.66	1.18	118.62	1.89	0.83	0.83
15.91	67.14	82.12	1.29	105.88	1.99	0.80	0.80

:: 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	44.28	55.34	1.66	92.06	2.20	0.75	0.75
16.24	23.89	30.64	2.79	85.39	2.50	0.67	0.67
16.40	11.60	14.94	5.11	76.39	2.84	1.08	1.08
16.57	8.34	10.36	5.35	55.42	2.86	0.14	0.75
16.73	7.98	9.67	4.43	42.84	2.76	0.00	0.71
16.90	9.39	11.50	4.25	48.89	2.73	0.14	0.85
17.06	10.86	13.54	4.71	63.80	2.79	0.28	0.99
17.23	12.60	15.83	4.74	75.13	2.80	1.15	1.15
17.39	14.34	18.02	4.50	81.14	2.77	1.32	1.32
17.55	15.76	19.73	4.23	83.42	2.73	1.45	1.45
17.72	16.02	19.99	4.32	86.41	2.74	1.46	1.46
17.88	15.74	19.50	4.26	83.15	2.74	1.43	1.43
18.05	15.21	18.79	4.61	86.71	2.78	1.37	1.37
18.21	15.21	18.69	4.63	86.56	2.78	1.36	1.36
18.37	15.94	19.62	4.85	95.18	2.81	1.42	1.42
18.54	18.62	22.77	4.21	95.94	2.73	1.67	1.67
18.70	23.82	28.84	3.29	94.96	2.59	0.67	0.67
18.87	32.79	38.95	2.26	88.04	2.39	0.70	0.70
19.03	43.57	50.77	1.67	84.94	2.20	0.74	0.74
19.19	54.10	62.24	1.44	89.43	2.09	0.76	0.76
19.36	61.39	70.22	1.38	97.06	2.06	0.78	0.78
19.52	66.62	76.10	1.40	106.54	2.07	0.79	0.79
19.69	70.96	80.73	1.39	112.27	2.06	0.80	0.80
19.85	74.56	84.37	1.36	114.87	2.04	0.80	0.80
20.01	74.48	83.79	1.34	111.92	2.03	0.80	0.80
20.18	70.27	78.79	1.36	107.03	2.04	0.79	0.79
20.34	62.19	69.70	1.44	100.67	2.09	0.78	0.78
20.51	51.73	58.19	1.68	97.94	2.21	0.75	0.75
20.67	37.80	42.71	2.21	94.39	2.37	0.71	0.71
20.83	24.06	27.22	3.40	92.66	2.61	2.00	2.00
21.00	14.06	15.61	5.21	81.31	2.85	1.12	1.12
21.16	9.87	10.55	6.21	65.50	2.95	0.24	0.75
21.33	8.81	9.21	5.71	52.59	2.90	0.12	0.66
21.49	8.52	8.79	5.38	47.26	2.87	0.12	0.63
21.65	8.63	8.87	5.32	47.18	2.86	0.12	0.64
21.82	8.77	8.99	5.24	47.09	2.85	0.12	0.65
21.98	9.01	9.23	5.09	46.98	2.84	0.12	0.66
22.15	9.18	9.43	5.54	52.19	2.88	0.12	0.68
22.31	9.89	10.21	5.54	56.64	2.88	0.24	0.73
22.47	11.93	12.55	5.41	67.91	2.87	0.24	0.90
22.64	13.33	14.10	5.26	74.15	2.85	1.01	1.01
22.80	13.20	13.91	5.56	77.34	2.89	1.00	1.00
22.97	11.57	11.97	5.95	71.23	2.93	0.86	0.86
23.13	10.24	10.38	6.19	64.26	2.95	0.23	0.74
23.30	9.68	9.68	6.23	60.37	2.95	0.23	0.69
23.46	8.99	8.84	6.82	60.28	3.01	0.23	0.63
23.62	8.43	8.15	7.37	60.08	3.05	0.23	0.58
23.79	8.07	7.70	7.78	59.86	3.09	0.23	0.55

:: 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	8.04	7.63	7.83	59.75	3.09	0.23	0.54
24.12	8.37	7.97	7.96	63.40	3.10	0.23	0.57
24.28	8.91	8.53	7.84	66.88	3.09	0.34	0.61
24.44	9.14	8.74	7.64	66.84	3.08	0.34	0.62
24.61	9.48	9.08	7.36	66.80	3.05	0.22	0.65
24.77	11.25	11.00	6.37	70.06	2.97	0.79	0.79
24.94	14.55	14.52	4.97	72.17	2.82	1.04	1.04
25.10	15.30	15.25	4.70	71.73	2.79	1.10	1.10
25.26	13.62	13.37	4.91	65.65	2.81	0.33	0.96
25.43	10.58	10.05	6.26	62.85	2.95	0.22	0.72
25.59	9.68	9.03	6.54	59.09	2.98	0.22	0.64
25.76	9.76	9.06	6.51	59.00	2.98	0.22	0.65
25.92	10.36	9.67	6.47	62.59	2.98	0.22	0.69
26.08	11.43	10.78	6.42	69.16	2.97	0.32	0.77
26.25	12.53	11.90	6.31	75.03	2.96	0.85	0.85
26.41	12.82	12.15	6.62	80.47	2.99	0.87	0.87
26.58	12.51	11.76	7.05	82.94	3.03	0.84	0.84
26.74	11.97	11.14	7.43	82.73	3.06	0.80	0.80
26.90	11.77	10.87	7.36	79.99	3.05	0.78	0.78
27.07	12.17	11.23	6.87	77.21	3.01	0.80	0.80
27.23	12.81	11.84	6.73	79.76	3.00	0.85	0.85
27.40	13.61	12.62	6.51	82.17	2.98	0.90	0.90
27.56	14.11	13.07	6.46	84.51	2.97	0.93	0.93
27.72	14.24	13.15	6.41	84.35	2.97	0.94	0.94
27.89	14.07	12.91	6.71	86.65	3.00	0.92	0.92
28.05	14.04	12.81	6.94	88.85	3.02	0.92	0.92
28.22	14.30	13.01	6.99	90.95	3.02	0.93	0.93
28.38	14.50	13.15	6.90	90.79	3.01	0.94	0.94
28.54	14.30	12.89	6.86	88.35	3.01	0.92	0.92
28.71	13.66	12.18	7.05	85.86	3.03	0.87	0.87
28.87	13.06	11.52	7.02	80.88	3.02	0.82	0.82
29.04	12.53	10.93	7.15	78.19	3.04	0.78	0.78
29.20	12.23	10.59	7.13	75.45	3.03	0.76	0.76
29.36	12.06	10.37	7.26	75.31	3.05	0.74	0.74
29.53	11.93	10.19	7.11	72.51	3.03	0.73	0.73
29.69	12.13	10.35	7.00	72.41	3.02	0.74	0.74
29.86	12.57	10.72	6.99	74.98	3.02	0.77	0.77
30.02	13.01	11.10	7.41	82.30	3.06	0.79	0.79
30.19	12.81	10.85	7.78	84.40	3.09	0.78	0.78
30.35	12.31	10.32	7.93	81.86	3.10	0.74	0.74
30.51	12.14	10.11	7.61	76.95	3.07	0.72	0.72
30.68	12.78	10.67	7.20	76.91	3.04	0.76	0.76
30.84	13.55	11.36	6.98	79.28	3.02	0.81	0.81
31.01	13.88	11.63	7.01	81.53	3.02	0.83	0.83
31.17	13.61	11.32	7.19	81.38	3.04	0.81	0.81
31.33	13.15	10.83	7.28	78.86	3.05	0.77	0.77
31.50	12.72	10.37	7.11	73.77	3.03	0.74	0.74
31.66	12.35	9.99	6.84	68.31	3.01	0.28	0.71

:: 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	12.09	9.70	6.74	65.35	3.00	0.28	0.69
31.99	11.69	9.28	7.03	65.24	3.03	0.28	0.66
32.15	11.33	8.91	6.98	62.15	3.02	0.28	0.64
32.32	10.90	8.47	6.96	58.89	3.02	0.19	0.60
32.48	11.37	8.87	6.63	58.85	2.99	0.19	0.63
32.65	12.35	9.73	6.36	61.93	2.97	0.28	0.70
32.81	13.09	10.37	5.96	61.79	2.93	0.28	0.74
32.97	12.56	9.85	5.95	58.58	2.93	0.18	0.70
33.14	11.50	8.84	6.24	55.19	2.95	0.18	0.63
33.30	10.87	8.24	6.69	55.11	3.00	0.18	0.59
33.47	11.08	8.39	6.56	55.06	2.98	0.18	0.60
33.63	11.79	8.99	6.49	58.34	2.98	0.18	0.64
33.79	12.60	9.68	6.64	64.33	2.99	0.27	0.69
33.96	13.40	10.37	6.72	69.70	3.00	0.36	0.74
34.12	13.67	10.56	6.83	72.16	3.01	0.75	0.75
34.29	13.14	10.05	6.92	69.50	3.02	0.36	0.72
34.45	13.43	10.26	7.01	71.94	3.02	0.73	0.73
34.61	16.15	12.63	6.42	81.13	2.97	0.90	0.90
34.78	21.69	17.45	5.52	96.29	2.88	1.25	1.25
34.94	28.41	23.36	4.49	104.97	2.76	1.66	1.66
35.11	38.41	32.20	3.19	102.87	2.58	0.68	0.68
35.27	42.00	35.32	2.78	98.22	2.50	0.69	0.69
35.43	38.65	32.23	2.91	93.77	2.53	0.68	0.68
35.60	26.93	21.69	4.33	93.90	2.74	1.54	1.54
35.76	18.73	14.45	5.97	86.20	2.93	1.03	1.03
35.93	14.57	10.81	7.20	77.87	3.04	0.77	0.77
36.09	12.74	9.21	7.68	70.66	3.08	0.66	0.66
36.26	11.94	8.49	8.29	70.31	3.13	0.61	0.61
36.42	11.74	8.28	8.18	67.78	3.12	0.34	0.59
36.58	11.91	8.39	7.78	65.26	3.09	0.25	0.60
36.75	11.71	8.19	7.29	59.74	3.05	0.25	0.59
36.91	11.72	8.16	6.95	56.72	3.02	0.17	0.58
37.08	11.85	8.24	6.49	53.48	2.98	0.17	0.59
37.24	12.19	8.49	6.67	56.63	2.99	0.17	0.61
37.40	12.82	8.99	6.94	62.37	3.02	0.25	0.64
37.57	15.23	10.95	6.82	74.65	3.01	0.78	0.78
37.73	18.80	13.87	6.26	86.81	2.96	0.99	0.99
37.90	23.20	17.44	5.45	95.15	2.87	1.25	1.25
38.06	26.87	20.46	4.77	97.61	2.80	1.46	1.46
38.22	28.17	21.49	4.52	97.08	2.77	1.53	1.53
38.39	28.77	21.91	4.42	96.75	2.76	1.56	1.56
38.55	29.57	22.52	4.20	94.60	2.73	1.60	1.60
38.72	31.44	24.01	3.91	93.87	2.69	1.70	1.70
38.88	33.20	25.40	3.74	94.94	2.66	1.79	1.79
39.04	38.67	29.94	3.11	93.17	2.56	0.67	0.67
39.21	46.90	36.87	2.43	89.57	2.43	0.70	0.70
39.37	53.22	42.25	1.99	84.17	2.31	0.71	0.71
39.54	55.55	44.18	1.83	81.05	2.26	0.72	0.72

:: 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	56.14	44.60	1.78	79.46	2.24	0.72	0.72
39.86	56.80	44.92	1.87	83.98	2.27	0.72	0.72
40.03	54.75	42.83	2.17	92.84	2.36	0.71	0.71
40.19	48.98	37.71	2.64	99.48	2.47	0.70	0.70
40.36	42.26	31.95	3.16	100.95	2.57	0.68	0.68
40.52	34.56	25.51	3.85	98.30	2.68	1.80	1.80
40.68	30.65	22.29	4.08	90.88	2.71	1.57	1.57
40.85	32.58	23.86	3.56	84.82	2.64	1.68	1.68
41.01	40.12	30.03	2.70	81.06	2.49	0.67	0.67
41.18	47.70	36.18	2.30	83.31	2.40	0.69	0.69
41.34	52.77	40.23	2.14	86.03	2.36	0.71	0.71
41.50	56.25	42.97	2.03	87.34	2.33	0.72	0.72
41.67	58.66	44.81	1.98	88.69	2.31	0.72	0.72
41.83	59.32	45.23	1.96	88.59	2.30	0.72	0.72
42.00	57.76	43.74	2.06	89.89	2.33	0.72	0.72
42.16	53.46	39.92	2.40	95.84	2.42	0.71	0.71
42.32	50.67	37.50	2.56	96.13	2.46	0.70	0.70
42.49	52.76	39.08	2.45	95.69	2.43	0.70	0.70
42.65	55.15	41.01	2.22	90.99	2.38	0.71	0.71
42.82	53.68	39.56	2.41	95.34	2.42	0.70	0.70
42.98	45.48	32.82	2.90	95.16	2.53	0.68	0.68
43.15	40.19	28.49	3.33	94.76	2.60	0.66	0.66
43.31	36.09	25.24	3.54	89.27	2.63	1.77	1.77
43.47	40.30	28.53	3.03	86.48	2.55	0.66	0.66
43.64	50.29	36.41	2.37	86.31	2.41	0.69	0.69
43.80	63.35	46.73	1.96	91.44	2.30	0.73	0.73
43.97	70.55	52.18	1.90	99.19	2.28	0.74	0.74
44.13	71.32	52.52	1.96	102.69	2.30	0.74	0.74
44.29	72.57	53.38	1.92	102.60	2.29	0.74	0.74
44.46	73.35	53.93	1.86	100.15	2.27	0.74	0.74
44.62	72.27	52.84	1.91	101.13	2.29	0.74	0.74
44.79	67.63	48.90	2.09	102.12	2.34	0.73	0.73
44.95	67.16	48.42	2.08	100.77	2.34	0.73	0.73
45.11	68.01	49.08	1.98	96.96	2.31	0.73	0.73
45.28	68.09	49.03	1.95	95.60	2.30	0.73	0.73
45.44	66.05	47.25	2.02	95.43	2.32	0.73	0.73
45.61	71.48	51.34	1.91	97.92	2.29	0.74	0.74
45.77	80.67	58.45	1.73	100.96	2.22	0.75	0.75
45.93	91.81	67.03	1.59	106.89	2.17	0.77	0.77
46.10	99.31	72.65	1.54	112.17	2.15	0.78	0.78
46.26	108.68	79.79	1.48	117.98	2.11	0.80	0.80
46.43	117.46	86.36	1.44	124.43	2.09	0.81	0.81
46.59	119.06	87.24	1.46	127.01	2.10	0.81	0.81
46.75	118.62	86.58	1.47	127.43	2.11	0.81	0.81
46.92	115.58	83.94	1.50	125.56	2.12	0.80	0.80
47.08	114.76	83.22	1.48	122.77	2.11	0.80	0.80
47.25	105.76	75.84	1.57	119.40	2.16	0.79	0.79
47.41	86.30	60.43	1.88	113.51	2.28	0.76	0.76

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

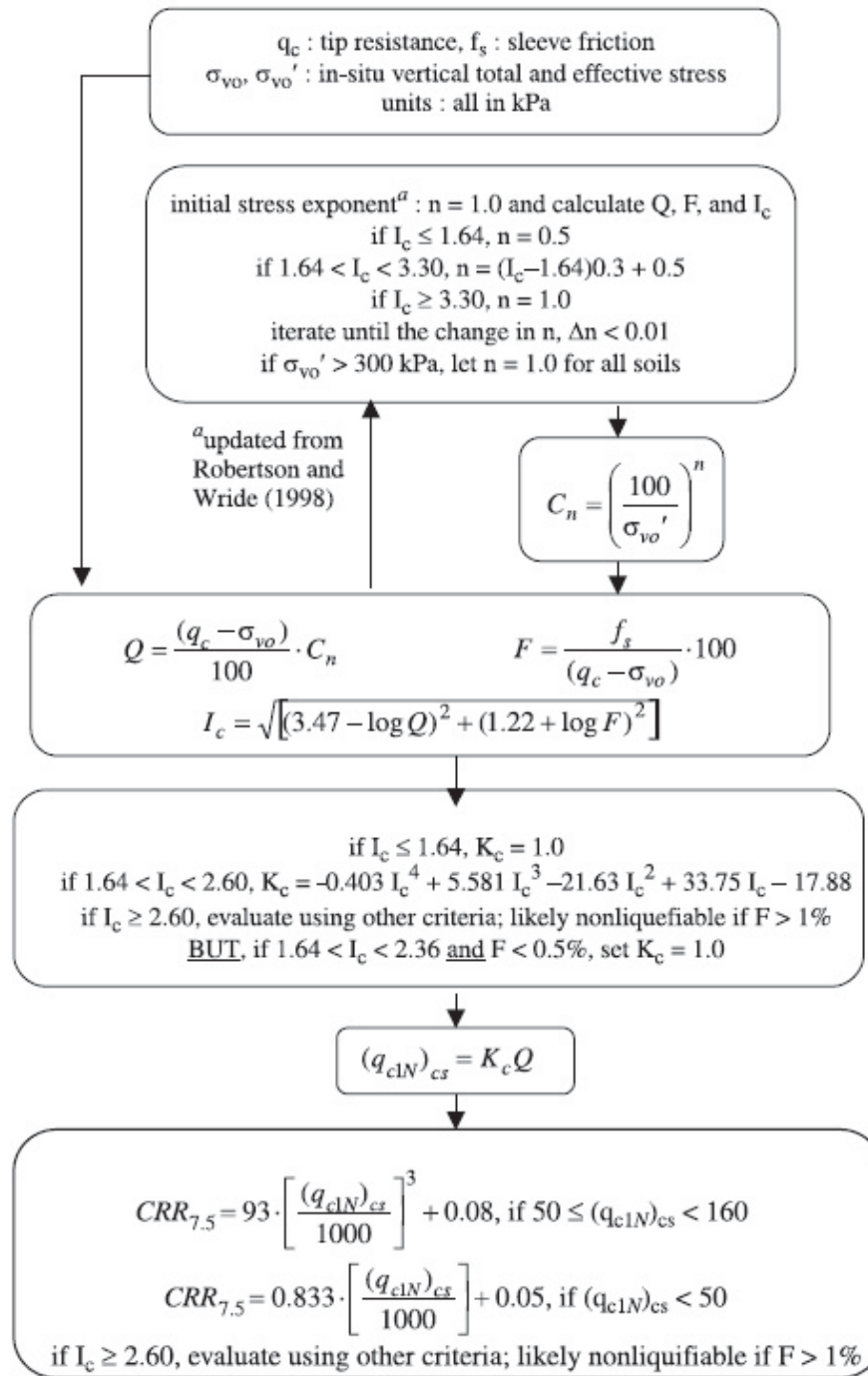
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
47.57	63.66	43.00	2.50	107.33	2.44	0.72	0.72
47.74	61.05	41.15	2.40	98.93	2.42	0.71	0.71
47.90	75.10	52.19	1.76	91.78	2.24	0.74	0.74
48.07	95.60	68.15	1.43	97.44	2.09	0.77	0.77
48.23	94.62	66.83	1.52	101.55	2.13	0.77	0.77
48.39	78.03	53.50	1.90	101.69	2.28	0.74	0.74
48.56	58.98	38.94	2.53	98.57	2.45	0.70	0.70
48.72	44.01	28.02	3.16	88.60	2.57	0.66	0.66
48.89	34.24	21.07	3.70	77.89	2.66	1.47	1.47
49.05	23.91	13.78	5.27	72.56	2.85	0.98	0.98
49.22	19.79	11.06	6.26	69.26	2.96	0.32	0.79
49.38	22.08	12.50	5.19	64.88	2.85	0.32	0.89
49.54	27.62	16.37	3.91	64.02	2.69	0.19	1.15
49.71	31.16	18.83	3.47	65.37	2.62	0.32	1.31
49.87	35.94	22.00	3.35	73.72	2.60	1.52	1.52
50.04	42.48	26.50	2.99	79.12	2.54	0.66	0.66
50.20	48.32	30.76	2.49	76.72	2.44	0.67	0.67
50.36	46.00	29.14	2.47	72.11	2.44	0.67	0.67
50.53	34.49	20.88	3.18	66.46	2.58	0.14	0.63
50.69	24.08	13.46	5.05	68.01	2.83	0.32	0.96

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)

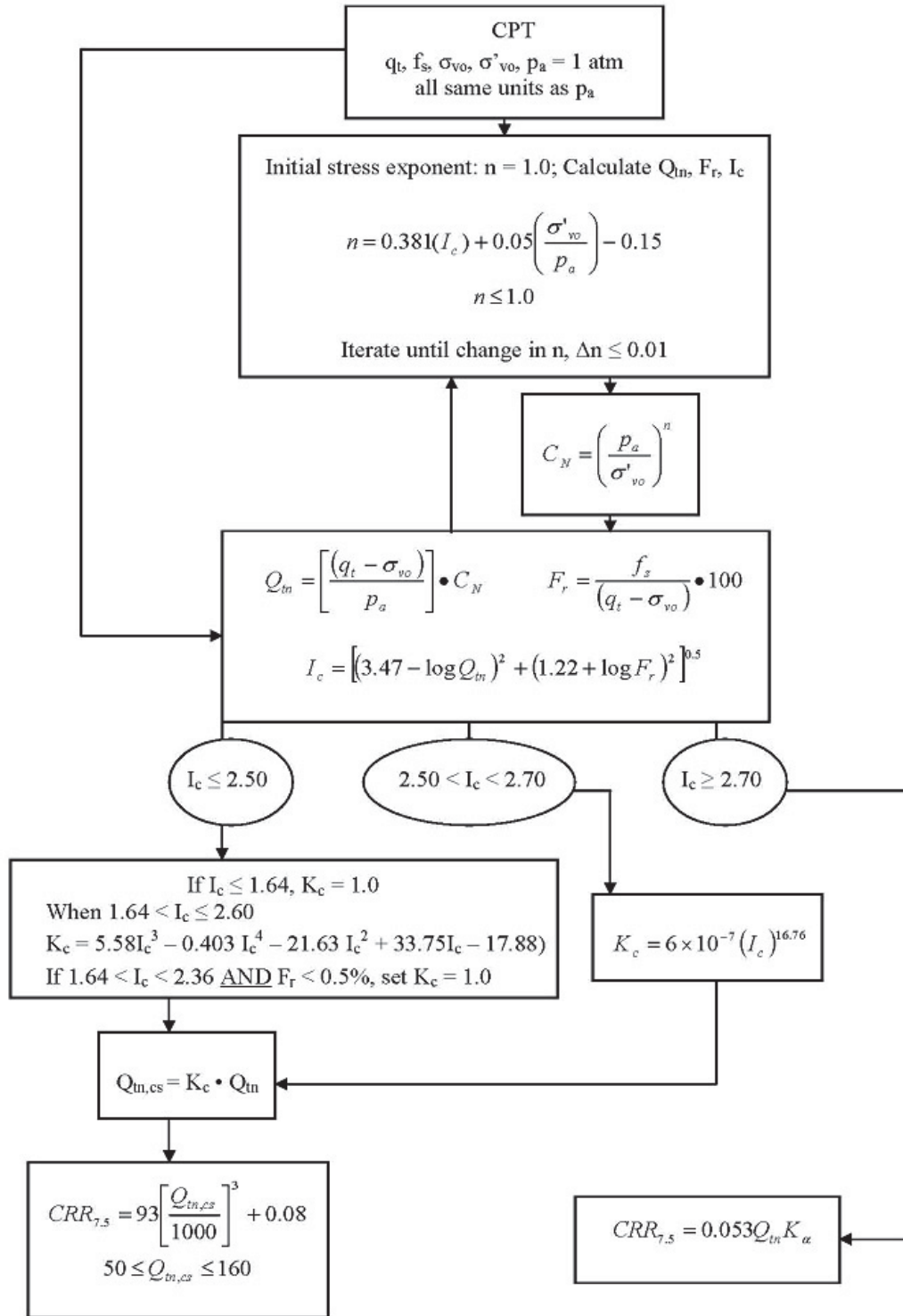
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart¹:



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

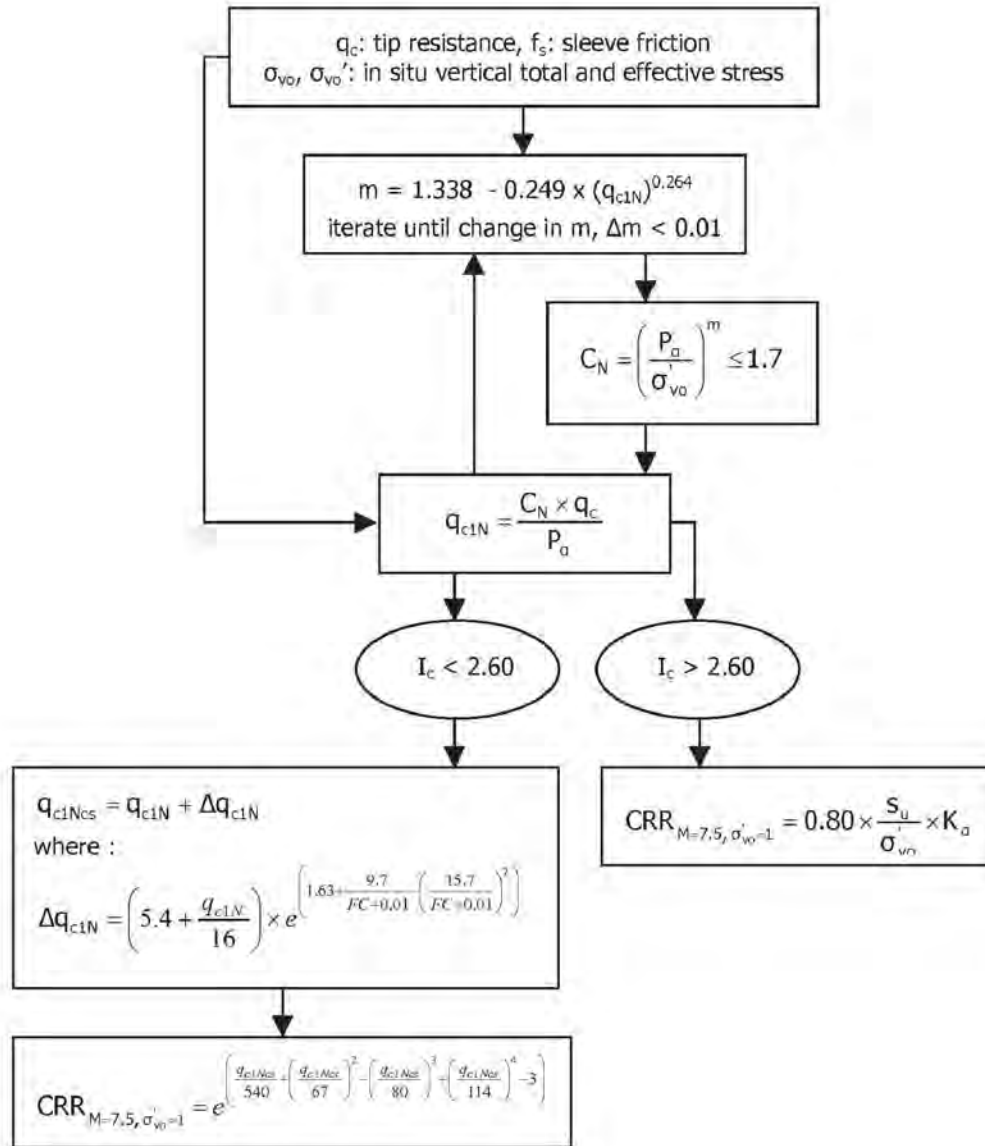
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

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 flowchart¹:

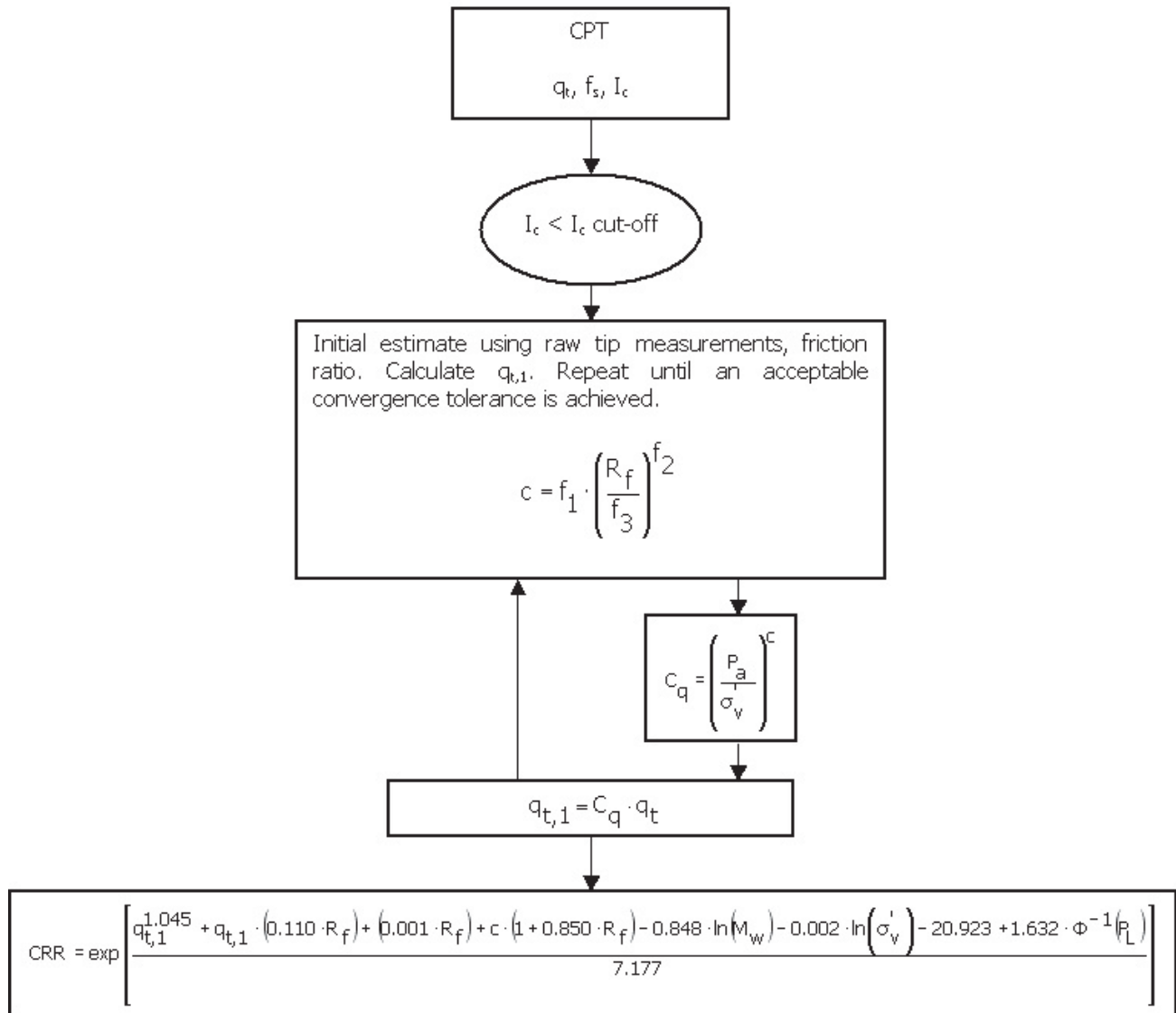


¹ P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

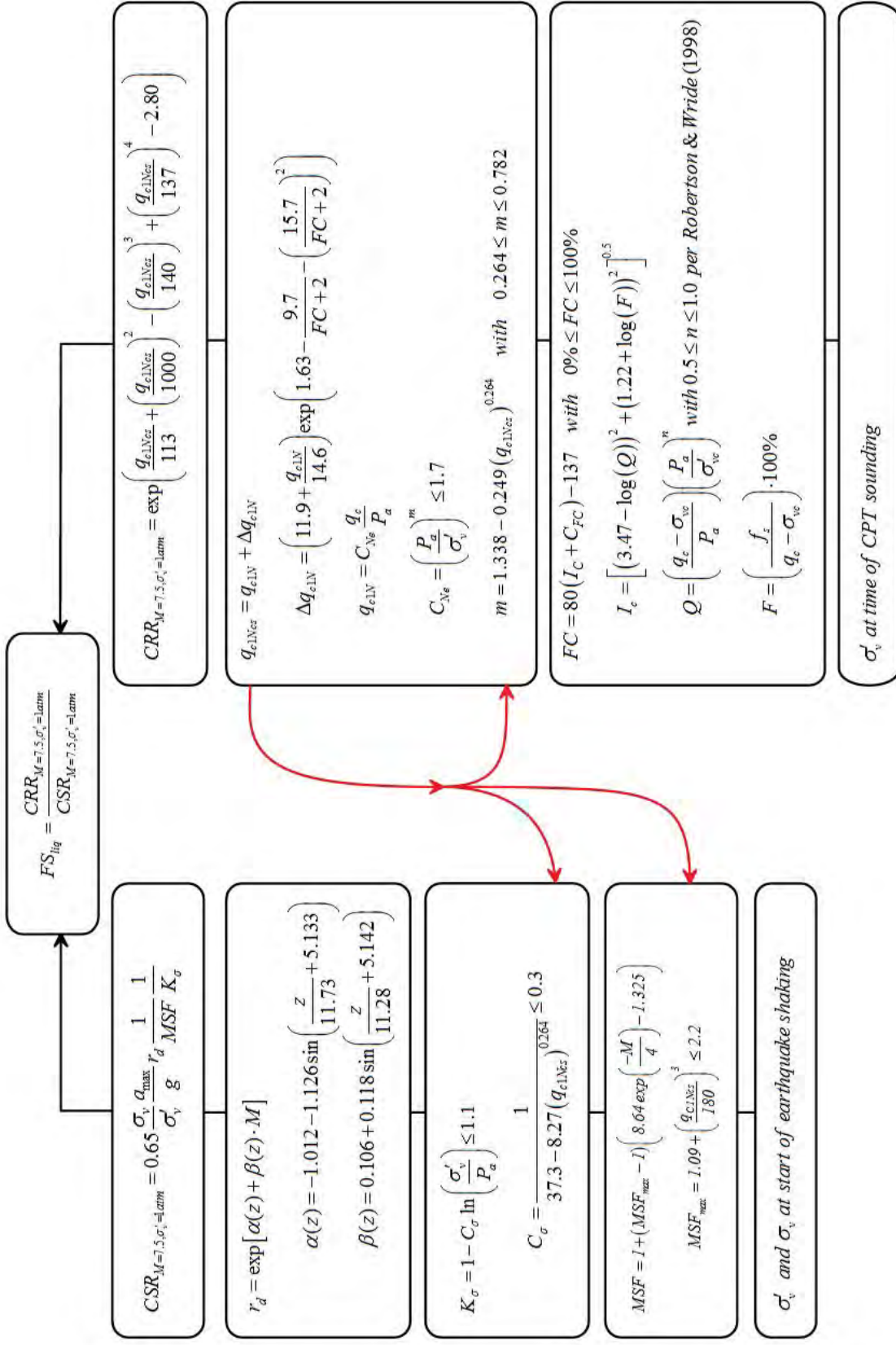
Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



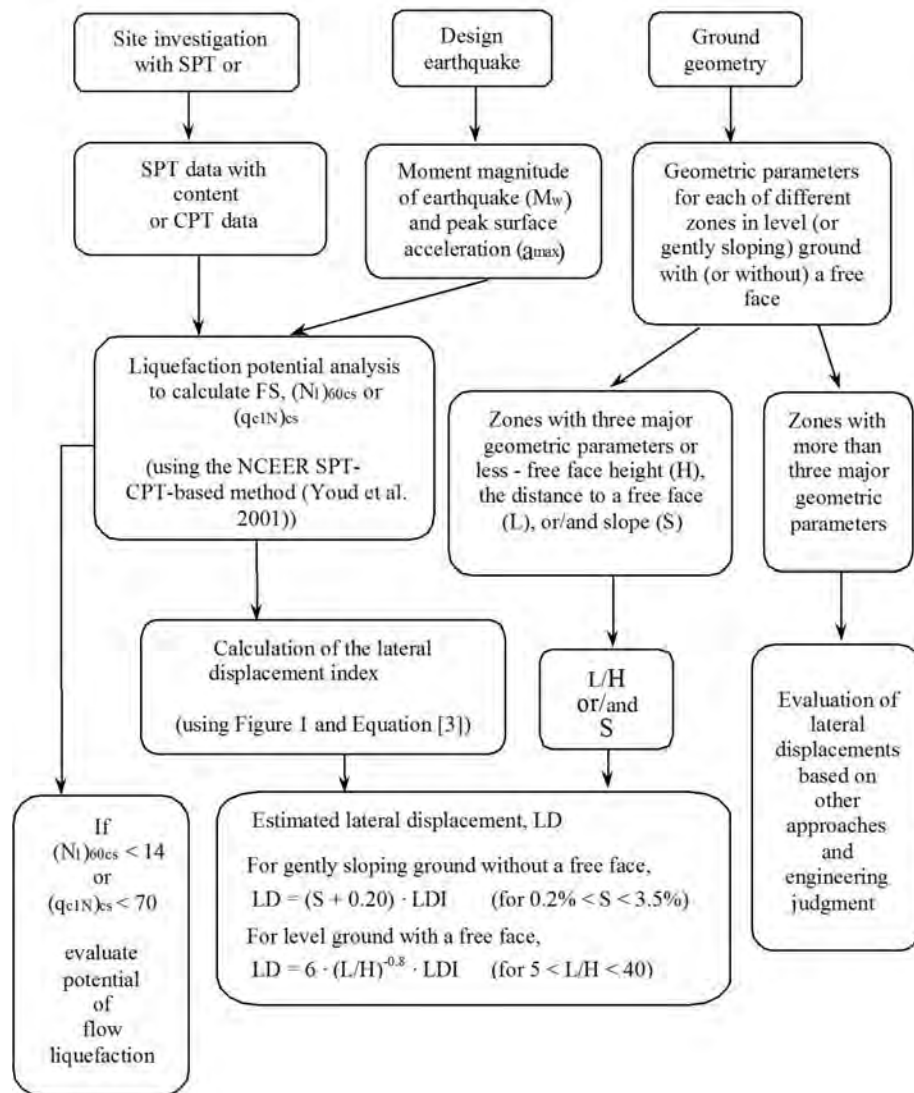
Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



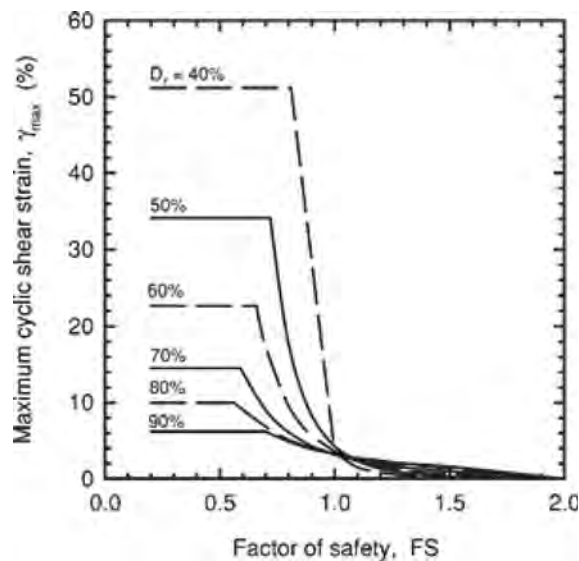
Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)



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



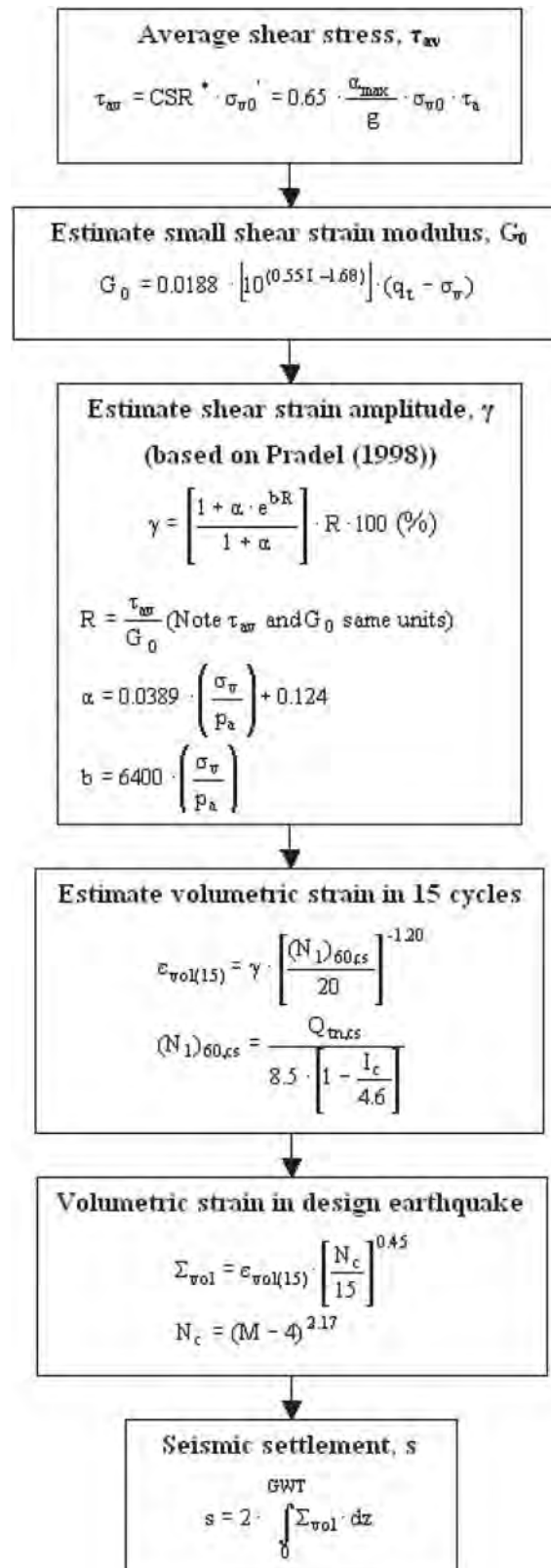
¹ Figure 1

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

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



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 methodology 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:

$$LPI = \int_0^{20} (10 - 0.5z) \times F_L \times dz$$

where:

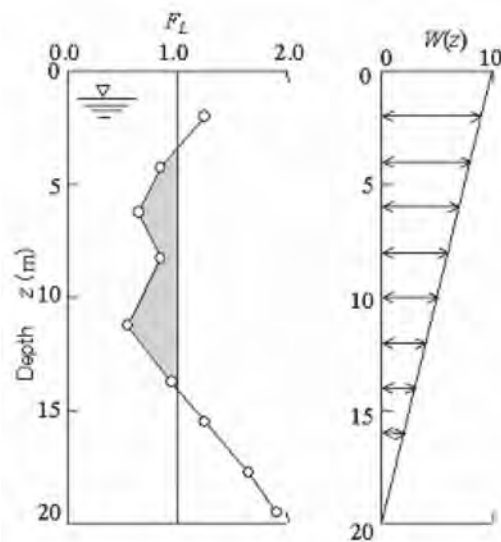
$F_L = 1$ - F.S. when F.S. less than 1

$F_L = 0$ when F.S. greater than 1

z depth of measurement 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
- $0 < LPI \leq 5$: Liquefaction risk is low
- $5 < LPI \leq 15$: Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high



Graphical presentation of the LPI calculation procedure

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APPENDIX F

General Earthwork and Grading Recommendations



Leighton

APPENDIX F

LEIGHTON CONSULTING, INC. EARTHWORK AND GRADING GUIDE SPECIFICATIONS

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F - 1 . 0 G E N E R A L

F-1.1 Intent

These Earthwork and Grading Guide Specifications are for grading and earthwork shown on the current, approved grading plan(s) and/or indicated in the Leighton Consulting, Inc. geotechnical report(s). These Guide Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the project-specific recommendations in the geotechnical report shall supersede these Guide Specifications. Leighton Consulting, Inc. shall provide geotechnical observation and testing during earthwork and grading. Based on these observations and tests, Leighton Consulting, Inc. may provide new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

F-1.2 Role of Leighton Consulting, Inc.

Prior to commencement of earthwork and grading, Leighton Consulting, Inc. shall meet with the earthwork contractor to review the earthwork contractor's work plan, to schedule sufficient personnel to perform the appropriate level of observation, mapping and compaction testing. During earthwork and grading, Leighton Consulting, Inc. shall observe, map, and document subsurface exposures to verify geotechnical design assumptions. If observed conditions are found to be significantly different than the interpreted assumptions during the design phase, Leighton Consulting, Inc. shall inform the owner, recommend appropriate changes in design to accommodate these observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include (1) natural ground after clearing to receiving fill but before fill is placed, (2) bottoms of all "remedial removal" areas, (3) all key bottoms, and (4) benches made on sloping ground to receive fill.

Leighton Consulting, Inc. shall observe moisture-conditioning and processing of the subgrade and fill materials, and perform relative compaction testing of fill to determine the attained relative compaction. Leighton Consulting, Inc. shall provide *Daily Field Reports* to the owner and the Contractor on a routine and frequent basis.

F-1.3 The Earthwork Contractor

The earthwork contractor (Contractor) shall be qualified, experienced and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Guide

Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing grading and backfilling in accordance with the current, approved plans and specifications.

The Contractor shall inform the owner and Leighton Consulting, Inc. of changes in work schedules at least one working day in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that Leighton Consulting, Inc. is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish earthwork and grading in accordance with the applicable grading codes and agency ordinances, these Guide Specifications, and recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of Leighton Consulting, Inc., unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, Leighton Consulting, Inc. shall reject the work and may recommend to the owner that earthwork and grading be stopped until unsatisfactory condition(s) are rectified.

F - 2 . 0 P R E P A R A T I O N O F A R E A S T O B E F I L L E D

F-2.1 **Clearing and Grubbing**

Vegetation, such as brush, grass, roots and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies and Leighton Consulting, Inc.. Care should be taken not to encroach upon or otherwise damage native and/or historic trees designated by the Owner or appropriate agencies to remain. Pavements, flatwork or other construction should not extend under the “drip line” of designated trees to remain.

Leighton Consulting, Inc. shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 3 percent of organic materials (by dry weight: ASTM D 2974). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that

are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

F-2.2 Processing

Existing ground that has been declared satisfactory for support of fill, by Leighton Consulting, Inc., shall be scarified to a minimum depth of 6 inches (15 cm). Existing ground that is not satisfactory shall be over-excavated as specified in the following Section D-2.3. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

F-2.3 Overexcavation

In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by Leighton Consulting, Inc. during grading. All undocumented fill soils under proposed structure footprints should be excavated

F-2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), (>20 percent grade) the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet (4.5 m) wide and at least 2 feet (0.6 m) deep, into competent material as evaluated by Leighton Consulting, Inc.. Other benches shall be excavated a minimum height of 4 feet (1.2 m) into competent material or as otherwise recommended by Leighton Consulting, Inc.. Fill placed on ground sloping flatter than 5:1 (horizontal to vertical units), (<20 percent grade) shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.

F-2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by Leighton Consulting, Inc. as suitable to receive fill. The Contractor shall obtain a written acceptance (*Daily Field Report*) from Leighton Consulting, Inc. prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys and benches.

F - 3 . 0 F I L L M A T E R I A L

F-3.1 Fill Quality

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by Leighton Consulting, Inc. prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to Leighton Consulting, Inc. or mixed with other soils to achieve satisfactory fill material.

F-3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 6 inches (15 cm), shall not be buried or placed in fill unless location, materials and placement methods are specifically accepted by Leighton Consulting, Inc.. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet (3 m) measured vertically from finish grade, or within 2 feet (0.61 m) of future utilities or underground construction.

F-3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section D-3.1, and be free of hazardous materials ("contaminants") and rock larger than 3-inches (8 cm) in largest dimension. All import soils shall have an Expansion Index (EI) of 20 or less and a sulfate content no greater than ($\leq$) 500 parts-per-million (ppm). A representative sample of a potential import source shall be given to Leighton Consulting, Inc. at least four full working days before importing begins, so that suitability of this import material can be determined and appropriate tests performed.

F - 4 . 0 F I L L P L A C E M E N T A N D C O M P A C T I O N

F-4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill, as described in Section D-2.0, above, in near-horizontal layers not exceeding 8 inches (20 cm) in loose thickness. Leighton Consulting, Inc. may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers, and only if the building officials with the appropriate jurisdiction approve. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

F-4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM) Test Method D 1557.

F-4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, each layer shall be uniformly compacted to not-less-than ($\geq$) 90 percent of the maximum dry density as determined by ASTM Test Method D 1557. In some cases, structural fill may be specified (see project-specific geotechnical report) to be uniformly compacted to at least ($\geq$) 95 percent of the ASTM D 1557 modified Proctor laboratory maximum dry density. For fills thicker than ($>$) 15 feet (4.5 m), the portion of fill deeper than 15 feet below proposed finish grade shall be compacted to 95 percent of the ASTM D 1557 laboratory maximum density. Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

F-4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by back rolling of slopes with sheepfoot rollers at increments of 3 to 4 feet (1 to 1.2 m) in fill elevation, or by other methods producing satisfactory results acceptable to Leighton Consulting, Inc.. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of the ASTM D 1557 laboratory maximum density.

F-4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by Leighton Consulting, Inc.. Location and frequency of tests shall be at our field representative(s) discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

F-4.6 Compaction Test Locations

Leighton Consulting, Inc. shall document the approximate elevation and horizontal coordinates of each density test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that Leighton

Consulting, Inc. can determine the test locations with sufficient accuracy. Adequate grade stakes shall be provided.

F - 5 . 0 E X C A V A T I O N

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by Leighton Consulting, Inc. during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by Leighton Consulting, Inc. based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, then observed and reviewed by Leighton Consulting, Inc. prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by Leighton Consulting, Inc..

F - 6 . 0 T R E N C H B A C K F I L L S

F-6.1 **Safety**

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations. Work should be performed in accordance with Article 6 of the *California Construction Safety Orders*, 2009 Edition or more current (see also: <http://www.dir.ca.gov/title8/sb4a6.html>).

F-6.2 **Bedding and Backfill**

All utility trench bedding and backfill shall be performed in accordance with applicable provisions of the 2015 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Bedding material shall have a Sand Equivalent greater than 30 (SE>30). Bedding shall be placed to 1-foot (0.3 m) over the top of the conduit, and densified by jetting in areas of granular soils, if allowed by the permitting agency. Otherwise, the pipe-bedding zone should be backfilled with Controlled Low Strength Material (CLSM) consisting of at least one sack of Portland cement per cubic-yard of sand, and conforming to Section 201-6 of the 2015 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Backfill over the bedding zone shall be placed and densified mechanically to a minimum of 90 percent of relative compaction (ASTM D 1557) from 1 foot (0.3 m) above the top of the conduit to the surface. Backfill above the pipe zone shall **not** be jetted. Jetting of the bedding around the conduits shall be observed by Leighton Consulting, Inc. and backfill above the pipe zone (bedding) shall be observed and tested by Leighton Consulting, Inc..

F-6.3 Lift Thickness

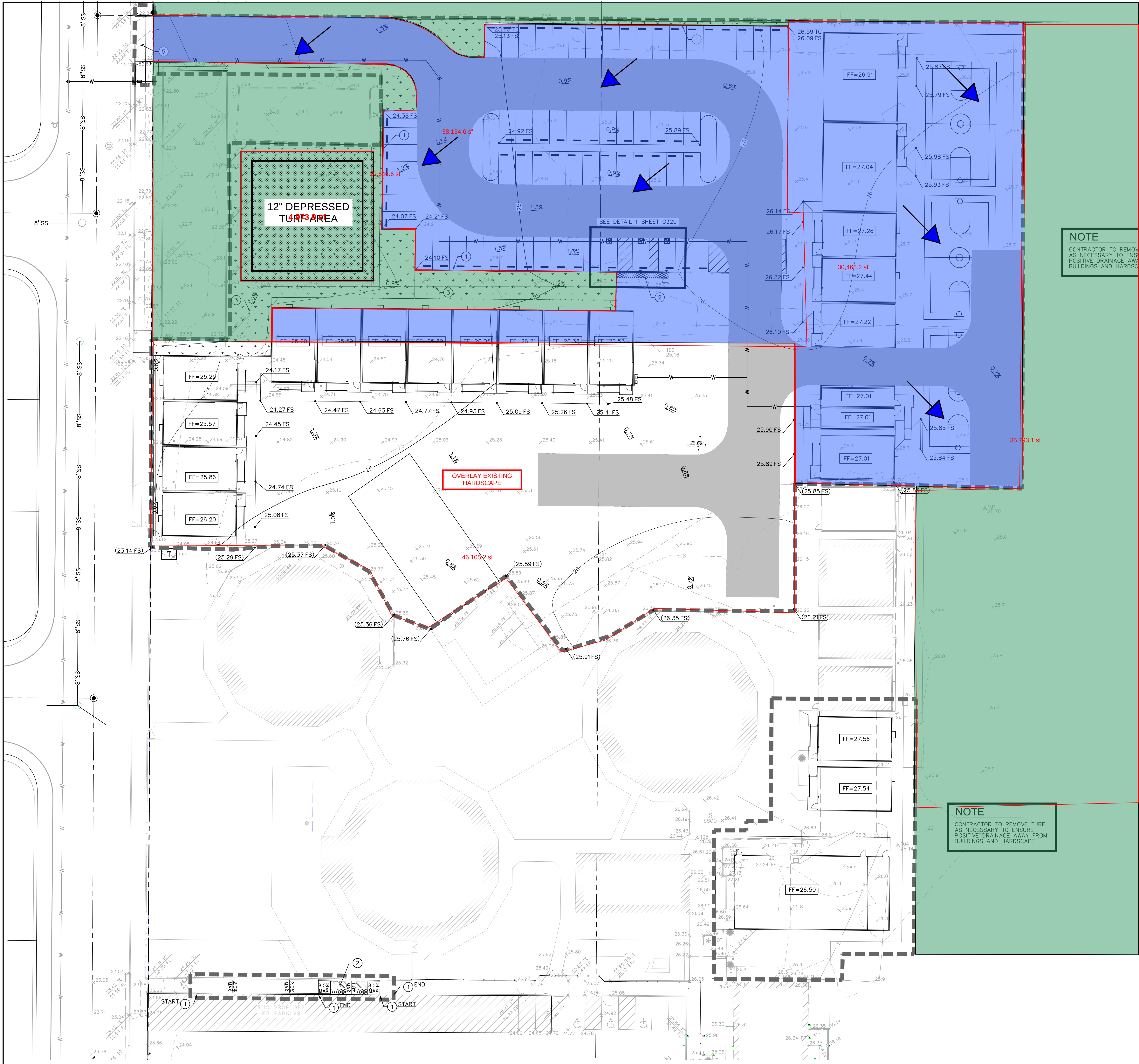
Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to Leighton Consulting, Inc. that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method, and only if the building officials with the appropriate jurisdiction approve.

Appendices

Appendix B Hydrology Data

Appendices

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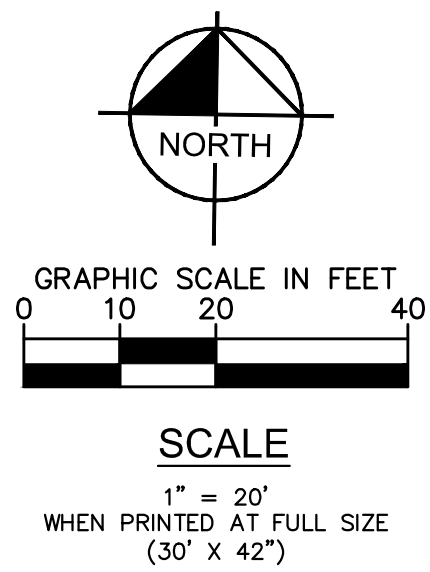


- LEGEND**
- EXISTING HARDSCAPE
 - PROPOSED HARDSCAPE
 - LANDSCAPE
 - EXISTING FLOW PATTERN
 - PROPOSED FLOW PATTERN

NOTE
CONTRACTOR TO REMOVE TURF
AS NECESSARY TO ENSURE
POSITIVE DRAINAGE AWAY FROM
BUILDINGS AND HARDSCAPE

NOTE
CONTRACTOR TO REMOVE TURF
AS NECESSARY TO ENSURE
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**DRAINAGE
EXHIBIT**



Worksheet A: Hydrologic Source Control Calculation Form

Drainage area ID		A1-A2		
Total drainage area		1.57	acres	
Total drainage area Impervious Area (IA_{total})		1.57	acres	

HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per criteria in BMP Fact Sheets (XIV.1) $(d_{HSC})^1$	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
A1	PROPOSED PARKING LOT	0.45"	0.87	0.39
A3	PROPOSED HARDSCAPE	0.55"	0.70	0.39
Box 1:		$\sum d_i \times IA_i =$		0.78
Box 2:		$IA_{total} =$		1.57
[Box 1]/[Box 2]:		$d_{HSC\ total} =$		0.50
		Percent Capture Provided by HSCs (Table III.1)		50%

1 - For HSCs meeting criteria to be considered self-retaining, enter the DCV for the project.

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, d (inches)	$d=$	0.70	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	$d_{HSC}=$	0.50	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}=$	0.20	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), A (acres)	$A=$	1.57	acres
2	Enter Project Imperviousness, imp (unitless)	$imp=$	0.67	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	$C=$	0.65	
4	Calculate runoff volume, $V_{design} = (C \times d_{remainder} \times A \times 43560 \times (1/12))$	$V_{design}=$	750	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{observed}^1$ (in/hr) (Appendix VII)	$K_{observed}=$		In/hr
2	Enter combined safety factor from Worksheet H, S_{total} (unitless)	$S_{total}=$		
3	Calculate design infiltration rate, $K_{design} = K_{observed} / S_{total}$	$K_{design}=$	0.30	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, T (max 48 hours)	$T=$	48	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	$D_{max}=$	1.2	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	$A_{min}=$	625	sq-ft

¹ $K_{observed}$ is the vertical infiltration measured in the field, before applying a factor of safety. If field testing measures a rate that is different than the vertical infiltration rate (for example, three-dimensional borehole percolation rate), then this rate must be adjusted by an acceptable method (for example, Porchet method) to yield the field estimate of vertical infiltration rate, $K_{observed}$. See Appendix VII.

Appendix C Mitigation Monitoring and Reporting Program

Appendices

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Mitigation Monitoring and Reporting Program

Table 1 Mitigation Monitoring Requirements

Mitigation Measure		Responsibility for Implementation	Timing	Responsibility for Monitoring	Monitor (Signature Required) (Date of Compliance)
5.1 AIR QUALITY					
AQ-1	The Ocean View School District shall include the following provisions in the construction bid contract for the improvements at Sun View Elementary School (ES). The construction contractor shall limit hauling of demolition debris during Stage 1 in Phase 1 to a maximum of 18 trucks per day (36 one-way haul trips per day if 16 cubic yard trucks are used), assuming a one-way haul distance of 20 miles. If the truck haul distance for export of soil from site preparation activities is greater than 20 miles one way, as identified by the contractor(s), hauling shall be restricted to no more than 720 miles per day. Demolition debris hauling operations shall not overlap with any grading operations and grading soil haul operations. These requirements shall be noted on all construction management plans and verified by the Ocean View School District prior to and during demolition activities at Pleasant View/OVPP and Sun View ES.	- Ocean View School District - Construction Contractor	During demolition of Sun View Elementary School	Ocean View School District	
5.2 CULTURAL RESOURCES					
CUL-1	Prior to any earth-disturbing activities (e.g., excavation, trenching, grading) that exceed 3 feet below ground surface, the construction contractor shall demonstrate that the disturbance would occur within the limits of the previously disturbed soils, such as artificial fill materials. In the event that the activities could encounter undisturbed soils, an archaeologist who meets the Secretary of the Interior's Professional Qualifications Standards of Archaeology shall be retained to determine if the construction activities could result in a substantial, adverse change in the significance of an archaeological resource pursuant to Section 15064.5 of the California Environmental Quality Act Guidelines. If the archaeologist determines that monitoring during grading activities is necessary, a Native American monitor(s) from the applicable tribe (e.g., the Gabrielino Tongva Nation and/or the Native American Heritage Commission) shall also be invited to be present at the pregrading conference; shall establish procedures for archaeological and/or tribal resource surveillance; and shall establish, in coordination with the construction contractor, procedures for temporary	- Ocean View School District - Consulting Archaeologist	Prior to grading that exceeds 3 feet below ground surface	Ocean View School District	

Mitigation Monitoring and Reporting Program

Table 1 Mitigation Monitoring Requirements

Mitigation Measure	Responsibility for Implementation	Timing	Responsibility for Monitoring	Monitor (Signature Required) (Date of Compliance)
halting or redirecting work to permit the sampling, identification, and evaluation of the artifacts, as appropriate. Should archaeological resources, including tribal resources, be found during ground-disturbing activities, the qualified monitor shall first determine whether the resource is a "unique archaeological resource" pursuant to Section 21083.2(g) of the California Public Resources Code (PRC) or a "historical resource" pursuant to Section 15064.5(a) of the State CEQA Guidelines (14 California Code of Regulations [CCR]), or "tribal cultural resources" pursuant to PRC Section 21074. Once the determination is made pursuant to CEQA Guidelines Section 21083.2, the appropriate actions shall be taken in appropriate sections of the regulations (e.g., 14 CCR §15126.4) to ensure that impacts are reduced to a less than significant level. If evidence of an archaeological site or other suspected historical resource as defined by CEQA Guidelines Section 15064.5, including darkened soil representing past human activity, that could conceal material remains (e.g., worked stone, fired clay vessels, faunal bone, hearths, storage pits, or burials) are discovered during any project-related earth-disturbing activities, all earth-disturbing activity within 100 feet of the find shall be halted and the District shall be notified. Impacts to any significant resources shall be mitigated to a less than significant level through data recovery or other methods determined adequate by the archaeologist and that are consistent with the Secretary of the Interior's Standards for Archaeological Documentation. Any identified cultural resources shall be recorded on the appropriate DPR 523 form and filed with the appropriate Information Center.				
5.4 HYDROLOGY AND WATER QUALITY				
HYD-1 Prior to grading of Sun View Elementary School, Ocean View School District shall adhere to the National Pollutant Discharge Elimination System (NPDES) Construction General Permit Order No. 2012-0006-DWQ, Statewide General Construction Permit, by completing and filing Registration Documents with the State Water Resources Control Board, which include a Notice of Intent (NOI), a Risk Assessment, a Site Map, a Storm Water Pollution Prevention Plan (SWPPP) and associated best management practices (BMPs), an annual fee, and a signed certification statement. It	■ Ocean View School District ■ Construction Contractor	Prior to grading	Ocean View School District	

Mitigation Monitoring and Reporting Program

Table 1 Mitigation Monitoring Requirements

Mitigation Measure		Responsibility for Implementation	Timing	Responsibility for Monitoring	Monitor (Signature Required) (Date of Compliance)
requires that a SWPPP be prepared prior to the start of grading, and provisions in the SWPPP must be implemented throughout the construction period.					
HYD-2	Ocean View School District (OVSD) shall demonstrate that runoff discharges at Sun View Elementary School meet one of the following or equivalent design criteria: ▪ Capture and retain the volume of stormwater runoff produced from a 24-hour 85th percentile storm event and demonstrate that this design capture volume (DCV) is drawn down within 48 hours or less following the end of precipitation. Or ▪ Demonstrate via use of nomographs or continuous simulation that best management practices (BMPs) will retain 80 percent of average annual runoff volume via volume-based, flow-based, or combined approaches. Or Where it is demonstrated based on substantial evidence that it is not feasible to fully infiltrate the DCV or equivalent per the listed criteria above, but i.e., partial infiltration is determined to be feasible, OVSD shall demonstrate in the site plans for Sun View Elementary School and Pleasant View/Ocean View Preparatory Preschool that the following design criteria have been incorporated: ▪ Maximize volume and pollutant retention through the incorporation of all of the following design elements that apply: ▪ Use of all applicable hydrologic source controls. ▪ Use of retention compartments in BMPs, including gravel storage below the lowest point of treated discharge, amended soils, and other features designed to achieve similar processes.	▪ Ocean View School District ▪ Construction Contractor	Prior to grading	Ocean View School District	

Mitigation Monitoring and Reporting Program

Table 1 Mitigation Monitoring Requirements

Mitigation Measure		Responsibility for Implementation	Timing	Responsibility for Monitoring	Monitor (Signature Required) (Date of Compliance)
5.6 TRANSPORTATION AND TRAFFIC					
T-1	Busing Program. Ocean View School District shall prepare and implement a busing program so that the two identified intersections—Beach Boulevard at Heil Avenue (#11) and Newland Street and Warner Avenue (#15)—do not operate at unacceptable level of service (LOS) E or worse under With Project conditions. The busing program will direct students to gather at their designated bus stops, from which they will be transported to the interim housing school by bus and returned at the end of the school day. The busing program shall include a formula to identify a minimum busing percentage and limit parent-driven trips to ensure that the two intersections do not degrade to LOS E or worse. This program will be adjusted for variables in location, enrollment, and other characteristics as each home school is engaged in the modernization.	■ Ocean View School District	Each year prior to hosting students from each modernization school at Sun View Elementary School and the Pleasant View/Ocean View Preparatory/Preschool	Ocean View School District	