

CITY OF MANTECA

Request for Proposals (RFP)

for

Progressive Design-Build Services

for the

Sidestream Treatment (CIP 25005)

and UV Rehabilitation (CIP 25004) Project



Issued: [DATE]

Electronic Proposals Due: [DATE] @ 5:00 p.m.

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I. INTRODUCTION

The City of Manteca (City) is issuing this Request for Proposals (RFP) to invite the entities identified below (Proposers) to submit a Proposal to provide integrated design and construction services of new facilities related to sidestream treatment (CIP 25005) and ultraviolet (UV) disinfection (CIP 25004) Project (Project).

A. RFP ORGANIZATION

This RFP consists of 11 sections and 4 attachments:

- Section I: Introduction.
- Section II: Project and Services Description.
- Section III: Scope of Services.
- Section IV: Materials Furnished by City.
- Section V: Proposal Instructions.
- Section VI: Acceptance of Proposals.
- Section VII: Proposal Evaluation and Selection.
- Section VIII: Negotiations and Engagement.
- Section IX: Conflict of Interest.
- Section X: Schedule for PDB Team Selection.
- Section XI: Communications with City Contact.
- Attachment A: Project Requirements.
- Attachment B: Draft Scope of PDB Services.
- Attachment C: Draft PDB Agreement.
- Attachment D: Fee Proposal Form

B. PROJECT DELIVERY AND CONTRACTING APPROACH

As described in the Request for Qualifications (RFQ) issued by the City on April 1, 2025, the Project will be delivered using the Progressive Design-Build (PDB) project delivery approach. Using the PDB project delivery method, the successful Proposer (PDB Team) will provide design and construction services for the Project in two phases.

- **Preconstruction Phase:** The City will issue a contract (PDB Agreement) with the PDB Team to provide Preconstruction Phase services for the development of the design for the Project. During this phase, the PDB Team will advance the design to approximately 60 percent completion and present a construction schedule and an open book Guaranteed Maximum Price (GMP) to the City. The

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GMP will include the cost of the Construction Phase work through commissioning and start-up, general conditions pricing, overhead, and profit.

- **Construction Phase:** Should the City and PDB Team agree on the GMP, the Construction Phase services will be authorized and initiated by an amendment to the PDB Agreement following City Council approval. The PDB Team will procure all subcontractors and vendors, and will be responsible for the Project's construction, startup, commissioning, operator training, performance testing, and warranty services as will be described in the RFP and PDB Agreement. Should the City and the PDB Team be unable to agree on a price for the Construction Phase services, the City reserves the right to terminate the PDB Agreement and begin negotiations with another PDB Team or complete the design and prepare construction documents for public bidding of the Project.

The Draft PDB Agreement is included as Attachment C to this RFP.

C. ELIGIBILITY

The following firms have been deemed eligible to submit Proposals in accordance with the process described in the RFQ.

- 1.
- 2.
- 3.

II. PROJECT AND SERVICES DESCRIPTION

A. PROJECT DESCRIPTION

A description of the Project was provided in the RFQ which included the *Sidestream Treatment and UV Rehabilitation Preliminary Design Report* prepared by Carollo Engineers.

Additional information has been provided in Attachment A to this RFP.

B. SERVICES

The successful PDB Team will provide integrated design, construction, and other services as described in Section III and Attachment B to this RFP.

C. DBE GOAL

There is no DBE goal for this project.

III. SCOPE OF SERVICES

A detailed Draft Scope of PDB Services is included as Attachment B to this RFP. The following summary of the scope of services is not inclusive and is only intended to be used as an indication of the minimum services to be provided. It is the City's expectation

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that the PDB Team shall include in their Proposal (see Section (V) (A) (4) of this RFP) all work necessary for the completion of the Preconstruction Phase Services and no future amendments to a contract would be required.

In general, the successful PDB Team will provide the following services:

- **Design** - Preparation of all design drawings, specifications, and all other necessary design-related work products required to construct the Project in compliance with all permit requirements and all contract documents. Anticipated design-related activities include:
 - » Designing all Project improvements and necessary interconnections.
 - » Identifying opportunities for construction and operational efficiencies and incorporating them into the design.
 - » Complying with applicable local and state design review processes.
 - » Securing all regulatory approvals for Project facilities design and pre-construction activities.
- **Permitting** - Application, acquisition, and maintenance of various governmental approvals required for the Project. The City will provide reasonable assistance to the PDB Team in connection with such obligation; however, such assistance will be limited in the manner set forth in the draft PDB Agreement.
- **Construction** - Construction of the Project facilities including, amongst others, procuring equipment and subcontractors, securing necessary permits, constructing the Project facilities, conducting startup, commissioning and performance testing, etc. Anticipated construction-related activities include:
 - » Securing all permitting and regulatory approvals required for construction.
 - » Constructing the Project facilities in accordance with all contract documents.
 - » Complying with all City, County, and State of California labor and wage requirements.
 - » Complying with all City, County, State, and Federal permit requirements.
 - » Completing all required Project commissioning activities, including start-up and acceptance testing.
 - » Preparing an operations and maintenance manual.
 - » Providing training to City operations and maintenance personnel.

IV. MATERIALS FURNISHED BY CITY

All software, data, reports, surveys, drawings, and other documents furnished to the PDB Team by City for the PDB Team's use in the performance of services shall be made available only for use in performing the assignment and shall remain the property of City. All such materials shall be returned to City upon completion of services, termination of the Agreement, or other such time as City may determine.

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V. PROPOSAL INSTRUCTIONS

Proposals must be submitted electronically in searchable PDF format and will be accepted until 5:00 p.m., Pacific Time, on the Proposal Due Date identified in Section X of this RFP.

Electronic submittals shall be sent via email to the following:

Kyzen Nicolas
Associate Engineer
City of Manteca – Engineering Department
1001 West Center Street, Suite E
Manteca, CA 95337
knicolas@manteca.gov

All Proposals received after the deadline may be rejected. No extensions will be granted.

Proposers shall include the following information in their Proposals in the order indicated in Subsection A below:

A. Proposal Content:

1. Transmittal Letter

Proposers must submit a transmittal letter on the Proposer's letterhead and signed by a representative of the Proposer who is authorized to sign such material and submit a Proposal. The transmittal letter may include information deemed relevant by the Proposer. If Proposer is a joint venture, the letter must include a joint and several liability statement, and the letter must be signed by an authorized representative for each member of the joint venture.

2. Proposal Section 1: Updates to Statement of Qualifications

Proposal Section 1 shall include a narrative, no longer than five pages that summarizes the Proposer's project team structure, technical qualifications and experience that were submitted in the Proposer's Statement of Qualifications (SOQ) submitted on May 20, 2025. ***Beyond this summary, Proposers are not required to resubmit information that was provided in their SOQ unless indicated below.***

The Proposer shall affirm the submitted SOQ information. If any part of the submitted SOQ information has materially changed, or if it is expected to change prior to or during the execution of the PDB Agreement, Proposer shall include a detailed listing by SOQ section, or state that there are no changes. ***This submittal requirement applies to ALL SOQ sections, including Appendices.***

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Proposers are reminded that each Proposer was qualified as a complete team, based on the contents of the Proposers SOQ submittal. The City reserves the right to reject any material changes to the information provided in the SOQ, including but not limited to:

- Respondent profile (SOQ Part 2).
- Project team organization and structure (SOQ Part 3, Section A).
- Project team Key Personnel (SOQ Part 3, Section B).
- Relevant Project Experience (SOQ Part 4).
- Financial information (SOQ Appendix B).

In Proposal Section 1, Proposers may also provide additional (new) information to augment their SOQ submittal. Such information shall be categorized by SOQ submittal section (Parts 1 through 4) and contain all information requested by the RFQ for that particular section/subsection.

3. Proposal Section 2: Project Approach

Proposal Section 2 shall include a description of the Proposer's approach for managing and performing its services during the Project's Preconstruction and Construction Phases. The Project approach should include the following items:

- A discussion of how a collaborative relationship between the PDB Team and the City would be established during Preconstruction Phase development, scheduling, cost estimating and risk management, and the specific communications approach and protocol that will be established and followed.
- A discussion of how the design and construction processes will interface (including how constructability issues, construction document packaging, value engineering and risk issues will be addressed).
- A discussion of how decisions will be made regarding the PDB Team's self-performance of Construction Phase Work vs. utilization of subcontractors and the benefits to the City of the approach.
- A description of the process for developing the GMP proposal at the 60 percent design completion (defined by the City), including the PDB Team's approach to establishing contingencies.
- A description of the process for developing early equipment and/or construction package GMPs.
- Identification of the key Project risk factors and the approach for mitigation.
- A narrative on the approach to Project safety.
- A narrative on the approach to delivering a quality project.

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- A discussion of the specific approach to meeting schedule(s) as well as approaches to mitigate schedule slippage.
- A discussion of the PDB Team's approach to GMP adherence during the Construction Phase.

4. Proposal Section 3: Preconstruction Phase Detailed Scope of Services and Baseline Preconstruction Phase Schedule

Section 3 of the Proposal shall include a Detailed Scope of Services for the Preconstruction Phase Services based on the minimum scope of work requirements provided in Attachment B (Scope of PDB Services) of this RFP. In addition to expanding on the information provided in Attachment B, the Detailed Scope of Services should clearly identify any additional and/or optional task(s), deliverables, and unique approaches that the Proposer believes will provide benefit or value to the City.

Section 3 of the Proposal shall also include:

- A table that identifies all deliverables to be prepared under the Detailed Scope of Services and any assumptions regarding level of effort (e.g., number/duration of meetings, number of drafts of deliverables, etc.).
- A Baseline Preconstruction Phase Services Schedule that identifies the sequencing and duration of the tasks contained in the Detailed Scope of Services.

***Note:** Using the task sequencing and duration information provided in the Baseline Preconstruction Phase Services Schedule as well as the final Preconstruction Phase Services scope of work, the Preconstruction Phase Services Schedule will be developed in coordination with the City following selection of the PDB Team. See Attachment B (Scope of PDB Services).*

5. Proposal Appendix A: Fee Proposal

The Fee Proposal consists entirely of the Fee Proposal Form provided as Attachment D to this RFP and Proposer-provided attachments (see items 5 and 6 below).

The Fee Proposal shall be submitted along with, but as a separate file, the Proposal. The Fee Proposal file name shall be clearly marked with the following:

- *Progressive Design-Build Services – Sidestream and UV Rehabilitation – Fee Proposal [PROPOSER NAME]*

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The Fee Proposal consists of the following six components:

1. The Preconstruction Phase Services Fee is the not-to-exceed amount that the PDB Team proposes as its maximum compensation for completing the Preconstruction Phase Services as presented in Proposal Part 3.
2. The Construction Phase Services Fee Percentage is the proposed maximum percentage that will be used to determine the fixed amount that will be included in the GMP portion of the Construction Phase Work as total compensation for profit and overhead.
3. The Construction Phase Services Subcontractor Mark-up is the percentage of the cost of the Construction Phase Services that the PDB Team proposes to charge for that portion of the Construction Phase Work provided by subcontractors to the PDB Team.
The Construction Phase Services Fee Percentage (#2 above) is not applied to subcontractor-performed work.
4. The Construction Phase Services Major Equipment Mark-up is the percentage of the cost of the Major Equipment portion of the Construction Phase Work that the PDB Team proposes to charge.
The Construction Phase Services Fee Percentage (#2 above) is not applied to the Major Equipment portion of the Work.
5. Preconstruction Phase Personnel Rates and Prices are the hourly rates and prices that shall apply for all personnel who will perform Preconstruction Phase Services, including Key Personnel, Subcontractors, and others. (Proposers shall provide this information as an attachment to the completed Fee Proposal Form.)
6. Preconstruction Phase Other Direct Costs are the rates and prices that shall apply for all non-labor costs incurred during the execution of the Preconstruction Phase Services. (Proposers shall provide this information as an attachment to the completed Fee Proposal Form.)

B. PDB Agreement:

A draft of the PDB Agreement is included in Attachment C to this RFP and will be the basis for the contract between City and PDB Team.

Insurance requirements for professional services is included in Attachment D to this RFP.

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C. Proposal Format:

Proposals should not exceed 50 (8 ½" x 11") pages single-sided. Up to 5 pages of this limit may utilize 11" x 17" format. Proposals shall not include any unnecessarily elaborate or promotional material. Page limit does not include the outside cover, section dividers, cover letters and Proposal Appendix A (Fee Proposal). Proposals that do not contain the required information identified in Section V (A) and (C) may be rejected.

D. Changes:

At any time during the procurement process, if a firm makes any changes to proposed Key personnel or subconsultants; they must notify the City in writing of those proposed changes. The City reserves the right to accept or reject such proposed changes or to revise the evaluation scoring to reflect the proposed staffing changes.

E. Appendices:

Information considered being pertinent to the Project and which has not been specifically solicited in any of the aforementioned sections may be placed included in additional appendices to the Proposal and not subject to the page limit restrictions identified in Subsection C above. PDB Teams are cautioned, however, that this does not constitute an invitation to submit large amounts of extraneous materials; appendices should be relevant and brief.

VI. ACCEPTANCE OF PROPOSALS

The City reserves the right to accept or reject any and all proposals, or any item or part thereof, or to waive any informalities or irregularities in proposals. The City reserves the right to withdraw or cancel this RFP at any time without prior notice and the City makes no representation that any contract will be awarded to any firm responding to this RFP. The City reserves the right to re-issue a new RFP for the same or similar services. The City reserves the right to postpone proposal openings for its own convenience. Proposals received by the City are public information and must be made available to any person upon request. Submitted proposals are not to be copyrighted.

VII. PROPOSAL EVALUATION AND SELECTION

A. General:

The Proposals will be reviewed and evaluated by the City's selection committee (with assistance provided by outside advisors, if desired by City) according to the requirements and criteria outlined in this Section VII. During the proposal evaluation process, City may submit written questions or requests for clarification to one or more Proposers regarding its Proposal or related matters. A Proposer's failure to respond in a timely manner to any such questions or requests may be grounds for elimination of

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the Proposer from further consideration. In addition, the City may require that all or a limited number of Proposers participate in interviews.

B. Responsiveness and Price Reasonableness:

Each Proposal will be reviewed to determine whether it is responsive to the RFP based on the submittal requirements presented in Section V of this RFP. Failure to comply with the requirements of this RFP may result in rejection of the Proposal as non-responsive. At its sole discretion, however, the selection committee may waive any such failure to meet a requirement of this RFP and may request clarification or additional information to remedy a deficiency.

Each component of the Fee Proposal will be evaluated on a pass/fail basis for price reasonableness. With respect to the Preconstruction Phase Services Fee, the analysis will take into consideration the Detailed Scope of Services and the Preconstruction Phase Personnel Rates and Other Direct Costs in the Fee Proposal Form. The City may disqualify any Proposer that submits a Fee Proposal component that the City determines is unreasonable or unrealistic.

C. Evaluation Criteria:

The selection committee will evaluate and rank those Proposals determined responsive per Subsection B above by applying weighted evaluation criteria, as set forth in the table below.

Criterion	SOQ/Proposal Section	Weighting	Max Point Score
Project Team	SOQ Part 3	25%	250
Project Experience	SOQ Part 4	20%	200
Project Approach	Proposal Section 2	25%	250
Preconstruction Phase Services Detailed Scope of Services and Baseline Preconstruction Phase Schedule	Proposal Section 3	20%	200
Construction Phase Services Fee Percentage	Fee Proposal (Proposal Appendix A)	10%	100

In ranking the Proposals, the selection committee will use a 1000-point scale whereby the maximum points awarded for each of the evaluation criteria will be based on the percentage weight set forth above.

For the purposes of evaluating the Construction Phase Services Fee Percentage component of the Fee Proposal, the Proposer that submits a Fee Proposal with the lowest Construction Phase Services Fee Percentage will receive the maximum score for the criterion of 100.

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For each Construction Phase Services Fee Percentage component of the Fee Proposal with a higher value, the score will be calculated based upon the following formula:

$$= \left(1 - \frac{\text{Proposer's Fee Percentage Proposal Value} - \text{Lowest Fee Percentage Proposal Value}}{\text{Lowest Fee Percentage Proposal Value}} \right) \times 100$$

Note: *With the exception of the Construction Phase Services Fee Percentage, the information provided in the Fee Proposal will not be considered in the Proposal scoring process but will be evaluated for price reasonableness as described in Section VII (B). Such components will be subject to negotiation as provided in this RFP and the PDB Agreement.*

D. Shortlisting and Interviews:

Following completion of the evaluation and scoring process described in Subsection C above, the City will invite the 3 highest ranked Proposers to participate in interviews to present the key points of their Proposals and to answer questions of the selection committee. While the interviews will not be separately scored, the selection committee will have the opportunity to adjust the Proposer point assignments based on the Proposers' interview performance, particularly with respect to the question and answer period.

E. Selection:

After completion of the process described in Subsections C and D above, the City will notify Proposers of the rankings.

VIII. NEGOTIATIONS AND ENGAGEMENT

The City will enter into negotiations with the top-ranked Proposer. If negotiations with the top-ranked Proposer are not successful, the City will negotiate with the next highest-ranked Proposer (and so on for lower-ranked Proposers until either a Contract is reached or negotiations with all ranked Proposers end).

IX. CONFLICT OF INTEREST

The selected PDB Team will not be prevented from participating in future projects to the extent that no direct conflict of interest exists at the time. PDB Team's responsible for a project's design may not participate in construction management/construction inspection of the project. The determination of a conflict of interest, direct or incidental, shall be at the sole discretion of City.

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X. SCHEDULE FOR PDB TEAM SELECTION

The following is a tentative schedule and is subject to change:

Issue Request for Proposals	[Date]
Deadline to Request Clarifications/Questions	[Date]
Q&A and/or Addenda Publication	[Date]
Proposal Due Date	[Date]
Evaluation of Proposals Complete	[Date]
Proposer Interviews	[Date]
PDB Team Selection	[Date]
PDB Agreement Negotiation	[Date]
City Council Approval	[Date]
Notice to Proceed	[Date]

XI. COMMUNICATIONS WITH CITY CONTACT

Kyzen Nicolas will act as the City Contact and shall administer the RFP process. All communications shall be submitted by email and shall specifically reference this RFP. All communications should be directed to the City Contact as follows:

Kyzen Nicolas
Associate Engineer
knicolas@manteca.gov

Proposers may not rely on any communications from the City Contact or any other individual unless it is provided in writing in the form of an addendum to this RFP. No contact with City staff or any public official concerning the Project during the procurement process outside of any pre-proposal meeting is allowed. City may in, its sole discretion, disqualify from this procurement any Proposer that violates these rules of contact.

All related questions and answers and any addenda will be published on the City website:

<https://www.manteca.gov/business/request-for-proposals>

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ATTACHMENT A **PROJECT REQUIREMENTS**

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PROJECT REQUIREMENTS

The purpose of this document is to provide Technical Requirements for the Manteca WQCF Sidestream Treatment and UV Rehabilitation Project (Project) Request for Proposals. The DB Entity is responsible for providing final design documents for the Project including sealing and signing the final design by California professionally licensed engineers.

I. INTRODUCTION

The project consists of two main components, ultraviolet (UV) disinfection facility improvements and a new sidestream treatment facility. The UV improvements generally consist of constructing a new UV facility to replace the current facility, installing new influent and effluent piping, altering the effluent pump station and existing UV facility, revisions to the flow meter vault and influent piping, and electrical and instrumentation equipment. The sidestream treatment facility generally consists of intercepting and diverting centrate flows from the existing centrifuges, constructing new equalization (EQ) basins and reactors, a blower and electrical/control building, and modifications to the electrical feed.

II. BACKGROUND

A. UV FACILITY

The existing UV facility consists of an inlet basin, two UV channels, and a wet well with an effluent pump station. Electrical room containers rest over enclosed spaces on each side of the channels, powering each channel independently. The system cables are fed through the enclosed space to the UV channels via cable trays and conduits. The master control panel is located in the southern electrical container. The facility is electrically fed from the adjacent effluent motor control center (MCC)/generator building. A bridge crane spans the entire structure, allowing removal of UV banks/modules and pumps.

The existing UV disinfection system was installed in 2007 and is approaching the end of its useful life. Operations staff have noted differences in performance between the two channels with no logical explanation. The UV manufacturer, Wedeco (a Xylem brand), has assisted the City in investigating the differences, but has not been able to determine a reason for the varied performance. The existing south channel has had more coliform hits necessitating increasing the UV dose setpoint to over 200 millijoules per square centimeter (mJ/cm²), using significantly more energy than called for in the design to achieve the permitted disinfection levels. City staff have indicated that they lack confidence in the reliability of this channel and use the north channel as the duty channel.

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Several UV manufacturers were evaluated as part of the project and a recommendation was made for implementation of the Trojan UVSigna 2-Row system. This system was recommended due to lower capital, operations and maintenance, and life-cycle costs, as well as ease of operation and maintenance.

B. SIDESTREAM TREATMENT

The sidestream refers to the liquid (centrate) separated from the biosolids during the dewatering process. A significant amount of nutrient load can be found in the sidestream, particularly nitrogen, contributing about 15 to 20 percent of the influent load but typically only around 1 percent of the influent flow. The high nutrient load sidestream is typically returned to the head of the facility, therefore increasing the nutrient load on the mainstream liquid treatment. Capturing and treating the nutrient rich sidestream has proven to be a more efficient and cost-effective way to reduce the overall nutrient load on the system compared to the mainstream conventional treatment.

Several treatment technologies were evaluated as part of the project and a recommendation was made for implementation of the ANITA™ Mox process by Veolia. ANITA™ Mox process was recommended due to less process equipment, simpler controls, and being less susceptible to losing biomass through washout events. Based on discussions with plant staff, two parallel sidestream treatment reactors and EQ basins are desired to provide additional flexibility for operations and equipment maintenance.

III. PROJECT COMPONENTS AND DESIGN CRITERIA

A. UV FACILITY

This section discusses the critical parameters used to size a replacement UV disinfection system, including flow, ultraviolet transmittance (UVT), UV dose, UV equipment design factors (quartz sleeve fouling and end of lamp life), and redundancy. Trojan's most recent proposal is included as Appendix A to this attachment.

Table A.1 Replacement UV Disinfection Design Criteria

Description	Trojan UVSigna 2-Row
Design Parameter	
Peak Design Flow Rate (mgd)	31.08
Average Day Flow Rate (mgd)	9.87
Design UVT (percent)	60
Average UVT (percent)	65
TSS (mg/L)	< 5

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Description	Trojan UVSigna 2-Row
Quartz Sleeve Fouling Factor	0.94
End of Lamp Life Factor	0.86
MS2 RED (mJ/cm ²), per 2012 NWRI <i>UV Guidelines</i>	102.0
Permit Limit	
Total Coliform, 7-day median	2.2 MPN/100 mL
Total Coliform, more than once in any 30-day period	23 MPN/100 mL
Total Coliform, at any time	240 MPN/100 mL
Configuration	
Number of Channels	3
Number of Duty Banks/Channel	6
Number of Standby Banks/Channel	1
Total Number of Banks/Channel	7
Number of Modules/Bank	1
Number of Lamps/Module	22
Total Number of Lamps	462
Number of UV Sensors	21
Number of Power Distribution Centers	9
Number of Master Control Panels	1
Number of Remote Local Operator Interface Panels	1
Total Power Consumption (kW)	501.8
Number of Lamps Operating at Average Conditions ⁽¹⁾	110
Power Consumption at Average Conditions (kW) ⁽¹⁾	109.0
Headloss per Channel at Design Flow (inches)	2.2
Headloss per Channel at Design Flow x 1.20 (inches)	2.9

Notes:

kW – kilowatts; mgd – million gallons per day; mL – milliliter; MPN – most probable number; RED – Reduction Equivalent Dose; TSS – total suspended solids.

(1) Average Conditions are defined as a flow rate of 9.87 mgd and a UV transmittance of 65 percent and include the quartz sleeve fouling and end of lamp life factors.

Channel covers should be designed to minimize the number of covers requiring removal to service the UV equipment. The UV channel and UV cable trench should be under aluminum planks spanning the entire channel. This allows the cable trench and channel to be exposed by removing a single plank. Separate covers for the cable trench are not acceptable.

New UV effluent finger weirs will be provided to meet the below design criteria and maintain a constant water level and submergence of the UV banks. The design weir crest length is 43 feet, which provides 3 inches of head over the weir at a flow of 11.5 mgd per UV channel (allows for an additional 11 percent of flow per channel to minimize channel cycling). Baffle plates will be required upstream

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of the UV channels to condition the flow through each channel. Carollo will perform a CFD analysis during design to confirm the location and design of the baffle plates.

Table A.2 Hydraulic Design Criteria

Criteria	Value	Units
Peak Flow	31.08	mgd
Free-Discharge Downstream of UV Effluent Weirs	5	inches
Head Upstream of UV Effluent Weirs	3	inches
Design Weir Crest Length (Per Channel)	43	feet
Headloss Across UV Banks (Total)	2.2	inches
Headloss from Inlet Baffle Plate	2.0	inches

B. SIDESTREAM TREATMENT

The centrate from the three centrifuges shall be diverted from the plant drain system and routed to new sidestream treatment facilities. The centrate “slop” (solids wasted to drain during centrifuge startup operations) shall be diverted away from the sidestream facilities to not add additional solids load to the process. Include one or two EQ basins and two reactor trains. Each reactor will include two cylindrical screen assemblies, medium bubble aeration system, and a mixer. A new process control building is needed to house dedicated process aeration blowers and electrical and controls equipment. Considerations for ancillary systems are discussed below. Table A.3 shows the design criteria for the process. Veolia’s most recent proposal is included as Appendix B to this attachment for reference.

Table A.3 Design Criteria

Parameter	Value
Number of Process Trains	2
Flow, mgd	0.145
NH ₃ Load, lb/d	965
Minimum EQ Basin hydraulic retention time, hours	8
Maximum Reactor Media Fill, %	40%
Minimum NH ₃ Removal, %	80%
Minimum TIN Removal, %	70%
Minimum/maximum influent temperature, degrees Celsius	30/35
Estimated Additional Alkalinity Requirement, lb/d	864

Notes:

lb/d – pounds per day; NH₃ – ammonia; TIN – total inorganic nitrogen.

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Plant staff shall have the option to route treated effluent either to the head of the plant or to the front of one or both of the aeration basins, downstream of primary clarifiers. Anammox bacteria sloughed off the media in the sidestream reactors can be utilized in the bioreactors in the mainstream to further enhance nitrogen removal.

Centrate temperature collected between December 2024 and January 2025 were typically between 26 and 27 degrees Celsius (C) with occasional values as low as 23 or 24 degrees C. The WQCF has an uncovered sludge holding tank between digestion and dewatering that provides about one day of sludge storage that results in significant heat loss. The design shall maintain temperature feed of at least 30 degrees C. Options to maintain design feed temperatures may include covering and insulating the sludge feed tank, adding a dedicated heat exchanger to new centrate facilities, or adding submerged hot water piping to the reactors fed from existing heat exchangers for the digesters.

The drinking water source for the City changes seasonally, which affects the alkalinity concentrations in the wastewater. Alkalinity is consumed as part of the process and based on historical data; an alkalinity feed system is needed to meet the required NH_3 removal. The PDR evaluated different alkalinity feed systems. Caustic soda (sodium hydroxide) was eliminated from consideration because it adds sodium, which causes concern with discharge compliance requirements. Additionally, magnesium hydroxide was eliminated from consideration because it adds magnesium, which can exacerbate struvite maintenance issues at the plant. Therefore, lime (calcium oxide) is recommended for alkalinity feed. The City prefers hydrated lime over slaked lime because of the additional labor operations and maintenance needed to hydrate slaked lime into a reliable usable form.

Additionally, the City currently doses 20 to 30 mg/L of caustic in the influent for supplemental alkalinity into the mainstream treatment. There is a separate caustic dosing location in the effluent to increase the pH if it is dropping near the compliance threshold. within compliance. The project shall include a new alkalinity feed system for all plant uses including the new sidestream alkalinity feed system.

IV. ELECTRICAL, INSTRUMENTATION, AND CONTROL

A. UV FACILITY

The existing UV equipment is a Wedeco TAK55 system comprised of two UV channels, each with a container-style electrical building. Each container is supplied from a dedicated 500 kilovolt-amperes (kVA), 480-400/231V outdoor,

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dry type transformer. Each transformer is supplied from the existing switchboard DSBE-08-01 (located in the effluent MCC building). Switchboard DSBE-08-01 is rated 277/480V, 3ph, 4W, 2500A. The existing switchboard DSBE-08-01 is connected to a standby generator with a rating of 1875 kVA/1500 kW. While the main switchboard is four-wire, record drawings indicate the standby power switchboard GSBE-08-01 is a three-wire switchboard. There is an automatic transfer switch shown on the Nolte single line diagram (shown in DSBE-08-01) which supplies power to the existing 500 kVA UV transformers when utility power is lost. A field investigation will be required to determine how the system was installed with respect to the neutral when the system is operating on the standby power source. If the neutral becomes disconnected when the system is operating from the standby generator source, then new UV transformers will be supplied with a three-wire, 480V connection to DSBE-08-01.

The existing upstream power distribution equipment and standby generator equipment do not need to be upgraded, as there is sufficient capacity. City staff also noted there have not been any power distribution capacity issues for the present overall UV/effluent pumping configuration. The DB Entity will be required to design all power supply and distribution improvements.

The existing UV/effluent building PLC is Schneider Quantum technology which is now obsolete. This PLC panel shall be upgraded to a modern Schneider platform (i.e., Modicon M340 or M580 platform).

Provide three separate dedicated main power supply feeders from the existing switchboard DSBE-08-01 to UV equipment installed within each of the three new UV channels. Provide three field-mounted panelboards (one for each new UV channel) which will distribute power to each channel's Power Distribution Centers, Hydraulic System Centers, and inlet gate. Note that the upstream switchboard is 3ph, 4W; however the record drawings indicate the upstream generator nameplate is 3ph, 3W, so there may need to be a transformer between the upstream switchboard and each UV area 480V panelboard when operating on backup power.

A single electrical building will feed the UV system and will require a dedicated 480V, 225A supply feeder (which is the equivalent of 150 kVA). This would be for heating, ventilation, and air conditioning equipment, lighting, etc. to support the building. Per the NEC, this will require one set of 3-#4/0, 1#4GND XHHW-2 copper conductors in a 4-inch conduit. Redundant six-pair fiber optic cables in 2-inch conduit will communicate between the UV/effluent MCC building and the new UV electrical building.

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Table A.4 Electrical Summary

Description	Trojan UVSigna (2-Row)
Total Connected Load (kVA)	532.5
Channel Panelboard Demand (kVA)	177.5
Feeder Size (Amps)	268
Conductors Needed	4 – 300KCMil 1 - #4GND XHHW-2

DB Entity shall coordinate with the City and incorporate the City's instrumentation labeling standards for all instruments.

B. SIDESTREAM TREATMENT

The dewatering building is currently the only facility at the plant where the power is not tied in to backup power. Upon preliminary investigation, it appears there should be sufficient spare capacity in the dewatering building to connect new loads for this project. As part of this project, the dewatering building shall be rewired to be on backup power so plant staff can drain and clean out equipment during a power outage. Plant staff do not intend to utilize backup power to perform dewatering operations. However, the sidestream treatment process shall remain operational during a power outage so as to not disrupt the biological process or the plant's ability to meet effluent treatment objectives. This work requires rerouting wiring from a switchboard in the influent pump station electrical building to upstream of the transfer switch. It is assumed the project will not increase the generator capacity and that the existing backup power is sufficient for the plant needs.

V. GEOTECHNICAL CRITERIA

Shallow groundwater approximately 20 feet below surface, and liquifiable soils have been identified during previous designs. Liquefaction could result in significant damage to the facilities and yard piping during a seismic event. The DB Entity shall evaluate liquefaction where new facilities are proposed and where liquefaction hazards are found, design mitigation measures as required to protect the system. Expansion and flexible connections may be needed on yard piping to prevent damage to the pipeline in a liquefaction event. For reference a previous geotechnical evaluation at the solids handling facility is included as Appendix C.

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VI. WORK RESTRICTIONS AND CONSTRAINTS

The DB Entity must comply with the following work restrictions and constraints.

- Pothole existing utilities to validate design.
- Maintain existing operations through commissioning.
 - Full UV capacity is required during wet weather months. Shutdowns from October to April shall be limited to 8 hours and shall not occur 48 hours before or during wet weather events.
- Maintain City personnel access to existing facilities during construction.

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APPENDIX A

TROJAN UV PROPOSAL

PROPOSAL FOR MANTECA, CALIFORNIA
QUOTE: 247166
10/16/2024



TrojanUVSignaTM incorporates revolutionary innovations, including TrojanUV Solo LampTM technology, to reduce the total cost of ownership and drastically simplify operation and maintenance. It is the ideal solution for facilities wanting to upgrade their disinfection system easily and cost-effectively.

We are pleased to provide the enclosed TrojanUVSigna proposal. Please do not hesitate to contact us if you have any questions regarding this proposal. We look forward to working with you.

With best regards,

Jordan Fournier
Regional Manager
Trojan Technologies
jfournier@trojantechnologies.com
519-619-7352

DESIGN CRITERIA

Peak Design Flow:	31.08 MGD
Design UV Transmittance:	60% (minimum)
Total Suspended Solids:	5 mg/l (Maximum, grab sample)
Disinfection Limit:	2.20 Total Coliform per 100 ml, 7 day Median, 23 Total Coliform per 100 ml more than once in any 30-day period.
Dose:	102 mJ/cm² MS2 RED per 2012 NWRI UV Guidelines
Redundancy:	1 redundant bank per channel

DESIGN SUMMARY

CHANNEL (Refer to Trojan layout drawing for complete details)	
Number of Channels:	3
Minimum Channel Length Required:	50
Channel Width at UV Banks:	5.1
Channel Depth Recommended:	7.8
UV BANKS	
Number of Banks per Channel:	7 (6 duty, 1 redundant)
Number of Lamps per Bank:	22
Total Number of UV Lamps:	462 (Including 66 Redundant Lamps)
Maximum Duty Power Draw:	417 kW
UV PANELS	
Power Distribution Center Quantity:	9
Hydraulic System Center Quantity:	6
System Control Center Quantity:	1
ANCILLARY EQUIPMENT	
Level Controller Quantity and Type:	3 Weir Troughs
Integral Bank Walls:	Included
On-line UVT Monitoring:	Hach UVAS sc Sensor
Other Equipment:	
ELECTRICAL REQUIREMENTS	
- Each Power Distribution Center requires an electrical supply of one (1) 480/277V 60Hz, 3 Phase, 4 Wire + Ground, 71.2 kVA - Electrical supply for Hydraulic System Center will be (1) 480V 60Hz, 3 Phase, 3 Wire + Ground, 2.5 kVA - Electrical supply for System Control Center will be (1) 120V 60Hz, 1 Phase, 2 Wire + Ground, 1.8 kVA - The On-line UVT monitor requires (1) 120 Volts, 1 phase, 2 wire + ground, 1A - Electrical disconnects are not included in this proposal. Refer to local electrical codes	

COMMERCIAL INFORMATION

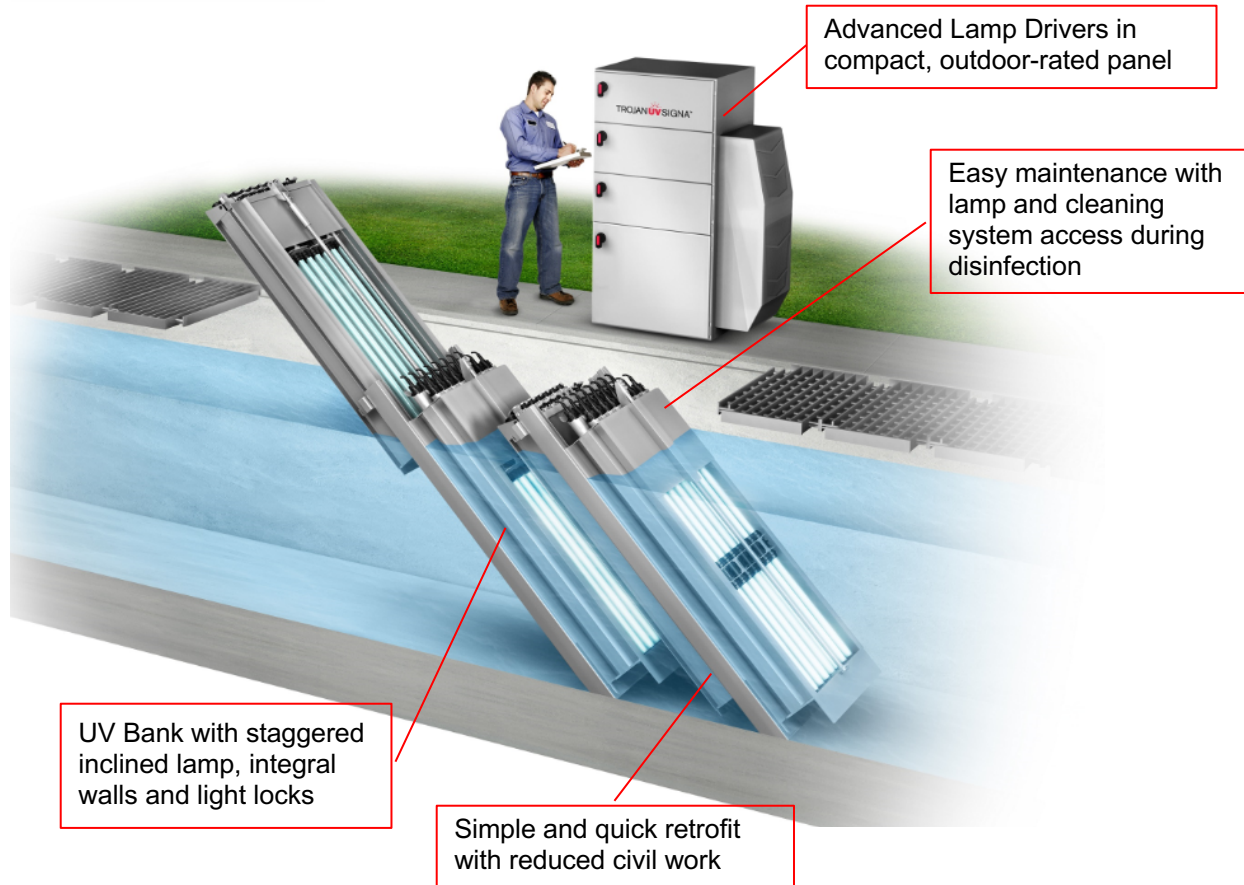
Total Capital Cost: \$ 3,050,500 (USD)

This price excludes any taxes or duties that may be applicable.
Standard equipment warranties and start up by Trojan-certified technicians are included.

Easy and Cost-Effective Maintenance

- The 1000 watt TrojanUV Solo Lamp combines the benefits of both low pressure and medium pressure lamps
- Fewer lamps, long lamp life and easy change-outs save time and money
- Lamp change-outs and cleaning solution replacement are done while the UV system is in the channel – minimizing downtime and simplifying maintenance
- Routine maintenance can be performed while banks are in the channel, but an Automatic Raising Mechanism (ARM) makes other tasks, such as winterization, simple, safe and easy
- Lamp plugs with LED status indicators and integral safety interlock prevent an operator from accidentally removing an energized lamp
- ActiClean WW™ chemical/mechanical cleaning system to keep sleeves clean during operation

SYSTEM OVERVIEW



Simple to Design and Install

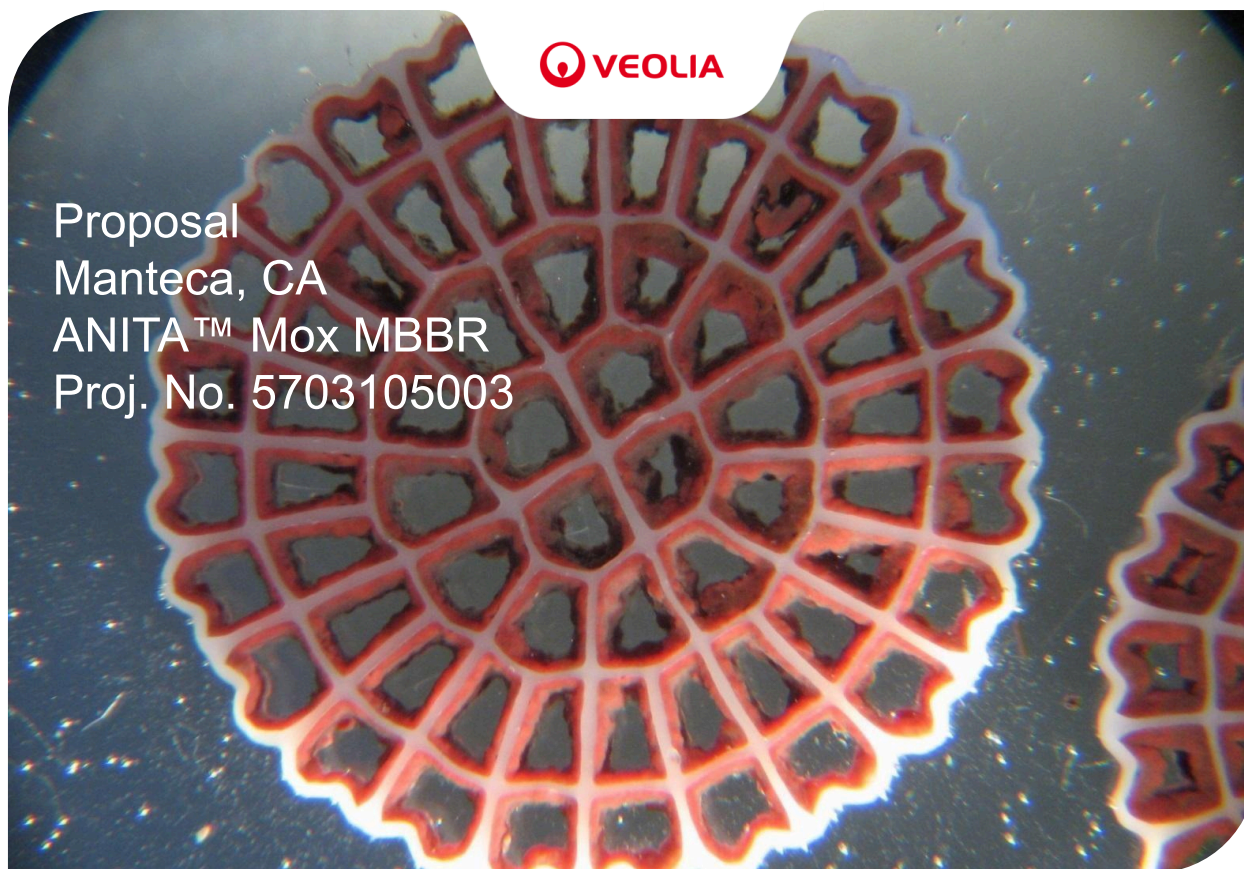
- Light locks on the UV banks control water level within the channel, reducing dependence on downstream weirs and preventing short-circuiting above the lamp arc
- UV Banks include integral reactor walls to make installation easy and prevent short circuiting at the channel walls
- Stringent tolerances on concrete channel walls are not required – making retrofits simple and cost-effective

Supported by Trojan Technologies

- Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.
- UV lamps are warranted for 15,000 hours of operation or 3 years from shipment, whichever comes first. Lamp warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.
- Trojan offers an unparalleled Lifetime Performance Guarantee. The spirit of this guarantee is simple: the Trojan equipment, as sized for the project, will meet the disinfection requirements for the life of the system.

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APPENDIX B ANITA™ MOX PROPOSAL



Proposal
Manteca, CA
ANITA™ Mox MBBR
Proj. No. 5703105003

Submitted to: John Witter, PE
Carollo Engineers

Submitted by: Sarah Spivey
Application Engineer

Date: February 18, 2025

*This document is confidential and may contain proprietary information
It is not to be disclosed to a third party without the written consent of Veolia Water Technologies.*

Veolia Water Technologies Inc.
4001 Weston Parkway
Cary, NC 27513
tel. +1 919-677-8310 | fax. +1 919-677-0082
www.veoliawatertech.com

Water Technologies

Dear John,

Veolia Water Technologies, Inc appreciates the project opportunity and is pleased to present this revised proposal for our ANITA™ Mox MBBR process for deammonification of the anaerobic digester centrate in Manteca, CA.

- Based on the new design basis, we have changed the design from a one-reactor design to a two-reactor design. Due to the increase in number of reactors, more equipment such as mixers, blowers, instrumentation and controls have been added to the scope.
- The dimensions and other details are summarized in Table 3 below. The number of trains and dimensions of each reactor can be adjusted if site specific conditions or certain engineering design goals necessitate such adjustments.
- Please also note that blowers have been included in our scope. If excess air and sufficient pressure are available from the main plant's blower station, it may be possible to tap air from the main blowers. Many of our full-scale plants get the air supply in this way.
- The current design is a greenfield design. However, if the plant has existing tanks with similar volume as the proposed reactor(s), the ANITA Mox system can potentially be retrofitted into the existing tanks. The ANITA Mox systems at James River VA, Howard County MD, South Durham NC and Denver CO are all retrofits in existing tanks.
- Some equalization volume will provide benefits to the operations of the process. The volume of equalization recommended is often dependent on the plant's dewatering schedule and flow characteristics.
- Please note that the airlift sprayers/pumps are not included in the system. Therefore, antifoam dosing may be required especially during the startup.

The system has proven to be simple, stable and robust with more than thirty full-scale projects globally and multiple pilot studies. We sincerely hope that our unique ANITA Mox technology, Veolia's unparalleled experience and excellent services discussed above and below add value to your proposal and enable you to achieve your overall project goals in this endeavor.

In summary, this unique and proven technology, together with Veolia's successful experience and vast resources will ensure the ANITA Mox process for the sidestream nitrogen removal system is designed for optimum performance and best economic value.

We appreciate the opportunity to provide this proposal to you. If you have any questions or need further information, please contact our local Representative, Simon Morris of JBI Water, or our Regional Sales Manager, Rodrigo Lara, at (503) 380-3995 (rodrigo.lara@veolia.com).

cc: Process, Sales, project file (Veolia)
Simon Morris (JBI Water)

Revision	Date	Process Eng.	Comments
0	9/10/2024	JM /JY	Initial, budgetary proposal.
1	10/10/2024	JM /JY	Water depth changed
2	02/18/2025	JM / MJ	Updated to split design flow between 2 basins.

ANITA Mox Unique Advantages

ANITA Mox provides several key differentiators for deammonification treatment:

- The media based process has been proven to be simple to operate and requires fewer specialized components than suspended/granular sludge technologies and, therefore, less maintenance and attention.
- All of Veolia's installations have demonstrated that the performance of the system is stable and less prone to process upset due to temporary fluctuations in sidestream characteristics.
- Anammox bacteria grow as a fixed biofilm on HDPE media carriers and are securely retained within the reactor by maintenance-free media retention screens. Unlike suspended growth/granular technologies, there is little risk of anammox washout, substantially improving operational simplicity and reducing maintenance and life cycle cost of the system.
- The AnoxK™ 5 media has a large protected surface area per unit volume (244 ft²/ft³) for biofilm growth, enabling a compact system design.
- The ANITA Mox system is tolerant of temporary limitations or fluctuations in pH, temperature and parameter concentrations. Therefore, the system can withstand a wide range of short-term influent variations and recovers when the conditions are corrected.
- The ANITA Mox MBBR process can tolerate higher design TSS concentrations than suspended growth systems without the need for pretreatment. This is another benefit of the anammox bacteria being securely retained on the carriers.
- The ANITA Mox System can be expanded without the need for additional construction. As flows and loads increase carriers can be incrementally added, which provides the ultimate flexibility for future system expansion.
- Carriers are manufactured from HDPE resins and are designed to last the life of the system. Veolia has MBBR installations in service for over 20 years without carrier replacement.
- Seed media is readily available from multiple US-based bio-farms for accelerated startup. In the case of systems with multiple trains, once one reactor is started up, the media in that reactor can be used as seed for the startup of other reactors.

Robustness

- The ANITA Mox system is tolerant of temporary limitations or fluctuations in pH, temperature and parameter concentrations. Therefore, the system can withstand a wide range of short-term influent variations without being upset.
 - Tolerates variability in dewatering schedules and dewatering starts/stops
 - Tolerates higher TSS and swings in TSS, does not typically require solids pretreatment.
 - Tolerates episodes of high polymer residual
 - Tolerates wide range of DO, BOD, TP, pH and other parameters
 - Tolerates episodes of high NO₂-N and ammonia residual
 - Proven by third-party robustness testing (by LA County) to be an incredibly resilient process that overcomes operational perturbations. For each of the following, LA County purposely upset the biofilm system for a 24-hour period and timed the system's recovery. In each case, ANITA Mox rebounded quickly and efficiently:

Scenario	Recovery Time
24 hour power outage	0 hr
24 hr no feed	0 hr
240 hr Excess Polymer (10x normal)	32 hr
24 hr Excess Polymer (3x normal)	8 hr
24 hr no aeration	16 hrs
24 hr over aeration (23% more)	0 hr
24 hr overfeed (2x)	16 hr

- Proven at various installations, the ANITA Mox system is able to withstand short term or even prolonged system shutdowns. The system can be placed into low-loading mode. This allows the facility to have flexibility in dewatering schedules and perform routine or even emergency maintenance to their digesters and/or dewatering equipment without significant impact to system performance.

Unparalleled ANITA Mox Expertise in Both the US and Rest of World

Veolia is a leader in providing the media based deammonification solution to the US municipal market. The Veolia US team works directly with our counterparts at Veolia Engineering and Research Institute in France and AnoxKaldnes AB in Sweden to incorporate the latest knowledge and developments in the design of the media based deammonification technology. The delivery of cutting edge and global knowledge, coupled with the robustness of the technology, has enabled us to gain the trust of our customers and resulted in rapid adoption. Veolia has a total of more than forty five (45) full scale ANITA Mox projects worldwide (including

15 projects in the US since 2014) since 2010 with more than one hundred years of combined successful operating history. The team has published numerous papers on the technology at various national and international conferences.

Strongest US Technical Support and Customer Service

The Veolia US team, has served the US municipal market for more than 25 years and is headquartered in Cary, NC. A group of more than 10 core process and project experts have each been with Veolia for more than 10 to 25 years. All these experts have been involved in the modeling, design, delivery, startup and troubleshooting of our full scale ANITA Mox projects in the US and to some extent in those of the international installations. These experts have more than 250 years of combined experience and work as a team to provide critical technical support to our customers whenever it is needed.

For services and parts, we have a customer support center and warehouse in Raleigh, NC to respond to your needs in a timely manner. Our local representative, JBI Water, can also provide immediate support and spare parts in most cases.

Strongest Financial Backing

Veolia is the world's #1 ranked waste and water treatment company, bringing not only expertise and experience, but also vast resources and financial backing that can be leveraged by your project team and the City. Veolia will guarantee process performance and is willing to support such guarantee with a process performance Guarantee Bond. A bid bond and/or payment and performance bonds can also be supplied if desired. We believe such bonds provide more value and protection to your interest.

State of the Art Digital Services Offer

The ANITA Mox process includes the use of our Hubgrade Performance Plant start-up kit, which offers many advantages during the critical period of growth and acclimation of the Anammox bacteria. With the use of a Veolia-provided temporary nitrite probe and remote PLC access provided through a highly secure OPC bridge on a separate "DMZ" network, Veolia's advanced algorithms and ANITA Mox expert input ensure that the system is fully optimized 24/7 for the proper reactor conditions. Continued use of the Hubgrade Performance Plant system for full-time optimization is also available via an additional service contract. Key benefits include:

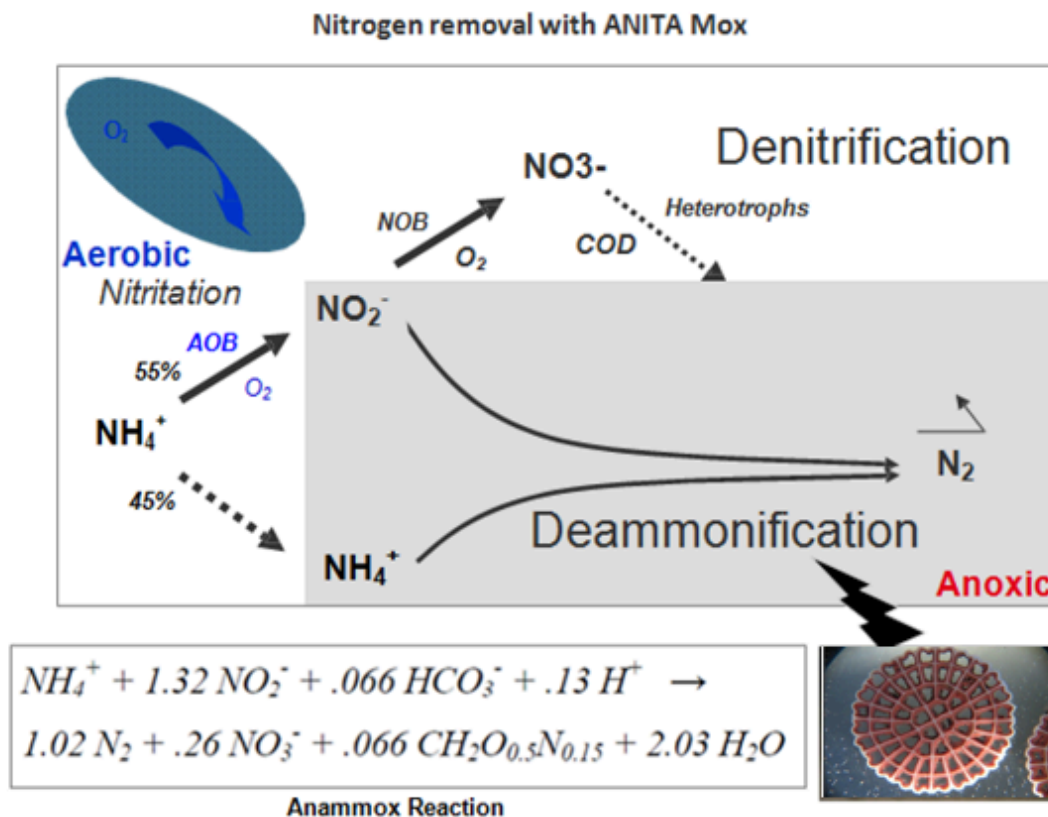
	Hubgrade Performance ANITA™Mox Start-Up Kit	+Hubgrade Performance Advanced Offer
Focus/Driver	Start-up Time Minimized Start-up Labor Minimized Sampling Minimized Optimized Conditions 24/7	Optimized Conditions 24/7 Energy Minimized

Process Description

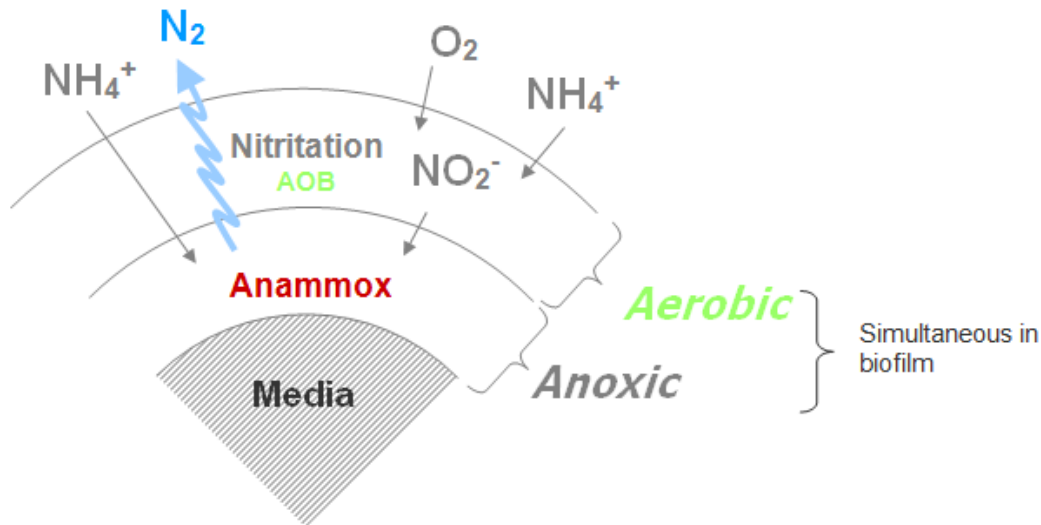
AnoxKaldnes MBBR

The ANITA™ Mox MBBR process is a single-stage nitrogen removal process based on the MBBR platform. It is a continuous-flow, non-clogging biofilm reactor containing moving “carrier elements” or media. The media flows with the water currents in the reactor and does not require backwashing or cleaning. The process is specifically designed for treatment of waste streams with high ammonia concentrations. The system can achieve ammonia removals of up to 80-90% and total nitrogen removals of up to 75-85%. The treatment method uses only 40% of the oxygen demand of conventional nitrification, and it requires no external carbon source.

The anammox biofilm (bacteria) that is critical to the deammonification process is attached to and securely protected by the surfaces of the media. The media is designed to provide a large protected surface area for the biofilm and optimal conditions for biological activity when suspended in water. Media of different shapes and sizes provide flexibility to use the most suitable type depending on wastewater characteristics, discharge standards and available volumes. In addition, a phased approach with different media fill percentage makes expansion of the ANITA Mox system much easier. More media can simply be added for future increase of flow and loads. AnoxKaldnes media is made from virgin HDPE and has a density slightly less than water.



The ANITA Mox process consists of an aerobic nitritation reaction and an anoxic ammonia oxidation (anammox) reaction. The two steps take place simultaneously in different layers of the biofilm. Nitritation occurs in the outer layer of the biofilm. Approximately 55% of the influent ammonia is oxidized to nitrite (NO_2^-). Anammox activity occurs in the inner layer. In this step, the nitrite produced and the remaining ammonia are utilized by the anammox bacteria and converted to nitrogen gas (N_2) and a small amount of nitrate (NO_3^-).



ANITA Mox minimizes the risk of anammox washout. With ANITA Mox, the retention of the anammox bacteria within the reactor is easily achieved through the retention of the AnoxKaldnes media by stainless steel media screens. This bacteria retention method is proven to be simple and effective in more than 1,000 AnoxKaldnes MBBR/IFAS systems. Unlike other anammox retention systems, this system is designed to be maintenance free and requires little attention/maintenance from the operators. Anammox retention is an important characteristic of the system, since the anammox bacteria growth rate is very slow compared to conventional wastewater bacteria growth rates. Washout of the anammox bacteria can cause serious upsets of the deammonification process and even irreversible loss of performance.

The ANITA Mox MBBR system consists of four major in-basin mechanical components, media, media retaining screens, air grids and mixers. The media, media retaining screens and air grids are designed to be maintenance-free throughout the lifetime of the system.

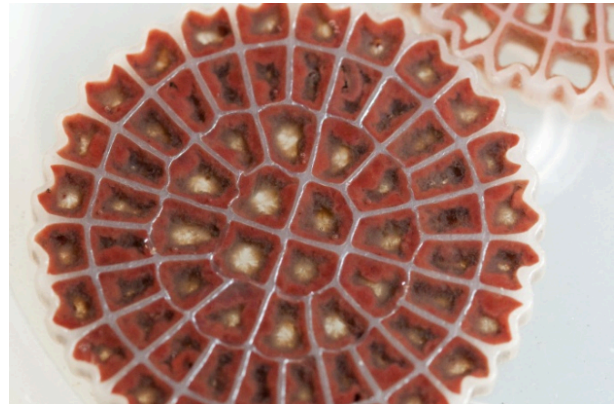
The ANITA Mox MBBR system does not require RAS/WAS pumps or recirculation pumps within the system. Moreover, it requires neither internal nor external sludge settlers because it's a biofilm system with all biofilms attached to and securely protected by the media carriers.

Another benefit of the ANITA Mox MBBR system is that it does not require the addition of micronutrients for the process to work. Unlike certain suspended growth systems that need

micronutrients for sludge conditioning or granule formation, the ANITA Mox system takes advantage of the more robust and adaptive biofilm that is more resistant to adverse influent centrate/filtrate conditions.

AnoxKaldnes ANITA™ Mox System Configuration

Veolia's scope of supply includes the AnoxKaldnes media, screen assemblies (to keep media in each reactor), medium bubble aeration grids, mixers, etc. In cases where they are needed, Veolia also provides the blowers, instrumentation and controls, SCADA, and field instruments (dissolved oxygen, nitrate, ammonia, etc.) for single-source responsibility.



Design Summary

The ANITA Mox influent design basis is summarized in Table 1. The target effluent criteria for the ANITA Mox system are listed in Table 2. The process design is summarized in Table 3.

Depending on the facility's dewatering schedule some equalization volume may provide benefits to the operations of the process.

The design assumes that the side stream entering into the proposed ANITA Mox system contains no toxic compounds and has sufficient alkalinity and that none of the equipment provided would be used in a classified area (e.g. Class 1, Division 1 or Class 1, Division 2).

Table 1: Influent Design Basis

Parameter	Units	Current	Future / Design
Flow	MGD	0.11	0.145
BOD ₅ *	mg/L	275	275
COD	mg/L	1,408	1,408
TSS	mg/L	524	524
TKN	mg/L	893	893
NH ₄ -N	mg/L	800	800
Alkalinity ^{2,3}	mg/L	2,753	2,753
Elevation ¹	ft	200	200
Min / Max Temperatures ¹	°C	30 / 35	30 / 35

1. Assumed values.

2. Based on the above design basis, the influent alkalinity is borderline sufficient to achieve 80% ammonia removal. To be safe, provision of a caustic skid is recommended just in case external alkalinity is needed, especially during the performance test period. If a slight variation in removal percentage is acceptable (say anywhere between 75% to 82%), the skid can be omitted. To achieve 85% removal, however, an estimated 480 lbs/day or 60 gal/day (at 25%) of alkalinity will be required. To achieve 90% removal, an estimated 1180 lbs/day or 140 gal/day (at 25%) of alkalinity will be required.

Table 2: Target Effluent Concentrations- 30 Day Average

Parameter	Units	Value
NH ₄ -N	-	80% removal
Total Inorganic Nitrogen	-	70% removal

* Effluent values indicate anticipated performance and do not imply guarantees.

Table 3: Process Design Summary

Parameter	Units	Current Flow	Future Flow
Number of Process Trains	-	2	
Reactor Dimensions (Each)	ft	20 L × 20 W × 21 SWD	
Reactor Volume (Each)	ft ³	8,400	
Total Volume (All Trains)	ft ³	16,800	
Recommended Freeboard	ft	2 – 3	
Media Type	-	AnoxK™5	
Fill of Biofilm Carriers	%	38	50
Media Volume (All Reactors)	ft ³	6,650	8,650
Aeration System Type	-	Medium Bubble	
Residual DO, Design	mg/L	1.5	
Estimated Process Air Requirement	SCFM	525	690
Pressure at Top of Drop Pipe*	psi	10.2	

* Does not include pressure losses between the blowers and reactor drop pipes.

Scope of Supply

Veolia is pleased to present our scope of supply which includes process engineering design, equipment procurement, and field services required for the proposed treatment system, as related to the equipment specified. The work will be performed to Veolia's high standards under the direction of a Project Manager. All matters related to the design, installation, or performance of the system shall be communicated through the Veolia representative giving the Engineer and Owner ready access to Veolia's extensive capabilities.

Process and Design

Veolia will provide process engineering and design support for the system as follows:

- Process Engineering consisting of aeration system sizing and configuration, sieve and outlet design.
- Review and approval of P&I Diagram for the AnoxKaldnes ANITA Mox portion of the process. Preliminary General Arrangement Drawings and review and approval of final General Arrangement Drawings for the process. Review of reactor drawings with respect to penetrations and dimensions, excluding structural design.
- Equipment installation instructions for all equipment supplied by Veolia.

Field Services

Veolia will furnish a Service Engineer to perform the following tasks:

- Inspect installation of key pieces of equipment during construction.
- Inspect the completed system prior to startup.
- Assist the Contractor with initial startup of the system.
- Train the Owner's staff in the proper operation and maintenance of the AnoxKaldnes ANITA Mox system.
- Test and start any Veolia - supplied control equipment, including PLC programming and SCADA systems.

Hubgrade Performance Plant - ANITA Mox Start-up Kit

The start-up kit includes software implementation and expert assistance during the start-up period. Specifically, Veolia will:

- Provide the temporary use of one (1) nitrite analyzer
- Deliver the communication software package OPC Bridge (UA client to client) software along with all functional specifications for proper implementation with the PLC/SCADA, including Watchdog interaction for safe communication
- Work with the client's systems integrator to complete implementation of the software package and verify communication to/from the Hubgrade Performance cloud server
- Implement, configure, tune and test of the Hubgrade Performance Plant features

- Provide remote expert review of system operation via the Hubgrade Performance Plant cloud platform throughout the start-up phase and completion of effluent performance tests

AnoxKaldnes ANITA™ Mox System Equipment

Mechanical Equipment Items	Qty	Description
AnoxKaldnes AnoxK™5 Media (ft ³)	See Table 3	Carrier elements are made of high density polyethylene. The total media quantity will include a fraction of seed media to help start up the system.
Cylindrical Screen Assemblies	4	Two (2) per reactor. 304L SS. 19"ø perforated plate construction terminated in custom flanges for mounting directly to the tank wall.
Medium Bubble Aeration System	2	One (1) air grid system per reactor. 304L SS including headers, lateral piping, and hardware (excluding concrete anchor bolts).
Specially Designed Mechanical Mixers	2	One (1) per ANITA Mox Reactor. Includes VFD.
Process Aeration Blowers	2 + 1	Two (2) duty plus one (1) standby. Each blower will be rated for 415 SCFM at 10.2 psig. 30 HP. Type: Rotary Lobe. All blowers operated by integrated VFDs.

Instrumentation and Controls Equipment Items	Qty	Description
PLC Control Panel	1	NEMA 12 Freestanding or Wall Mount Control Panel (For Indoor Use). ControlLogix PLC; Panelview HMI; 120V Feed.
High Level Float Switch	2	One (1) for each reactor..
Submersible Level Probe	2	One (1) for each reactor to monitor water level.
DO Probe (LDO)	2	One (1) for each reactor.
pH meter	2	One (1) pH meter for each reactor.
Thermal Mass Airflow Meter	2	One (1) for each reactor for air flow control.
Magnetic Flowmeter	2	One (1) magnetic flow meter per reactor to measure influent flow.
Ancillary Equipment (NOT INCLUDED)*	Qty	Description
Centrate Feed Pumps	2+1	One (1) duty for each reactor plus one (1) standby to feed centrate from the equalization tank. Operated by VFD.

Notes Regarding System Design and Installation

- A note on concrete specifications: For any MBBR or IFAS systems, it is sound practice to require good, quality concrete work for the process reactors. The Consulting Engineer's standard concrete specification section is typically adequate to eliminate large holes, excessive form marks, large pockets, and excessively rough areas. It is particularly important to eliminate the potential for annular space around media retention screens.

- A note on construction sequencing: It is important, particularly for IFAS installations, to have level detection and level communication systems in place and operational prior to the filling of process tanks with water and media.

Scope of Supply BY INSTALLER/PURCHASER

The scope of supply by others for the AnoxKaldnes ANITA™ Mox system should include, but is not limited to, the following items:

- All civil/site and electrical work.
- A concrete foundation for the tanks.
- Reactors to house the MBBR treatment equipment.
- All provisions for interconnecting piping.
- Unloading, storage and installation of equipment.
- Install and test all level floats, level transmitters, level alarms, and alarm communication devices prior to filling a process tank with media and water
- Centrate equalization tanks
- Cover for reactor tanks (if necessary)
- Temporary provisions for screened primary or secondary effluent during startup.
- Temporary reactor heating during startup.
- Mixer bridges and other structural modifications for the reactors.
- Video recording of any training activities.

Design Options

In addition to the proposed system as detailed herein, Veolia is able to further incorporate our process and controls expertise into wastewater treatment plants, allowing municipalities to meet stringent effluent requirements and future plant upgrades. Veolia is also able to offer our instrumentation and controls expertise to build upon the proposed system by providing a **customized plant-wide SCADA system** or designing a **Motor Control Center (MCC)**, providing clients a single source responsibility for plant controls. Please contact Veolia if the options above are of interest or to be included in the current proposed system or future upgrades. ***Please note that the design options listed above are not included in the pricing noted herein.*

Schedule

- Shop drawings will be submitted within 6-8 weeks of receipt of an executed contract by all parties.
- All equipment will be delivered within 18-28 weeks after receipt of written approval of the shop drawings.
- Installation manuals will be furnished upon delivery of equipment.
- Operation and Maintenance Manuals will be submitted within 90 days after receipt of approved shop drawings.

Pricing

The price for the AnoxKaldnes ANITA™ Mox system, as defined herein, including process and design engineering, field services, and equipment supply is:

Current Flow \$1,450,000

Future Flow \$1,520,000

Pricing is DDP to the job site. This pricing does not include any sales or use taxes. In addition, pricing is valid for thirty (30) days from the date of issue. The proposed goods may be affected by the ongoing market fluctuations impacting material and shipping costs. Veolia reserves the right to re-evaluate the Proposal price prior to order acceptance.

Please note that the above pricing is expressly contingent upon the items in this proposal and are subject to Veolia's Standard Terms of Sale detailed herein.

Veolia Standard Terms of Payment

The terms of payment are as follows:

- 10% on receipt of fully executed contract
- 15% on submittal of shop drawings
- 75% on the delivery of equipment to the site

Payment shall not be contingent upon receipt of funds by the Contractor from the Owner. There shall be no retention in payments due to Veolia. All other terms per our Standard Terms of Sale are attached.

All payment terms are net 30 days from the date of invoice. Final payment not to exceed 120 days from delivery of equipment.



Standard Terms of Sale

1. **Applicable Terms.** These terms govern the purchase and sale of the equipment and related services, if any (collectively, "Equipment"), referred to in Seller's purchase order, quotation, proposal or acknowledgment, as the case may be ("Seller's Documentation"). Whether these terms are included in an offer or an acceptance by Seller, such offer or acceptance is conditioned on Buyer's assent to these terms. Seller rejects all additional or different terms in any of Buyer's forms or documents.
2. **Payment.** Buyer shall pay Seller the full purchase price as set forth in Seller's Documentation. Unless Seller's Documentation provides otherwise, freight, storage, insurance and all taxes, duties or other governmental charges relating to the Equipment shall be paid by Buyer. If Seller is required to pay any such charges, Buyer shall immediately reimburse Seller. All payments are due within 30 days after receipt of invoice. Buyer shall be charged the lower of 1 ½% interest per month or the maximum legal rate on all amounts not received by the due date and shall pay all of Seller's reasonable costs (including attorneys' fees) of collecting amounts due but unpaid. All orders are subject to credit approval.
3. **Delivery.** Delivery of the Equipment shall be in material compliance with the schedule in Seller's Documentation. Unless Seller's Documentation provides otherwise, Delivery terms are DDP to jobsite.
4. **Ownership of Materials.** All devices, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data and other documents or information disclosed by Seller or prepared solely by Seller or Buyer or jointly by Seller and Buyer in connection with this Agreement, and all intellectual property rights therein, shall be and remain the confidential and proprietary property of Seller, whether or not patented by Seller ("Work Product"). Buyer hereby irrevocably assigns all rights in any Work Product to Seller. Seller grants Buyer a non-exclusive, non-transferable (except to a successor-in interest to the ownership of the Equipment), paid-up license to use the Work Product solely in connection with Buyer's use, operation, repair and maintenance of the Equipment at the Jobsite defined in this Agreement. Buyer may not disclose, share, transfer, or sell any such Work Product to third parties without Seller's prior written consent and such consent may be arbitrarily withheld. Buyer agrees not to resell, transfer or give any of the biologically colonized media or bacteria from the system to any party other than Seller or any of Seller's affiliates without the prior written consent of Seller for a period of fifteen (15) years from the effective date of this Agreement. Buyer shall not cultivate bacteria or use biomass carriers retrieved from the ANITA Mox system for any research or non-research purposes without prior written consent of the Seller. Any new developments, discoveries or inventions resulting from the operation of the ANITA Mox system in which the ANITA Mox process is a component or is in any way incorporated in whole or in part shall be owned solely by the Seller.
5. **Changes.** Seller shall not implement any changes in the scope of work described in Seller's Documentation unless Buyer and Seller agree in writing to the details of the change and any resulting price, schedule or other contractual modifications. This includes any changes necessitated by a change in applicable law occurring after the effective date of any contract including these terms.
6. **Warranty.** Subject to the following sentence, Seller warrants to Buyer that the Equipment shall materially conform to the description in Seller's Documentation and shall be free from defects in material and workmanship. The foregoing warranty shall not apply to any Equipment that is specified or otherwise demanded by Buyer and is not manufactured or selected by Seller, as to which (i) Seller hereby assigns to Buyer, to the extent assignable, any warranties made to Seller and (ii) Seller shall have no other liability to Buyer under warranty, tort or any other legal theory. If Buyer gives Seller prompt written notice of breach of this warranty within 18 months from delivery or 1 year from beneficial use, whichever occurs first (the "Warranty Period"), Seller shall, at its sole option and as Buyer's sole remedy, repair or replace the subject parts or refund the purchase price therefore. If Seller determines that any claimed breach is not, in fact, covered by this warranty, Buyer shall pay Seller its then customary charges for any repair or replacement made by Seller. Seller's warranty is conditioned on Buyer's (a) operating and maintaining the Equipment in accordance with Seller's instructions, (b) not making any unauthorized repairs or alterations, and (c) not being in default of any payment obligation to Seller. Seller's warranty does not cover damage caused by chemical action or abrasive material, misuse or improper installation (unless installed by Seller). THE WARRANTIES SET FORTH IN THIS SECTION ARE SELLER'S SOLE AND EXCLUSIVE WARRANTIES AND ARE SUBJECT TO SECTION 10 BELOW. SELLER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.
7. **Indemnity.** Seller shall indemnify, defend and hold Buyer harmless from any claim, cause of action or liability incurred by Buyer as a result of third party claims for personal injury, death or damage to tangible property, to the extent caused by Seller's negligence. Seller shall have the sole authority to direct the defense of and settle any indemnified claim. Seller's indemnification is conditioned on Buyer (a) promptly, within the Warranty Period, notifying Seller of any claim, and (b) providing reasonable cooperation in the defense of any claim.
8. **Force Majeure.** Neither Seller nor Buyer shall have any liability for any breach (except for breach of payment obligations) caused by extreme weather or other act of God, strike or other labor shortage or disturbance, fire, accident, war or civil disturbance, delay of carriers, failure of normal sources of supply, act of government or any other cause beyond such party's reasonable control.
9. **Cancellation.** If Buyer cancels or suspends its order for any reason other than Seller's breach, Buyer shall promptly pay Seller for work performed prior to cancellation or suspension and any other direct costs incurred by Seller as a result of such cancellation or suspension.
10. **LIMITATION OF LIABILITY.** NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES, AND SELLER'S TOTAL LIABILITY ARISING AT ANY TIME FROM THE SALE OR USE OF THE EQUIPMENT SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE EQUIPMENT. THESE LIMITATIONS APPLY WHETHER THE LIABILITY IS BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER THEORY.
11. **Miscellaneous.** If these terms are issued in connection with a government contract, they shall be deemed to include those federal acquisition regulations that are required by law to be included. These terms, together with any quotation, purchase order or acknowledgement issued or signed by the Seller, comprise the complete and exclusive statement of the agreement between the parties (the "Agreement") and supersede any terms contained in Buyer's documents, unless separately signed by Seller. No part of the Agreement may be changed or cancelled except by a written document signed by Seller and Buyer. No course of dealing or performance, usage of trade or failure to enforce any term shall be used to modify the Agreement. If any of these terms is unenforceable, such term shall be limited only to the extent necessary to make it enforceable, and all other terms shall remain in full force and effect. Buyer may not assign or permit any other transfer of the Agreement without Seller's prior written consent. The Agreement shall be governed by the laws of the State of North Carolina without regard to its conflict of laws provisions.

Request For Proposals
Progressive Design-Build Services - Sidestream Treatment and UV Rehabilitation

APPENDIX C

**PREVIOUS PROJECT GEOTECHNICAL
REPORT**



**MANTECA WASTEWATER TREATMENT PLANT IMPROVEMENTS
TASK I – NEW THICKENING FACILITY
2540 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA
KLEINFELDER PROJECT # 25001380.001A**

AUGUST 26, 2024

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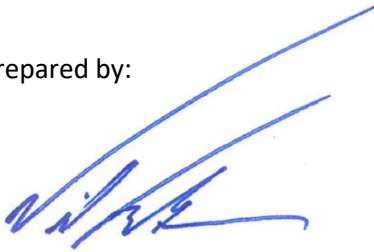
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REPORT WAS PREPARED.**

A Report Prepared for:

Mr. Ryan Sellman
Project Manager/Associate VP
Carollo Engineers, Inc.
2795 Mitchell Drive
Walnut Creek, CA 94598

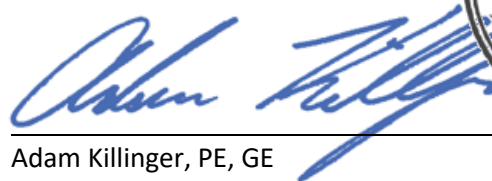
MANTECA WASTEWATER TREATMENT PLANT IMPROVEMENTS
TASK I – NEW THICKENING FACILITY
2540 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA

Prepared by:



Neil Falke, GIT
Staff Professional - Geologist

Reviewed by:



Adam Killinger, PE, GE
Senior Principal Geotechnical Engineer



KLEINFELDER

2001 Arch Airport Road
Stockton, CA 95206
Phone: 209.948.1345
Fax: 209.234.4700

August 26, 2024
Kleinfelder Project No:25001380.001A

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MANTECA WASTEWATER TREATMENT PLANT IMPROVEMENTS
TASK I – NEW THICKENING FACILITY
2540 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA

1 INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical investigation for the Manteca Wastewater Treatment Plant (WWTP) Improvements Project to be located at 2450 W Yosemite Avenue in Manteca, California. A Site Vicinity Map and Exploration Location Map showing the location of the project site are presented on Figures 1 and 2, respectively. This report contains a description of our site investigation methods and findings including field and laboratory data. It also provides our geotechnical conclusions and recommendations for earthwork, foundations, and other construction considerations. Conclusions and recommendations presented in this report are based on the subsurface conditions encountered at the locations of our explorations and our experience in the area.

1.2 PROJECT UNDERSTANDING

For this task, we understand the City of Manteca plans to add a new thickening facility. The thickening facility will be supported by a 60-foot by 60-foot conventional shallow reinforced mat foundation embedded mostly 2 to 3 ft below existing grade with a small section along the western side of the thickening facility embedded about 7½ ft. Structural loading will be about 1,000 psf foundation/soil contact pressure. Ancillary construction will include shallow spread footings loaded at 2,500 psf contact pressure, 6-inch below-grade ductile piping, and potentially concrete flatwork.

Project site topography is relatively flat. Accordingly, we anticipate fills to be up to 4 feet and cuts to be as deep as 7½ feet during earthwork to provide a level foundation pad with positive site drainage. Excavations for underground utilities are not anticipated to exceed 10 feet below final site grade. If grading conditions are significantly different from these assumptions, we should be given the opportunity to review our recommendations and provide supplemental recommendations, if appropriate.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this investigation is to explore and evaluate the subsurface conditions at the site in order to provide geotechnical input for the design and construction of the proposed facility and the associated earthwork for this project. Our scope of services was outlined in our proposal dated May 31, 2024 (Proposal No.: LOCALMKT.WEOH/1082900) and consisted of pre-field activities, field exploration, laboratory testing, engineering analysis, and preparation of this report.

This investigation specifically excludes the assessment of site environmental characteristics or future environmental mitigations, particularly those involving hazardous chemicals.

2 FIELD EXPLORATION AND LABORATORY TESTING

2.1 FIELD EXPLORATION

2.1.1 Pre-Field Activities

Prior to subsurface exploration, Kleinfelder filed an application for a drilling permit with the San Joaquin County Environmental Health Department (SJCEHD), marked exploration locations in the field, and contacted Underground Service Alert North (USAN) to provide utility clearance in the public right-of-way. We also employed the services of a private utility locator to assess the presence of unmarked/unknown buried utilities at the proposed subsurface exploration sites. We prepared a work plan and a site-specific health and safety plan for the field exploration activities. These plans were discussed with the field crews prior to the start of field exploration work.

2.1.2 Subsurface Explorations

To evaluate the subsurface conditions at the site for the proposed improvements, two borings (B-1 and B-2) were performed on July 25, 2024, and one seismic cone penetrometer test (sCPT) (CPT-1) was performed on July 29, 2024 at the approximate locations shown on Figure 2. The depth of the borings ranged from approximately 16½ to 31½ feet below ground surface (bgs) and the sCPT was advanced to approximately 50 feet bgs. The borings were advanced by Taber Drilling (Taber) of West Sacramento, California using a hand auger in the upper 5 feet and a Deidrich D-120 truck-mounted drill rig thereafter. Taber used a 4-inch outside diameter (O.D.) mud rotary drill bit and/or a 4-inch O.D. solid-stem auger. The sCPT was also advanced by Taber using a 20-ton electronic push CPT mounted on a ten-wheeled truck. Explorations were located in the field using a handheld GPS on a mobile device and should be considered approximate. Horizontal coordinates of the borings are approximate and were not surveyed.

A Kleinfelder geologist maintained logs of the borings, visually classified the soils encountered according to the Unified Soil Classification System (presented on Figure A-1 in Appendix A) and obtained samples of the subsurface materials. Soil classifications made in the field from samples and auger cuttings were in accordance with American Society for Testing and Materials (ASTM) Method D2488. These classifications were re-evaluated in the laboratory after further examination and testing in accordance with ASTM D2487. Sample classifications, blow counts recorded during sampling, and other related information were

recorded on the boring logs. The blow counts listed on the boring logs are raw values and have not been corrected for the effects of overburden pressure, rod length, sampler size and type, or hammer efficiency.

Keys to the soil descriptions and symbols used on the boring logs are presented in Appendix A along with logs of the borings and CPT. The exploration locations are shown on Figure 2.

Upon completion, the borings and CPT voids were backfilled with neat cement grout in accordance with the SJCEHD drilling permit requirements.

2.1.3 Sampling Procedures

Soil samples were collected from the borings at depth intervals of approximately 2.5 to 5 feet or less at the discretion of the field geologist. Samples were collected from the borings at selected depths by driving either a 1½-inch inside diameter (I.D.) Standard Penetration Test (STP) Sampler or a 2½-inch I.D. California sampler driven 18 inches into undisturbed soil. The samplers were driven using a 140-pound automatic hammer free-falling a distance of 30 inches. Blow counts were recorded at 6-inch intervals for each sample attempt and are reported on the logs.

The 1½-inch I.D. STP samplers did not have space for liners. The 2½-inch I.D. California sampler contained stainless steel liners. Driven soil samples obtained using this sampler may have experienced some disturbance due to hammer impact, retrieval, and handling.

Soil samples obtained from the borings were packaged and sealed in the field to reduce moisture loss and disturbance. Following drilling, the samples were returned to our laboratory for further examination and testing.

2.2 LABORATORY TESTING

Kleinfelder performed laboratory tests on selected samples recovered from the soil borings to evaluate their physical and engineering characteristics. The following laboratory tests were performed:

- Moisture Content (ASTM D2216)
- Percent Passing No. 200 Sieve (ASTM D1140)
- Atterburg Limits (ASTM D4318)

- Corrosion – Soluble Sulfate Content (CA DOT Test #417) – Performed by Sunland Analytical
- Corrosion – Soluble Chloride Content (CA DOT Test #422) – Performed by Sunland Analytical
- Corrosion – pH (CA DOT Test #643) – Performed by Sunland Analytical
- Corrosion – Minimum Resistivity (CA DOT Test #643) – Performed by Sunland Analytical

All laboratory test data are presented in Appendix B. The corrosion test results are also discussed in Section 5.7, Soil Corrosion.

3 GEOLOGIC SETTING

3.1 REGIONAL GEOLOGY

The project site lies within the central portion of the Great Valley geomorphic province of California. The province is bordered to the north by the Cascade Range and Klamath Mountains, to the west by the structurally complex sedimentary and volcanic rock units of the Coast Ranges, to the east by the granitic and metamorphic basement rocks which form the gently sloping western foothills of the Sierra Nevada Mountains, and to the south by the east-west trending Transverse Ranges. About 645 km long and 80 km wide, the Great Valley is an asymmetrical, synclinal trough formed by tilting of the Sierran block during the late Tertiary and Quaternary periods with the western side dropping to form the valley and the eastern side uplifting to form the Sierra Nevada Mountains. Within the project area, erosion of the adjacent Sierra Nevada Mountains and Coast Ranges has in-filled this valley with a thick sequence of unconsolidated to semi-consolidated Quaternary (Pleistocene and Holocene) age alluvial, basin, and delta plain sediments deposited by the Sacramento and San Joaquin rivers and their tributaries. The thickness of the valley sediments varies from a thin veneer at the edges of the valley to thousands of meters in the western portion. The bedrock complex is likely composed of metamorphosed marine sediments similar to those found in the foothills of the western Sierra Nevada Mountains and the core of the Coast Ranges.

3.2 AREA AND SITE GEOLOGY

The project site is situated within the central portion of the San Joaquin Valley and within the Lathrop 7½-minute US Geological Survey quadrangle. This portion of the San Joaquin Valley consists of very gently sloping alluvial fans flanked on the west by the San Joaquin River and on the east by the foothills of the Sierra Nevada Mountain Ranges. Farther to the east are the Sierra Nevada Mountain Ranges and to the west lie the Coast Ranges.

Based on available published geologic maps covering the site and surrounding areas, the project site is mapped as being underlain by the Upper Member of the Modesto Formation (map symbol Qmu) (Delattre, M.P. et. al. [2023]) which is late Pleistocene age (between 11,000 and 2.6M years) and is adjacent the Pleistocene aged fine grained Lower Member of the Modesto Formation (map symbol Qmlb) and the Holocene (between 11,000 years to present) to late Pleistocene dune sand deposits (map symbol Qds). The Upper Member of the Modesto Formation is described as follows:

- **Qmu** – Alluvium derived either from the interior of the Sierra Nevada along major west-flowing streams or contemporaneously, locally from small foothill watersheds deposited in fan, interdistributary area, and basin settings.

A portion of the Delattre, M.P. et al. (2023) geologic map is presented on Figure 3 detailing the surface geology at and near the project site.

4 SITE AND SUBSURFACE CONDITIONS

4.1 SITE DESCRIPTION

The project site is located near the center of the Manteca WWTP which is mostly surrounded by agricultural land or vacant lots with West Yosemite Avenue on the north and an irrigation canal to the west. The area of the proposed improvements is currently a vacant portion of the WWTP between structures covered by imported gravel and an asphalt access path.

4.2 SUBSURFACE CONDITIONS

Surficial soils consist of loose to medium dense silty sand (SM) and poorly graded sand with silt (SP-SM) that extends to a depth of about 16 feet below the ground surface. These soils are underlain by cohesive layers of medium stiff to hard lean clay with sand and sandy lean clay. We also encountered a clayey sand layer near the bottom of boring B-1 at approximately 30 feet bgs.

The above is a description of the subsurface conditions encountered at the site during our geotechnical engineering investigation. Refer to the exploration logs in Appendix A for a more detailed description of the subsurface conditions encountered at our exploration points.

4.3 GROUNDWATER

Groundwater was encountered in both boring B-1 and boring B-2 during drilling at depths of about 13 feet and 11 feet bgs, respectively. Groundwater data presented on the Sustainable Groundwater Management Act website¹ monitored by the California Department Water Resources indicates that groundwater at the project site is typically between 17 and 25 feet below the ground surface. The higher groundwater encountered during our field explorations may have been locally perched groundwater above the less-permeable clayey layers.

It should be noted that perched groundwater may be encountered during construction, or groundwater levels can fluctuate depending on factors such as seasonal rainfall and runoff, groundwater

¹ <https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels>

withdrawal/recharge, and construction and irrigation activities on this or adjacent sites. The evaluation of such factors is beyond the scope of this investigation.

4.4 VARIATIONS IN SUBSURFACE CONDITIONS

Our interpretations of soil and groundwater conditions at the site are based on the conditions encountered in our explorations at the site at the time of our investigation and our review of available geologic and geotechnical data. Soil conditions can deviate from those conditions encountered at the boring locations. The recommendations that follow are based on those interpretations. If significant variation in the subsurface conditions is encountered during construction, it may be necessary for Kleinfelder to review the recommendations presented herein and recommend adjustments as necessary.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

Based on the results of our investigation it is our professional opinion that the site should be suitable from a geotechnical standpoint for support of the proposed lightly to moderately loaded structures, provided the recommendations contained herein are incorporated into the project design and construction. The primary geotechnical concern at the site is the presence of saturated near surface sands and shallow groundwater potentially resulting in liquefaction and consequential settlement during a seismic event. Specific conclusions and recommendations regarding this and other geotechnical aspects of design and construction are presented in the following sections of this report.

5.2 SITE PREPARATION AND EARTHWORK CONSTRUCTION

5.2.1 General

We anticipate site grading and excavations can be performed with conventional grading/earth moving equipment and techniques. General recommendations for site preparation and earthwork construction are presented in the following sections of this report. All references to compaction, maximum density and optimum moisture content are based on ASTM D1557, unless otherwise noted.

5.2.2 Stripping and Grubbing

Prior to general site grading, the existing imported gravel should be stripped from project site and stockpiled. The imported gravel may be reused if desired if it does not become contaminated with other materials during the process. The depth of stripping will be dependent upon the thickness of the loose gravels at the site. Although not observed during our investigation, any weeds, roots or other organic material encountered should also be stripped from the project area and discarded.

5.2.3 Disturbed Soil, Undocumented Fill and Subsurface Obstructions

Although these were not observed during our field investigation, as part of site development, any existing undocumented fills on site should be over-excavated to firm soil or to depths determined by the geotechnical engineer during construction. Any over-excavation should extend at least 5 feet beyond the

perimeter of the proposed structure and 3 feet beyond the perimeter of pavement areas or to the edge of adjacent structures/flatwork if less than these recommended distances.

The exposed subgrades (existing and over-excavated) to receive engineered fills should be proof-rolled with a fully-loaded tandem-axle dump truck or water truck. Areas identified as being soft or yielding should be over-excavated to firm, native soil, or to depths determined by the geotechnical engineer during construction should pumping soils occur due to shallow groundwater. After proof-rolling, the subgrade should be scarified to a depth of 8 inches, moisture conditioned, and compacted as engineered fill. Deleterious materials encountered during over-excavation should be removed, and the excavated materials compacted to the requirements for engineered fill. This proof rolling, over-excavation and recompaction operation would serve to provide a uniform, stable subgrade throughout the development area thereby improving foundation design conditions and reducing settlement potential. The zone of proof rolling, over-excavation and compaction should extend horizontally at least 5 feet outside the perimeter of the proposed structure and at least 3 feet outside the perimeter of pavement areas or to the edge of adjacent structures/flatwork if less than these recommended distances.

All site grading should include a reasonable search to locate soil disturbed by previous activity and abandoned underground structures or existing utilities that may exist within the areas of construction. Any loose or disturbed soils, void spaces made by burrowing animals, or undocumented fill that may be encountered should be over-excavated to expose firm soil, as approved by a representative of Kleinfelder.

5.2.4 Scarification and Compaction

In areas requiring placement of fill, it is recommended the fill be placed and compacted as engineered fill. Following site stripping and grubbing and any required overexcavation, it is recommended areas to receive engineered fill be scarified to a depth of 8 inches, uniformly moisture conditioned to between about 1 and 4 percentage points above the optimum moisture content and be compacted to at least 90 percent relative compaction, as determined by ASTM D1557. Fills exceeding 10 feet in thickness should be compacted to at least 95 percent relative density.

5.2.5 Engineered Fill

5.2.5.1 Materials

All engineered fill soils should be nearly free of organics or other deleterious debris and less than 3 inches in maximum dimension. In general, mixtures of sand, silt, and clay are acceptable for use as engineered

fill. Particles larger than 3 inches should be removed from engineered fill. In general, on-site native soils similar to those encountered in our test borings are anticipated to be suitable for use as engineered fill. Soils that have less than 3 percent organics by weight and are free of debris or other deleterious matter may be used as engineered fill. Any imported fill materials to be used for engineered fill should be sampled and tested by a representative of the project Geotechnical Engineer prior to being transported to the site. Table 5-1 provides general criteria for imported soil.

Table 5-1: Imported Engineered Fill Requirements

Fill Requirement		Test Procedures	
<i>Gradation</i>		ASTM ¹	Caltrans ²
Sieve Size	Percent Passing		
3 inch	100	D6913	202
¾-inch	70-100	D6913	202
No. 200	15-70	D6913	202
<i>Plasticity</i>			
Liquid Limit	Plasticity Index		
<35	<12	D4318	204
<i>R-Value</i>			
30 or more		---	301
<i>Organic Content</i>			
No visible organics		---	---
<i>Expansion Potential</i>			
20 or less		D4829	---
<i>Soluble Sulfates</i>			
Less than 2,000 ppm		---	417
<i>Soluble Chloride</i>			
Less than 300 ppm		---	422
<i>Resistivity</i>			
Greater than 2,000 ohm-cm		---	643

¹ American Society for Testing and Materials Standards (latest edition)

² State of California, Department of Transportation, Standard Test Methods (latest edition)

5.2.5.2 Compaction Criteria

On-site or imported soils that meet the criteria outlined in Table 5-1 above that are to be used for engineered fill should be uniformly moisture conditioned to between 1 to 4 percentage points above the optimum moisture content, placed in horizontal lifts less than about 8 inches in loose thickness, and compacted to at least 90 percent relative compaction. Additional fill lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable. Discing and/or blending may be required to uniformly moisture condition soils used for engineered fill.

5.2.6 Anticipated Excavation Conditions

5.2.6.1 General

This report does not represent a study of the excavability of the subsurface materials that may be encountered within the limits of the proposed project. The contractor should independently evaluate the condition of the subsurface materials in order to select the appropriate excavation equipment and techniques. Furthermore, the contractor should be aware of past development and activities within the project area that abandoned utility lines, wells, and/or foundations will be encountered within the proposed site. Excavation and removal of these features, if encountered, will require special consideration by the contractor.

5.2.6.2 Shallow Trenches

The near-surface materials encountered in the borings generally consisted of a loose to medium dense silty sand, poorly graded sand with silt, and sandy silt in the upper 16 feet below site grade. These materials can be excavated with conventional backhoes or track-mounted excavators. The trench side walls within the loose sand materials are expected to be susceptible to caving/raveling if not sloped. Groundwater was encountered in our explorations at depths in the range of 8 feet and dewatering is anticipated to be needed for trenching operations below these depths. Dewatering recommendations for excavations are presented in Section 5.9.

Section 5.2.7 presents further recommendations regarding temporary excavations and should be followed.

5.2.7 Temporary Excavations

5.2.7.1 General

All excavations should comply with applicable local, state, and federal safety regulations including the current Occupational Safety & Health Administration (OSHA) Excavation and Trench Safety Standards. Construction site safety generally is the responsibility of the Contractor, who is responsible for the means, methods, and sequencing of construction operations. Kleinfelder is providing the information below solely as a service to the client. Under no circumstances should the information provided be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the Contractor's activities. Such responsibility is not being implied and should not be inferred.

To reduce the potential for settlement of existing foundations, the contractor should consider structural shoring and/or underpinning if the projected footing geometries fall within an imaginary 1½ to 1 (1.5:1) projection between the existing bottom of foundation and the proposed bottom of foundation. It is the contractor's responsibility through means and methods to prevent structural settlement of existing facilities during construction.

5.2.7.2 Excavation and Slopes

Excavated slope height, slope inclination, or excavation depths (including utility trench and wet well excavations) should in no case exceed those specified in local, state, and/or federal safety regulations (e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations). Such regulations are strictly enforced and, if they are not followed, the Owner, Contractor, and/or earthwork and utility subcontractors could be liable for substantial penalties.

5.2.7.3 Wet Weather Considerations

Should construction be performed during or subsequent to wet weather, near-surface site soils may be significantly above the optimum moisture content. These conditions could hamper equipment maneuverability and efforts to compact site soils to the recommended compaction criteria. Disking to aerate, chemical treatment, replacement with drier material, stabilization with a geotextile fabric or geogrid, or other methods may be required to mitigate the effects of excessive soil moisture and facilitate earthwork and construction operations. If needed, Kleinfelder can provide supplemental recommendations for soil stabilization during construction.

If construction is to proceed during the winter and spring months, one way to reduce the exposure of the pad and potential repairs is to leave the subgrade at least 1 foot above the proposed subgrade elevation, cutting it down immediately before processing subgrade and placing foundation materials. The cut areas should be proof rolled at the discretion of the Geotechnical Engineer of Record to identify whether undercutting of any remaining wet/unstable soils is required. Cut soils can be placed in landscape areas or disced and aerated (dried) during dry weather for placement in pavement, future pad, or other areas.

5.2.8 Materials

All trench backfill should be placed and compacted in accordance with recommendations provided for engineered fill (see Section 5.2.5). Mechanical compaction is recommended.

Pipe embedment zone backfill (i.e., bedding, haunching, pipe zone and initial backfill per ASTM D2321) should consist of soil compatible with design requirements for the specific types of pipes. Consideration should be given to use of Class III or better material. It is recommended the project designer or pipe supplier develop the material specifications based on planned pipe types, bedding conditions, tolerable deformation and other factors beyond the scope of this study. Final backfill (i.e., material placed between the embedment zone backfill and finished subgrade) may consist of native soil which meets the requirements for engineered fill.

5.3 2022 CBC SEISMIC DESIGN PARAMETERS

Based on information obtained from the investigation, published geologic literature and maps, and on our interpretation of the 2022 CBC criteria, the project sites may be classified as Site Class D, Stiff Soil, according to 2022 CBC and Table 20.3-1 of ASCE 7-16. Site Class D is defined as a soil profile consisting of a stiff soil profile with a shear wave velocity between 600 feet per second and 1,200 feet second, SPT blow counts (N-value) between 15 blows per foot and 50 blows per foot, or undrained shear strength between 1,000 pounds per square foot and 2,000 pound per square foot in the top 100 feet.

Seismic design parameters were developed consistent with the requirements of the 2022 CBC, ASCE/SEI 7-16, and Supplements 1 through 3 of that standard. We note that in accordance with Section 11.4.8 of ASCE/SEI 7-16 Supplement 3, a site-specific ground motion hazard analysis is required for Site Class D sites with a mapped S_1 value greater than or equal to 0.2g unless exceptions are taken by the project structural engineer. Based on the Site Class D designation, the exception of Section 11.4.8 of ASCE 7-16 Supplement 3 states that a ground motion hazard analysis is not required when the values of S_{M1} and S_{D1} are increased by 50 percent. Per Table 11.4-2 of ASCE 7-16 Supplement 3, a F_v value of 1.991 may be used in conjunction

with the code-based S_1 value for purposes of calculating the T_s value, determination of the Seismic Design Category, and, when taking the exceptions of Section 11.4.8 of ASCE 7-16 Supplement 3, for calculation of S_{M1} and S_{D1} values. As such, code-based seismic design parameters provided in Table 5-2 for the spectral response acceleration at a period of 1.0 second include the 50 percent increase assuming that the exception of Section 11.4.8 of ASCE 7-16 Supplement 3 will be utilized. The parameters listed in the Table 5-2 are estimated using the Seismic Design Maps website maintained by SEAOC/OSHPD (<https://www.seismicmaps.org>) and the requirements of the 2022 CBC/ASCE 7-16.

Approximate coordinates for the site are noted below.

- Latitude: 37.723414°N
- Longitude: 121.506151°W

Table 5-2
Ground Motion Parameters Based on 2022 CBC/ASCE 7-16

Parameter	Value	Reference
S_s	0.825g	Fig 22-1
S_1	0.309g	Fig 22-2
Site Class	D	Table 20.3-1
F_a	1.200	Table 11.4-1
F_v	1.991	See Section 11.4.8
PGA	0.343g	Fig 22-9
S_{MS}	0.990g	Eq. 11.4-1
S_{M1}	0.923g*	See Section 11.4.8
S_{DS}	0.660g	Eq. 11.4-3
S_{D1}	0.615g*	See Section 11.4.8
F_{PGA}	1.257	Table 11.8-1
PGA_M	0.432g	Eq. 11.8-1
C_{RS}	0.945	Fig 22-18A
C_{R1}	0.951	Fig 22-19A
T_L	8 seconds	See Section 11.4.6

*Note: Section 11.4.8 of ASCE/SEI 7-16 Supplement 3 requires a site-specific ground motion hazard analysis be performed for Site Class D sites with S_1 greater than or equal to 0.2g unless an exception is taken in which the values of S_{M1} and S_{D1} are increased by 50 percent. Values of S_{M1} and S_{D1} provided in the table include this 50 percent increase assuming the exception will be taken. This value of F_v shall only be used for calculation of T_s , determination of Seismic Design Category, linear interpolation for intermediate values of S_1 , and when taking the exceptions under Item 1 of Section 11.4.8 for the calculation of S_{D1} .

5.4 LIQUEFACTION

Soil liquefaction is a condition where saturated, granular soils undergo a substantial loss of strength and deformation due to pore pressure increase resulting from cyclic stress application induced by earthquakes. In the process, the soil acquires mobility sufficient to permit both horizontal and vertical movements if the soil mass is not confined. Soils most susceptible to liquefaction are saturated, loose, clean, uniformly graded, and fine-grained sand deposits. If liquefaction occurs, foundations resting on or within the liquefiable layer may undergo settlements. This will result in reduction of foundation stiffness and capacities.

Liquefaction triggering analyses were performed using the methods proposed by Youd (2001), Cetin (2004/2009), and Idriss and Boulanger (2008). In order to perform liquefaction analysis, estimates of earthquake magnitude and peak ground acceleration (PGA_M) are needed. Using the U.S. Geological Survey (USGS) interactive deaggregation website, the earthquake magnitude $M_w = 7.13$ was estimated and used in the analysis. The peak ground acceleration (PGA_M) value for our analyses was calculated based on Equation 11.8-1 in Section 11.8.3 of the American Society of Civil Engineers (ASCE) 7-10 for the Risk-Targeted Maximum Considered Earthquake (MCER). The PGA_M value was calculated using the US Seismic Design Maps application assuming a Site Class D. The calculated PGA_M value used in our analysis was 0.432g for the MCER.

The evaluation of liquefaction in response to an earthquake is based on a comparison of a soil's resistance to liquefaction and the cyclic load or demand placed on the soil by the earthquake. A safety factor against liquefaction is commonly defined as the ratio of the cyclic shear stress required to cause liquefaction (cyclic resistance ratio, or CRR) to the equivalent cyclic shear stress induced by the earthquake (cyclic stress ratio, or CSR). We used a safety factor of 1.1 for this project.

Based on our analyses, the potentially liquefiable near surface soils will settle between 3 and 5½ inches during and directly following a design seismic event depending on methodology. We estimate differential settlements between adjacent supports (assumed to be about 50 feet) of about half the maximum total seismic settlement (1½ to 3½ inches) be considered for design. Should these settlements be considered too excessive, ground improvement or deep foundations can be considered as a mitigation measure. Deep foundations will likely be significantly more expensive than ground improvement but will make settlement negligible if properly designed to accommodate the upper 18 ft of drag loads. A likely more affordable option is to use ground improvement to a depth of 18 ft bgs. Ground improvement options include:

- Rammed-Aggregate-Piers,

- Stone columns,
- Rigid inclusions, and
- A variety of grouting techniques.

The ground improvement design should be performed by a qualified ground improvement contractor licensed in the state of California. We should be allowed to review and comment on the design prior to mobilization. Contact this office for a list of design-build contractors. Our liquefaction analysis is presented in Appendix C.

5.5 FOUNDATION DESIGN

5.5.1 Mat Foundation

The reinforced concrete mat slab foundation may be designed for a net allowable bearing pressure of 1,000 psf due to dead plus live loads corresponding to a total settlement of under 3 inches. Differential settlement is on the order of 1½ inches across the mat foundation. The mat foundation should be founded at least 18 inches below lowest adjacent finished grade. The mat slab foundation should be supported on a minimum of 1 foot of engineered fill beneath foundations. The zone of engineered fill should extend laterally at least 3 feet beyond the perimeter of the foundations as permitted by adjacent structures. Kleinfelder should be contacted once grading plans are completed to provide additional consultation regarding the depth of overexcavation and recompaction required. A one-third increase may be applied to this value when considering the effects of transient loads such as wind or seismic.

5.5.2 Spread Foundations

Ancillary structures may be supported by shallow spread footings constructed of reinforced concrete founded on undisturbed native soil or engineered fill. Foundations should be embedded at least 18 inches below lowest adjacent subgrade. A net allowable bearing pressure of 2,500 pounds per square foot (psf) due to dead plus live loads may be used to size proposed footings.

The allowable bearing pressure provided above is a net value. Therefore, the weight of the foundation that extends below grade may be neglected when computing dead loads. The allowable bearing pressure applies to dead plus live loads, includes a calculated factor of safety of at least 3, and may be increased by one-third for short-term loading due to wind or seismic forces. We anticipate total and differential settlement to be on the order 1 and ½ inch, respectively.

5.5.3 Lateral Load Resistance

Lateral loads may be resisted by a combination of friction between the foundation bottoms and the supporting subgrade, and by passive resistance acting against the vertical faces of the foundations. An allowable coefficient of sliding friction of 0.35 between the foundation and the supporting subgrade may be used for design. For allowable passive resistance, an equivalent fluid weight of 350 pounds per cubic foot (pcf) acting against the side of the foundation may be used. This value generally corresponds to a lateral deflection of less than about ½ inch. Passive resistance in the upper 12 inches of soil should be neglected unless the area in front of the footing is protected from disturbance by concrete or pavement. The allowable friction coefficient and passive resistance may be used concurrently.

5.5.4 Construction Considerations

Underground utilities paralleling the mat slab that are 4 feet deep or shallower generally should be located no closer than 2 feet outside of the perimeter edges of the slab. Deeper utilities should be located above a 1H:1V slope projected downward from the bottom edges of the slab. Utility plans should be reviewed by Kleinfelder prior to trenching to evaluate conformance with this requirement.

Beneath cast-in-place concrete mat foundations, we recommend the design include a base course of well-graded aggregate (such as Caltrans Class 2 Aggregate Base) at least 4 inches thick. The base course should be compacted to at least 95 percent relative compaction at a moisture content slightly above optimum. Mat slabs should have turned down or thickened edges at least 18 inches deep to reduce water infiltration beneath the slabs. Thickened slab edges should engage the building pad soil and should not be underlain by the gravel base course.

5.6 EXTERIOR FLATWORK

Following site stripping and undocumented fill removal, as a minimum all areas to support exterior concrete flatwork, i.e., sidewalks and the like, should be scarified to a depth of 12 inches, uniformly moisture conditioned to between 1 and 4 percent above the optimum moisture content, and compacted as engineered fill. Additional criteria regarding general earthwork are presented in Section 5.2.

The near-surface soil conditions do not necessarily warrant the placement of aggregate base below flatwork from a geotechnical standpoint. Flatwork, however, tends to perform better during and following construction with less maintenance if it is underlain by a layer Class 2 aggregate base. The aggregate base serves to provide a firm/uniform surface directly below the flatwork where surcharge stresses are highest.

As a result, we have found that flatwork supported on aggregate base tends to experience less stress cracking and movement or deflection at joints. If considered, the aggregate base should have a thickness of at least 4 inches and be compacted to at least 90 percent relative compaction. In areas where concrete flatwork will support construction equipment and/or vehicle traffic, we suggest that the aggregate base be increased to a thickness of 6- to 8-inches and be compacted to at least 95 percent relative compaction.

5.7 SOIL CORROSION

Laboratory chloride concentration, sulfate concentration, pH, and electrical resistivity tests were performed on a near surface soil sample obtain from Boring B-1. The results of the tests are summarized in Table 5-6.

Table 5-3: Soil Corrosion Potential Results

Exploration	Depth	Material	Resistivity ohm-cm	pH	Sulfate ppm	Chloride ppm
B-2	0.4-5	Silty Sand	6,160	7.06	12.8	2.3

Chemical tests performed on a near surface composite soil sample obtained from Boring B-1 indicated a pH of 7.06. The minimum resistivity test performed on the soil sample suggests that the soils in the vicinity of Boring B-2 are considered to be moderately corrosive to buried metal objects as indicated by a result of 6,160 ohm-centimeters.

As indicated in the 2006 edition (second edition) of “Corrosion Basics - An Introduction”, generally adopted corrosion-severity ratings are provided in Table 5-7 below.

Table 5-4: Soil Resistivity and Corrosivity Correlation

Soil Resistivity	Corrosivity
< 1,000 ohm-cm	Extremely corrosive
1,000 to 3,000 ohm-cm	Highly Corrosive
3,000 to 5,000 ohm-cm	Corrosive
5,000 to 10,000 ohm-cm	Moderately Corrosive
10,000 to 20,000 ohm-cm	Mildly Corrosive
>20,000 ohm-cm	Essentially Noncorrosive

As noted in the above reference, soil resistivity is not the only parameter affecting the risk of corrosion damage; and a high soil resistivity will not guarantee the absence of serious corrosion. For example, the

American Water Works Association (AWWA) has developed a numerical soil-corrosivity scale, applicable to cast-iron alloys.

Results from sulfate and chloride content tests performed by Sunland Analytical for the soil sample obtained from Boring B-2 yielded values of 12.8 parts per million (ppm) and 2.3 ppm, respectively.

In accordance with California Test 532, “if the chloride concentration is determined to be less than 500 ppm,” “the influence of the chloride-ion at this level is considered to be non-corrosive.” The ACI Manual of Concrete Practice, Section 201.2R-92, recommends using a Type I or II cement for foundations placed in these soils.

In accordance with “Guideline for Stabilization of Subgrade Soils in California, UCPRC-GL-2010—01, dated May 4, 2012” as published by Caltrans and the University of California Pavement Research Center (UC Davis/UC Berkeley), soluble sulfate concentrations less than 3,000 ppm have a “low” risk with respect to cementitious stabilization of subgrade soils.

ACI 318-11 provides the following exposure categories with respect to sulfate content and concrete.

Table 5-5: Sulfate Exposure Categories and Classes

Severity	Class	Water-Soluble Sulfate (SO ₄) in soil, percent by mass ¹	Dissolved Sulfate (SO ₄) in water, ppm ²
Not Applicable	S0	SO ₄ < 0.10	SO ₄ < 150
Moderate	S1	0.10 ≤ SO ₄ < 0.20	150 ≤ SO ₄ < 1,500
Severe	S2	0.20 ≤ SO ₄ ≤ 2.00	1,500 ≤ SO ₄ ≤ 10,000
Very Severe	S3	SO ₄ > 2.00	SO ₄ > 10,000

¹ Percent sulfate by mass in soil shall be determined by ASTM C1580.

² Concentration of dissolved sulfates in water in ppm shall be determined by ASTM D516 or ASTM D4130.

This report includes information obtained through laboratory testing regarding corrosivity of onsite soils. It is important to note that our scope does not include corrosion engineering and that detailed analysis of corrosion test results is not included in this report. A qualified corrosion engineer should be retained to review the test results and design protective systems that may be required.

5.8 SITE DRAINAGE

Foundation and slab performance depend greatly on how well runoff water drains from the site. Accordingly, positive drainage should be provided away from the building pad toward appropriate drop inlets or other surface drainage devices without ponding. In general, we recommend consideration be given to providing at least 1 to 2 percent slope away from structure foundations or access ways for drainage. The drainage should be maintained both during construction and over the life span of the project. Roof draining should be installed with appropriate downspout extensions out falling on splash blocks so that water is directed a minimum of 5 feet horizontally away from the structures or be connected to the storm drain system for the development.

A number of post-construction landscape practices beyond the control of the design engineers can occur to cause distress to pavements. Potential man-made water sources, such as buried pipelines, drains and the like, should be periodically tested and/or examined for signs of leakage or damage. Any such leakage or damage should be promptly repaired.

5.9 CONSTRUCTION DEWATERING

Depending on the time of year construction is performed, the deepest portion of the thickening facility may be below groundwater. If exposed below the groundwater level, these soils could become unstable or even “quick” due to upward seepage forces, losing their ability to maintain stable excavation/trench slopes. Therefore, we anticipate that dewatering will be necessary to permit stable construction. The groundwater should be lowered and continuously maintained at least 2 to 3 feet below the bottom of the proposed excavation until the foundation underlayment, backfill, and structure weights are adequate to provide uplift resistance and backfill is complete at least 3 feet above the normal stabilized water level.

Temporary dewatering of the excavations can be accomplished using several methods. Well point or deep well systems that are installed around the periphery of the excavation are the most common dewatering systems in use today to permit stable construction in the dry. Where excavations are relatively shallow, gravel-filled gravity ditches with filtered, perforated pipes that drain to sumps that are pumped out may also be effective and likely sufficient for this application. The dewatering system for the project should be designed by an experienced consultant to appropriately filter the native soils and reduce any dispersion, piping, and associated loss of ground. The consultant should also account for any improvements near the project such as structures, buried pipelines, etc. The lowering of the groundwater table produces additional effective stresses on the soils below the original water table. These additional pressures may cause consolidation of the soils and settlement of the nearby improvements. It is often appropriate to

institute a survey program before and during dewatering to monitor settlements in adjacent improvements and/or require recharge wells to reduce the effects of settlement. The minimum amount of dewatering necessary should be applied.

During initial earthwork, we have found that exposed soils at the base of the excavations, particularly in the case of gravity ditches, are often not fully drained by the dewatering and are wet and/or pliant. To facilitate construction, the contractor may need to cover the bottom of the excavation(s) with a 6- to 12-inch-thick stabilizing layer of clean, crushed gravel that is firmly tamped into place. The crushed gravel can also serve as a collection medium for rainwater or seepage that can be removed by pumping from shallow sumps. If the gravel will provide foundation support following construction, the material should be wrapped entirely with a geotextile filter fabric, such as Mirafi 140N or an equivalent substitute, to reduce the potential for soil infiltration into the gravel and loss of ground. Highly-wet and/or unstable soils encountered should be removed and replaced with compacted crushed rock, bedding material, or dryer soil. A second option would be to place a reinforcing geotextile fabric, such as Tensar HX145 between the subgrade soils and crushed gravel in accordance with the manufacturer's recommendations. Our firm should be consulted prior to implementing any remedial measure to observe the subgrade condition and provide site-specific recommendations.

6 ADDITIONAL SERVICES

6.1 PLANS AND SPECIFICATIONS

Kleinfelder should conduct a general review of plans and specifications to evaluate that the earthwork and foundation recommendations presented in this report have been properly interpreted and implemented during design. In the event Kleinfelder is not retained to perform this recommended review, no responsibility for misinterpretation of the recommendations by Kleinfelder is accepted.

6.2 CONSTRUCTION OBSERVATION AND TESTING

It is recommended that all earthwork and foundation construction be monitored by a representative from Kleinfelder, including site preparation, placement of all engineered fill and trench backfill, construction of slab and pavement subgrade, and all foundation excavations. The purpose of these services is to observe the soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

7 LIMITATIONS

This report presents information for planning, permitting, design, and construction of the proposed Manteca Wastewater Treatment Plant Improvements Project – Task 1 in Manteca, California. Recommendations contained in this report are based on materials encountered in exploratory borings, our previous experience in the area, geologic interpretation based on published articles and geotechnical data, and our present knowledge of the proposed construction.

It is possible that soil conditions could vary between and beyond the points explored. If the scope of the proposed construction, including the proposed location, changes from that described in this report, we should be notified immediately in order that a review may be made, and any supplemental recommendations provided.

We have prepared this report in accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our investigation. No warranty expressed or implied is made.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on-site and off-site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party.

FIGURES

LIST OF ATTACHMENTS

The following figures are attached.

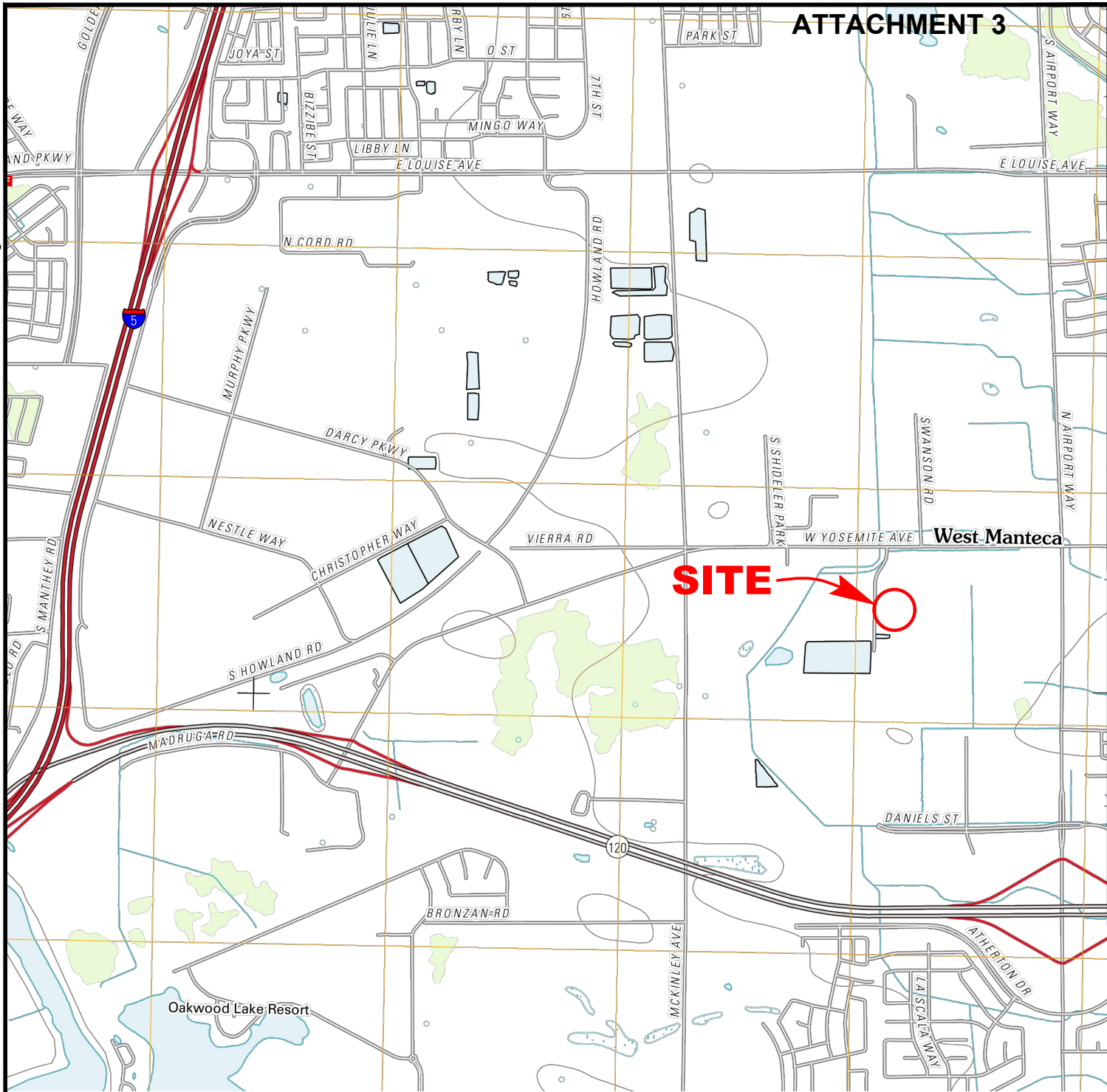
FIGURE 1	Site Vicinity Map
FIGURE 2	Exploration Location Map
FIGURE 3	Site Geologic Map

PLOTTED: 06 Aug 2024, 10:38am, GGomez

CAD FILE: W:2500\25001380.001A - Manteca WWTP\PLANS\ LAYOUT: FIGURE 1

ATTACHED IMAGES:
ATTACHED XREFS:
OFFICE NAME

ATTACHMENT 3



0 2000 4000

SCALE: 1" = 2000' SCALE IN FEET

REFERENCE:
Lathrop, Ca. Quadrangle California 7.5-Minute Series

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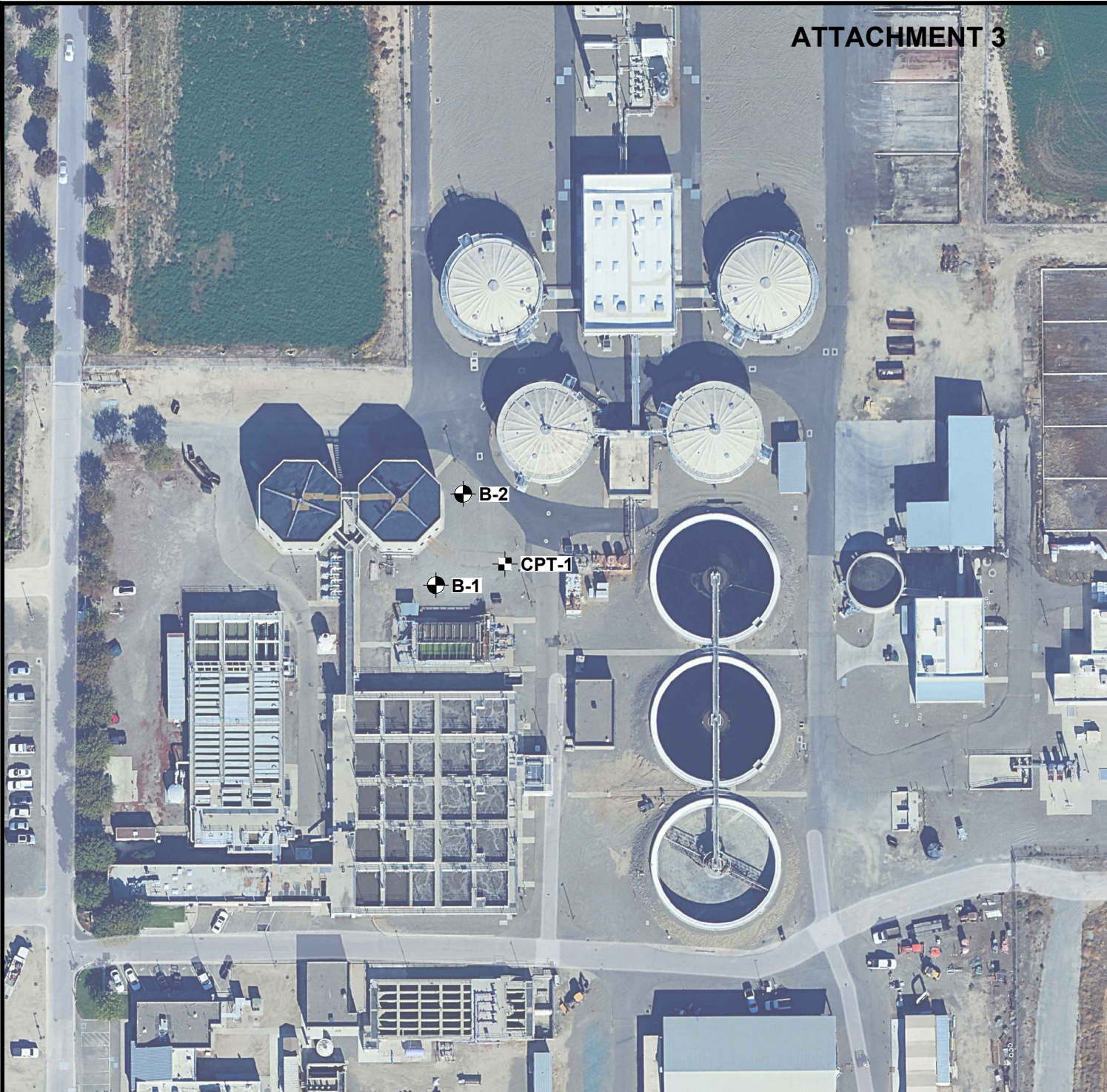
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FILE NAME:
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SITE VICINITY MAP

MANTECA WWTP, TASK 1
2450 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA

FIGURE

1



Soil Boring Locations (Kleinfelder, 2024)

CPT Location (Kleinfelder, 2024)



0 100 200



SCALE: 1" = 100' SCALE IN FEET

REFERENCE:

Produced by Google Earth Pro, dated 2024

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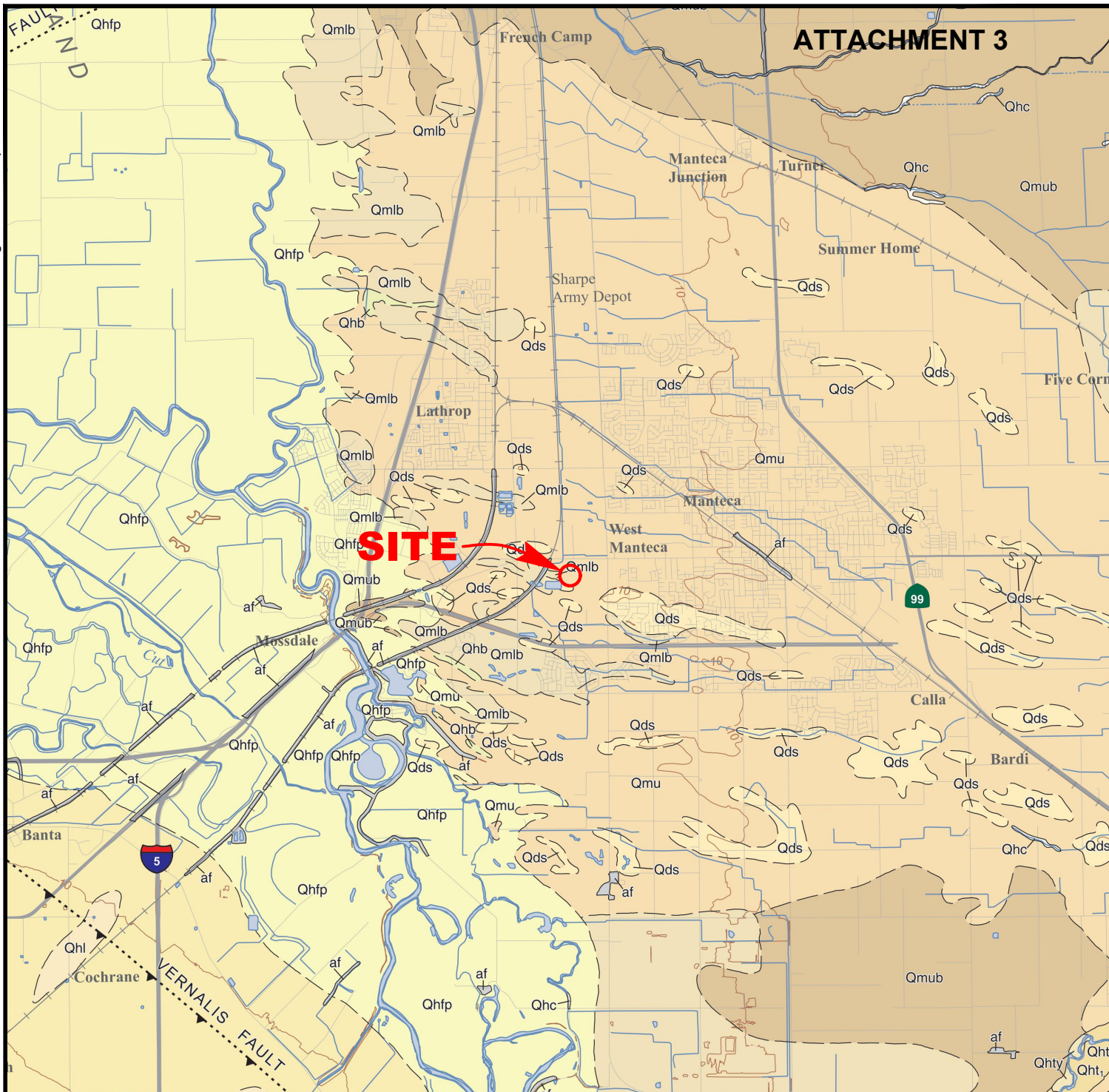
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EXPLORATION LOCATION MAP

MANTECA WWTP, TASK 1
2450 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA

FIGURE

2



af	Artificial fill	Qht ₁	Holocene stream terrace deposits, Unit 1
Qds	Holocene to late Pleistocene dune sand deposits	Qhty	Latest Holocene stream terrace deposits
Qhb	Holocene basin deposits		
Qhc	Latest Holocene stream channel deposits		Modesto Formation (late Pleistocene)
Qhfp	Holocene flood plain deposits	Qmlb	Lower member, fine-grained
Qhl	Holocene fan levee deposits	Qmu	Upper member, undivided alluvium
		Qmub	Upper member, fine-grained

Citation:
Delattre, M.P., Graymer, R.W., Langenheim, V.E., Knudsen, K.L.,
Dawson, T.E., Brabb, E.E., Wentworth, C.M., and Raymond, L.A., 2023,
Geologic and geophysical maps of the Stockton Quadrangle,"
California: California Geological Survey Regional Geologic Map No. 5,
Scale 1:100,000

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GEOLOGIC MAP

MANTECA WWTP - TASK 1
2450 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA

FIGURE

3

APPENDIX A
LOGS OF EXPLORATIONS

LIST OF ATTACHMENTS

The following figures are attached and complete this appendix.

FIGURE A-1	Graphics Key
FIGURE A-2	Soil Description Key
FIGURES A-3 through A-5	Logs of Explorations

BULK SAMPLE

CALIFORNIA SAMPLER
(3 in. (76.2 mm.) outer diameter)

STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

WATER LEVEL (level where first observed)

WATER LEVEL (level after stabilizing period)

WATER LEVEL (additional levels after exploration)

OBSERVED SEEPAGE

NOTES

• The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.

• Solid lines separating strata on the logs represent approximate boundaries only, dashed lines are inferred or extrapolated boundaries. Actual transitions may be gradual or differ from those represented.

• No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.

• Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.

• In general, Unified Soil Classification System (ASTM D2488/D2487) designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.

• Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., CL-ML, GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.

• If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

ABBREVIATIONS

C_u - Coefficients of Uniformity

C_c - Coefficients of Curvature

WOH - Weight of Hammer

WOR - Weight of Rod

REFERENCES

1. American Society for Materials and Testing (ASTM), 2011, ASTM D2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System).

DRILLING METHOD/SAMPLER TYPE GRAPHICS

UNIFIED SOIL CLASSIFICATION SYSTEM¹

GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)

CLEAN GRAVEL WITH <5% FINES

GW

WELL-GRADED GRAVEL, WELL-GRADED GRAVEL WITH SAND

GP

POORLY GRADED GRAVEL, POORLY GRADED GRAVEL WITH SAND

GW-GM

WELL-GRADED GRAVEL WITH SILT, WELL-GRADED GRAVEL WITH SILT AND SAND

GW-GC

WELL-GRADED GRAVEL WITH CLAY (OR SILTY CLAY), WELL-GRADED GRAVEL WITH CLAY AND SAND (OR SILT CLAY AND SAND)

GP-GM

POORLY GRADED GRAVEL WITH SILT, POORLY GRADED GRAVEL WITH SILT AND SAND

GP-GC

POORLY GRADED GRAVEL WITH CLAY (OR SILTY CLAY), POORLY GRADED GRAVEL WITH CLAY AND (OR SILTY CLAY AND SAND)

GRAVELS WITH 5% TO 12% FINES

GM

SILTY GRAVEL, SILTY GRAVEL WITH SAND

GC

CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND

GC-GM

SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL WITH SAND

GRAVELS WITH > 12% FINES

GM

SILTY GRAVEL, SILTY GRAVEL WITH SAND

GC

CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND

GC-GM

SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL WITH SAND

COARSE GRAINED SOILS (50% or more of coarse fraction passes the No. 4 Sieve)

CLEAN SANDS WITH <5% FINES

SW

WELL-GRADED SAND, WELL-GRADED SAND WITH GRAVEL

SP

POORLY GRADED SAND, POORLY GRADED SAND WITH GRAVEL

SW-SM

WELL-GRADED SAND WITH SILT, WELL-GRADED SAND WITH SILT AND GRAVEL

SW-SC

WELL-GRADED SAND WITH CLAY (OR SILTY CLAY), WELL-GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)

SP-SM

POORLY GRADED SAND WITH SILT, POORLY GRADED SAND WITH SILT AND GRAVEL

SP-SC

POORLY GRADED SAND WITH CLAY, POORLY GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)

SANDS WITH 5% TO 12% FINES

SM

SILTY SAND, SILTY SAND WITH GRAVEL

SC

CLAYEY SAND, CLAYEY SAND WITH GRAVEL

SC-SM

SILTY, CLAYEY SAND, SILTY, CLAYEY SAND WITH GRAVEL

SANDS WITH > 12% FINES

SM

SILTY SAND, SILTY SAND WITH GRAVEL

SC

CLAYEY SAND, CLAYEY SAND WITH GRAVEL

SC-SM

SILTY, CLAYEY SAND, SILTY, CLAYEY SAND WITH GRAVEL

FINE GRAINED SOILS (50% or more passes the No. #200 sieve)

SILTS AND CLAYS (Liquid Limit less than 50)

ML

SILT, SILT WITH SAND, SILT WITH GRAVEL

CL

LEAN CLAY, LEAN CLAY WITH SAND, LEAN CLAY WITH GRAVEL

CL-ML

SILTY CLAY, SILTY CLAY WITH SAND, SILTY CLAY WITH GRAVEL

OL

ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL

SILTS AND CLAYS (Liquid Limit 50 or greater)

MH

ELASTIC SILT, ELASTIC SILT WITH SAND, ELASTIC SILT WITH GRAVEL

CH

FAT CLAY, FAT CLAY WITH SAND, FAT CLAY WITH GRAVEL

OH

ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDED ON THIS LEGEND.

GRAIN SIZE¹

DESCRIPTION		SIEVE SIZE	GRAIN SIZE
Boulders		>12 in.	>12 in. (304.8 mm.)
Cobbles		3 - 12 in.	3 - 12 in. (76.2 - 304.8 mm.)
Gravel	coarse	3/4 - 3 in.	3/4 - 3 in. (19 - 76.2 mm.)
	fine	#4 - 3/4 in.	0.19 - 0.75 in. (4.8 - 19 mm.)
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)
Fines		Passing #200	<0.0029 in. (<0.07 mm.)

SECONDARY CONSTITUENT¹

Term of Use	AMOUNT	
	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

PLASTICITY¹

DESCRIPTION	CRITERIA
Non-Plastic	A 1/8 in. (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

MOISTURE CONTENT¹

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CONSISTENCY - FINE-GRAINED SOIL^{2,3}

CONSISTENCY	SPT - N (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q _u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Easily penetrated several inches by fist
Soft	2 - 4	0.25 ≤ PP < 0.5	500 - 1,000	Easily penetrated several inches by thumb
Medium Stiff	4 - 8	0.5 ≤ PP < 1	1,000 - 2,000	Can be penetrated several inches by thumb with moderate effort
Stiff	8 - 15	1 ≤ PP < 2	2,000 - 4,000	Readily indented by thumb but penetrated only with great effort
Very Stiff	15 - 30	2 ≤ PP < 4	4,000 - 8,000	Readily indented by thumbnail
Hard	>30	4 ≤ PP	>8,000	Indented by thumbnail with difficulty

APPARENT DENSITY - COARSE-GRAINED SOIL²

APPARENT DENSITY	SPT-N (# blows / ft)
Very Loose	<4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

STRUCTURE¹

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. (6mm) thick, note thickness.
Laminated	Alternating layers of varying material or color with the layers less than 1/4-in. (6 mm) thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout

ANGULARITY¹

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

REACTION WITH HYDROCHLORIC ACID¹

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

CEMENTATION¹

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or little finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

REFERENCES

- American Society for Materials and Testing (ASTM), 2017, ASTM D2488: Standard Practice for Description and Identification of Soils (Visual Manual Procedures).
- Terzaghi, K and Peck, R., 1948, Soil Mechanics in Engineering Practice, John Wiley & Sons, New York.
- United States Department of the Interior Bureau of Reclamation (USBR), 1998, Earth Manual, Part I.

PROJECT NO.:
25001389.001A

DRAWN BY: GG

CHECKED BY: NF

DATE:

SOIL DESCRIPTION KEY
(For additional tables, see ASTM D2488)MANTECA WWTP IMPROVEMENTS, PHASE I
2450 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA

FIGURE

A-2

Date Begin - End: 7/25/2024
Logged By: NF
Hor.-Vert. Datum: - WGS 84 (Google Earth)
Plunge: -90 degrees
Weather: Sunny/Warm
Drilling Company: Taber
Drill Crew: Rick/Nick/Francisco
Drilling Equipment: Diedrich 120 Truck
Drilling Method: Hand Auger/Solid Stem Auger/Mud Rotary
Hammer Type - Drop: 140 lb. Auto - 30 in.
Exploration Diameter: 4 in./8 in.

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS								
			Latitude: 37.79446° Longitude: -121.26044° Approximate Ground Surface Elevation (ft.): 28.00 Surface Condition: Gravel	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
			Lithologic Description													
			Clean crushed gravel, approximately 1" minus	Bulk 1											Hand Auger to 5'	
			Silty SAND (SM): fine to medium sand, olive brown, moist													
25																
	5		loose	1C 1B 1A		BC=6 6 7	18"		9.3			16				Switched to Solid Stem Auger
20				2		BC=3 2 3	17"									
	10		medium dense, weakly cemented lenses	3C 3B 3A		BC=4 7 7	18"									
15																
	15		Poorly Graded SAND with Silt (SP-SM): medium to coarse sand, pale olive, wet, loose to medium dense	4B		BC=6 5 5	18"									Switched to Mud Rotary
	10		Lean CLAY with Sand (CL): fine sand, medium to high plasticity, no dilatancy, light brownish gray, wet, stiff, homogeneous	4A 5		PP=1.5 BC=5 6 7 PP=3.5, 2.5, 2.0	18"		32.6				45	21		
	20		Sandy Lean CLAY (CL): fine sand, medium plasticity, slow dilatancy, pale olive, moist, stiff to very stiff	6C 6B 6A		BC=8 11 10 PP=3.5, 4.5+										
	5		Lean CLAY with Sand (CL): fine to medium sand, medium to high plasticity, light brownish gray, wet, very stiff to hard													
	25		slow dilatancy, medium stiff olive brown with mottled bluish gray, lensed sands	7		BC=2 2 3	18"									
0																
	30		Clayey SAND (SC): fine to medium sand, medium plasticity, bluish gray, wet, medium dense, homogeneous	8C 8B 8A		BC=11 15 22	18"									
-5			The boring was terminated at approximately 31.5 ft. below ground surface. The boring was backfilled with neat cement on July 25, 2024.													
35			GROUNDWATER LEVEL INFORMATION: ∇ Groundwater was observed at approximately 13 ft. below ground surface during drilling. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.													



PROJECT NO.:
25001389.001A

DRAWN BY: GG

CHECKED BY: NF

DATE: 7/26/2024

BORING LOG B-1

MANTECA WWTP IMPROVEMENTS, PHASE I
2450 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA

FIGURE

A-3

PAGE: 1 of 1

Date Begin - End: 7/25/2024 Drilling Company: Taber
Logged By: NF Drill Crew: Rick/Nick/Francisco
Hor.-Vert. Datum: - WGS 84 (Google Earth) Drilling Equipment: Diedrich 120 Truck Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees Drilling Method: Hand Auger/Solid Stem Auger
Weather: Sunny/Warm Exploration Diameter: 4 in.

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS								
			Latitude: 37.79694° Longitude: -121.76035° Approximate Ground Surface Elevation (ft.): 27.00 Surface Condition: Gravel	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
			Lithologic Description													
			Clean crushed gravel, approximately 1" minus Silty SAND (SM): fine to medium sand, non-plastic, olive brown, moist	Bulk-1											Hand Auger to 5'	
25																
	5		loose, homogeneous	1		BC=5 5 4	18"									Switched to Solid Stem Auger
20			loose to medium dense	2C 2B 2A		BC=7 8 7	16"		7.7			28				
	10		Poorly Graded SAND with Silt (SP-SM): fine to medium sand, pale olive, moist, loose to medium dense, homogeneous	3B 3A		BC=3 2 2	15"									
15			Silty SAND (SM): fine to medium sand, olive brown, moist, loose, homogeneous													
	15		Poorly Graded SAND with Silt (SP-SM): fine to medium sand, pale olive, wet, loose, homogeneous													
	15		medium dense	4C 4B 4A		BC=3 9 14										
10			The boring was terminated at approximately 16.5 ft. below ground surface. The boring was backfilled with neat cement on July 25, 2024.													
	20		GROUNDWATER LEVEL INFORMATION: Groundwater was observed at approximately 11 ft. below ground surface during drilling. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.													
	5															
	25															
	0															
	30															
	-5															



PROJECT NO.:
25001389.001A

DRAWN BY: GG

CHECKED BY: NF

DATE: 7/26/2024

BORING LOG B-2

MANTECA WWTP IMPROVEMENTS, PHASE I
2450 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA

FIGURE

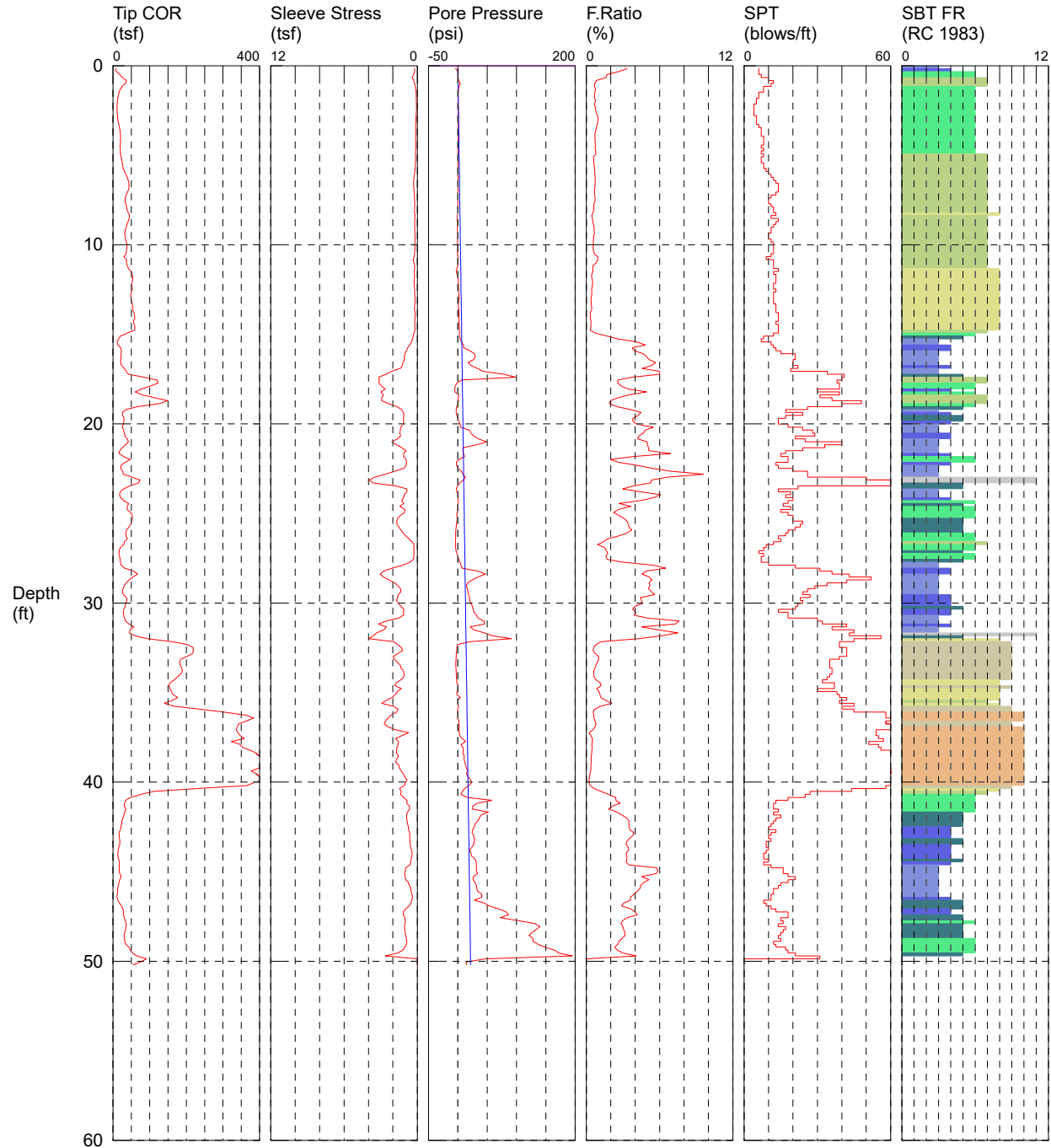
A-4

SOUNDING

SOUNDING
 CUSTOMER: Taber Drilling
 OPERATOR: David
 CONE ID: DDG1652
 LOCATION:

JOB NUMBER:
 HOLE NUMBER: CPT-1
 TEST DATE: 7/29/2024 7:59:02 AM
 COMMENT: Auto Enhance On
 COMMENT: Filter On

COMMENT:
 GPS (LAT,LON,ALT): 0.00,0.00,0.0
 LOCATION:
 LOCATION:



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 (*)

*SBT/SPT CORRELATION: UBC-1983

APPENDIX B
LABORATORY TESTING RESULTS

LIST OF ATTACHMENTS

The following figures are attached.

FIGURE B-1	Laboratory Test Results Summary
FIGURE B-2	Atterberg Limits
FIGURE B-3	Corrosion Test Results

ATTACHMENT 3

Exploration ID	Depth (ft.)	Sample No.	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
						Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	6.0	1A	SILTY SAND (SM)	9.3				16				
B-1	17.0	5	SANDY LEAN CLAY (CL)	32.6					45	24	21	
B-2	0.4	Bulk-1	SILTY SAND (SM)									pH= 7.06
												Resistivity= 6.16
												Sulfates= 12.8
												Chlorides= 2.3
B-2	8.0	2B	SILTY SAND (SM)	7.7				28				





gINT FILE: Klf_gint_master_2025
PROJECT NUMBER: 25001380.001A
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2025.GLB [KLF_ATTERBERG (ASTM)]

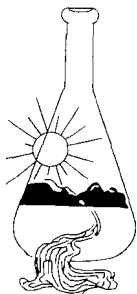


KLEINFELDER
Bright People. Right Solutions.

DRAWN BY: GG
CHECKED BY: NF
DATE:

MANTECA WWTP IMPROVEMENTS, TASK I
2450 W. YOSEMITE AVENUE
MANTECA, CALIFORNIA

B-2



Sunland Analytical

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

ATTACHMENT 3

Date Reported 08/14/2024
Date Submitted 08/07/2024

To: Adam Killinger
Kleinfelder-Sacramento
3130 Kilgore Road Ste 200
Rancho Cordova CA 95670

From: Gene Oliphant, Ph.D. \ Ty Bui 
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 25001380.001A Site ID : B-2 BULK0.4-5FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 92871-192343.

EVALUATION FOR SOIL CORROSION

Soil pH	7.06		
Minimum Resistivity	6.16 ohm-cm (x1000)		
Chloride	2.3 ppm	00.00023	%
Sulfate	12.8 ppm	00.00128	%

METHODS

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

FIGURE

B-3

APPENDIX C
LIQUEFACTION ANALYSIS

TABLE OF CONTENTS

CPT 1 results	
Summary data report	1
Input field data	8
Cyclic stress resistance results	15
Cyclic resistance ratio results	22
Liquefaction potential index data	29
Vertical settlements summary report	33
Vertical settlements data report	34
Strength loss data report	37

LIQUEFACTION ANALYSIS REPORT

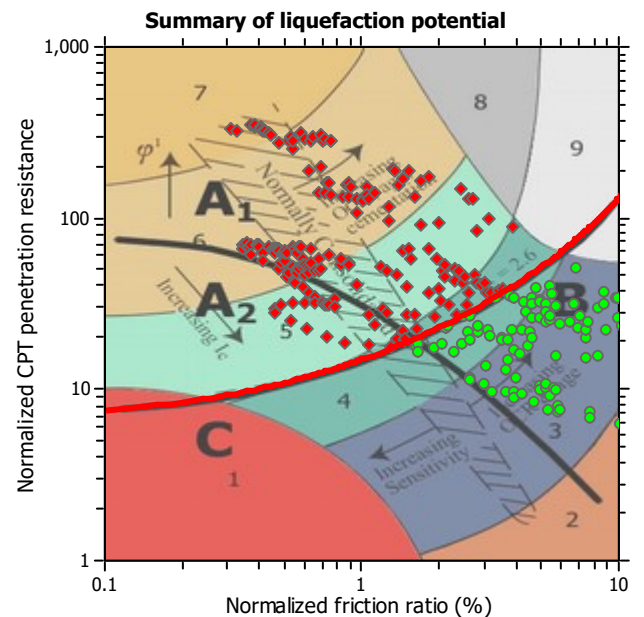
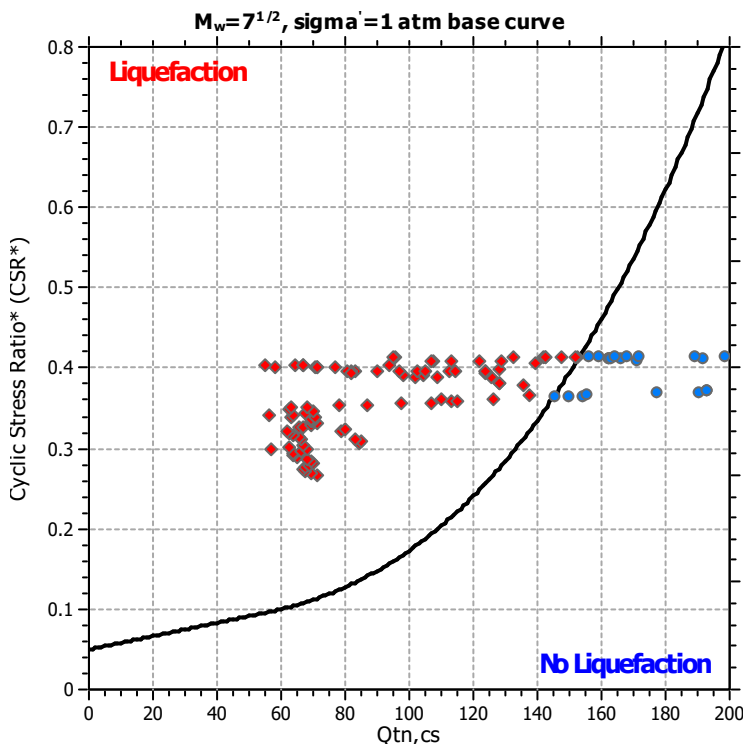
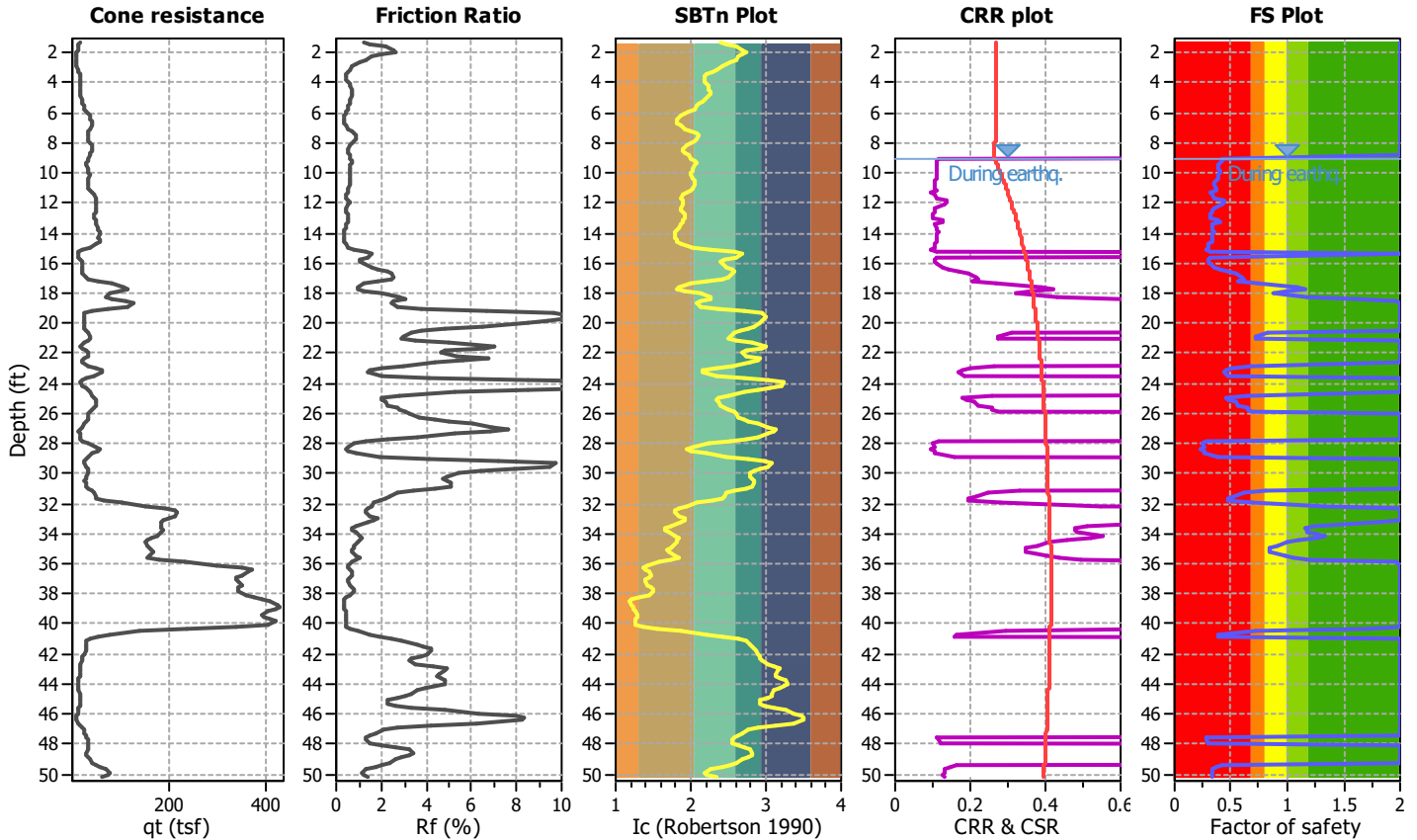
Project title : Manteca WWTP

Location : Manteca, CA

CPT file : CPT 1

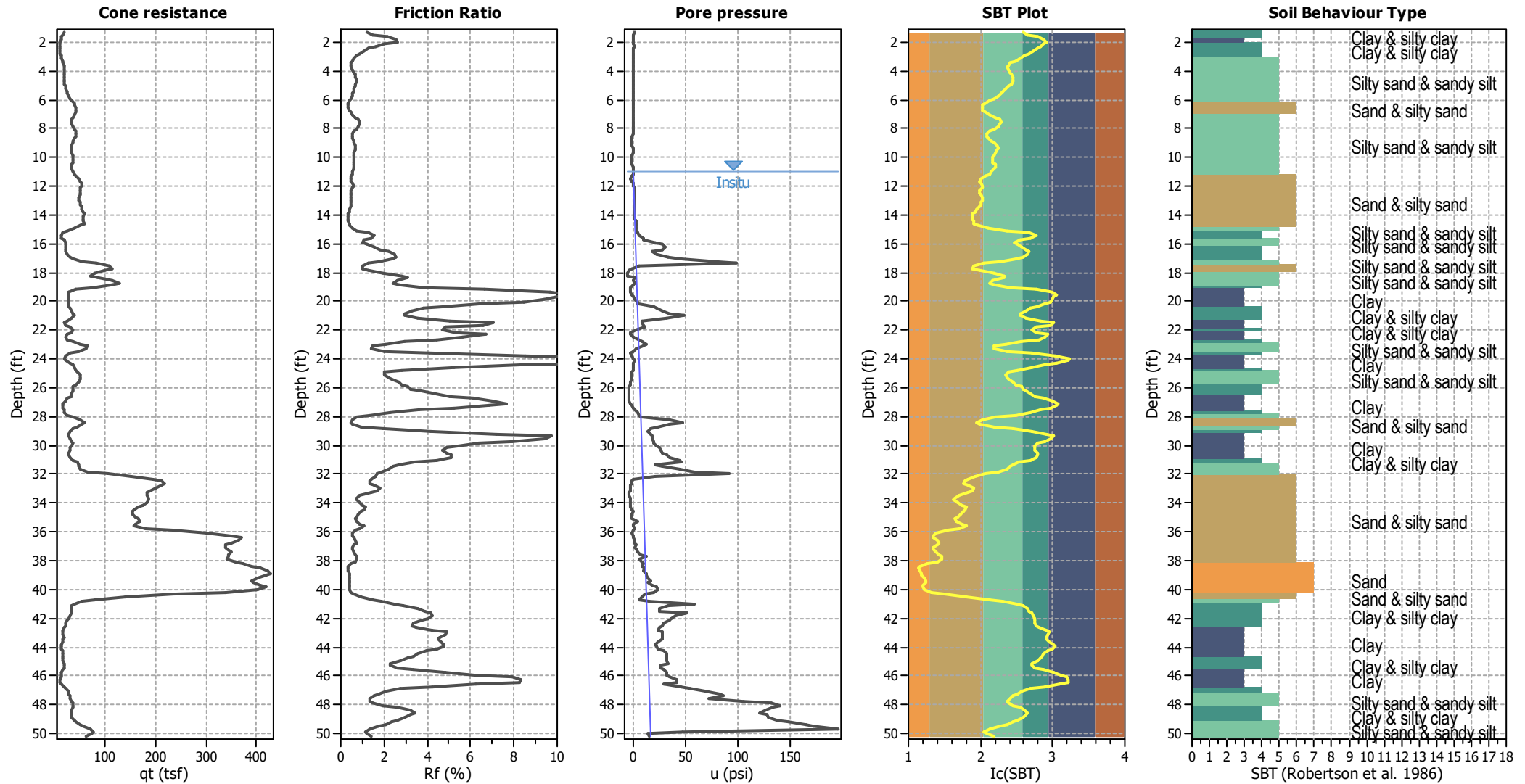
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	11.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	9.00 ft	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	7.13	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_o applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



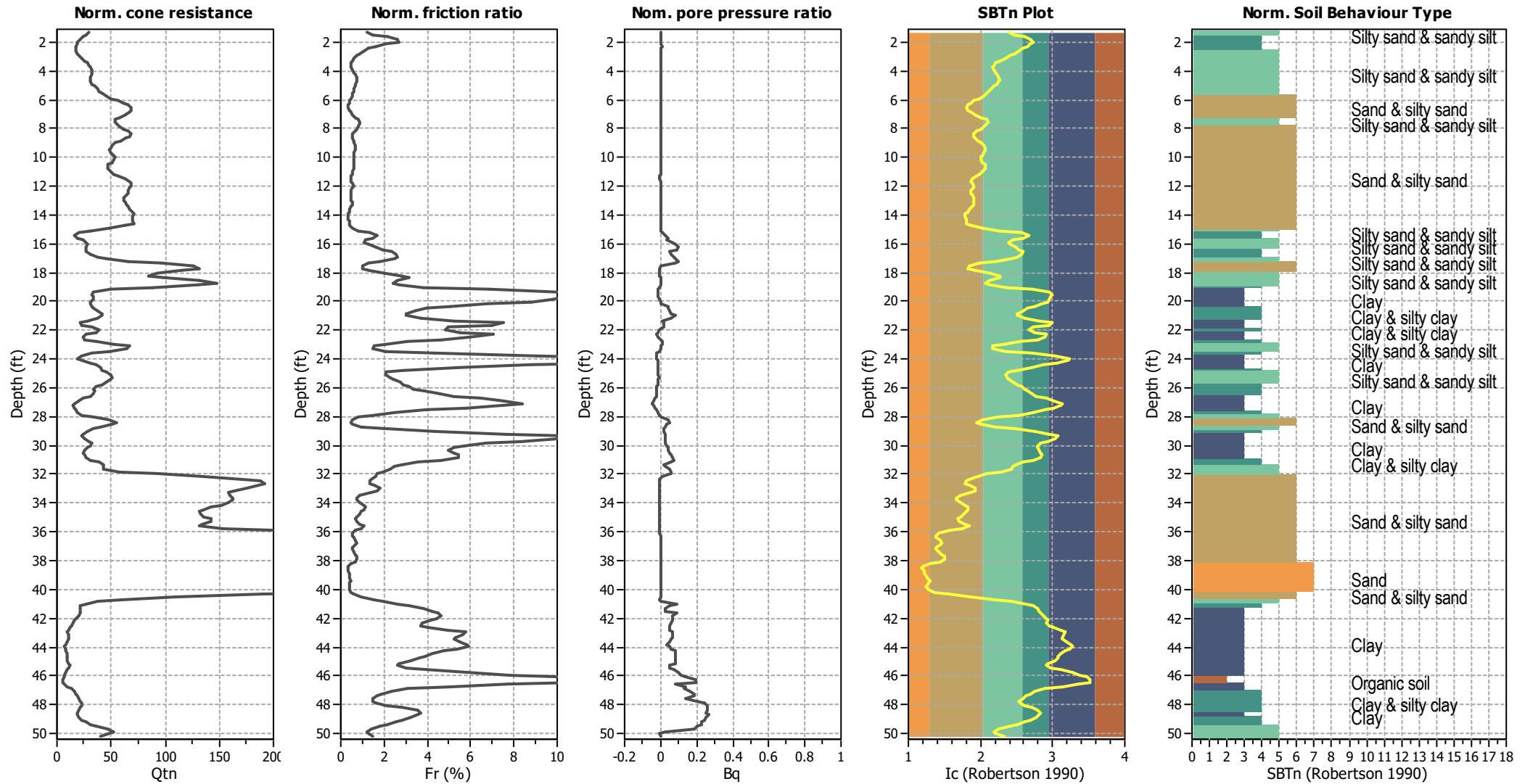
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (earthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_0 applied:	Yes
Earthquake magnitude M_w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



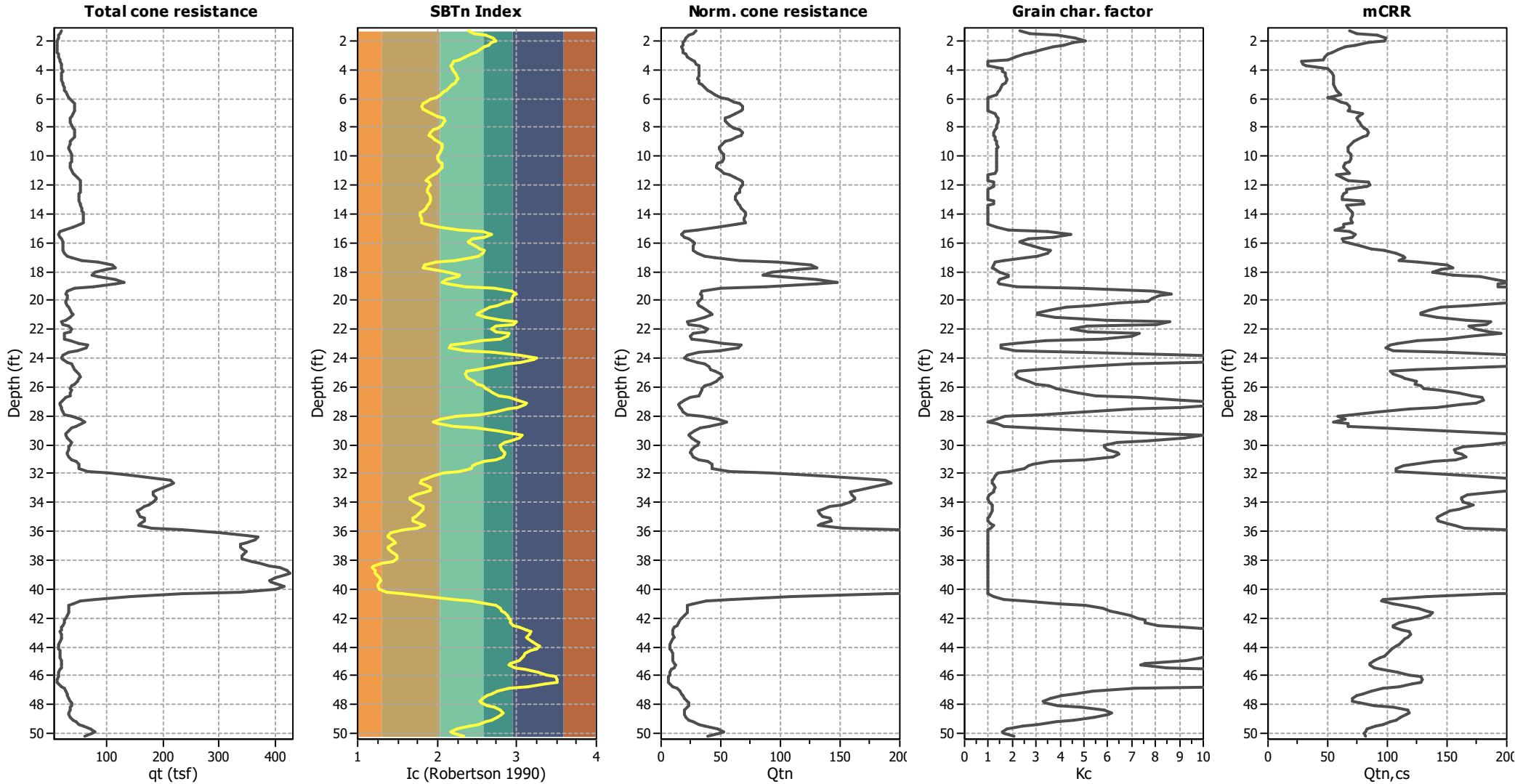
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

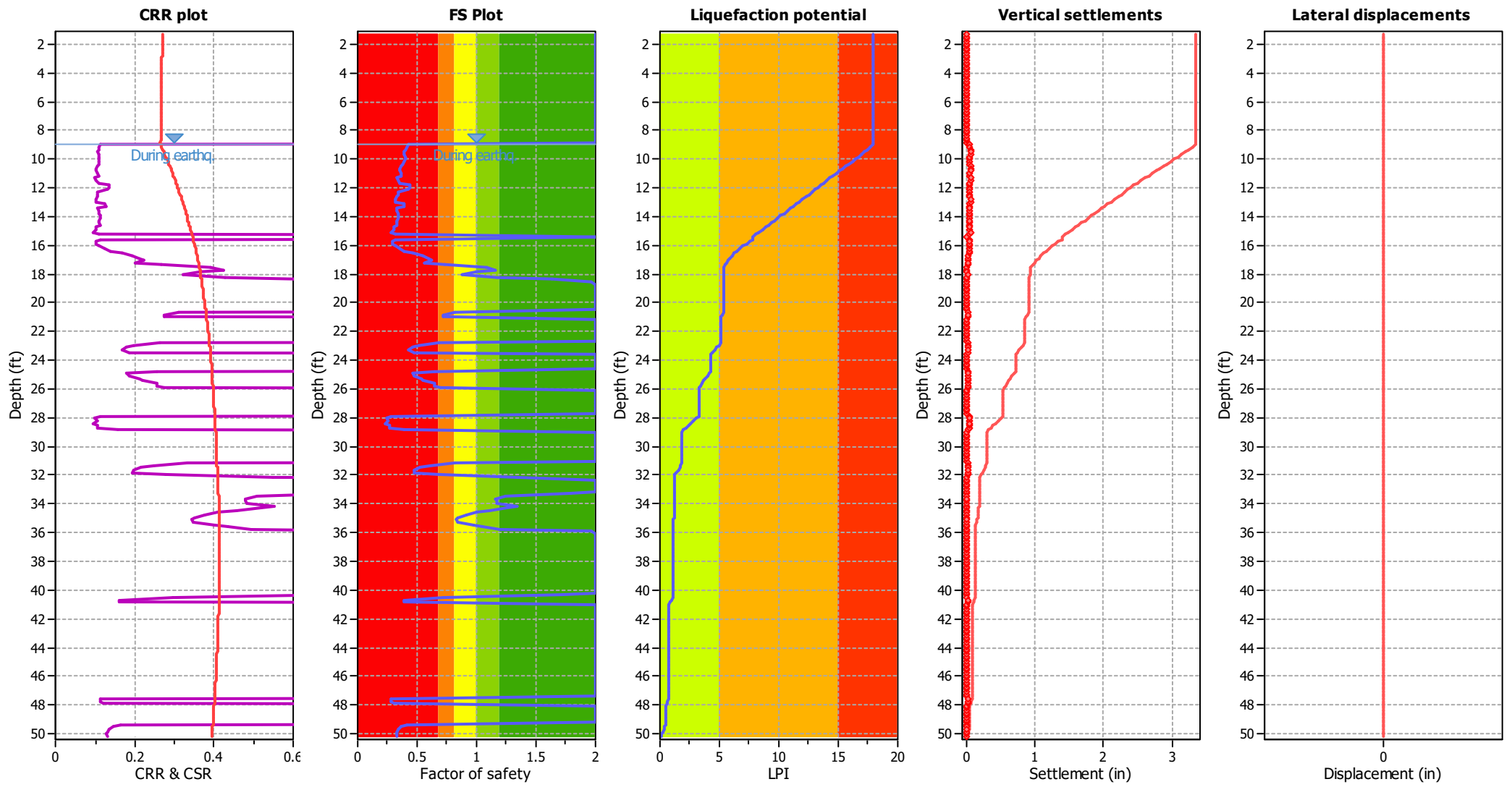
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (earthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

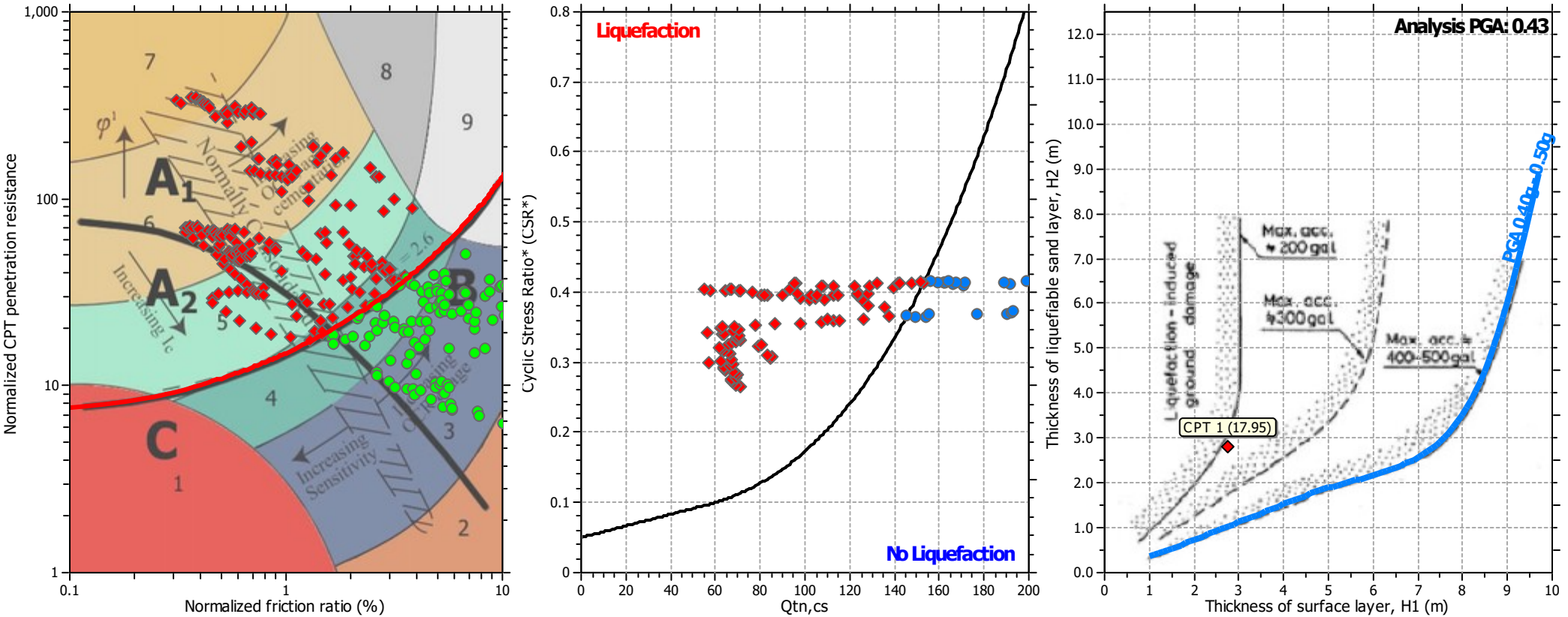
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

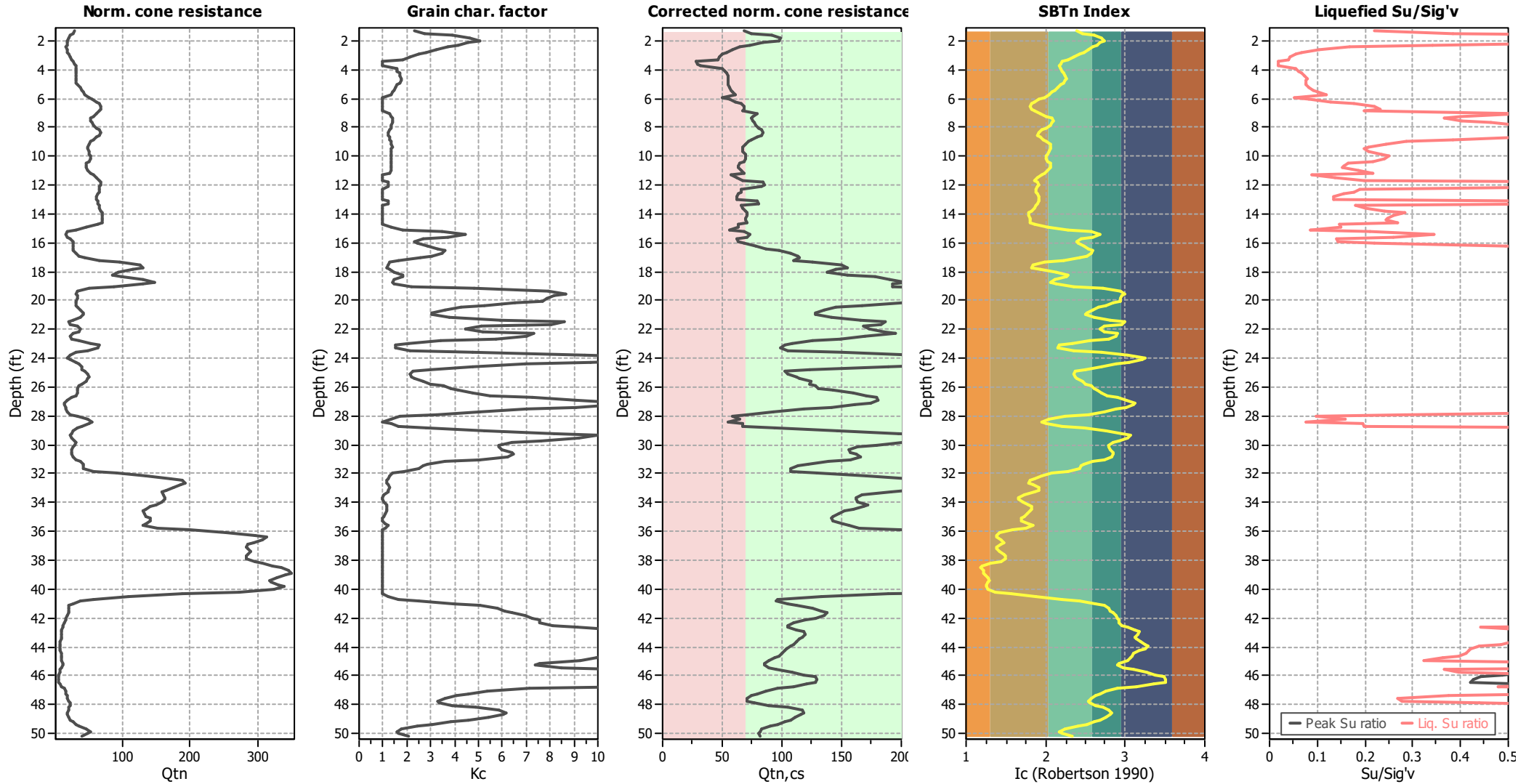
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_o applied:	Yes
Earthquake magnitude M_w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

:: Field input data ::

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	1.31	19.66	0.22	0.99	25.89	106.41
2	1.48	16.04	0.23	0.58	29.25	107.07
3	1.64	15.14	0.30	0.42	36.05	108.47
4	1.80	12.95	0.42	0.39	40.18	108.78
5	1.97	11.89	0.31	0.25	42.19	108.04
6	2.13	11.69	0.23	0.19	39.89	105.63
7	2.30	10.87	0.17	1.01	37.49	103.64
8	2.46	10.95	0.14	0.57	35.03	101.79
9	2.63	11.30	0.11	0.38	32.41	100.64
10	2.79	11.95	0.10	0.32	29.67	99.47
11	2.95	12.45	0.09	0.32	27.17	99.04
12	3.12	13.96	0.09	0.32	24.36	98.69
13	3.28	15.74	0.08	0.37	21.66	98.71
14	3.44	17.48	0.08	0.56	5.00	98.71
15	3.61	19.05	0.08	0.51	5.00	99.27
16	3.77	19.33	0.09	0.50	5.00	100.26
17	3.94	20.68	0.11	0.38	18.55	101.23
18	4.10	19.92	0.12	0.35	18.96	102.09
19	4.26	20.32	0.13	0.28	19.94	102.65
20	4.43	19.47	0.14	0.25	20.51	103.15
21	4.59	19.71	0.15	0.27	21.05	103.33
22	4.76	19.48	0.14	0.24	20.79	103.27
23	4.92	19.97	0.14	0.21	20.09	103.29
24	5.08	21.59	0.14	0.20	18.77	103.41
25	5.25	23.49	0.14	0.23	17.48	103.76
26	5.41	25.02	0.15	0.21	16.33	103.92
27	5.58	26.13	0.14	0.07	15.29	104.04
28	5.74	27.94	0.14	0.11	14.05	104.28
29	5.91	31.19	0.15	0.13	5.00	104.74
30	6.07	35.40	0.16	0.20	5.00	104.76
31	6.23	38.85	0.13	0.19	5.00	104.89
32	6.40	41.42	0.14	0.18	5.00	104.97
33	6.56	43.21	0.15	0.17	5.00	105.74
34	6.73	43.70	0.17	0.15	5.00	106.48
35	6.89	42.55	0.19	0.11	5.00	107.24
36	7.05	39.64	0.21	0.05	11.18	108.03
37	7.22	35.73	0.24	-0.03	13.27	108.72
38	7.38	32.75	0.28	-0.07	15.15	109.38
39	7.55	32.77	0.30	-0.08	15.83	109.91
40	7.71	34.96	0.31	-0.06	15.40	110.24
41	7.87	36.53	0.30	-0.10	14.46	110.24
42	8.04	37.71	0.29	-0.14	13.10	109.97
43	8.20	41.52	0.26	-0.20	11.47	109.56
44	8.37	45.15	0.24	-0.65	10.55	109.17
45	8.53	43.86	0.23	-1.23	10.50	108.89
46	8.69	41.20	0.23	-1.37	11.13	108.42
47	8.86	38.12	0.21	-0.94	12.16	108.16
48	9.02	35.46	0.23	-1.09	13.29	107.92

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	9.19	33.19	0.23	-0.96	14.50	108.03
50	9.35	32.09	0.23	-0.72	14.83	107.66
51	9.51	32.64	0.20	-0.64	14.68	107.51
52	9.68	33.97	0.21	-0.73	13.99	107.45
53	9.84	36.39	0.22	-0.80	13.50	107.81
54	10.01	38.00	0.22	-0.99	13.20	107.97
55	10.17	37.31	0.22	-1.08	13.22	107.95
56	10.34	36.86	0.21	-0.95	13.52	107.81
57	10.50	35.95	0.21	-0.87	14.64	107.35
58	10.66	29.10	0.20	0.58	14.63	107.15
59	10.83	36.65	0.20	-0.28	14.59	107.12
60	10.99	36.61	0.21	-0.20	13.49	107.55
61	11.15	38.29	0.22	-0.09	12.83	107.77
62	11.32	42.47	0.21	-1.73	5.00	108.11
63	11.48	48.98	0.21	-2.77	5.00	108.55
64	11.65	52.37	0.23	-1.52	5.00	109.41
65	11.81	54.03	0.27	-0.05	10.11	110.70
66	11.97	53.15	0.34	0.58	10.55	111.20
67	12.14	51.76	0.30	0.99	10.48	110.68
68	12.30	51.37	0.21	1.05	5.00	109.49
69	12.47	52.86	0.22	1.07	5.00	109.15
70	12.63	50.39	0.26	1.16	5.00	109.29
71	12.79	48.04	0.23	1.53	5.00	109.35
72	12.96	48.69	0.23	1.59	5.00	109.34
73	13.12	50.48	0.26	1.30	10.55	109.79
74	13.29	52.46	0.27	0.92	10.31	109.99
75	13.45	52.68	0.24	0.88	5.00	109.74
76	13.62	53.44	0.23	1.53	5.00	109.32
77	13.78	56.94	0.22	1.60	5.00	109.04
78	13.94	59.02	0.21	1.76	5.00	108.64
79	14.11	59.59	0.19	1.90	5.00	108.26
80	14.27	55.09	0.19	1.84	5.00	108.31
81	14.44	57.73	0.21	2.11	5.00	108.73
82	14.60	59.67	0.23	2.35	5.00	109.31
83	14.76	58.46	0.24	2.46	5.00	108.59
84	14.93	38.93	0.17	2.47	13.52	107.45
85	15.09	19.92	0.19	2.69	21.65	105.87
86	15.26	14.94	0.20	4.04	33.73	105.15
87	15.42	11.29	0.21	5.74	39.14	104.98
88	15.58	12.78	0.21	9.81	35.02	105.49
89	15.75	21.02	0.21	9.78	28.50	105.79
90	15.91	22.72	0.19	20.60	25.87	107.03
91	16.08	21.92	0.29	27.98	27.06	108.26
92	16.24	21.72	0.34	29.76	30.07	109.81
93	16.40	20.71	0.39	27.06	32.49	110.95
94	16.57	20.75	0.46	17.34	34.60	112.54
95	16.73	22.94	0.62	22.27	33.66	114.66
96	16.90	30.35	0.79	33.35	31.12	116.62

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	17.06	35.65	0.89	42.45	27.78	118.31
98	17.22	42.48	1.02	78.12	19.61	120.02
99	17.39	84.52	1.07	98.63	12.66	121.42
100	17.55	119.95	1.06	5.99	8.98	122.43
101	17.72	122.76	1.17	-1.71	8.67	122.89
102	17.88	101.92	1.22	-4.48	11.14	123.22
103	18.05	77.68	1.39	-5.61	16.94	124.30
104	18.21	60.49	2.13	-5.28	21.50	125.88
105	18.37	79.73	2.55	1.96	21.23	128.13
106	18.54	112.82	3.18	0.06	16.52	129.73
107	18.70	149.04	3.11	0.97	14.87	130.51
108	18.86	126.57	3.14	0.07	16.91	130.02
109	19.03	67.48	2.93	-2.31	24.90	128.65
110	19.19	35.59	2.64	-2.84	41.04	127.10
111	19.36	25.55	2.98	-3.11	54.98	126.02
112	19.52	26.05	2.78	-1.93	57.94	126.11
113	19.68	30.18	2.93	-0.33	56.03	126.18
114	19.85	29.27	2.93	1.69	54.73	125.89
115	20.01	28.01	2.39	3.77	53.89	124.54
116	20.18	25.02	1.67	4.67	48.99	122.57
117	20.34	28.73	1.29	19.52	43.19	120.72
118	20.50	30.76	1.14	22.11	38.15	119.83
119	20.67	32.17	1.10	27.08	34.52	119.79
120	20.83	38.41	1.15	34.75	31.31	119.98
121	21.00	42.18	1.11	48.90	31.05	120.13
122	21.16	34.22	1.15	32.11	35.68	120.29
123	21.32	24.96	1.37	8.55	46.15	120.17
124	21.49	18.04	1.39	8.24	57.79	120.02
125	21.65	16.19	1.43	9.52	55.57	120.19
126	21.82	28.97	1.38	11.38	42.54	121.46
127	21.98	46.58	1.61	2.03	39.27	122.89
128	22.15	33.17	2.10	-2.69	42.71	123.19
129	22.31	21.88	1.71	-2.38	52.58	122.00
130	22.47	20.72	1.27	0.13	51.20	119.87
131	22.64	26.79	0.92	5.95	45.46	118.84
132	22.80	27.32	1.11	8.43	33.39	119.37
133	22.97	51.96	1.13	12.89	23.73	120.27
134	23.13	74.04	0.93	9.37	17.76	120.27
135	23.29	69.17	0.87	3.21	17.72	119.60
136	23.46	45.94	0.90	-0.52	24.46	119.46
137	23.62	28.98	1.12	-2.61	40.57	120.55
138	23.79	19.36	1.85	-1.73	61.17	122.37
139	23.95	17.66	2.62	-0.30	76.34	124.60
140	24.11	20.46	3.48	0.63	74.45	126.70
141	24.28	28.96	3.95	0.59	62.01	128.16
142	24.44	42.09	3.64	0.43	50.90	127.40
143	24.61	39.40	1.78	-0.34	40.67	124.67
144	24.77	38.66	0.86	-0.68	30.87	120.50

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	24.93	47.15	0.86	-0.92	25.63	119.10
146	25.10	52.30	1.07	-2.12	24.34	119.99
147	25.26	52.33	1.13	-1.32	25.20	120.98
148	25.43	51.04	1.28	-1.97	25.99	121.04
149	25.59	48.86	1.13	-2.54	28.70	121.51
150	25.75	43.10	1.44	-2.94	30.80	120.73
151	25.92	36.62	1.02	-3.54	33.95	120.28
152	26.08	34.80	1.05	-3.76	35.83	119.98
153	26.25	35.61	1.37	-3.77	37.47	121.18
154	26.41	39.09	1.60	-3.89	40.82	122.21
155	26.57	31.67	1.70	-4.12	44.27	122.53
156	26.74	28.91	1.69	-4.46	52.24	121.84
157	26.90	19.77	1.50	-4.27	59.68	120.82
158	27.07	16.74	1.36	-3.27	67.51	119.39
159	27.23	16.08	1.16	-1.52	66.21	118.24
160	27.39	17.93	0.95	-0.10	59.58	116.78
161	27.56	19.21	0.69	1.44	51.04	114.83
162	27.72	20.36	0.45	3.40	42.29	112.06
163	27.89	22.01	0.26	5.13	32.17	110.12
164	28.05	31.91	0.29	7.00	20.34	109.70
165	28.21	56.43	0.27	34.60	13.90	110.68
166	28.38	66.87	0.28	46.91	5.00	110.95
167	28.54	54.16	0.29	34.47	13.28	111.23
168	28.71	43.44	0.33	24.11	19.42	113.01
169	28.87	35.76	0.61	16.63	29.69	116.62
170	29.04	30.68	1.20	14.22	43.22	120.57
171	29.20	26.96	2.07	16.12	55.93	123.50
172	29.36	25.41	2.76	17.28	63.22	125.37
173	29.53	27.84	3.04	18.11	60.18	126.27
174	29.69	36.44	2.78	19.84	53.67	126.21
175	29.86	37.73	2.34	19.87	48.39	125.18
176	30.02	33.74	1.84	22.60	46.07	123.76
177	30.18	33.56	1.60	24.54	46.06	122.22
178	30.35	29.16	1.37	26.18	46.56	121.30
179	30.51	28.01	1.36	27.41	48.46	121.10
180	30.68	28.86	1.56	31.77	48.72	121.56
181	30.84	30.89	1.62	34.29	47.60	122.25
182	31.00	33.70	1.70	44.58	42.25	122.60
183	31.17	43.59	1.55	45.66	34.54	122.66
184	31.33	56.31	1.33	20.85	30.02	121.86
185	31.50	46.70	1.10	27.32	28.52	121.07
186	31.66	44.47	1.14	44.83	27.28	120.69
187	31.82	58.86	1.13	58.47	21.92	122.25
188	31.99	93.50	1.54	90.90	15.46	125.69
189	32.15	160.96	2.55	21.11	11.86	129.02
190	32.32	201.79	3.18	-0.54	9.25	130.54
191	32.48	218.49	2.54	-2.05	8.11	130.93
192	32.64	219.33	2.73	-1.82	7.93	131.12

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	32.81	217.42	3.33	-2.57	9.15	131.92
194	32.97	202.02	3.62	-2.95	10.97	132.67
195	33.14	184.65	3.98	-3.19	10.83	131.54
196	33.30	181.25	1.96	-3.54	9.52	129.73
197	33.47	183.18	1.61	-3.69	6.61	126.58
198	33.63	187.79	1.33	-3.51	5.51	125.37
199	33.79	189.62	1.19	-3.05	5.42	125.29
200	33.96	185.00	1.57	-2.77	6.49	126.32
201	34.12	175.77	1.98	-2.42	7.87	127.22
202	34.28	167.03	1.89	-2.24	8.79	127.20
203	34.45	155.25	1.66	-1.95	8.71	126.28
204	34.61	153.18	1.40	0.28	8.31	125.35
205	34.78	155.13	1.33	-1.01	7.46	124.48
206	34.94	159.33	1.15	-1.47	6.73	123.92
207	35.10	163.58	1.09	-1.85	5.88	123.57
208	35.27	176.66	1.11	4.12	6.10	123.98
209	35.43	162.35	1.34	-0.69	7.67	125.10
210	35.60	139.95	1.74	-0.40	8.98	126.24
211	35.76	167.80	1.85	1.27	7.02	126.55
212	35.92	235.63	1.32	-0.40	4.00	127.02
213	36.09	301.09	1.64	-0.90	1.84	127.59
214	36.25	363.02	1.82	-0.04	1.23	129.04
215	36.42	383.79	2.07	-0.36	1.35	130.28
216	36.58	364.37	2.53	1.65	2.12	131.39
217	36.74	342.55	2.93	1.61	2.40	131.17
218	36.91	339.18	1.95	2.45	2.06	130.09
219	37.07	336.23	1.58	1.61	1.30	128.55
220	37.24	340.45	1.70	2.40	1.39	128.86
221	37.40	347.21	2.16	3.52	1.75	129.93
222	37.57	358.40	2.40	7.28	2.44	130.87
223	37.73	322.56	2.60	13.08	2.78	131.41
224	37.89	346.65	2.71	5.36	2.84	131.42
225	38.06	353.67	2.41	8.71	1.97	130.75
226	38.22	374.50	1.81	9.47	0.51	128.37
227	38.39	390.42	0.72	8.30	0.00	126.56
228	38.55	408.87	1.27	10.76	0.00	126.59
229	38.71	425.29	1.77	10.15	0.00	128.16
230	38.88	429.58	1.57	11.73	0.00	128.66
231	39.04	426.57	1.57	12.87	0.00	128.46
232	39.21	399.99	1.67	14.40	0.09	128.54
233	39.37	377.42	1.69	16.80	0.36	128.66
234	39.53	390.98	1.71	14.44	0.23	128.51
235	39.70	411.33	1.55	17.39	0.02	128.60
236	39.86	421.99	1.70	21.63	0.00	128.77
237	40.03	420.07	1.78	23.68	0.13	128.62
238	40.19	364.72	1.51	19.05	1.14	127.87
239	40.35	230.57	1.48	11.23	3.78	126.28
240	40.52	111.86	1.34	7.80	9.70	124.35

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	40.68	76.79	1.14	4.81	19.32	122.12
242	40.85	47.38	1.05	15.60	27.28	120.06
243	41.01	35.23	0.84	57.86	36.62	118.84
244	41.17	31.35	0.98	33.23	42.31	118.49
245	41.34	30.41	1.06	25.30	45.67	119.90
246	41.50	35.25	1.46	24.35	47.11	120.62
247	41.67	31.69	1.33	51.71	48.40	121.18
248	41.83	30.49	1.37	39.84	50.78	120.38
249	41.99	26.56	1.14	36.44	52.20	119.19
250	42.16	24.34	0.85	34.26	53.44	117.77
251	42.32	23.24	0.87	29.40	53.41	116.21
252	42.49	21.38	0.64	28.09	55.66	115.36
253	42.65	20.03	0.64	25.28	60.00	114.84
254	42.81	16.70	0.79	23.93	66.53	115.42
255	42.98	16.38	0.88	27.06	71.06	116.02
256	43.14	17.55	0.88	27.96	69.61	116.27
257	43.31	18.58	0.84	28.26	67.32	116.15
258	43.47	18.27	0.81	27.02	68.14	115.68
259	43.63	15.78	0.75	23.87	72.09	115.05
260	43.80	13.98	0.71	20.22	76.97	114.24
261	43.96	13.23	0.65	22.09	79.41	113.64
262	44.13	13.22	0.62	23.70	76.31	113.38
263	44.29	15.37	0.62	28.94	70.98	113.46
264	44.45	17.05	0.61	31.20	66.14	113.55
265	44.62	17.30	0.59	31.32	64.08	113.30
266	44.78	16.69	0.54	31.39	63.05	112.72
267	44.95	16.77	0.48	31.50	60.32	112.00
268	45.11	18.31	0.43	33.41	53.46	111.71
269	45.28	22.41	0.44	26.43	52.71	111.90
270	45.44	18.28	0.51	25.77	57.14	112.43
271	45.60	15.93	0.56	29.18	66.23	112.82
272	45.77	14.49	0.60	31.62	78.61	114.27
273	45.93	12.05	0.96	32.32	87.78	115.43
274	46.10	12.66	0.98	33.93	97.23	116.42
275	46.26	11.40	1.05	41.01	100.00	116.50
276	46.42	11.01	1.02	40.81	100.00	116.37
277	46.59	12.49	0.94	28.44	85.78	116.00
278	46.75	17.92	0.74	45.02	68.00	115.52
279	46.92	23.00	0.65	53.94	51.80	114.70
280	47.08	27.09	0.53	69.67	43.78	114.19
281	47.24	28.63	0.53	82.45	39.69	113.42
282	47.41	27.84	0.44	86.14	37.07	112.85
283	47.57	30.73	0.40	72.40	34.44	112.56
284	47.74	33.68	0.45	105.29	32.49	113.34
285	47.90	36.10	0.55	131.68	32.98	114.75
286	48.06	35.25	0.67	139.76	36.35	116.79
287	48.23	33.90	0.98	133.42	41.26	118.44
288	48.39	31.76	1.14	126.26	45.92	119.52

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	48.56	30.15	1.16	121.12	47.48	119.54
290	48.72	30.85	1.03	127.89	46.73	119.20
291	48.88	31.81	0.99	128.32	43.95	119.00
292	49.05	35.24	1.02	136.68	39.79	119.36
293	49.21	43.29	1.06	147.76	35.72	119.77
294	49.38	46.61	1.04	165.00	31.33	120.04
295	49.54	53.66	1.00	171.75	26.94	120.13
296	49.70	64.80	0.96	195.26	20.80	120.33
297	49.87	91.08	0.90	46.36	18.32	120.15
298	50.03	75.84	0.85	13.75	19.44	119.88
299	50.20	54.40	0.91	14.88	23.92	119.46

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_G	User FS	CSR*	Belongs to transition
1	1.31	0.07	0.00	0.07	1.00	0.279	1.14	0.245	1.00	1.10	2.000	No
2	1.48	0.08	0.00	0.08	1.00	0.279	1.14	0.245	1.00	1.10	2.000	No
3	1.64	0.09	0.00	0.09	1.00	0.279	1.14	0.245	1.00	1.10	2.000	No
4	1.80	0.10	0.00	0.10	1.00	0.279	1.14	0.245	1.00	1.10	2.000	No
5	1.97	0.11	0.00	0.11	1.00	0.279	1.14	0.245	1.00	1.10	2.000	No
6	2.13	0.11	0.00	0.11	1.00	0.279	1.14	0.245	1.00	1.10	2.000	No
7	2.30	0.12	0.00	0.12	1.00	0.279	1.14	0.245	1.00	1.10	2.000	No
8	2.46	0.13	0.00	0.13	1.00	0.278	1.14	0.245	1.00	1.10	2.000	No
9	2.63	0.14	0.00	0.14	1.00	0.278	1.14	0.245	1.00	1.10	2.000	No
10	2.79	0.15	0.00	0.15	1.00	0.278	1.14	0.245	1.00	1.10	2.000	No
11	2.95	0.16	0.00	0.16	1.00	0.278	1.14	0.244	1.00	1.10	2.000	No
12	3.12	0.16	0.00	0.16	0.99	0.278	1.14	0.244	1.00	1.10	2.000	No
13	3.28	0.17	0.00	0.17	0.99	0.278	1.14	0.244	1.00	1.10	2.000	No
14	3.44	0.18	0.00	0.18	0.99	0.278	1.14	0.244	1.00	1.10	2.000	No
15	3.61	0.19	0.00	0.19	0.99	0.278	1.14	0.244	1.00	1.10	2.000	No
16	3.77	0.20	0.00	0.20	0.99	0.278	1.14	0.244	1.00	1.10	2.000	No
17	3.94	0.20	0.00	0.20	0.99	0.277	1.14	0.244	1.00	1.10	2.000	No
18	4.10	0.21	0.00	0.21	0.99	0.277	1.14	0.244	1.00	1.10	2.000	No
19	4.26	0.22	0.00	0.22	0.99	0.277	1.14	0.244	1.00	1.10	2.000	No
20	4.43	0.23	0.00	0.23	0.99	0.277	1.14	0.244	1.00	1.10	2.000	No
21	4.59	0.24	0.00	0.24	0.99	0.277	1.14	0.243	1.00	1.10	2.000	No
22	4.76	0.25	0.00	0.25	0.99	0.277	1.14	0.243	1.00	1.10	2.000	No
23	4.92	0.25	0.00	0.25	0.99	0.277	1.14	0.243	1.00	1.10	2.000	No
24	5.08	0.26	0.00	0.26	0.99	0.277	1.14	0.243	1.00	1.10	2.000	No
25	5.25	0.27	0.00	0.27	0.99	0.277	1.14	0.243	1.00	1.10	2.000	No
26	5.41	0.28	0.00	0.28	0.99	0.277	1.14	0.243	1.00	1.10	2.000	No
27	5.58	0.29	0.00	0.29	0.99	0.276	1.14	0.243	1.00	1.10	2.000	No
28	5.74	0.30	0.00	0.30	0.99	0.276	1.14	0.243	1.00	1.10	2.000	No
29	5.91	0.31	0.00	0.31	0.99	0.276	1.14	0.243	1.00	1.10	2.000	No
30	6.07	0.31	0.00	0.31	0.99	0.276	1.14	0.243	1.00	1.10	2.000	No
31	6.23	0.32	0.00	0.32	0.99	0.276	1.14	0.243	1.00	1.10	2.000	No
32	6.40	0.33	0.00	0.33	0.99	0.276	1.14	0.242	1.00	1.10	2.000	No
33	6.56	0.34	0.00	0.34	0.99	0.276	1.14	0.242	1.00	1.10	2.000	No
34	6.73	0.35	0.00	0.35	0.99	0.276	1.14	0.242	1.00	1.10	2.000	No
35	6.89	0.36	0.00	0.36	0.99	0.276	1.14	0.242	1.00	1.10	2.000	No
36	7.05	0.37	0.00	0.37	0.99	0.275	1.14	0.242	1.00	1.10	2.000	No
37	7.22	0.38	0.00	0.38	0.99	0.275	1.14	0.242	1.00	1.10	2.000	No
38	7.38	0.38	0.00	0.38	0.98	0.275	1.14	0.242	1.00	1.10	2.000	No
39	7.55	0.39	0.00	0.39	0.98	0.275	1.14	0.242	1.00	1.10	2.000	No
40	7.71	0.40	0.00	0.40	0.98	0.275	1.14	0.242	1.00	1.10	2.000	No
41	7.87	0.41	0.00	0.41	0.98	0.275	1.14	0.242	1.00	1.10	2.000	No
42	8.04	0.42	0.00	0.42	0.98	0.275	1.14	0.242	1.00	1.10	2.000	No
43	8.20	0.43	0.00	0.43	0.98	0.275	1.14	0.241	1.00	1.10	2.000	No
44	8.37	0.44	0.00	0.44	0.98	0.275	1.14	0.241	1.00	1.10	2.000	No
45	8.53	0.45	0.00	0.45	0.98	0.275	1.14	0.241	1.00	1.10	2.000	No
46	8.69	0.46	0.00	0.46	0.98	0.274	1.14	0.241	1.00	1.10	2.000	No
47	8.86	0.47	0.00	0.47	0.98	0.274	1.14	0.241	1.00	1.10	2.000	No
48	9.02	0.47	0.00	0.47	0.98	0.275	1.14	0.241	1.00	1.10	0.266	No

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

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR _{eq}	K_σ	User FS	CSR*	Belongs to transition
49	9.19	0.48	0.01	0.48	0.98	0.277	1.14	0.244	1.00	1.10	0.268	No
50	9.35	0.49	0.01	0.48	0.98	0.280	1.14	0.246	1.00	1.10	0.271	No
51	9.51	0.50	0.02	0.48	0.98	0.283	1.14	0.249	1.00	1.10	0.274	No
52	9.68	0.51	0.02	0.49	0.98	0.286	1.14	0.251	1.00	1.10	0.276	No
53	9.84	0.52	0.03	0.49	0.98	0.288	1.14	0.253	1.00	1.10	0.279	No
54	10.01	0.53	0.03	0.50	0.98	0.291	1.14	0.256	1.00	1.10	0.281	No
55	10.17	0.54	0.04	0.50	0.98	0.294	1.14	0.258	1.00	1.10	0.284	No
56	10.34	0.55	0.04	0.50	0.98	0.296	1.14	0.260	1.00	1.10	0.286	No
57	10.50	0.55	0.05	0.51	0.98	0.299	1.14	0.262	1.00	1.10	0.289	No
58	10.66	0.56	0.05	0.51	0.98	0.301	1.14	0.265	1.00	1.10	0.291	No
59	10.83	0.57	0.06	0.51	0.98	0.303	1.14	0.267	1.00	1.10	0.293	No
60	10.99	0.58	0.06	0.52	0.98	0.306	1.14	0.269	1.00	1.10	0.296	No
61	11.15	0.59	0.07	0.52	0.98	0.308	1.14	0.271	1.00	1.10	0.298	No
62	11.32	0.60	0.07	0.53	0.98	0.310	1.14	0.273	1.00	1.10	0.300	No
63	11.48	0.61	0.08	0.53	0.98	0.313	1.14	0.275	1.00	1.10	0.302	No
64	11.65	0.62	0.08	0.53	0.98	0.315	1.14	0.277	1.00	1.10	0.304	No
65	11.81	0.63	0.09	0.54	0.98	0.317	1.14	0.279	1.00	1.10	0.307	No
66	11.97	0.63	0.09	0.54	0.97	0.319	1.14	0.281	1.00	1.10	0.309	No
67	12.14	0.64	0.10	0.55	0.97	0.321	1.14	0.282	1.00	1.10	0.311	No
68	12.30	0.65	0.10	0.55	0.97	0.323	1.14	0.284	1.00	1.10	0.313	No
69	12.47	0.66	0.11	0.55	0.97	0.325	1.14	0.286	1.00	1.10	0.315	No
70	12.63	0.67	0.11	0.56	0.97	0.327	1.14	0.288	1.00	1.10	0.317	No
71	12.79	0.68	0.12	0.56	0.97	0.329	1.14	0.290	1.00	1.10	0.318	No
72	12.96	0.69	0.12	0.56	0.97	0.331	1.14	0.291	1.00	1.10	0.320	No
73	13.12	0.70	0.13	0.57	0.97	0.333	1.14	0.293	1.00	1.10	0.322	No
74	13.29	0.71	0.13	0.57	0.97	0.335	1.14	0.295	1.00	1.10	0.324	No
75	13.45	0.72	0.14	0.58	0.97	0.337	1.14	0.296	1.00	1.10	0.326	No
76	13.62	0.72	0.14	0.58	0.97	0.339	1.14	0.298	1.00	1.10	0.328	No
77	13.78	0.73	0.15	0.58	0.97	0.341	1.14	0.299	1.00	1.10	0.329	No
78	13.94	0.74	0.15	0.59	0.97	0.343	1.14	0.301	1.00	1.10	0.331	No
79	14.11	0.75	0.16	0.59	0.97	0.344	1.14	0.303	1.00	1.10	0.333	No
80	14.27	0.76	0.16	0.60	0.97	0.346	1.14	0.304	1.00	1.10	0.335	No
81	14.44	0.77	0.17	0.60	0.97	0.348	1.14	0.306	1.00	1.10	0.336	No
82	14.60	0.78	0.17	0.60	0.97	0.349	1.14	0.307	1.00	1.10	0.338	No
83	14.76	0.79	0.18	0.61	0.97	0.351	1.14	0.309	1.00	1.10	0.339	No
84	14.93	0.80	0.18	0.61	0.97	0.353	1.14	0.310	1.00	1.10	0.341	No
85	15.09	0.80	0.19	0.61	0.97	0.354	1.14	0.312	1.00	1.10	0.343	No
86	15.26	0.81	0.20	0.62	0.97	0.356	1.14	0.313	1.00	1.10	0.344	No
87	15.42	0.82	0.20	0.62	0.97	0.358	1.14	0.314	1.00	1.10	0.346	No
88	15.58	0.83	0.21	0.62	0.97	0.359	1.14	0.316	1.00	1.10	0.347	No
89	15.75	0.84	0.21	0.63	0.97	0.361	1.14	0.317	1.00	1.10	0.349	No
90	15.91	0.85	0.22	0.63	0.97	0.362	1.14	0.318	1.00	1.10	0.350	No
91	16.08	0.86	0.22	0.64	0.97	0.364	1.14	0.320	1.00	1.10	0.352	No
92	16.24	0.87	0.23	0.64	0.97	0.365	1.14	0.321	1.00	1.10	0.353	No
93	16.40	0.87	0.23	0.64	0.97	0.367	1.14	0.322	1.00	1.10	0.355	No
94	16.57	0.88	0.24	0.65	0.97	0.368	1.14	0.324	1.00	1.10	0.356	No
95	16.73	0.89	0.24	0.65	0.96	0.369	1.14	0.325	1.00	1.10	0.357	No
96	16.90	0.90	0.25	0.66	0.96	0.371	1.14	0.326	1.00	1.10	0.358	No

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

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
97	17.06	0.91	0.25	0.66	0.96	0.372	1.14	0.327	1.00	1.10	0.360	No
98	17.22	0.92	0.26	0.67	0.96	0.373	1.14	0.328	1.00	1.10	0.361	No
99	17.39	0.93	0.26	0.67	0.96	0.374	1.14	0.329	1.00	1.10	0.362	No
100	17.55	0.94	0.27	0.68	0.96	0.375	1.14	0.330	1.00	1.10	0.363	No
101	17.72	0.95	0.27	0.68	0.96	0.377	1.14	0.331	1.00	1.10	0.364	No
102	17.88	0.96	0.28	0.69	0.96	0.378	1.14	0.332	1.00	1.10	0.365	No
103	18.05	0.97	0.28	0.69	0.96	0.379	1.14	0.333	1.00	1.10	0.366	No
104	18.21	0.98	0.29	0.70	0.96	0.380	1.14	0.334	1.00	1.10	0.367	No
105	18.37	0.99	0.29	0.70	0.96	0.381	1.14	0.335	1.00	1.10	0.368	No
106	18.54	1.00	0.30	0.71	0.96	0.382	1.14	0.335	1.00	1.10	0.369	No
107	18.70	1.01	0.30	0.71	0.96	0.382	1.14	0.336	1.00	1.10	0.370	No
108	18.86	1.03	0.31	0.72	0.96	0.383	1.14	0.337	1.00	1.10	0.371	No
109	19.03	1.04	0.31	0.72	0.96	0.384	1.14	0.338	1.00	1.10	0.371	No
110	19.19	1.05	0.32	0.73	0.96	0.385	1.14	0.338	1.00	1.10	0.372	No
111	19.36	1.06	0.32	0.73	0.96	0.386	1.14	0.339	1.00	1.10	0.373	No
112	19.52	1.07	0.33	0.74	0.96	0.387	1.14	0.340	1.00	1.10	0.374	No
113	19.68	1.08	0.33	0.74	0.96	0.388	1.14	0.341	1.00	1.10	0.375	No
114	19.85	1.09	0.34	0.75	0.96	0.388	1.14	0.341	1.00	1.10	0.376	No
115	20.01	1.10	0.34	0.75	0.96	0.389	1.14	0.342	1.00	1.10	0.376	No
116	20.18	1.11	0.35	0.76	0.96	0.390	1.14	0.343	1.00	1.10	0.377	No
117	20.34	1.12	0.35	0.76	0.96	0.391	1.14	0.344	1.00	1.10	0.378	No
118	20.50	1.13	0.36	0.77	0.96	0.392	1.14	0.344	1.00	1.10	0.379	No
119	20.67	1.14	0.36	0.77	0.96	0.393	1.14	0.345	1.00	1.10	0.380	No
120	20.83	1.15	0.37	0.78	0.95	0.393	1.14	0.346	1.00	1.10	0.380	No
121	21.00	1.16	0.37	0.78	0.95	0.394	1.14	0.346	1.00	1.10	0.381	No
122	21.16	1.17	0.38	0.79	0.95	0.395	1.14	0.347	1.00	1.10	0.382	No
123	21.32	1.18	0.38	0.79	0.95	0.396	1.14	0.348	1.00	1.10	0.383	No
124	21.49	1.19	0.39	0.80	0.95	0.397	1.14	0.348	1.00	1.10	0.383	No
125	21.65	1.20	0.39	0.80	0.95	0.397	1.14	0.349	1.00	1.10	0.384	No
126	21.82	1.21	0.40	0.81	0.95	0.398	1.14	0.350	1.00	1.10	0.385	No
127	21.98	1.22	0.41	0.81	0.95	0.399	1.14	0.350	1.00	1.10	0.385	No
128	22.15	1.23	0.41	0.82	0.95	0.399	1.14	0.351	1.00	1.10	0.386	No
129	22.31	1.24	0.42	0.82	0.95	0.400	1.14	0.352	1.00	1.10	0.387	No
130	22.47	1.25	0.42	0.83	0.95	0.401	1.14	0.352	1.00	1.10	0.387	No
131	22.64	1.26	0.43	0.83	0.95	0.401	1.14	0.353	1.00	1.10	0.388	No
132	22.80	1.27	0.43	0.84	0.95	0.402	1.14	0.353	1.00	1.10	0.389	No
133	22.97	1.28	0.44	0.84	0.95	0.403	1.14	0.354	1.00	1.10	0.389	No
134	23.13	1.29	0.44	0.85	0.95	0.403	1.14	0.354	1.00	1.10	0.390	No
135	23.29	1.30	0.45	0.85	0.95	0.404	1.14	0.355	1.00	1.10	0.390	No
136	23.46	1.31	0.45	0.85	0.95	0.404	1.14	0.355	1.00	1.10	0.391	No
137	23.62	1.32	0.46	0.86	0.95	0.405	1.14	0.356	1.00	1.10	0.392	No
138	23.79	1.33	0.46	0.86	0.95	0.406	1.14	0.356	1.00	1.10	0.392	No
139	23.95	1.34	0.47	0.87	0.95	0.406	1.14	0.357	1.00	1.10	0.393	No
140	24.11	1.35	0.47	0.87	0.94	0.407	1.14	0.357	1.00	1.10	0.393	No
141	24.28	1.36	0.48	0.88	0.94	0.407	1.14	0.358	1.00	1.10	0.393	No
142	24.44	1.37	0.48	0.89	0.94	0.407	1.14	0.358	1.00	1.10	0.394	No
143	24.61	1.38	0.49	0.89	0.94	0.408	1.14	0.358	1.00	1.10	0.394	No
144	24.77	1.39	0.49	0.90	0.94	0.408	1.14	0.359	1.00	1.10	0.395	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	24.93	1.40	0.50	0.90	0.94	0.409	1.14	0.359	1.00	1.10	0.395	No
146	25.10	1.41	0.50	0.90	0.94	0.409	1.14	0.360	1.00	1.10	0.396	No
147	25.26	1.42	0.51	0.91	0.94	0.410	1.14	0.360	1.00	1.10	0.396	No
148	25.43	1.43	0.51	0.91	0.94	0.410	1.14	0.360	1.00	1.10	0.397	No
149	25.59	1.44	0.52	0.92	0.94	0.411	1.14	0.361	1.00	1.10	0.397	No
150	25.75	1.45	0.52	0.92	0.94	0.411	1.14	0.361	1.00	1.10	0.397	No
151	25.92	1.46	0.53	0.93	0.94	0.411	1.14	0.362	1.00	1.10	0.398	No
152	26.08	1.47	0.53	0.93	0.94	0.412	1.14	0.362	1.00	1.10	0.398	No
153	26.25	1.48	0.54	0.94	0.94	0.412	1.14	0.362	1.00	1.10	0.399	No
154	26.41	1.49	0.54	0.94	0.94	0.413	1.14	0.363	1.00	1.10	0.399	No
155	26.57	1.50	0.55	0.95	0.94	0.413	1.14	0.363	1.00	1.10	0.399	No
156	26.74	1.51	0.55	0.95	0.94	0.413	1.14	0.363	1.00	1.10	0.400	No
157	26.90	1.52	0.56	0.96	0.93	0.414	1.14	0.364	1.00	1.10	0.400	No
158	27.07	1.53	0.56	0.96	0.93	0.414	1.14	0.364	1.00	1.10	0.400	No
159	27.23	1.54	0.57	0.97	0.93	0.414	1.14	0.364	1.00	1.10	0.401	No
160	27.39	1.55	0.57	0.97	0.93	0.415	1.14	0.364	1.00	1.10	0.401	No
161	27.56	1.55	0.58	0.98	0.93	0.415	1.14	0.365	1.00	1.10	0.401	No
162	27.72	1.56	0.58	0.98	0.93	0.415	1.14	0.365	1.00	1.10	0.402	No
163	27.89	1.57	0.59	0.98	0.93	0.416	1.14	0.366	1.00	1.10	0.402	No
164	28.05	1.58	0.59	0.99	0.93	0.416	1.14	0.366	1.00	1.10	0.402	No
165	28.21	1.59	0.60	0.99	0.93	0.417	1.14	0.366	1.00	1.10	0.403	No
166	28.38	1.60	0.60	1.00	0.93	0.417	1.14	0.367	1.00	1.10	0.403	No
167	28.54	1.61	0.61	1.00	0.93	0.417	1.14	0.367	1.00	1.10	0.404	No
168	28.71	1.62	0.61	1.00	0.93	0.418	1.14	0.367	1.00	1.10	0.404	No
169	28.87	1.63	0.62	1.01	0.93	0.418	1.14	0.367	1.00	1.10	0.404	No
170	29.04	1.64	0.63	1.01	0.93	0.418	1.14	0.368	1.00	1.10	0.404	No
171	29.20	1.65	0.63	1.02	0.92	0.418	1.14	0.368	1.00	1.10	0.404	No
172	29.36	1.66	0.64	1.02	0.92	0.419	1.14	0.368	1.00	1.10	0.405	No
173	29.53	1.67	0.64	1.03	0.92	0.419	1.14	0.368	1.00	1.10	0.405	No
174	29.69	1.68	0.65	1.03	0.92	0.419	1.14	0.368	1.00	1.10	0.405	No
175	29.86	1.69	0.65	1.04	0.92	0.419	1.14	0.368	1.00	1.10	0.405	No
176	30.02	1.70	0.66	1.04	0.92	0.419	1.14	0.368	1.00	1.10	0.405	No
177	30.18	1.71	0.66	1.05	0.92	0.419	1.14	0.368	1.00	1.10	0.405	No
178	30.35	1.72	0.67	1.05	0.92	0.419	1.14	0.368	1.00	1.10	0.405	No
179	30.51	1.73	0.67	1.06	0.92	0.419	1.14	0.369	1.00	1.10	0.405	No
180	30.68	1.74	0.68	1.06	0.92	0.419	1.14	0.369	1.00	1.10	0.406	No
181	30.84	1.75	0.68	1.07	0.92	0.419	1.14	0.369	1.00	1.10	0.406	No
182	31.00	1.76	0.69	1.07	0.92	0.420	1.14	0.369	1.00	1.10	0.407	No
183	31.17	1.77	0.69	1.08	0.91	0.420	1.14	0.369	1.00	1.10	0.407	No
184	31.33	1.78	0.70	1.08	0.91	0.420	1.14	0.369	1.00	1.10	0.408	No
185	31.50	1.79	0.70	1.09	0.91	0.420	1.14	0.369	0.99	1.10	0.408	No
186	31.66	1.80	0.71	1.09	0.91	0.420	1.14	0.369	0.99	1.10	0.408	No
187	31.82	1.81	0.71	1.10	0.91	0.420	1.14	0.369	0.99	1.10	0.409	No
188	31.99	1.82	0.72	1.10	0.91	0.420	1.14	0.369	0.99	1.10	0.409	No
189	32.15	1.83	0.72	1.11	0.91	0.420	1.14	0.369	0.99	1.10	0.409	No
190	32.32	1.84	0.73	1.11	0.91	0.420	1.14	0.369	0.99	1.10	0.410	No
191	32.48	1.85	0.73	1.12	0.91	0.419	1.14	0.369	0.99	1.10	0.410	No
192	32.64	1.86	0.74	1.12	0.91	0.419	1.14	0.369	0.99	1.10	0.410	No

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

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR*	Belongs to transition
193	32.81	1.87	0.74	1.13	0.90	0.419	1.14	0.368	0.99	1.10	0.411	No
194	32.97	1.88	0.75	1.14	0.90	0.419	1.14	0.368	0.99	1.10	0.411	No
195	33.14	1.89	0.75	1.14	0.90	0.419	1.14	0.368	0.98	1.10	0.411	No
196	33.30	1.91	0.76	1.15	0.90	0.419	1.14	0.368	0.98	1.10	0.411	No
197	33.47	1.92	0.76	1.15	0.90	0.419	1.14	0.368	0.98	1.10	0.412	No
198	33.63	1.93	0.77	1.16	0.90	0.418	1.14	0.368	0.98	1.10	0.412	No
199	33.79	1.94	0.77	1.16	0.90	0.418	1.14	0.368	0.98	1.10	0.412	No
200	33.96	1.95	0.78	1.17	0.90	0.418	1.14	0.367	0.98	1.10	0.412	No
201	34.12	1.96	0.78	1.17	0.90	0.418	1.14	0.367	0.98	1.10	0.413	No
202	34.28	1.97	0.79	1.18	0.90	0.418	1.14	0.367	0.98	1.10	0.413	No
203	34.45	1.98	0.79	1.18	0.89	0.418	1.14	0.367	0.98	1.10	0.413	No
204	34.61	1.99	0.80	1.19	0.89	0.417	1.14	0.367	0.98	1.10	0.413	No
205	34.78	2.00	0.80	1.19	0.89	0.417	1.14	0.367	0.98	1.10	0.413	No
206	34.94	2.01	0.81	1.20	0.89	0.417	1.14	0.367	0.98	1.10	0.413	No
207	35.10	2.02	0.81	1.20	0.89	0.417	1.14	0.366	0.97	1.10	0.414	No
208	35.27	2.03	0.82	1.21	0.89	0.417	1.14	0.366	0.97	1.10	0.414	No
209	35.43	2.04	0.82	1.21	0.89	0.417	1.14	0.366	0.97	1.10	0.414	No
210	35.60	2.05	0.83	1.22	0.89	0.416	1.14	0.366	0.97	1.10	0.414	No
211	35.76	2.06	0.83	1.22	0.89	0.416	1.14	0.366	0.97	1.10	0.414	No
212	35.92	2.07	0.84	1.23	0.88	0.416	1.14	0.365	0.97	1.10	0.414	No
213	36.09	2.08	0.85	1.24	0.88	0.416	1.14	0.365	0.97	1.10	0.414	No
214	36.25	2.09	0.85	1.24	0.88	0.415	1.14	0.365	0.97	1.10	0.414	No
215	36.42	2.10	0.86	1.25	0.88	0.415	1.14	0.365	0.97	1.10	0.414	No
216	36.58	2.11	0.86	1.25	0.88	0.415	1.14	0.364	0.97	1.10	0.414	No
217	36.74	2.12	0.87	1.26	0.88	0.414	1.14	0.364	0.97	1.10	0.415	No
218	36.91	2.13	0.87	1.26	0.88	0.414	1.14	0.364	0.97	1.10	0.415	No
219	37.07	2.14	0.88	1.27	0.88	0.414	1.14	0.363	0.96	1.10	0.415	No
220	37.24	2.16	0.88	1.27	0.87	0.413	1.14	0.363	0.96	1.10	0.415	No
221	37.40	2.17	0.89	1.28	0.87	0.413	1.14	0.363	0.96	1.10	0.415	No
222	37.57	2.18	0.89	1.29	0.87	0.412	1.14	0.362	0.96	1.10	0.415	No
223	37.73	2.19	0.90	1.29	0.87	0.412	1.14	0.362	0.96	1.10	0.415	No
224	37.89	2.20	0.90	1.30	0.87	0.412	1.14	0.362	0.96	1.10	0.414	No
225	38.06	2.21	0.91	1.30	0.87	0.411	1.14	0.361	0.96	1.10	0.414	No
226	38.22	2.22	0.91	1.31	0.87	0.411	1.14	0.361	0.96	1.10	0.414	No
227	38.39	2.23	0.92	1.31	0.86	0.410	1.14	0.361	0.96	1.10	0.414	No
228	38.55	2.24	0.92	1.32	0.86	0.410	1.14	0.360	0.96	1.10	0.414	No
229	38.71	2.25	0.93	1.32	0.86	0.410	1.14	0.360	0.96	1.10	0.414	No
230	38.88	2.26	0.93	1.33	0.86	0.409	1.14	0.360	0.96	1.10	0.414	No
231	39.04	2.27	0.94	1.33	0.86	0.409	1.14	0.359	0.95	1.10	0.414	No
232	39.21	2.28	0.94	1.34	0.86	0.408	1.14	0.359	0.95	1.10	0.414	No
233	39.37	2.29	0.95	1.35	0.86	0.408	1.14	0.359	0.95	1.10	0.414	No
234	39.53	2.30	0.95	1.35	0.86	0.408	1.14	0.358	0.95	1.10	0.414	No
235	39.70	2.31	0.96	1.36	0.85	0.407	1.14	0.358	0.95	1.10	0.414	No
236	39.86	2.32	0.96	1.36	0.85	0.407	1.14	0.357	0.95	1.10	0.413	No
237	40.03	2.34	0.97	1.37	0.85	0.406	1.14	0.357	0.95	1.10	0.413	No
238	40.19	2.35	0.97	1.37	0.85	0.406	1.14	0.357	0.95	1.10	0.413	No
239	40.35	2.36	0.98	1.38	0.85	0.405	1.14	0.356	0.95	1.10	0.413	No
240	40.52	2.37	0.98	1.38	0.85	0.405	1.14	0.356	0.95	1.10	0.413	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	40.68	2.38	0.99	1.39	0.84	0.404	1.14	0.355	0.95	1.10	0.413	No
242	40.85	2.39	0.99	1.39	0.84	0.404	1.14	0.355	0.95	1.10	0.413	No
243	41.01	2.40	1.00	1.40	0.84	0.404	1.14	0.355	0.95	1.10	0.412	No
244	41.17	2.41	1.00	1.40	0.84	0.403	1.14	0.354	0.95	1.10	0.412	No
245	41.34	2.42	1.01	1.41	0.84	0.403	1.14	0.354	0.94	1.10	0.412	No
246	41.50	2.43	1.01	1.41	0.84	0.402	1.14	0.354	0.94	1.10	0.412	No
247	41.67	2.44	1.02	1.42	0.84	0.402	1.14	0.353	0.94	1.10	0.412	No
248	41.83	2.45	1.02	1.42	0.83	0.401	1.14	0.353	0.94	1.10	0.412	No
249	41.99	2.45	1.03	1.43	0.83	0.401	1.14	0.352	0.94	1.10	0.411	No
250	42.16	2.46	1.03	1.43	0.83	0.400	1.14	0.352	0.94	1.10	0.411	No
251	42.32	2.47	1.04	1.43	0.83	0.400	1.14	0.352	0.94	1.10	0.411	No
252	42.49	2.48	1.04	1.44	0.83	0.400	1.14	0.351	0.94	1.10	0.411	No
253	42.65	2.49	1.05	1.44	0.83	0.399	1.14	0.351	0.94	1.10	0.411	No
254	42.81	2.50	1.06	1.45	0.83	0.399	1.14	0.350	0.94	1.10	0.410	No
255	42.98	2.51	1.06	1.45	0.82	0.398	1.14	0.350	0.94	1.10	0.410	No
256	43.14	2.52	1.07	1.46	0.82	0.398	1.14	0.350	0.94	1.10	0.410	No
257	43.31	2.53	1.07	1.46	0.82	0.397	1.14	0.349	0.94	1.10	0.410	No
258	43.47	2.54	1.08	1.47	0.82	0.397	1.14	0.349	0.94	1.10	0.409	No
259	43.63	2.55	1.08	1.47	0.82	0.396	1.14	0.348	0.94	1.10	0.409	No
260	43.80	2.56	1.09	1.47	0.82	0.396	1.14	0.348	0.94	1.10	0.409	No
261	43.96	2.57	1.09	1.48	0.81	0.395	1.14	0.348	0.94	1.10	0.409	No
262	44.13	2.58	1.10	1.48	0.81	0.395	1.14	0.347	0.93	1.10	0.408	No
263	44.29	2.59	1.10	1.49	0.81	0.394	1.14	0.347	0.93	1.10	0.408	No
264	44.45	2.60	1.11	1.49	0.81	0.394	1.14	0.346	0.93	1.10	0.408	No
265	44.62	2.61	1.11	1.49	0.81	0.393	1.14	0.346	0.93	1.10	0.408	No
266	44.78	2.62	1.12	1.50	0.81	0.393	1.14	0.345	0.93	1.10	0.407	No
267	44.95	2.62	1.12	1.50	0.80	0.393	1.14	0.345	0.93	1.10	0.407	No
268	45.11	2.63	1.13	1.51	0.80	0.392	1.14	0.345	0.93	1.10	0.407	No
269	45.28	2.64	1.13	1.51	0.80	0.392	1.14	0.344	0.93	1.10	0.406	No
270	45.44	2.65	1.14	1.51	0.80	0.391	1.14	0.344	0.93	1.10	0.406	No
271	45.60	2.66	1.14	1.52	0.80	0.391	1.14	0.343	0.93	1.10	0.406	No
272	45.77	2.67	1.15	1.52	0.80	0.390	1.14	0.343	0.93	1.10	0.406	No
273	45.93	2.68	1.15	1.53	0.79	0.389	1.14	0.342	0.93	1.10	0.405	No
274	46.10	2.69	1.16	1.53	0.79	0.389	1.14	0.342	0.93	1.10	0.405	No
275	46.26	2.70	1.16	1.54	0.79	0.388	1.14	0.341	0.93	1.10	0.404	No
276	46.42	2.71	1.17	1.54	0.79	0.388	1.14	0.341	0.93	1.10	0.404	No
277	46.59	2.72	1.17	1.55	0.79	0.387	1.14	0.340	0.93	1.10	0.404	No
278	46.75	2.73	1.18	1.55	0.79	0.387	1.14	0.340	0.93	1.10	0.403	No
279	46.92	2.74	1.18	1.55	0.78	0.386	1.14	0.339	0.93	1.10	0.403	No
280	47.08	2.75	1.19	1.56	0.78	0.386	1.14	0.339	0.93	1.10	0.403	No
281	47.24	2.76	1.19	1.56	0.78	0.385	1.14	0.338	0.93	1.10	0.402	No
282	47.41	2.76	1.20	1.57	0.78	0.384	1.14	0.338	0.92	1.10	0.402	No
283	47.57	2.77	1.20	1.57	0.78	0.384	1.14	0.337	0.92	1.10	0.402	No
284	47.74	2.78	1.21	1.57	0.78	0.383	1.14	0.337	0.92	1.10	0.401	No
285	47.90	2.79	1.21	1.58	0.77	0.383	1.14	0.336	0.92	1.10	0.401	No
286	48.06	2.80	1.22	1.58	0.77	0.382	1.14	0.336	0.92	1.10	0.400	No
287	48.23	2.81	1.22	1.59	0.77	0.381	1.14	0.335	0.92	1.10	0.400	No
288	48.39	2.82	1.23	1.59	0.77	0.381	1.14	0.335	0.92	1.10	0.400	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	48.56	2.83	1.23	1.60	0.77	0.380	1.14	0.334	0.92	1.10	0.399	No
290	48.72	2.84	1.24	1.60	0.77	0.380	1.14	0.334	0.92	1.10	0.399	No
291	48.88	2.85	1.24	1.61	0.76	0.379	1.14	0.333	0.92	1.10	0.398	No
292	49.05	2.86	1.25	1.61	0.76	0.378	1.14	0.332	0.92	1.10	0.398	No
293	49.21	2.87	1.25	1.62	0.76	0.378	1.14	0.332	0.92	1.10	0.397	No
294	49.38	2.88	1.26	1.62	0.76	0.377	1.14	0.331	0.92	1.10	0.397	No
295	49.54	2.89	1.26	1.63	0.76	0.376	1.14	0.331	0.92	1.10	0.397	No
296	49.70	2.90	1.27	1.63	0.76	0.376	1.14	0.330	0.92	1.10	0.396	No
297	49.87	2.91	1.28	1.64	0.75	0.375	1.14	0.330	0.92	1.10	0.396	No
298	50.03	2.92	1.28	1.64	0.75	0.374	1.14	0.329	0.92	1.10	0.395	No
299	50.20	2.93	1.29	1.64	0.75	0.374	1.14	0.329	0.92	1.10	0.395	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 _c (tsf)	I _c	Fr (%)	n	Q _{tn}	K _c	Q _{tn cs}	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
1	1.31	18.47	2.39	1.21	0.72	29.56	2.31	68.19	4.000	No	No	2.00
2	1.48	16.96	2.47	1.49	0.75	27.12	2.76	74.96	4.000	No	No	2.00
3	1.64	14.72	2.61	2.18	0.79	23.50	3.88	91.11	4.000	No	Yes	2.00
4	1.80	13.33	2.69	2.60	0.82	21.26	4.65	98.94	4.000	No	Yes	2.00
5	1.97	12.18	2.73	2.65	0.83	19.40	5.05	98.04	4.000	No	Yes	2.00
6	2.13	11.49	2.69	2.07	0.81	18.28	4.60	84.01	4.000	No	Yes	2.00
7	2.30	11.18	2.64	1.63	0.80	17.76	4.14	73.53	4.000	No	Yes	2.00
8	2.46	11.05	2.59	1.29	0.79	17.54	3.69	64.81	4.000	No	No	2.00
9	2.63	11.41	2.54	1.06	0.77	18.10	3.25	58.87	4.000	No	No	2.00
10	2.79	11.90	2.48	0.85	0.75	18.89	2.83	53.37	4.000	No	No	2.00
11	2.95	12.79	2.42	0.73	0.73	20.30	2.47	50.21	4.000	No	No	2.00
12	3.12	14.05	2.35	0.61	0.71	22.32	2.12	47.40	4.000	No	No	2.00
13	3.28	15.73	2.28	0.53	0.69	25.00	1.84	46.00	4.000	No	No	2.00
14	3.44	17.43	2.21	0.46	0.67	27.72	1.00	27.72	4.000	No	No	2.00
15	3.61	18.63	2.18	0.45	0.66	29.63	1.00	29.63	4.000	No	No	2.00
16	3.77	19.69	2.17	0.48	0.66	31.33	1.00	31.33	4.000	No	No	2.00
17	3.94	19.98	2.19	0.54	0.66	31.78	1.58	50.27	4.000	No	No	2.00
18	4.10	20.31	2.20	0.60	0.67	32.29	1.61	52.04	4.000	No	No	2.00
19	4.26	19.91	2.23	0.66	0.68	31.63	1.69	53.37	4.000	No	No	2.00
20	4.43	19.84	2.24	0.71	0.68	31.50	1.74	54.68	4.000	No	No	2.00
21	4.59	19.56	2.26	0.74	0.69	31.04	1.78	55.34	4.000	No	No	2.00
22	4.76	19.72	2.25	0.73	0.68	31.29	1.76	55.09	4.000	No	No	2.00
23	4.92	20.35	2.23	0.70	0.68	32.29	1.70	54.88	4.000	No	No	2.00
24	5.08	21.69	2.19	0.65	0.67	34.42	1.60	55.00	4.000	No	No	2.00
25	5.25	23.37	2.15	0.62	0.65	37.11	1.51	56.08	4.000	No	No	2.00
26	5.41	24.88	2.12	0.58	0.64	39.53	1.45	57.13	4.000	No	No	2.00
27	5.58	26.37	2.08	0.55	0.63	41.90	1.39	58.41	4.000	No	No	2.00
28	5.74	28.42	2.04	0.51	0.62	45.19	1.34	60.73	4.000	No	No	2.00
29	5.91	31.51	1.98	0.48	0.60	50.14	1.00	50.14	4.000	No	No	2.00
30	6.07	35.15	1.91	0.41	0.58	55.97	1.00	55.97	4.000	No	No	2.00
31	6.23	38.56	1.86	0.37	0.57	61.43	1.00	61.43	4.000	No	No	2.00
32	6.40	41.16	1.82	0.34	0.55	65.60	1.00	65.60	4.000	No	No	2.00
33	6.56	42.78	1.81	0.36	0.55	68.18	1.00	68.18	4.000	No	No	2.00
34	6.73	43.16	1.83	0.40	0.56	68.77	1.00	68.77	4.000	No	No	2.00
35	6.89	41.96	1.87	0.46	0.57	66.85	1.00	66.85	4.000	No	No	2.00
36	7.05	39.31	1.93	0.56	0.59	62.56	1.26	78.70	4.000	No	No	2.00
37	7.22	36.04	2.01	0.69	0.61	57.30	1.32	75.47	4.000	No	No	2.00
38	7.38	33.75	2.08	0.82	0.63	53.60	1.39	74.41	4.000	No	No	2.00
39	7.55	33.49	2.10	0.89	0.64	53.18	1.42	75.50	4.000	No	No	2.00
40	7.71	34.75	2.09	0.89	0.63	55.19	1.40	77.22	4.000	No	No	2.00
41	7.87	36.40	2.05	0.83	0.62	57.82	1.36	78.62	4.000	No	No	2.00
42	8.04	38.58	2.01	0.74	0.61	61.32	1.31	80.44	4.000	No	No	2.00
43	8.20	41.46	1.94	0.64	0.59	65.91	1.27	83.42	4.000	No	No	2.00
44	8.37	43.50	1.91	0.57	0.58	67.80	1.24	84.16	4.000	No	No	2.00
45	8.53	43.39	1.90	0.55	0.58	66.80	1.24	82.83	4.000	No	No	2.00
46	8.69	41.04	1.93	0.55	0.59	62.83	1.26	78.95	4.000	No	No	2.00
47	8.86	38.24	1.97	0.59	0.60	58.40	1.28	74.99	4.000	No	No	2.00
48	9.02	35.58	2.01	0.63	0.61	54.20	1.32	71.44	0.114	No	No	0.43

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

Point ID	Depth (ft)	q _c (tsf)	I _c	Fr (%)	n	Q _{tn}	K _c	Q _{tn cs}	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
49	9.19	33.57	2.06	0.69	0.63	51.03	1.36	69.46	0.111	No	No	0.41
50	9.35	32.63	2.07	0.68	0.63	49.14	1.37	67.55	0.109	No	No	0.40
51	9.51	32.89	2.06	0.66	0.63	48.92	1.37	66.95	0.108	No	No	0.39
52	9.68	34.32	2.04	0.62	0.62	50.26	1.34	67.43	0.109	No	No	0.39
53	9.84	36.11	2.02	0.61	0.61	52.10	1.32	69.02	0.111	No	No	0.40
54	10.01	37.22	2.01	0.60	0.61	53.04	1.32	69.75	0.112	No	No	0.40
55	10.17	37.38	2.01	0.59	0.61	52.72	1.32	69.36	0.111	No	No	0.39
56	10.34	36.69	2.02	0.59	0.61	51.33	1.33	68.05	0.109	No	No	0.38
57	10.50	33.96	2.06	0.62	0.63	47.34	1.37	64.71	0.105	No	No	0.36
58	10.66	33.90	2.06	0.60	0.63	46.77	1.37	63.89	0.104	No	No	0.36
59	10.83	34.12	2.06	0.60	0.63	46.60	1.36	63.60	0.104	No	No	0.35
60	10.99	37.18	2.02	0.56	0.61	50.01	1.32	66.24	0.107	No	No	0.36
61	11.15	39.11	2.00	0.54	0.61	52.19	1.30	68.04	0.109	No	No	0.37
62	11.32	43.22	1.94	0.50	0.59	57.00	1.00	57.00	0.097	No	No	0.32
63	11.48	47.91	1.89	0.46	0.58	62.46	1.00	62.46	0.103	No	No	0.34
64	11.65	51.77	1.87	0.47	0.57	67.01	1.00	67.01	0.108	No	No	0.35
65	11.81	53.18	1.89	0.54	0.57	68.81	1.23	84.58	0.136	No	No	0.44
66	11.97	52.99	1.91	0.58	0.58	68.50	1.24	85.03	0.137	No	No	0.44
67	12.14	52.11	1.90	0.55	0.58	67.05	1.24	83.10	0.133	No	No	0.43
68	12.30	52.01	1.87	0.47	0.57	66.34	1.00	66.34	0.107	No	No	0.34
69	12.47	51.56	1.87	0.45	0.57	65.48	1.00	65.48	0.106	No	No	0.34
70	12.63	50.45	1.89	0.48	0.57	64.01	1.00	64.01	0.104	No	No	0.33
71	12.79	49.06	1.91	0.50	0.58	62.20	1.00	62.20	0.102	No	No	0.32
72	12.96	49.09	1.91	0.50	0.58	62.01	1.00	62.01	0.102	No	No	0.32
73	13.12	50.56	1.91	0.51	0.58	63.60	1.24	78.94	0.126	No	No	0.39
74	13.29	51.89	1.90	0.50	0.58	64.95	1.23	80.20	0.128	No	No	0.39
75	13.45	52.88	1.88	0.47	0.57	65.79	1.00	65.79	0.106	No	No	0.33
76	13.62	54.37	1.85	0.43	0.56	67.16	1.00	67.16	0.108	No	No	0.33
77	13.78	56.49	1.82	0.40	0.55	69.27	1.00	69.27	0.111	No	No	0.34
78	13.94	58.54	1.79	0.36	0.55	71.25	1.00	71.25	0.114	No	No	0.34
79	14.11	57.93	1.79	0.34	0.55	70.24	1.00	70.24	0.112	No	No	0.34
80	14.27	57.50	1.80	0.35	0.55	69.56	1.00	69.56	0.111	No	No	0.33
81	14.44	57.53	1.81	0.37	0.55	69.47	1.00	69.47	0.111	No	No	0.33
82	14.60	58.65	1.81	0.39	0.55	70.65	1.00	70.65	0.113	No	No	0.33
83	14.76	52.39	1.87	0.41	0.57	63.26	1.00	63.26	0.104	No	No	0.31
84	14.93	39.14	2.02	0.52	0.61	47.86	1.33	63.44	0.104	No	No	0.30
85	15.09	24.64	2.28	0.79	0.69	30.69	1.84	56.44	0.097	No	No	0.28
86	15.26	15.44	2.57	1.36	0.78	19.51	3.47	67.72	0.109	No	No	0.32
87	15.42	13.10	2.68	1.68	0.81	16.54	4.45	73.61	3.600	No	Yes	2.00
88	15.58	15.15	2.59	1.47	0.79	19.01	3.69	70.21	0.112	No	No	0.32
89	15.75	19.03	2.45	1.12	0.74	23.61	2.66	62.73	0.103	No	No	0.30
90	15.91	22.17	2.39	1.07	0.72	27.34	2.31	63.04	0.103	No	No	0.29
91	16.08	22.50	2.42	1.24	0.73	27.74	2.46	68.20	0.110	No	No	0.31
92	16.24	21.86	2.49	1.60	0.75	27.04	2.89	78.02	0.124	No	No	0.35
93	16.40	21.42	2.54	1.92	0.77	26.52	3.27	86.60	0.140	No	No	0.40
94	16.57	21.79	2.58	2.34	0.78	27.01	3.62	97.77	0.167	No	No	0.47
95	16.73	25.03	2.56	2.58	0.78	30.97	3.46	107.16	0.194	No	No	0.54
96	16.90	30.12	2.51	2.62	0.76	37.07	3.05	112.90	0.214	No	No	0.60

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q _c (tsf)	I _c	Fr (%)	n	Q _{tn}	K _c	Q _{tn cs}	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
97	17.06	36.90	2.43	2.50	0.74	45.04	2.56	115.11	0.222	No	No	0.62
98	17.22	55.27	2.22	1.83	0.67	66.08	1.66	109.74	0.203	No	No	0.56
99	17.39	83.19	1.99	1.28	0.60	97.09	1.30	126.09	0.266	No	No	0.74
100	17.55	109.57	1.84	1.01	0.56	125.63	1.19	149.69	0.392	No	No	1.08
101	17.72	114.88	1.83	1.01	0.56	131.07	1.18	154.51	0.423	No	No	1.16
102	17.88	100.73	1.93	1.26	0.59	115.62	1.26	145.33	0.365	No	No	1.00
103	18.05	79.96	2.14	2.00	0.65	93.11	1.48	137.72	0.323	No	No	0.88
104	18.21	72.59	2.27	2.82	0.69	85.19	1.82	155.47	0.429	No	No	1.17
105	18.37	84.33	2.26	3.14	0.69	98.59	1.80	177.45	0.600	No	No	1.63
106	18.54	113.88	2.12	2.61	0.65	131.08	1.46	190.76	0.726	No	No	1.97
107	18.70	129.48	2.07	2.45	0.63	147.74	1.38	203.34	4.000	No	No	2.00
108	18.86	114.36	2.14	2.70	0.65	130.55	1.48	192.83	0.747	No	No	2.00
109	19.03	76.52	2.36	3.85	0.72	88.34	2.19	193.20	0.751	No	No	2.00
110	19.19	42.83	2.71	6.82	0.82	50.17	4.82	241.93	3.600	No	Yes	2.00
111	19.36	29.03	2.95	10.01	0.89	34.08	7.92	269.79	3.600	No	Yes	2.00
112	19.52	27.23	2.99	11.07	1.00	32.66	8.65	282.46	3.600	No	Yes	2.00
113	19.68	28.50	2.96	10.50	1.00	34.00	8.17	277.94	3.600	No	Yes	2.00
114	19.85	29.18	2.94	9.78	0.89	33.63	7.86	264.17	3.600	No	Yes	2.00
115	20.01	27.48	2.93	8.82	0.89	31.38	7.65	240.11	3.600	No	Yes	2.00
116	20.18	27.39	2.85	6.78	0.86	30.90	6.51	201.28	3.600	No	Yes	2.00
117	20.34	28.39	2.75	5.01	0.83	31.67	5.26	166.58	3.600	No	Yes	2.00
118	20.50	30.88	2.66	3.96	0.80	34.15	4.26	145.57	3.600	No	Yes	2.00
119	20.67	34.18	2.58	3.42	0.78	37.56	3.61	135.43	0.311	No	No	0.82
120	20.83	38.12	2.51	3.03	0.76	41.64	3.08	128.08	0.275	No	No	0.72
121	21.00	38.83	2.51	3.02	0.76	42.23	3.03	128.16	0.276	No	No	0.72
122	21.16	34.22	2.61	3.67	0.79	37.13	3.81	141.48	3.600	No	Yes	2.00
123	21.32	25.97	2.80	5.27	0.85	28.09	5.89	165.39	3.600	No	Yes	2.00
124	21.49	19.86	2.99	7.50	1.00	21.72	8.61	187.03	3.600	No	Yes	2.00
125	21.65	21.21	2.96	7.00	0.89	22.66	8.06	182.62	3.600	No	Yes	2.00
126	21.82	30.69	2.74	5.00	0.83	32.81	5.13	168.15	3.600	No	Yes	2.00
127	21.98	36.29	2.68	4.83	0.81	38.71	4.48	173.22	3.600	No	Yes	2.00
128	22.15	33.86	2.74	5.54	0.83	35.98	5.16	185.70	3.600	No	Yes	2.00
129	22.31	25.23	2.91	7.06	0.88	26.57	7.34	195.09	3.600	No	Yes	2.00
130	22.47	23.15	2.89	5.94	0.87	24.11	7.02	169.23	3.600	No	Yes	2.00
131	22.64	25.01	2.79	4.64	0.85	25.91	5.74	148.68	3.600	No	Yes	2.00
132	22.80	35.49	2.56	3.08	0.78	36.73	3.41	125.43	0.264	No	No	0.68
133	22.97	51.25	2.33	2.11	0.71	52.85	2.05	108.47	0.199	No	No	0.51
134	23.13	65.18	2.16	1.53	0.66	66.80	1.53	102.11	0.179	No	No	0.46
135	23.29	63.11	2.16	1.45	0.66	64.40	1.53	98.29	0.168	No	No	0.43
136	23.46	48.03	2.35	2.07	0.71	48.91	2.13	104.42	0.186	No	No	0.48
137	23.62	31.40	2.70	4.29	0.82	31.84	4.73	150.60	3.600	No	Yes	2.00
138	23.79	21.98	3.04	9.04	1.00	22.29	9.47	211.12	3.600	No	Yes	2.00
139	23.95	19.15	3.24	14.87	1.00	19.13	13.73	262.52	3.600	No	Yes	2.00
140	24.11	22.36	3.22	15.94	1.00	22.44	13.16	295.27	3.600	No	Yes	2.00
141	24.28	30.51	3.05	12.65	1.00	30.94	9.69	299.83	3.600	No	Yes	2.00
142	24.44	36.82	2.88	8.81	0.87	36.89	6.95	256.44	3.600	No	Yes	2.00
143	24.61	40.05	2.70	5.41	0.82	39.83	4.75	189.12	3.600	No	Yes	2.00
144	24.77	41.73	2.50	2.89	0.76	41.13	3.01	123.69	0.256	No	No	0.65

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q _c (tsf)	I _c	Fr (%)	n	Q _{tn}	K _c	Q _{tn cs}	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
145	24.93	46.02	2.38	2.09	0.72	45.17	2.27	102.75	0.181	No	No	0.46
146	25.10	50.57	2.35	2.08	0.71	49.55	2.12	105.15	0.188	No	No	0.48
147	25.26	51.86	2.37	2.30	0.72	50.69	2.22	112.68	0.213	No	No	0.54
148	25.43	50.72	2.39	2.39	0.72	49.37	2.32	114.55	0.220	No	No	0.55
149	25.59	47.63	2.45	2.77	0.74	46.18	2.68	123.97	0.257	No	No	0.65
150	25.75	42.82	2.50	2.89	0.76	41.25	3.00	123.60	0.256	No	No	0.64
151	25.92	38.12	2.57	3.18	0.78	36.47	3.51	127.96	0.275	No	No	0.69
152	26.08	35.62	2.61	3.35	0.79	33.88	3.84	129.96	3.600	No	Yes	2.00
153	26.25	36.45	2.64	3.83	0.80	34.57	4.13	142.91	3.600	No	Yes	2.00
154	26.41	35.40	2.71	4.59	0.82	33.43	4.78	159.75	3.600	No	Yes	2.00
155	26.57	33.16	2.77	5.25	0.84	31.11	5.49	170.66	3.600	No	Yes	2.00
156	26.74	26.72	2.90	6.45	0.88	24.72	7.26	179.53	3.600	No	Yes	2.00
157	26.90	21.75	3.02	7.49	1.00	19.84	9.09	180.27	3.600	No	Yes	2.00
158	27.07	17.49	3.13	8.39	1.00	15.58	11.17	174.04	3.600	No	Yes	2.00
159	27.23	16.89	3.11	7.54	1.00	14.92	10.81	161.36	3.600	No	Yes	2.00
160	27.39	17.74	3.02	5.76	1.00	15.67	9.06	141.99	3.600	No	Yes	2.00
161	27.56	19.19	2.88	3.95	0.87	16.95	6.98	118.36	3.600	No	Yes	2.00
162	27.72	20.57	2.73	2.45	0.83	18.20	5.07	92.35	3.600	No	Yes	2.00
163	27.89	24.83	2.53	1.44	0.77	22.18	3.21	71.26	0.114	No	No	0.28
164	28.05	37.01	2.24	0.78	0.68	33.66	1.72	57.94	0.098	No	No	0.24
165	28.21	52.16	2.03	0.56	0.62	47.92	1.34	64.14	0.105	No	No	0.26
166	28.38	59.71	1.95	0.48	0.59	54.93	1.00	54.93	0.095	No	No	0.24
167	28.54	55.33	2.01	0.56	0.61	50.67	1.32	66.76	0.108	No	No	0.27
168	28.71	44.81	2.21	0.95	0.67	40.62	1.65	66.89	0.108	No	No	0.27
169	28.87	36.89	2.48	2.03	0.75	33.04	2.83	93.45	0.156	No	No	0.39
170	29.04	31.36	2.75	4.36	0.83	27.72	5.27	145.98	3.600	No	Yes	2.00
171	29.20	27.91	2.96	7.66	1.00	24.32	8.15	198.17	3.600	No	Yes	2.00
172	29.36	26.98	3.07	10.36	1.00	23.34	10.01	233.58	3.600	No	Yes	2.00
173	29.53	30.16	3.02	10.04	1.00	26.13	9.22	240.81	3.600	No	Yes	2.00
174	29.69	34.28	2.93	8.34	0.89	29.87	7.60	227.05	3.600	No	Yes	2.00
175	29.86	36.27	2.84	6.71	0.86	31.59	6.38	201.54	3.600	No	Yes	2.00
176	30.02	35.33	2.80	5.72	0.85	30.62	5.87	179.68	3.600	No	Yes	2.00
177	30.18	32.51	2.80	5.21	0.85	27.93	5.87	163.86	3.600	No	Yes	2.00
178	30.35	30.62	2.81	4.99	0.85	26.11	5.98	156.01	3.600	No	Yes	2.00
179	30.51	29.09	2.84	5.22	0.86	24.61	6.40	157.41	3.600	No	Yes	2.00
180	30.68	29.70	2.85	5.40	0.86	25.06	6.45	161.73	3.600	No	Yes	2.00
181	30.84	31.68	2.83	5.43	0.86	26.74	6.20	165.85	3.600	No	Yes	2.00
182	31.00	36.66	2.73	4.65	0.83	31.12	5.07	157.65	3.600	No	Yes	2.00
183	31.17	45.07	2.58	3.53	0.78	38.60	3.61	139.32	0.331	No	No	0.81
184	31.33	49.32	2.49	2.80	0.75	42.33	2.88	121.82	0.248	No	No	0.61
185	31.50	49.61	2.45	2.49	0.74	42.49	2.66	112.95	0.214	No	No	0.52
186	31.66	50.64	2.42	2.30	0.73	43.29	2.49	107.73	0.196	No	No	0.48
187	31.82	66.54	2.28	1.96	0.69	57.42	1.86	107.06	0.194	No	No	0.47
188	31.99	105.26	2.09	1.68	0.63	91.98	1.40	128.97	0.279	No	No	0.68
189	32.15	152.62	1.96	1.61	0.60	134.22	1.28	171.27	0.547	No	No	1.34
190	32.32	193.84	1.85	1.44	0.56	170.99	1.20	205.49	4.000	No	No	2.00
191	32.48	213.18	1.80	1.33	0.55	188.03	1.15	216.69	4.000	No	No	2.00
192	32.64	218.38	1.79	1.32	0.55	192.20	1.14	219.60	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q _c (tsf)	I _c	Fr (%)	n	Q _{tn}	K _c	Q _{tn cs}	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
193	32.81	212.89	1.85	1.53	0.56	186.45	1.20	223.39	4.000	No	No	2.00
194	32.97	201.32	1.92	1.83	0.59	175.24	1.25	219.47	4.000	No	No	2.00
195	33.14	189.26	1.92	1.70	0.58	164.21	1.25	205.07	4.000	No	No	2.00
196	33.30	182.98	1.86	1.39	0.57	158.62	1.21	192.05	0.739	No	No	1.80
197	33.47	184.02	1.73	0.90	0.53	160.04	1.04	166.53	0.510	No	No	1.24
198	33.63	186.81	1.67	0.74	0.51	162.54	1.00	162.54	0.479	No	No	1.16
199	33.79	187.43	1.66	0.73	0.51	162.75	1.00	162.75	0.481	No	No	1.17
200	33.96	183.42	1.72	0.87	0.52	158.47	1.03	163.02	0.483	No	No	1.17
201	34.12	175.90	1.79	1.04	0.54	151.06	1.14	172.04	0.554	No	No	1.34
202	34.28	165.98	1.83	1.12	0.56	141.83	1.18	167.92	0.520	No	No	1.26
203	34.45	158.47	1.83	1.05	0.56	135.02	1.18	159.44	0.457	No	No	1.11
204	34.61	154.51	1.81	0.96	0.55	131.42	1.16	152.74	0.411	No	No	1.00
205	34.78	155.87	1.77	0.84	0.54	132.56	1.11	147.52	0.379	No	No	0.92
206	34.94	159.33	1.73	0.76	0.53	135.50	1.05	142.60	0.350	No	No	0.85
207	35.10	166.53	1.69	0.68	0.51	141.74	1.00	141.74	0.345	No	No	0.83
208	35.27	167.54	1.70	0.71	0.52	142.21	1.00	142.21	0.347	No	No	0.84
209	35.43	159.67	1.78	0.89	0.54	134.55	1.13	151.62	0.404	No	No	0.98
210	35.60	156.70	1.84	1.06	0.56	131.26	1.19	156.39	0.436	No	No	1.05
211	35.76	181.13	1.75	0.91	0.53	152.47	1.08	164.45	0.494	No	No	1.19
212	35.92	234.84	1.58	0.69	0.50	199.03	1.00	199.03	0.813	No	No	1.96
213	36.09	299.91	1.43	0.53	0.50	254.13	1.00	254.13	4.000	No	No	2.00
214	36.25	349.29	1.38	0.53	0.50	295.65	1.00	295.65	4.000	No	No	2.00
215	36.42	370.40	1.39	0.58	0.50	312.94	1.00	312.94	4.000	No	No	2.00
216	36.58	363.58	1.45	0.69	0.50	306.48	1.00	306.48	4.000	No	No	2.00
217	36.74	348.73	1.47	0.71	0.50	293.24	1.00	293.24	4.000	No	No	2.00
218	36.91	339.35	1.44	0.64	0.50	284.70	1.00	284.70	4.000	No	No	2.00
219	37.07	338.65	1.38	0.52	0.50	283.53	1.00	283.53	4.000	No	No	2.00
220	37.24	341.33	1.39	0.53	0.50	285.19	1.00	285.19	4.000	No	No	2.00
221	37.40	348.75	1.42	0.60	0.50	290.82	1.00	290.82	4.000	No	No	2.00
222	37.57	342.84	1.47	0.70	0.50	285.25	1.00	285.25	4.000	No	No	2.00
223	37.73	342.66	1.50	0.75	0.50	284.50	1.00	284.50	4.000	No	No	2.00
224	37.89	341.09	1.50	0.76	0.50	282.58	1.00	282.58	4.000	No	No	2.00
225	38.06	358.39	1.44	0.65	0.50	296.39	1.00	296.39	4.000	No	No	2.00
226	38.22	372.99	1.31	0.44	0.50	307.92	1.00	307.92	4.000	No	No	2.00
227	38.39	391.40	1.21	0.33	0.50	322.58	1.00	322.58	4.000	No	No	2.00
228	38.55	408.33	1.18	0.31	0.50	335.97	1.00	335.97	4.000	No	No	2.00
229	38.71	421.40	1.22	0.37	0.50	346.10	1.00	346.10	4.000	No	No	2.00
230	38.88	427.31	1.23	0.39	0.50	350.28	1.00	350.28	4.000	No	No	2.00
231	39.04	418.90	1.23	0.39	0.50	342.68	1.00	342.68	4.000	No	No	2.00
232	39.21	401.54	1.27	0.41	0.50	327.75	1.00	327.75	4.000	No	No	2.00
233	39.37	389.68	1.30	0.44	0.50	317.40	1.00	317.40	4.000	No	No	2.00
234	39.53	393.48	1.28	0.42	0.50	319.88	1.00	319.88	4.000	No	No	2.00
235	39.70	408.36	1.26	0.41	0.50	331.40	1.00	331.40	4.000	No	No	2.00
236	39.86	418.10	1.25	0.40	0.50	338.70	1.00	338.70	4.000	No	No	2.00
237	40.03	402.57	1.27	0.42	0.50	325.42	1.00	325.42	4.000	No	No	2.00
238	40.19	338.71	1.37	0.47	0.50	272.98	1.00	272.98	4.000	No	No	2.00
239	40.35	235.90	1.56	0.62	0.50	189.19	1.00	189.19	0.710	No	No	1.72
240	40.52	139.85	1.87	0.96	0.57	108.80	1.22	132.37	0.296	No	No	0.72

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q _c (tsf)	I _c	Fr (%)	n	Q _{tn}	K _c	Q _{tn cs}	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
241	40.68	78.81	2.21	1.54	0.67	58.47	1.64	95.82	0.162	No	No	0.39
242	40.85	53.51	2.42	1.98	0.73	38.24	2.49	95.13	0.160	No	No	0.39
243	41.01	38.50	2.63	2.65	0.80	26.41	3.98	105.10	3.600	No	Yes	2.00
244	41.17	32.89	2.73	3.15	0.83	22.01	5.08	111.80	3.600	No	Yes	2.00
245	41.34	32.73	2.79	3.84	0.85	21.71	5.78	125.55	3.600	No	Yes	2.00
246	41.50	32.94	2.82	4.20	0.85	21.73	6.10	132.49	3.600	No	Yes	2.00
247	41.67	33.03	2.84	4.53	0.86	21.68	6.38	138.39	3.600	No	Yes	2.00
248	41.83	30.19	2.88	4.61	0.87	19.53	6.92	135.21	3.600	No	Yes	2.00
249	41.99	27.66	2.90	4.44	0.88	17.65	7.25	128.02	3.600	No	Yes	2.00
250	42.16	25.19	2.92	4.18	0.89	15.84	7.55	119.58	3.600	No	Yes	2.00
251	42.32	23.43	2.92	3.75	0.88	14.57	7.54	109.82	3.600	No	Yes	2.00
252	42.49	21.95	2.96	3.68	1.00	12.97	8.08	104.79	3.600	No	Yes	2.00
253	42.65	19.74	3.02	4.01	1.00	11.46	9.17	105.06	3.600	No	Yes	2.00
254	42.81	18.07	3.11	4.94	1.00	10.31	10.90	112.38	3.600	No	Yes	2.00
255	42.98	17.26	3.17	5.76	1.00	9.74	12.17	118.51	3.600	No	Yes	2.00
256	43.14	17.90	3.16	5.64	1.00	10.13	11.76	119.11	3.600	No	Yes	2.00
257	43.31	18.53	3.13	5.27	1.00	10.51	11.12	116.83	3.600	No	Yes	2.00
258	43.47	17.92	3.14	5.21	1.00	10.07	11.35	114.26	3.600	No	Yes	2.00
259	43.63	16.35	3.19	5.49	1.00	9.01	12.47	112.33	3.600	No	Yes	2.00
260	43.80	14.65	3.25	5.81	1.00	7.87	13.92	109.52	3.600	No	Yes	2.00
261	43.96	13.79	3.28	5.89	1.00	7.29	14.67	106.89	3.600	No	Yes	2.00
262	44.13	14.30	3.24	5.37	1.00	7.59	13.72	104.11	3.600	No	Yes	2.00
263	44.29	15.62	3.17	4.75	1.00	8.41	12.15	102.22	3.600	No	Yes	2.00
264	44.45	17.01	3.11	4.22	1.00	9.28	10.79	100.22	3.600	No	Yes	2.00
265	44.62	17.46	3.08	3.92	1.00	9.54	10.24	97.71	3.600	No	Yes	2.00
266	44.78	17.37	3.07	3.66	1.00	9.45	9.96	94.19	3.600	No	Yes	2.00
267	44.95	17.72	3.03	3.22	1.00	9.64	9.25	89.23	3.600	No	Yes	2.00
268	45.11	19.60	2.92	2.66	0.89	11.31	7.55	85.42	3.600	No	Yes	2.00
269	45.28	20.08	2.91	2.64	0.88	11.61	7.37	85.65	3.600	No	Yes	2.00
270	45.44	19.26	2.98	3.02	1.00	10.53	8.45	88.95	3.600	No	Yes	2.00
271	45.60	16.65	3.11	3.97	1.00	8.84	10.82	95.70	3.600	No	Yes	2.00
272	45.77	14.60	3.27	5.92	1.00	7.53	14.42	108.50	3.600	No	Yes	2.00
273	45.93	13.54	3.38	7.82	1.00	6.83	17.38	118.65	3.600	No	Yes	2.00
274	46.10	12.55	3.48	10.11	1.00	6.18	20.72	128.15	3.600	No	Yes	2.00
275	46.26	12.25	3.51	10.64	1.00	5.97	21.64	129.22	3.600	No	Yes	2.00
276	46.42	12.16	3.51	10.58	1.00	5.90	21.74	128.17	3.600	No	Yes	2.00
277	46.59	14.36	3.36	7.73	1.00	7.24	16.71	120.95	3.600	No	Yes	2.00
278	46.75	18.41	3.13	4.95	1.00	9.73	11.31	110.02	3.600	No	Yes	2.00
279	46.92	23.48	2.90	3.08	0.88	13.52	7.16	96.78	3.600	No	Yes	2.00
280	47.08	27.23	2.76	2.32	0.84	16.20	5.38	87.16	3.600	No	Yes	2.00
281	47.24	29.00	2.69	1.91	0.81	17.49	4.56	79.70	3.600	No	Yes	2.00
282	47.41	30.22	2.63	1.66	0.80	18.38	4.06	74.67	3.600	No	Yes	2.00
283	47.57	32.02	2.58	1.47	0.78	19.68	3.59	70.69	0.113	No	No	0.28
284	47.74	34.99	2.54	1.44	0.77	21.75	3.27	71.02	0.113	No	No	0.28
285	47.90	36.82	2.55	1.63	0.77	22.90	3.34	76.60	0.122	No	No	0.30
286	48.06	37.03	2.62	2.14	0.79	22.77	3.93	89.50	3.600	No	Yes	2.00
287	48.23	35.55	2.72	2.84	0.82	21.46	4.87	104.44	3.600	No	Yes	2.00
288	48.39	33.76	2.80	3.54	0.85	20.01	5.84	116.77	3.600	No	Yes	2.00

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

Point ID	Depth (ft)	q_t (tsf)	I_c	Fr (%)	n	Q_{tn}	K_c	$Q_{tn,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
289	48.56	32.72	2.83	3.71	0.86	19.21	6.18	118.67	3.600	No	Yes	2.00
290	48.72	32.75	2.81	3.54	0.85	19.21	6.01	115.51	3.600	No	Yes	2.00
291	48.88	34.52	2.76	3.20	0.84	20.43	5.42	110.67	3.600	No	Yes	2.00
292	49.05	38.76	2.69	2.85	0.81	23.35	4.58	106.87	3.600	No	Yes	2.00
293	49.21	43.87	2.61	2.53	0.79	26.90	3.82	102.66	3.600	No	Yes	2.00
294	49.38	50.18	2.51	2.18	0.76	31.37	3.08	96.61	0.164	No	No	0.41
295	49.54	57.58	2.41	1.82	0.73	36.72	2.44	89.69	0.147	No	No	0.37
296	49.70	71.83	2.25	1.38	0.68	47.24	1.76	83.19	0.134	No	No	0.34
297	49.87	78.47	2.18	1.19	0.66	52.22	1.57	81.78	0.131	No	No	0.33
298	50.03	74.13	2.21	1.24	0.67	48.89	1.65	80.58	0.129	No	No	0.33
299	50.20	61.76	2.34	1.51	0.71	39.60	2.07	82.14	0.132	No	No	0.33

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
1.31	2.00	0.00	0.00	0.16	0.00	1.48	2.00	0.00	0.00	0.16	0.00
1.64	2.00	0.00	0.00	0.16	0.00	1.80	2.00	0.00	0.00	0.16	0.00
1.97	2.00	0.00	0.00	0.17	0.00	2.13	2.00	0.00	0.00	0.16	0.00
2.30	2.00	0.00	0.00	0.16	0.00	2.46	2.00	0.00	0.00	0.16	0.00
2.63	2.00	0.00	0.00	0.16	0.00	2.79	2.00	0.00	0.00	0.16	0.00
2.95	2.00	0.00	0.00	0.16	0.00	3.12	2.00	0.00	0.00	0.16	0.00
3.28	2.00	0.00	0.00	0.16	0.00	3.44	2.00	0.00	0.00	0.16	0.00
3.61	2.00	0.00	0.00	0.16	0.00	3.77	2.00	0.00	0.00	0.16	0.00
3.94	2.00	0.00	0.00	0.16	0.00	4.10	2.00	0.00	0.00	0.16	0.00
4.26	2.00	0.00	0.00	0.16	0.00	4.43	2.00	0.00	0.00	0.16	0.00
4.59	2.00	0.00	0.00	0.16	0.00	4.76	2.00	0.00	0.00	0.16	0.00
4.92	2.00	0.00	0.00	0.16	0.00	5.08	2.00	0.00	0.00	0.16	0.00
5.25	2.00	0.00	0.00	0.16	0.00	5.41	2.00	0.00	0.00	0.16	0.00
5.58	2.00	0.00	0.00	0.16	0.00	5.74	2.00	0.00	0.00	0.16	0.00
5.91	2.00	0.00	0.00	0.17	0.00	6.07	2.00	0.00	0.00	0.16	0.00
6.23	2.00	0.00	0.00	0.16	0.00	6.40	2.00	0.00	0.00	0.16	0.00
6.56	2.00	0.00	0.00	0.16	0.00	6.73	2.00	0.00	0.00	0.16	0.00
6.89	2.00	0.00	0.00	0.16	0.00	7.05	2.00	0.00	0.00	0.16	0.00
7.22	2.00	0.00	0.00	0.16	0.00	7.38	2.00	0.00	0.00	0.16	0.00
7.55	2.00	0.00	0.00	0.16	0.00	7.71	2.00	0.00	0.00	0.16	0.00
7.87	2.00	0.00	0.00	0.16	0.00	8.04	2.00	0.00	0.00	0.16	0.00
8.20	2.00	0.00	0.00	0.16	0.00	8.37	2.00	0.00	0.00	0.16	0.00
8.53	2.00	0.00	0.00	0.16	0.00	8.69	2.00	0.00	0.00	0.16	0.00
8.86	2.00	0.00	0.00	0.16	0.00	9.02	0.43	0.57	0.41	0.16	0.25
9.19	0.41	0.59	0.40	0.16	0.25	9.35	0.40	0.60	0.39	0.16	0.26
9.51	0.39	0.61	0.38	0.16	0.26	9.68	0.39	0.61	0.38	0.16	0.26
9.84	0.40	0.60	0.38	0.16	0.26	10.01	0.40	0.60	0.38	0.16	0.26
10.17	0.39	0.61	0.38	0.16	0.26	10.34	0.38	0.62	0.37	0.16	0.26
10.50	0.36	0.64	0.36	0.16	0.27	10.66	0.36	0.64	0.36	0.16	0.27
10.83	0.35	0.65	0.35	0.16	0.27	10.99	0.36	0.64	0.36	0.16	0.27
11.15	0.37	0.63	0.36	0.16	0.26	11.32	0.32	0.68	0.34	0.16	0.28
11.48	0.34	0.66	0.34	0.16	0.27	11.65	0.35	0.65	0.35	0.16	0.27
11.81	0.44	0.56	0.42	0.16	0.23	11.97	0.44	0.56	0.42	0.16	0.23
12.14	0.43	0.57	0.41	0.16	0.23	12.30	0.34	0.66	0.35	0.16	0.27
12.47	0.34	0.66	0.34	0.16	0.27	12.63	0.33	0.67	0.34	0.16	0.27
12.79	0.32	0.68	0.33	0.16	0.27	12.96	0.32	0.68	0.33	0.16	0.27
13.12	0.39	0.61	0.38	0.16	0.24	13.29	0.39	0.61	0.38	0.16	0.24
13.45	0.33	0.67	0.34	0.16	0.27	13.62	0.33	0.67	0.34	0.16	0.27
13.78	0.34	0.66	0.34	0.16	0.26	13.94	0.34	0.66	0.35	0.16	0.26
14.11	0.34	0.66	0.34	0.16	0.26	14.27	0.33	0.67	0.34	0.16	0.26
14.44	0.33	0.67	0.34	0.16	0.26	14.60	0.33	0.67	0.34	0.16	0.26
14.76	0.31	0.69	0.33	0.16	0.27	14.93	0.30	0.70	0.32	0.16	0.27
15.09	0.28	0.72	0.31	0.16	0.28	15.26	0.32	0.68	0.33	0.16	0.26
15.42	2.00	0.00	0.00	0.16	0.00	15.58	0.32	0.68	0.34	0.16	0.26
15.75	0.30	0.70	0.32	0.16	0.27	15.91	0.29	0.71	0.32	0.16	0.27
16.08	0.31	0.69	0.33	0.16	0.26	16.24	0.35	0.65	0.35	0.16	0.24
16.40	0.40	0.60	0.38	0.16	0.23	16.57	0.47	0.53	0.45	0.16	0.20
16.73	0.54	0.46	0.54	0.16	0.17	16.90	0.60	0.40	0.62	0.16	0.15

:: 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
17.06	0.62	0.38	0.67	0.16	0.14	17.22	0.56	0.44	0.56	0.16	0.16
17.39	0.74	0.00	0.00	0.16	0.10	17.55	1.08	0.00	0.00	0.16	0.00
17.72	1.16	0.00	0.00	0.16	0.00	17.88	1.00	0.00	0.00	0.16	0.00
18.05	0.88	0.00	0.00	0.16	0.04	18.21	1.17	0.00	0.00	0.16	0.00
18.37	1.63	0.00	0.00	0.16	0.00	18.54	1.97	0.00	0.00	0.16	0.00
18.70	2.00	0.00	0.00	0.16	0.00	18.86	2.00	0.00	0.00	0.16	0.00
19.03	2.00	0.00	0.00	0.16	0.00	19.19	2.00	0.00	0.00	0.16	0.00
19.36	2.00	0.00	0.00	0.16	0.00	19.52	2.00	0.00	0.00	0.16	0.00
19.68	2.00	0.00	0.00	0.16	0.00	19.85	2.00	0.00	0.00	0.16	0.00
20.01	2.00	0.00	0.00	0.16	0.00	20.18	2.00	0.00	0.00	0.16	0.00
20.34	2.00	0.00	0.00	0.16	0.00	20.50	2.00	0.00	0.00	0.16	0.00
20.67	0.82	0.00	0.00	0.16	0.06	20.83	0.72	0.28	1.03	0.16	0.09
21.00	0.72	0.28	1.03	0.16	0.09	21.16	2.00	0.00	0.00	0.16	0.00
21.32	2.00	0.00	0.00	0.16	0.00	21.49	2.00	0.00	0.00	0.16	0.00
21.65	2.00	0.00	0.00	0.16	0.00	21.82	2.00	0.00	0.00	0.16	0.00
21.98	2.00	0.00	0.00	0.16	0.00	22.15	2.00	0.00	0.00	0.16	0.00
22.31	2.00	0.00	0.00	0.16	0.00	22.47	2.00	0.00	0.00	0.16	0.00
22.64	2.00	0.00	0.00	0.16	0.00	22.80	0.68	0.32	0.84	0.16	0.10
22.97	0.51	0.49	0.49	0.16	0.16	23.13	0.46	0.54	0.44	0.16	0.18
23.29	0.43	0.57	0.41	0.16	0.18	23.46	0.48	0.52	0.45	0.16	0.17
23.62	2.00	0.00	0.00	0.16	0.00	23.79	2.00	0.00	0.00	0.16	0.00
23.95	2.00	0.00	0.00	0.16	0.00	24.11	2.00	0.00	0.00	0.16	0.00
24.28	2.00	0.00	0.00	0.16	0.00	24.44	2.00	0.00	0.00	0.16	0.00
24.61	2.00	0.00	0.00	0.16	0.00	24.77	0.65	0.35	0.74	0.16	0.11
24.93	0.46	0.54	0.43	0.16	0.17	25.10	0.48	0.52	0.45	0.16	0.16
25.26	0.54	0.46	0.53	0.16	0.14	25.43	0.55	0.45	0.55	0.16	0.14
25.59	0.65	0.35	0.74	0.16	0.11	25.75	0.64	0.36	0.73	0.16	0.11
25.92	0.69	0.31	0.88	0.16	0.09	26.08	2.00	0.00	0.00	0.16	0.00
26.25	2.00	0.00	0.00	0.16	0.00	26.41	2.00	0.00	0.00	0.16	0.00
26.57	2.00	0.00	0.00	0.16	0.00	26.74	2.00	0.00	0.00	0.16	0.00
26.90	2.00	0.00	0.00	0.16	0.00	27.07	2.00	0.00	0.00	0.16	0.00
27.23	2.00	0.00	0.00	0.16	0.00	27.39	2.00	0.00	0.00	0.16	0.00
27.56	2.00	0.00	0.00	0.16	0.00	27.72	2.00	0.00	0.00	0.16	0.00
27.89	0.28	0.72	0.31	0.16	0.21	28.05	0.24	0.76	0.30	0.16	0.22
28.21	0.26	0.74	0.30	0.16	0.21	28.38	0.24	0.76	0.29	0.16	0.22
28.54	0.27	0.73	0.31	0.16	0.21	28.71	0.27	0.73	0.31	0.16	0.21
28.87	0.39	0.61	0.38	0.16	0.17	29.04	2.00	0.00	0.00	0.16	0.00
29.20	2.00	0.00	0.00	0.16	0.00	29.36	2.00	0.00	0.00	0.16	0.00
29.53	2.00	0.00	0.00	0.16	0.00	29.69	2.00	0.00	0.00	0.16	0.00
29.86	2.00	0.00	0.00	0.16	0.00	30.02	2.00	0.00	0.00	0.16	0.00
30.18	2.00	0.00	0.00	0.16	0.00	30.35	2.00	0.00	0.00	0.16	0.00
30.51	2.00	0.00	0.00	0.16	0.00	30.68	2.00	0.00	0.00	0.16	0.00
30.84	2.00	0.00	0.00	0.16	0.00	31.00	2.00	0.00	0.00	0.16	0.00
31.17	0.81	0.00	0.00	0.16	0.05	31.33	0.61	0.39	0.65	0.16	0.10
31.50	0.52	0.48	0.51	0.16	0.12	31.66	0.48	0.52	0.46	0.16	0.13
31.82	0.47	0.53	0.45	0.16	0.14	31.99	0.68	0.32	0.85	0.16	0.08
32.15	1.34	0.00	0.00	0.16	0.00	32.32	2.00	0.00	0.00	0.16	0.00
32.48	2.00	0.00	0.00	0.16	0.00	32.64	2.00	0.00	0.00	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
32.81	2.00	0.00	0.00	0.16	0.00	32.97	2.00	0.00	0.00	0.16	0.00
33.14	2.00	0.00	0.00	0.16	0.00	33.30	1.80	0.00	0.00	0.16	0.00
33.47	1.24	0.00	0.00	0.16	0.00	33.63	1.16	0.00	0.00	0.16	0.00
33.79	1.17	0.00	0.00	0.16	0.00	33.96	1.17	0.00	0.00	0.16	0.00
34.12	1.34	0.00	0.00	0.16	0.00	34.28	1.26	0.00	0.00	0.16	0.00
34.45	1.11	0.00	0.00	0.16	0.00	34.61	1.00	0.00	0.00	0.16	0.00
34.78	0.92	0.00	0.00	0.16	0.02	34.94	0.85	0.00	0.00	0.16	0.04
35.10	0.83	0.00	0.00	0.16	0.04	35.27	0.84	0.00	0.00	0.16	0.04
35.43	0.98	0.00	0.00	0.16	0.01	35.60	1.05	0.00	0.00	0.16	0.00
35.76	1.19	0.00	0.00	0.16	0.00	35.92	1.96	0.00	0.00	0.16	0.00
36.09	2.00	0.00	0.00	0.16	0.00	36.25	2.00	0.00	0.00	0.16	0.00
36.42	2.00	0.00	0.00	0.16	0.00	36.58	2.00	0.00	0.00	0.16	0.00
36.74	2.00	0.00	0.00	0.16	0.00	36.91	2.00	0.00	0.00	0.16	0.00
37.07	2.00	0.00	0.00	0.16	0.00	37.24	2.00	0.00	0.00	0.16	0.00
37.40	2.00	0.00	0.00	0.16	0.00	37.57	2.00	0.00	0.00	0.16	0.00
37.73	2.00	0.00	0.00	0.16	0.00	37.89	2.00	0.00	0.00	0.16	0.00
38.06	2.00	0.00	0.00	0.16	0.00	38.22	2.00	0.00	0.00	0.16	0.00
38.39	2.00	0.00	0.00	0.16	0.00	38.55	2.00	0.00	0.00	0.16	0.00
38.71	2.00	0.00	0.00	0.16	0.00	38.88	2.00	0.00	0.00	0.16	0.00
39.04	2.00	0.00	0.00	0.16	0.00	39.21	2.00	0.00	0.00	0.16	0.00
39.37	2.00	0.00	0.00	0.16	0.00	39.53	2.00	0.00	0.00	0.16	0.00
39.70	2.00	0.00	0.00	0.16	0.00	39.86	2.00	0.00	0.00	0.16	0.00
40.03	2.00	0.00	0.00	0.16	0.00	40.19	2.00	0.00	0.00	0.16	0.00
40.35	1.72	0.00	0.00	0.16	0.00	40.52	0.72	0.28	0.99	0.16	0.05
40.68	0.39	0.61	0.38	0.16	0.12	40.85	0.39	0.61	0.38	0.16	0.12
41.01	2.00	0.00	0.00	0.17	0.00	41.17	2.00	0.00	0.00	0.16	0.00
41.34	2.00	0.00	0.00	0.16	0.00	41.50	2.00	0.00	0.00	0.16	0.00
41.67	2.00	0.00	0.00	0.16	0.00	41.83	2.00	0.00	0.00	0.16	0.00
41.99	2.00	0.00	0.00	0.16	0.00	42.16	2.00	0.00	0.00	0.16	0.00
42.32	2.00	0.00	0.00	0.16	0.00	42.49	2.00	0.00	0.00	0.16	0.00
42.65	2.00	0.00	0.00	0.16	0.00	42.81	2.00	0.00	0.00	0.16	0.00
42.98	2.00	0.00	0.00	0.16	0.00	43.14	2.00	0.00	0.00	0.16	0.00
43.31	2.00	0.00	0.00	0.16	0.00	43.47	2.00	0.00	0.00	0.16	0.00
43.63	2.00	0.00	0.00	0.16	0.00	43.80	2.00	0.00	0.00	0.16	0.00
43.96	2.00	0.00	0.00	0.16	0.00	44.13	2.00	0.00	0.00	0.16	0.00
44.29	2.00	0.00	0.00	0.16	0.00	44.45	2.00	0.00	0.00	0.16	0.00
44.62	2.00	0.00	0.00	0.16	0.00	44.78	2.00	0.00	0.00	0.16	0.00
44.95	2.00	0.00	0.00	0.16	0.00	45.11	2.00	0.00	0.00	0.16	0.00
45.28	2.00	0.00	0.00	0.16	0.00	45.44	2.00	0.00	0.00	0.16	0.00
45.60	2.00	0.00	0.00	0.16	0.00	45.77	2.00	0.00	0.00	0.16	0.00
45.93	2.00	0.00	0.00	0.16	0.00	46.10	2.00	0.00	0.00	0.16	0.00
46.26	2.00	0.00	0.00	0.16	0.00	46.42	2.00	0.00	0.00	0.16	0.00
46.59	2.00	0.00	0.00	0.16	0.00	46.75	2.00	0.00	0.00	0.16	0.00
46.92	2.00	0.00	0.00	0.16	0.00	47.08	2.00	0.00	0.00	0.16	0.00
47.24	2.00	0.00	0.00	0.16	0.00	47.41	2.00	0.00	0.00	0.16	0.00
47.57	0.28	0.72	0.31	0.16	0.10	47.74	0.28	0.72	0.31	0.16	0.10
47.90	0.30	0.70	0.32	0.16	0.09	48.06	2.00	0.00	0.00	0.16	0.00
48.23	2.00	0.00	0.00	0.16	0.00	48.39	2.00	0.00	0.00	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
48.56	2.00	0.00	0.00	0.16	0.00	48.72	2.00	0.00	0.00	0.16	0.00
48.88	2.00	0.00	0.00	0.16	0.00	49.05	2.00	0.00	0.00	0.16	0.00
49.21	2.00	0.00	0.00	0.16	0.00	49.38	0.41	0.59	0.40	0.16	0.07
49.54	0.37	0.63	0.36	0.16	0.08	49.70	0.34	0.66	0.34	0.16	0.08
49.87	0.33	0.67	0.34	0.16	0.08	50.03	0.33	0.67	0.34	0.16	0.08
50.20	0.33	0.67	0.34	0.16	0.08						

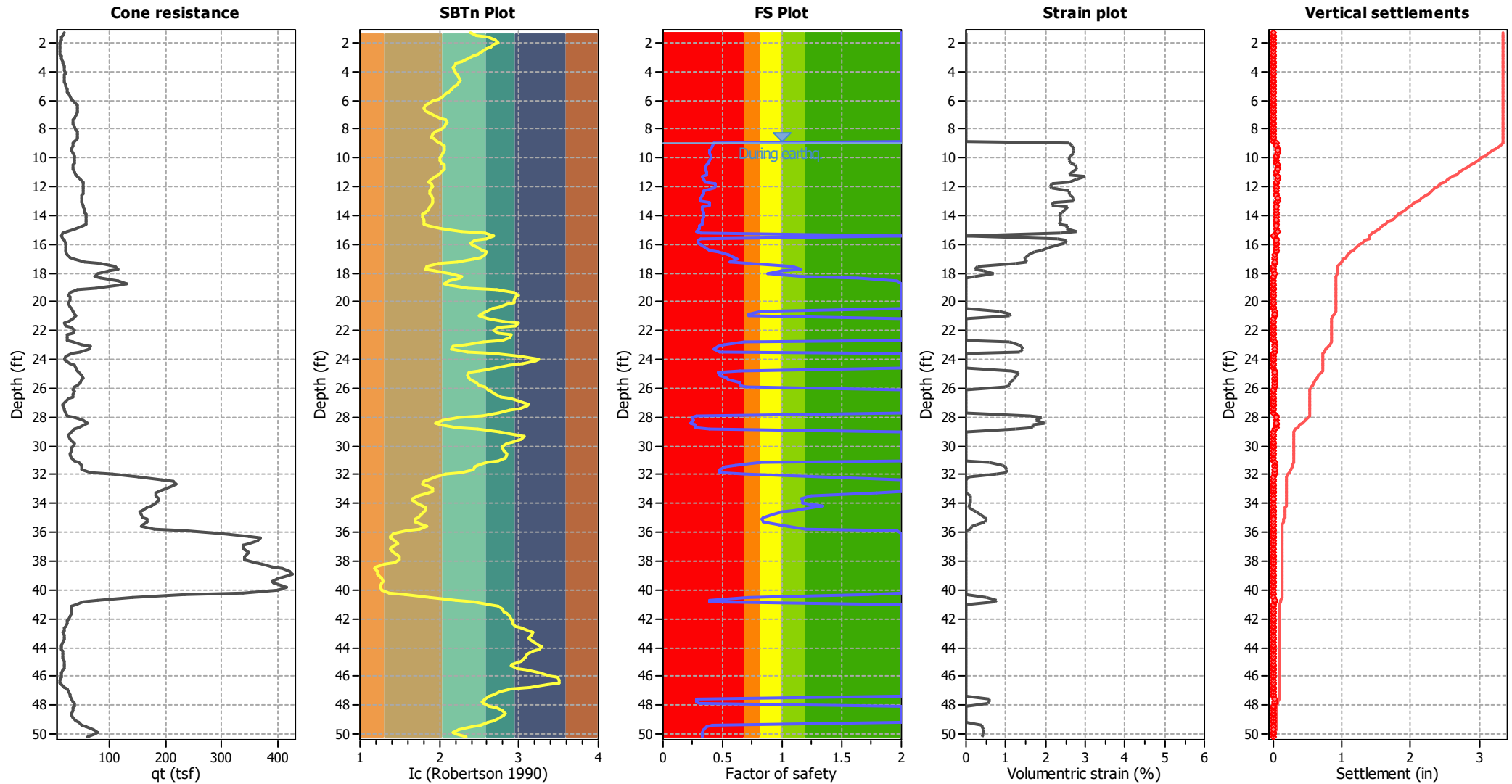
Overall liquefaction potential: 17.95

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 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)
9.02	71.44	0.43	2.61	0.85	0.05	9.19	69.46	0.41	2.66	0.84	0.05
9.35	67.55	0.40	2.71	0.84	0.05	9.51	66.95	0.39	2.72	0.84	0.05
9.68	67.43	0.39	2.70	0.84	0.05	9.84	69.02	0.40	2.64	0.83	0.05
10.01	69.75	0.40	2.61	0.83	0.05	10.17	69.36	0.39	2.61	0.83	0.05
10.34	68.05	0.38	2.64	0.82	0.05	10.50	64.71	0.36	2.74	0.82	0.05
10.66	63.89	0.36	2.76	0.82	0.05	10.83	63.60	0.35	2.77	0.82	0.05
10.99	66.24	0.36	2.67	0.81	0.05	11.15	68.04	0.37	2.60	0.81	0.05
11.32	57.00	0.32	2.99	0.81	0.06	11.48	62.46	0.34	2.77	0.81	0.05
11.65	67.01	0.35	2.60	0.80	0.05	11.81	84.58	0.44	2.14	0.80	0.04
11.97	85.03	0.44	2.13	0.80	0.04	12.14	83.10	0.43	2.16	0.79	0.04
12.30	66.34	0.34	2.59	0.79	0.05	12.47	65.48	0.34	2.61	0.79	0.05
12.63	64.01	0.33	2.65	0.79	0.05	12.79	62.20	0.32	2.70	0.78	0.05
12.96	62.01	0.32	2.70	0.78	0.05	13.12	78.94	0.39	2.21	0.78	0.04
13.29	80.20	0.39	2.17	0.77	0.04	13.45	65.79	0.33	2.54	0.77	0.05
13.62	67.16	0.33	2.49	0.77	0.05	13.78	69.27	0.34	2.42	0.77	0.05
13.94	71.25	0.34	2.36	0.76	0.05	14.11	70.24	0.34	2.38	0.76	0.05
14.27	69.56	0.33	2.39	0.76	0.05	14.44	69.47	0.33	2.38	0.76	0.05
14.60	70.65	0.33	2.34	0.75	0.05	14.76	63.26	0.31	2.55	0.75	0.05
14.93	63.44	0.30	2.54	0.75	0.05	15.09	56.44	0.28	2.78	0.74	0.05
15.26	67.72	0.32	2.39	0.74	0.05	15.42	73.61	2.00	0.00	0.74	0.00
15.58	70.21	0.32	2.30	0.74	0.05	15.75	62.73	0.30	2.51	0.73	0.05
15.91	63.04	0.29	2.49	0.73	0.05	16.08	68.20	0.31	2.33	0.73	0.05
16.24	78.02	0.35	2.08	0.72	0.04	16.40	86.60	0.40	1.90	0.72	0.04
16.57	97.77	0.47	1.71	0.72	0.03	16.73	107.16	0.54	1.58	0.72	0.03
16.90	112.90	0.60	1.51	0.71	0.03	17.06	115.11	0.62	1.48	0.71	0.03
17.22	109.74	0.56	1.53	0.71	0.03	17.39	126.09	0.74	1.25	0.71	0.02
17.55	149.69	1.08	0.30	0.70	0.01	17.72	154.51	1.16	0.21	0.70	0.00
17.88	145.33	1.00	0.43	0.70	0.01	18.05	137.72	0.88	0.68	0.69	0.01
18.21	155.47	1.17	0.21	0.69	0.00	18.37	177.45	1.63	0.00	0.69	0.00
18.54	190.76	1.97	0.00	0.69	0.00	18.70	203.34	2.00	0.00	0.68	0.00
18.86	192.83	2.00	0.00	0.68	0.00	19.03	193.20	2.00	0.00	0.68	0.00
19.19	241.93	2.00	0.00	0.67	0.00	19.36	269.79	2.00	0.00	0.67	0.00
19.52	282.46	2.00	0.00	0.67	0.00	19.68	277.94	2.00	0.00	0.67	0.00
19.85	264.17	2.00	0.00	0.66	0.00	20.01	240.11	2.00	0.00	0.66	0.00
20.18	201.28	2.00	0.00	0.66	0.00	20.34	166.58	2.00	0.00	0.66	0.00
20.50	145.57	2.00	0.00	0.65	0.00	20.67	135.43	0.82	0.85	0.65	0.02
20.83	128.08	0.72	1.12	0.65	0.02	21.00	128.16	0.72	1.11	0.64	0.02
21.16	141.48	2.00	0.00	0.64	0.00	21.32	165.39	2.00	0.00	0.64	0.00
21.49	187.03	2.00	0.00	0.64	0.00	21.65	182.62	2.00	0.00	0.63	0.00
21.82	168.15	2.00	0.00	0.63	0.00	21.98	173.22	2.00	0.00	0.63	0.00
22.15	185.70	2.00	0.00	0.62	0.00	22.31	195.09	2.00	0.00	0.62	0.00
22.47	169.23	2.00	0.00	0.62	0.00	22.64	148.68	2.00	0.00	0.62	0.00
22.80	125.43	0.68	1.09	0.61	0.02	22.97	108.47	0.51	1.34	0.61	0.03
23.13	102.11	0.46	1.40	0.61	0.03	23.29	98.29	0.43	1.43	0.61	0.03
23.46	104.42	0.48	1.36	0.60	0.03	23.62	150.60	2.00	0.00	0.60	0.00
23.79	211.12	2.00	0.00	0.60	0.00	23.95	262.52	2.00	0.00	0.59	0.00
24.11	295.27	2.00	0.00	0.59	0.00	24.28	299.83	2.00	0.00	0.59	0.00
24.44	256.44	2.00	0.00	0.59	0.00	24.61	189.12	2.00	0.00	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)
24.77	123.69	0.65	1.14	0.58	0.02	24.93	102.75	0.46	1.32	0.58	0.03
25.10	105.15	0.48	1.29	0.57	0.03	25.26	112.68	0.54	1.21	0.57	0.02
25.43	114.55	0.55	1.19	0.57	0.02	25.59	123.97	0.65	1.11	0.57	0.02
25.75	123.60	0.64	1.11	0.56	0.02	25.92	127.96	0.69	0.97	0.56	0.02
26.08	129.96	2.00	0.00	0.56	0.00	26.25	142.91	2.00	0.00	0.56	0.00
26.41	159.75	2.00	0.00	0.55	0.00	26.57	170.66	2.00	0.00	0.55	0.00
26.74	179.53	2.00	0.00	0.55	0.00	26.90	180.27	2.00	0.00	0.54	0.00
27.07	174.04	2.00	0.00	0.54	0.00	27.23	161.36	2.00	0.00	0.54	0.00
27.39	141.99	2.00	0.00	0.54	0.00	27.56	118.36	2.00	0.00	0.53	0.00
27.72	92.35	2.00	0.00	0.53	0.00	27.89	71.26	0.28	1.63	0.53	0.03
28.05	57.94	0.24	1.92	0.52	0.04	28.21	64.14	0.26	1.75	0.52	0.03
28.38	54.93	0.24	1.98	0.52	0.04	28.54	66.76	0.27	1.68	0.52	0.03
28.71	66.89	0.27	1.67	0.51	0.03	28.87	93.45	0.39	1.26	0.51	0.02
29.04	145.98	2.00	0.00	0.51	0.00	29.20	198.17	2.00	0.00	0.51	0.00
29.36	233.58	2.00	0.00	0.50	0.00	29.53	240.81	2.00	0.00	0.50	0.00
29.69	227.05	2.00	0.00	0.50	0.00	29.86	201.54	2.00	0.00	0.49	0.00
30.02	179.68	2.00	0.00	0.49	0.00	30.18	163.86	2.00	0.00	0.49	0.00
30.35	156.01	2.00	0.00	0.49	0.00	30.51	157.41	2.00	0.00	0.48	0.00
30.68	161.73	2.00	0.00	0.48	0.00	30.84	165.85	2.00	0.00	0.48	0.00
31.00	157.65	2.00	0.00	0.47	0.00	31.17	139.32	0.81	0.59	0.47	0.01
31.33	121.82	0.61	0.93	0.47	0.02	31.50	112.95	0.52	0.99	0.47	0.02
31.66	107.73	0.48	1.02	0.46	0.02	31.82	107.06	0.47	1.02	0.46	0.02
31.99	128.97	0.68	0.78	0.46	0.02	32.15	171.27	1.34	0.09	0.46	0.00
32.32	205.49	2.00	0.00	0.45	0.00	32.48	216.69	2.00	0.00	0.45	0.00
32.64	219.60	2.00	0.00	0.45	0.00	32.81	223.39	2.00	0.00	0.44	0.00
32.97	219.47	2.00	0.00	0.44	0.00	33.14	205.07	2.00	0.00	0.44	0.00
33.30	192.05	1.80	0.00	0.44	0.00	33.47	166.53	1.24	0.12	0.43	0.00
33.63	162.54	1.16	0.12	0.43	0.00	33.79	162.75	1.17	0.12	0.43	0.00
33.96	163.02	1.17	0.12	0.42	0.00	34.12	172.04	1.34	0.08	0.42	0.00
34.28	167.92	1.26	0.08	0.42	0.00	34.45	159.44	1.11	0.17	0.42	0.00
34.61	152.74	1.00	0.25	0.41	0.00	34.78	147.52	0.92	0.36	0.41	0.01
34.94	142.60	0.85	0.49	0.41	0.01	35.10	141.74	0.83	0.49	0.41	0.01
35.27	142.21	0.84	0.49	0.40	0.01	35.43	151.62	0.98	0.24	0.40	0.00
35.60	156.39	1.05	0.16	0.40	0.00	35.76	164.45	1.19	0.11	0.39	0.00
35.92	199.03	1.96	0.00	0.39	0.00	36.09	254.13	2.00	0.00	0.39	0.00
36.25	295.65	2.00	0.00	0.39	0.00	36.42	312.94	2.00	0.00	0.38	0.00
36.58	306.48	2.00	0.00	0.38	0.00	36.74	293.24	2.00	0.00	0.38	0.00
36.91	284.70	2.00	0.00	0.37	0.00	37.07	283.53	2.00	0.00	0.37	0.00
37.24	285.19	2.00	0.00	0.37	0.00	37.40	290.82	2.00	0.00	0.37	0.00
37.57	285.25	2.00	0.00	0.36	0.00	37.73	284.50	2.00	0.00	0.36	0.00
37.89	282.58	2.00	0.00	0.36	0.00	38.06	296.39	2.00	0.00	0.35	0.00
38.22	307.92	2.00	0.00	0.35	0.00	38.39	322.58	2.00	0.00	0.35	0.00
38.55	335.97	2.00	0.00	0.35	0.00	38.71	346.10	2.00	0.00	0.34	0.00
38.88	350.28	2.00	0.00	0.34	0.00	39.04	342.68	2.00	0.00	0.34	0.00
39.21	327.75	2.00	0.00	0.34	0.00	39.37	317.40	2.00	0.00	0.33	0.00
39.53	319.88	2.00	0.00	0.33	0.00	39.70	331.40	2.00	0.00	0.33	0.00
39.86	338.70	2.00	0.00	0.32	0.00	40.03	325.42	2.00	0.00	0.32	0.00
40.19	272.98	2.00	0.00	0.32	0.00	40.35	189.19	1.72	0.00	0.32	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)
40.52	132.37	0.72	0.52	0.31	0.01	40.68	95.82	0.39	0.75	0.31	0.01
40.85	95.13	0.39	0.75	0.31	0.01	41.01	105.10	2.00	0.00	0.30	0.00
41.17	111.80	2.00	0.00	0.30	0.00	41.34	125.55	2.00	0.00	0.30	0.00
41.50	132.49	2.00	0.00	0.30	0.00	41.67	138.39	2.00	0.00	0.29	0.00
41.83	135.21	2.00	0.00	0.29	0.00	41.99	128.02	2.00	0.00	0.29	0.00
42.16	119.58	2.00	0.00	0.29	0.00	42.32	109.82	2.00	0.00	0.28	0.00
42.49	104.79	2.00	0.00	0.28	0.00	42.65	105.06	2.00	0.00	0.28	0.00
42.81	112.38	2.00	0.00	0.27	0.00	42.98	118.51	2.00	0.00	0.27	0.00
43.14	119.11	2.00	0.00	0.27	0.00	43.31	116.83	2.00	0.00	0.27	0.00
43.47	114.26	2.00	0.00	0.26	0.00	43.63	112.33	2.00	0.00	0.26	0.00
43.80	109.52	2.00	0.00	0.26	0.00	43.96	106.89	2.00	0.00	0.25	0.00
44.13	104.11	2.00	0.00	0.25	0.00	44.29	102.22	2.00	0.00	0.25	0.00
44.45	100.22	2.00	0.00	0.25	0.00	44.62	97.71	2.00	0.00	0.24	0.00
44.78	94.19	2.00	0.00	0.24	0.00	44.95	89.23	2.00	0.00	0.24	0.00
45.11	85.42	2.00	0.00	0.24	0.00	45.28	85.65	2.00	0.00	0.23	0.00
45.44	88.95	2.00	0.00	0.23	0.00	45.60	95.70	2.00	0.00	0.23	0.00
45.77	108.50	2.00	0.00	0.22	0.00	45.93	118.65	2.00	0.00	0.22	0.00
46.10	128.15	2.00	0.00	0.22	0.00	46.26	129.22	2.00	0.00	0.22	0.00
46.42	128.17	2.00	0.00	0.21	0.00	46.59	120.95	2.00	0.00	0.21	0.00
46.75	110.02	2.00	0.00	0.21	0.00	46.92	96.78	2.00	0.00	0.20	0.00
47.08	87.16	2.00	0.00	0.20	0.00	47.24	79.70	2.00	0.00	0.20	0.00
47.41	74.67	2.00	0.00	0.20	0.00	47.57	70.69	0.28	0.60	0.19	0.01
47.74	71.02	0.28	0.59	0.19	0.01	47.90	76.60	0.30	0.55	0.19	0.01
48.06	89.50	2.00	0.00	0.19	0.00	48.23	104.44	2.00	0.00	0.18	0.00
48.39	116.77	2.00	0.00	0.18	0.00	48.56	118.67	2.00	0.00	0.18	0.00
48.72	115.51	2.00	0.00	0.17	0.00	48.88	110.67	2.00	0.00	0.17	0.00
49.05	106.87	2.00	0.00	0.17	0.00	49.21	102.66	2.00	0.00	0.17	0.00
49.38	96.61	0.41	0.39	0.16	0.01	49.54	89.69	0.37	0.41	0.16	0.01
49.70	83.19	0.34	0.43	0.16	0.01	49.87	81.78	0.33	0.43	0.15	0.01
50.03	80.58	0.33	0.42	0.15	0.01	50.20	82.14	0.33	0.41	0.15	0.01

Total estimated settlement: 3.34

Abbreviations

- Q_{tn,cs}: Equivalent dean 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

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
1.31	18.47	29.56	2.31	68.19	2.39	0.22	0.68
1.48	16.96	27.12	2.76	74.96	2.47	0.38	0.70
1.64	14.72	23.50	3.88	91.11	2.61	0.73	0.73
1.80	13.33	21.26	4.65	98.94	2.69	0.75	0.75
1.97	12.18	19.40	5.05	98.04	2.73	0.74	0.74
2.13	11.49	18.28	4.60	84.01	2.69	0.72	0.72
2.30	11.18	17.76	4.14	73.53	2.64	0.34	0.69
2.46	11.05	17.54	3.69	64.81	2.59	0.17	0.67
2.63	11.41	18.10	3.25	58.87	2.54	0.10	0.65
2.79	11.90	18.89	2.83	53.37	2.48	0.07	0.64
2.95	12.79	20.30	2.47	50.21	2.42	0.05	0.63
3.12	14.05	22.32	2.12	47.40	2.35	0.04	0.62
3.28	15.73	25.00	1.84	46.00	2.28	0.04	0.62
3.44	17.43	27.72	1.00	27.72	2.21	0.02	0.62
3.61	18.63	29.63	1.00	29.63	2.18	0.02	0.62
3.77	19.69	31.33	1.00	31.33	2.17	0.02	0.62
3.94	19.98	31.78	1.58	50.27	2.19	0.05	0.63
4.10	20.31	32.29	1.61	52.04	2.20	0.06	0.63
4.26	19.91	31.63	1.69	53.37	2.23	0.07	0.64
4.43	19.84	31.50	1.74	54.68	2.24	0.07	0.64
4.59	19.56	31.04	1.78	55.34	2.26	0.08	0.64
4.76	19.72	31.29	1.76	55.09	2.25	0.08	0.64
4.92	20.35	32.29	1.70	54.88	2.23	0.08	0.64
5.08	21.69	34.42	1.60	55.00	2.19	0.08	0.64
5.25	23.37	37.11	1.51	56.08	2.15	0.08	0.64
5.41	24.88	39.53	1.45	57.13	2.12	0.09	0.65
5.58	26.37	41.90	1.39	58.41	2.08	0.10	0.65
5.74	28.42	45.19	1.34	60.73	2.04	0.12	0.66
5.91	31.51	50.14	1.00	50.14	1.98	0.05	0.63
6.07	35.15	55.97	1.00	55.97	1.91	0.08	0.64
6.23	38.56	61.43	1.00	61.43	1.86	0.13	0.66
6.40	41.16	65.60	1.00	65.60	1.82	0.18	0.67
6.56	42.78	68.18	1.00	68.18	1.81	0.22	0.68
6.73	43.16	68.77	1.00	68.77	1.83	0.23	0.68
6.89	41.96	66.85	1.00	66.85	1.87	0.20	0.68
7.05	39.31	62.56	1.26	78.70	1.93	0.52	0.70
7.22	36.04	57.30	1.32	75.47	2.01	0.40	0.70
7.38	33.75	53.60	1.39	74.41	2.08	0.37	0.69
7.55	33.49	53.18	1.42	75.50	2.10	0.40	0.70
7.71	34.75	55.19	1.40	77.22	2.09	0.46	0.70
7.87	36.40	57.82	1.36	78.62	2.05	0.52	0.70
8.04	38.58	61.32	1.31	80.44	2.01	0.61	0.71
8.20	41.46	65.91	1.27	83.42	1.94	0.71	0.71
8.37	43.50	67.80	1.24	84.16	1.91	0.72	0.72
8.53	43.39	66.80	1.24	82.83	1.90	0.71	0.71
8.69	41.04	62.83	1.26	78.95	1.93	0.54	0.70
8.86	38.24	58.40	1.28	74.99	1.97	0.38	0.70
9.02	35.58	54.20	1.32	71.44	2.01	0.29	0.69

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
9.19	33.57	51.03	1.36	69.46	2.06	0.24	0.68
9.35	32.63	49.14	1.37	67.55	2.07	0.21	0.68
9.51	32.89	48.92	1.37	66.95	2.06	0.20	0.68
9.68	34.32	50.26	1.34	67.43	2.04	0.21	0.68
9.84	36.11	52.10	1.32	69.02	2.02	0.24	0.68
10.01	37.22	53.04	1.32	69.75	2.01	0.25	0.68
10.17	37.38	52.72	1.32	69.36	2.01	0.24	0.68
10.34	36.69	51.33	1.33	68.05	2.02	0.22	0.68
10.50	33.96	47.34	1.37	64.71	2.06	0.17	0.67
10.66	33.90	46.77	1.37	63.89	2.06	0.15	0.67
10.83	34.12	46.60	1.36	63.60	2.06	0.15	0.67
10.99	37.18	50.01	1.32	66.24	2.02	0.19	0.67
11.15	39.11	52.19	1.30	68.04	2.00	0.22	0.68
11.32	43.22	57.00	1.00	57.00	1.94	0.09	0.65
11.48	47.91	62.46	1.00	62.46	1.89	0.14	0.66
11.65	51.77	67.01	1.00	67.01	1.87	0.20	0.68
11.81	53.18	68.81	1.23	84.58	1.89	0.72	0.72
11.97	52.99	68.50	1.24	85.03	1.91	0.72	0.72
12.14	52.11	67.05	1.24	83.10	1.90	0.71	0.71
12.30	52.01	66.34	1.00	66.34	1.87	0.19	0.67
12.47	51.56	65.48	1.00	65.48	1.87	0.18	0.67
12.63	50.45	64.01	1.00	64.01	1.89	0.16	0.67
12.79	49.06	62.20	1.00	62.20	1.91	0.13	0.66
12.96	49.09	62.01	1.00	62.01	1.91	0.13	0.66
13.12	50.56	63.60	1.24	78.94	1.91	0.53	0.70
13.29	51.89	64.95	1.23	80.20	1.90	0.59	0.71
13.45	52.88	65.79	1.00	65.79	1.88	0.18	0.67
13.62	54.37	67.16	1.00	67.16	1.85	0.20	0.68
13.78	56.49	69.27	1.00	69.27	1.82	0.24	0.68
13.94	58.54	71.25	1.00	71.25	1.79	0.28	0.69
14.11	57.93	70.24	1.00	70.24	1.79	0.26	0.68
14.27	57.50	69.56	1.00	69.56	1.80	0.25	0.68
14.44	57.53	69.47	1.00	69.47	1.81	0.24	0.68
14.60	58.65	70.65	1.00	70.65	1.81	0.27	0.68
14.76	52.39	63.26	1.00	63.26	1.87	0.15	0.67
14.93	39.14	47.86	1.33	63.44	2.02	0.15	0.67
15.09	24.64	30.69	1.84	56.44	2.28	0.09	0.65
15.26	15.44	19.51	3.47	67.72	2.57	0.21	0.68
15.42	13.10	16.54	4.45	73.61	2.68	0.34	0.69
15.58	15.15	19.01	3.69	70.21	2.59	0.26	0.68
15.75	19.03	23.61	2.66	62.73	2.45	0.14	0.66
15.91	22.17	27.34	2.31	63.04	2.39	0.14	0.67
16.08	22.50	27.74	2.46	68.20	2.42	0.22	0.68
16.24	21.86	27.04	2.89	78.02	2.49	0.49	0.70
16.40	21.42	26.52	3.27	86.60	2.54	0.72	0.72
16.57	21.79	27.01	3.62	97.77	2.58	0.74	0.74
16.73	25.03	30.97	3.46	107.16	2.56	0.76	0.76
16.90	30.12	37.07	3.05	112.90	2.51	0.77	0.77

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
17.06	36.90	45.04	2.56	115.11	2.43	0.77	0.77
17.22	55.27	66.08	1.66	109.74	2.22	0.77	0.77
17.39	83.19	97.09	1.30	126.09	1.99	0.79	0.79
17.55	109.57	125.63	1.19	149.69	1.84	0.83	0.83
17.72	114.88	131.07	1.18	154.51	1.83	0.83	0.83
17.88	100.73	115.62	1.26	145.33	1.93	0.82	0.82
18.05	79.96	93.11	1.48	137.72	2.14	0.81	0.81
18.21	72.59	85.19	1.82	155.47	2.27	0.83	0.83
18.37	84.33	98.59	1.80	177.45	2.26	0.86	0.86
18.54	113.88	131.08	1.46	190.76	2.12	0.88	0.88
18.70	129.48	147.74	1.38	203.34	2.07	0.89	0.89
18.86	114.36	130.55	1.48	192.83	2.14	0.88	0.88
19.03	76.52	88.34	2.19	193.20	2.36	0.88	0.88
19.19	42.83	50.17	4.82	241.93	2.71	0.93	0.93
19.36	29.03	34.08	7.92	269.79	2.95	0.95	0.95
19.52	27.23	32.66	8.65	282.46	2.99	0.96	0.96
19.68	28.50	34.00	8.17	277.94	2.96	0.96	0.96
19.85	29.18	33.63	7.86	264.17	2.94	0.95	0.95
20.01	27.48	31.38	7.65	240.11	2.93	0.93	0.93
20.18	27.39	30.90	6.51	201.28	2.85	0.89	0.89
20.34	28.39	31.67	5.26	166.58	2.75	0.85	0.85
20.50	30.88	34.15	4.26	145.57	2.66	0.82	0.82
20.67	34.18	37.56	3.61	135.43	2.58	0.81	0.81
20.83	38.12	41.64	3.08	128.08	2.51	0.80	0.80
21.00	38.83	42.23	3.03	128.16	2.51	0.80	0.80
21.16	34.22	37.13	3.81	141.48	2.61	0.82	0.82
21.32	25.97	28.09	5.89	165.39	2.80	0.85	0.85
21.49	19.86	21.72	8.61	187.03	2.99	0.87	0.87
21.65	21.21	22.66	8.06	182.62	2.96	0.87	0.87
21.82	30.69	32.81	5.13	168.15	2.74	0.85	0.85
21.98	36.29	38.71	4.48	173.22	2.68	0.86	0.86
22.15	33.86	35.98	5.16	185.70	2.74	0.87	0.87
22.31	25.23	26.57	7.34	195.09	2.91	0.88	0.88
22.47	23.15	24.11	7.02	169.23	2.89	0.85	0.85
22.64	25.01	25.91	5.74	148.68	2.79	0.83	0.83
22.80	35.49	36.73	3.41	125.43	2.56	0.79	0.79
22.97	51.25	52.85	2.05	108.47	2.33	0.76	0.76
23.13	65.18	66.80	1.53	102.11	2.16	0.75	0.75
23.29	63.11	64.40	1.53	98.29	2.16	0.74	0.74
23.46	48.03	48.91	2.13	104.42	2.35	0.76	0.76
23.62	31.40	31.84	4.73	150.60	2.70	0.83	0.83
23.79	21.98	22.29	9.47	211.12	3.04	2.14	1.59
23.95	19.15	19.13	13.73	262.52	3.24	3.02	1.37
24.11	22.36	22.44	13.16	295.27	3.22	3.97	1.60
24.28	30.51	30.94	9.69	299.83	3.05	4.49	2.21
24.44	36.82	36.89	6.95	256.44	2.88	0.94	0.94
24.61	40.05	39.83	4.75	189.12	2.70	0.87	0.87
24.77	41.73	41.13	3.01	123.69	2.50	0.79	0.79

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
24.93	46.02	45.17	2.27	102.75	2.38	0.75	0.75
25.10	50.57	49.55	2.12	105.15	2.35	0.76	0.76
25.26	51.86	50.69	2.22	112.68	2.37	0.77	0.77
25.43	50.72	49.37	2.32	114.55	2.39	0.77	0.77
25.59	47.63	46.18	2.68	123.97	2.45	0.79	0.79
25.75	42.82	41.25	3.00	123.60	2.50	0.79	0.79
25.92	38.12	36.47	3.51	127.96	2.57	0.80	0.80
26.08	35.62	33.88	3.84	129.96	2.61	0.80	0.80
26.25	36.45	34.57	4.13	142.91	2.64	0.82	0.82
26.41	35.40	33.43	4.78	159.75	2.71	0.84	0.84
26.57	33.16	31.11	5.49	170.66	2.77	0.85	0.85
26.74	26.72	24.72	7.26	179.53	2.90	0.86	0.86
26.90	21.75	19.84	9.09	180.27	3.02	1.56	1.42
27.07	17.49	15.58	11.17	174.04	3.13	1.42	1.11
27.23	16.89	14.92	10.81	161.36	3.11	1.20	1.07
27.39	17.74	15.67	9.06	141.99	3.02	0.98	1.12
27.56	19.19	16.95	6.98	118.36	2.88	0.78	0.78
27.72	20.57	18.20	5.07	92.35	2.73	0.73	0.73
27.89	24.83	22.18	3.21	71.26	2.53	0.28	0.69
28.05	37.01	33.66	1.72	57.94	2.24	0.10	0.65
28.21	52.16	47.92	1.34	64.14	2.03	0.16	0.67
28.38	59.71	54.93	1.00	54.93	1.95	0.08	0.64
28.54	55.33	50.67	1.32	66.76	2.01	0.20	0.68
28.71	44.81	40.62	1.65	66.89	2.21	0.20	0.68
28.87	36.89	33.04	2.83	93.45	2.48	0.74	0.74
29.04	31.36	27.72	5.27	145.98	2.75	0.82	0.82
29.20	27.91	24.32	8.15	198.17	2.96	0.88	0.88
29.36	26.98	23.34	10.01	233.58	3.07	2.70	1.67
29.53	30.16	26.13	9.22	240.81	3.02	2.96	1.87
29.69	34.28	29.87	7.60	227.05	2.93	0.91	0.91
29.86	36.27	31.59	6.38	201.54	2.84	0.89	0.89
30.02	35.33	30.62	5.87	179.68	2.80	0.86	0.86
30.18	32.51	27.93	5.87	163.86	2.80	0.84	0.84
30.35	30.62	26.11	5.98	156.01	2.81	0.83	0.83
30.51	29.09	24.61	6.40	157.41	2.84	0.84	0.84
30.68	29.70	25.06	6.45	161.73	2.85	0.84	0.84
30.84	31.68	26.74	6.20	165.85	2.83	0.85	0.85
31.00	36.66	31.12	5.07	157.65	2.73	0.84	0.84
31.17	45.07	38.60	3.61	139.32	2.58	0.81	0.81
31.33	49.32	42.33	2.88	121.82	2.49	0.79	0.79
31.50	49.61	42.49	2.66	112.95	2.45	0.77	0.77
31.66	50.64	43.29	2.49	107.73	2.42	0.76	0.76
31.82	66.54	57.42	1.86	107.06	2.28	0.76	0.76
31.99	105.26	91.98	1.40	128.97	2.09	0.80	0.80
32.15	152.62	134.22	1.28	171.27	1.96	0.85	0.85
32.32	193.84	170.99	1.20	205.49	1.85	0.89	0.89
32.48	213.18	188.03	1.15	216.69	1.80	0.90	0.90
32.64	218.38	192.20	1.14	219.60	1.79	0.91	0.91

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

Depth (ft)	q _t (tsf)	Q _{tn}	K _c	Q _{tn,cs}	I _c	S _{u(liq)'/σ'_v}	S _{u(peak)'/σ'_v}
32.81	212.89	186.45	1.20	223.39	1.85	0.91	0.91
32.97	201.32	175.24	1.25	219.47	1.92	0.91	0.91
33.14	189.26	164.21	1.25	205.07	1.92	0.89	0.89
33.30	182.98	158.62	1.21	192.05	1.86	0.88	0.88
33.47	184.02	160.04	1.04	166.53	1.73	0.85	0.85
33.63	186.81	162.54	1.00	162.54	1.67	0.84	0.84
33.79	187.43	162.75	1.00	162.75	1.66	0.84	0.84
33.96	183.42	158.47	1.03	163.02	1.72	0.84	0.84
34.12	175.90	151.06	1.14	172.04	1.79	0.86	0.86
34.28	165.98	141.83	1.18	167.92	1.83	0.85	0.85
34.45	158.47	135.02	1.18	159.44	1.83	0.84	0.84
34.61	154.51	131.42	1.16	152.74	1.81	0.83	0.83
34.78	155.87	132.56	1.11	147.52	1.77	0.82	0.82
34.94	159.33	135.50	1.05	142.60	1.73	0.82	0.82
35.10	166.53	141.74	1.00	141.74	1.69	0.82	0.82
35.27	167.54	142.21	1.00	142.21	1.70	0.82	0.82
35.43	159.67	134.55	1.13	151.62	1.78	0.83	0.83
35.60	156.70	131.26	1.19	156.39	1.84	0.84	0.84
35.76	181.13	152.47	1.08	164.45	1.75	0.85	0.85
35.92	234.84	199.03	1.00	199.03	1.58	0.89	0.89
36.09	299.91	254.13	1.00	254.13	1.43	0.94	0.94
36.25	349.29	295.65	1.00	295.65	1.38	0.97	0.97
36.42	370.40	312.94	1.00	312.94	1.39	0.99	0.99
36.58	363.58	306.48	1.00	306.48	1.45	0.98	0.98
36.74	348.73	293.24	1.00	293.24	1.47	0.97	0.97
36.91	339.35	284.70	1.00	284.70	1.44	0.97	0.97
37.07	338.65	283.53	1.00	283.53	1.38	0.96	0.96
37.24	341.33	285.19	1.00	285.19	1.39	0.97	0.97
37.40	348.75	290.82	1.00	290.82	1.42	0.97	0.97
37.57	342.84	285.25	1.00	285.25	1.47	0.97	0.97
37.73	342.66	284.50	1.00	284.50	1.50	0.97	0.97
37.89	341.09	282.58	1.00	282.58	1.50	0.96	0.96
38.06	358.39	296.39	1.00	296.39	1.44	0.97	0.97
38.22	372.99	307.92	1.00	307.92	1.31	0.98	0.98
38.39	391.40	322.58	1.00	322.58	1.21	1.00	1.00
38.55	408.33	335.97	1.00	335.97	1.18	1.00	1.00
38.71	421.40	346.10	1.00	346.10	1.22	1.01	1.01
38.88	427.31	350.28	1.00	350.28	1.23	1.01	1.01
39.04	418.90	342.68	1.00	342.68	1.23	1.01	1.01
39.21	401.54	327.75	1.00	327.75	1.27	1.00	1.00
39.37	389.68	317.40	1.00	317.40	1.30	0.99	0.99
39.53	393.48	319.88	1.00	319.88	1.28	0.99	0.99
39.70	408.36	331.40	1.00	331.40	1.26	1.00	1.00
39.86	418.10	338.70	1.00	338.70	1.25	1.01	1.01
40.03	402.57	325.42	1.00	325.42	1.27	1.00	1.00
40.19	338.71	272.98	1.00	272.98	1.37	0.96	0.96
40.35	235.90	189.19	1.00	189.19	1.56	0.88	0.88
40.52	139.85	108.80	1.22	132.37	1.87	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)} /σ' _v	S _{u(peak)} /σ' _v
40.68	78.81	58.47	1.64	95.82	2.21	0.74	0.74
40.85	53.51	38.24	2.49	95.13	2.42	0.74	0.74
41.01	38.50	26.41	3.98	105.10	2.63	0.76	0.76
41.17	32.89	22.01	5.08	111.80	2.73	0.77	0.77
41.34	32.73	21.71	5.78	125.55	2.79	0.79	0.79
41.50	32.94	21.73	6.10	132.49	2.82	0.80	0.80
41.67	33.03	21.68	6.38	138.39	2.84	0.81	0.81
41.83	30.19	19.53	6.92	135.21	2.88	0.81	0.81
41.99	27.66	17.65	7.25	128.02	2.90	0.80	0.80
42.16	25.19	15.84	7.55	119.58	2.92	0.78	0.78
42.32	23.43	14.57	7.54	109.82	2.92	0.77	0.77
42.49	21.95	12.97	8.08	104.79	2.96	0.76	0.76
42.65	19.74	11.46	9.17	105.06	3.02	0.44	0.82
42.81	18.07	10.31	10.90	112.38	3.11	0.55	0.74
42.98	17.26	9.74	12.17	118.51	3.17	0.61	0.70
43.14	17.90	10.13	11.76	119.11	3.16	0.60	0.72
43.31	18.53	10.51	11.12	116.83	3.13	0.58	0.75
43.47	17.92	10.07	11.35	114.26	3.14	0.55	0.72
43.63	16.35	9.01	12.47	112.33	3.19	0.51	0.64
43.80	14.65	7.87	13.92	109.52	3.25	0.48	0.56
43.96	13.79	7.29	14.67	106.89	3.28	0.44	0.52
44.13	14.30	7.59	13.72	104.11	3.24	0.42	0.54
44.29	15.62	8.41	12.15	102.22	3.17	0.42	0.60
44.45	17.01	9.28	10.79	100.22	3.11	0.41	0.66
44.62	17.46	9.54	10.24	97.71	3.08	0.40	0.68
44.78	17.37	9.45	9.96	94.19	3.07	0.36	0.68
44.95	17.72	9.64	9.25	89.23	3.03	0.32	0.69
45.11	19.60	11.31	7.55	85.42	2.92	0.72	0.72
45.28	20.08	11.61	7.37	85.65	2.91	0.72	0.72
45.44	19.26	10.53	8.45	88.95	2.98	0.73	0.73
45.60	16.65	8.84	10.82	95.70	3.11	0.37	0.63
45.77	14.60	7.53	14.42	108.50	3.27	0.39	0.54
45.93	13.54	6.83	17.38	118.65	3.38	0.63	0.49
46.10	12.55	6.18	20.72	128.15	3.48	0.64	0.44
46.26	12.25	5.97	21.64	129.22	3.51	0.68	0.43
46.42	12.16	5.90	21.74	128.17	3.51	0.66	0.42
46.59	14.36	7.24	16.71	120.95	3.36	0.61	0.52
46.75	18.41	9.73	11.31	110.02	3.13	0.48	0.70
46.92	23.48	13.52	7.16	96.78	2.90	0.74	0.74
47.08	27.23	16.20	5.38	87.16	2.76	0.72	0.72
47.24	29.00	17.49	4.56	79.70	2.69	0.57	0.71
47.41	30.22	18.38	4.06	74.67	2.63	0.37	0.69
47.57	32.02	19.68	3.59	70.69	2.58	0.27	0.69
47.74	34.99	21.75	3.27	71.02	2.54	0.28	0.69
47.90	36.82	22.90	3.34	76.60	2.55	0.44	0.70
48.06	37.03	22.77	3.93	89.50	2.62	0.73	0.73
48.23	35.55	21.46	4.87	104.44	2.72	0.76	0.76
48.39	33.76	20.01	5.84	116.77	2.80	0.78	0.78

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

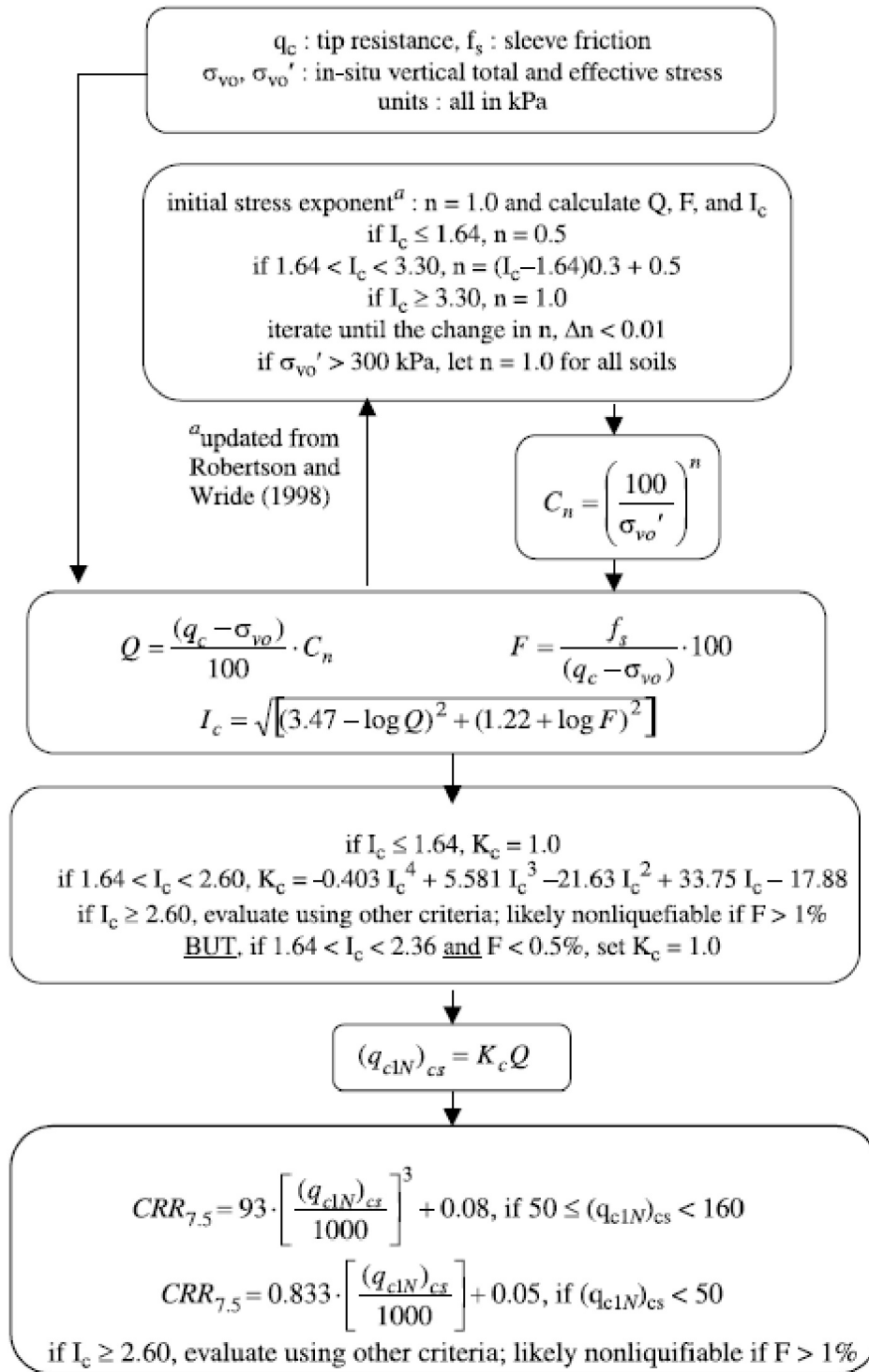
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
48.56	32.72	19.21	6.18	118.67	2.83	0.78	0.78
48.72	32.75	19.21	6.01	115.51	2.81	0.78	0.78
48.88	34.52	20.43	5.42	110.67	2.76	0.77	0.77
49.05	38.76	23.35	4.58	106.87	2.69	0.76	0.76
49.21	43.87	26.90	3.82	102.66	2.61	0.75	0.75
49.38	50.18	31.37	3.08	96.61	2.51	0.74	0.74
49.54	57.58	36.72	2.44	89.69	2.41	0.73	0.73
49.70	71.83	47.24	1.76	83.19	2.25	0.71	0.71
49.87	78.47	52.22	1.57	81.78	2.18	0.68	0.71
50.03	74.13	48.89	1.65	80.58	2.21	0.61	0.71
50.20	61.76	39.60	2.07	82.14	2.34	0.70	0.71

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)

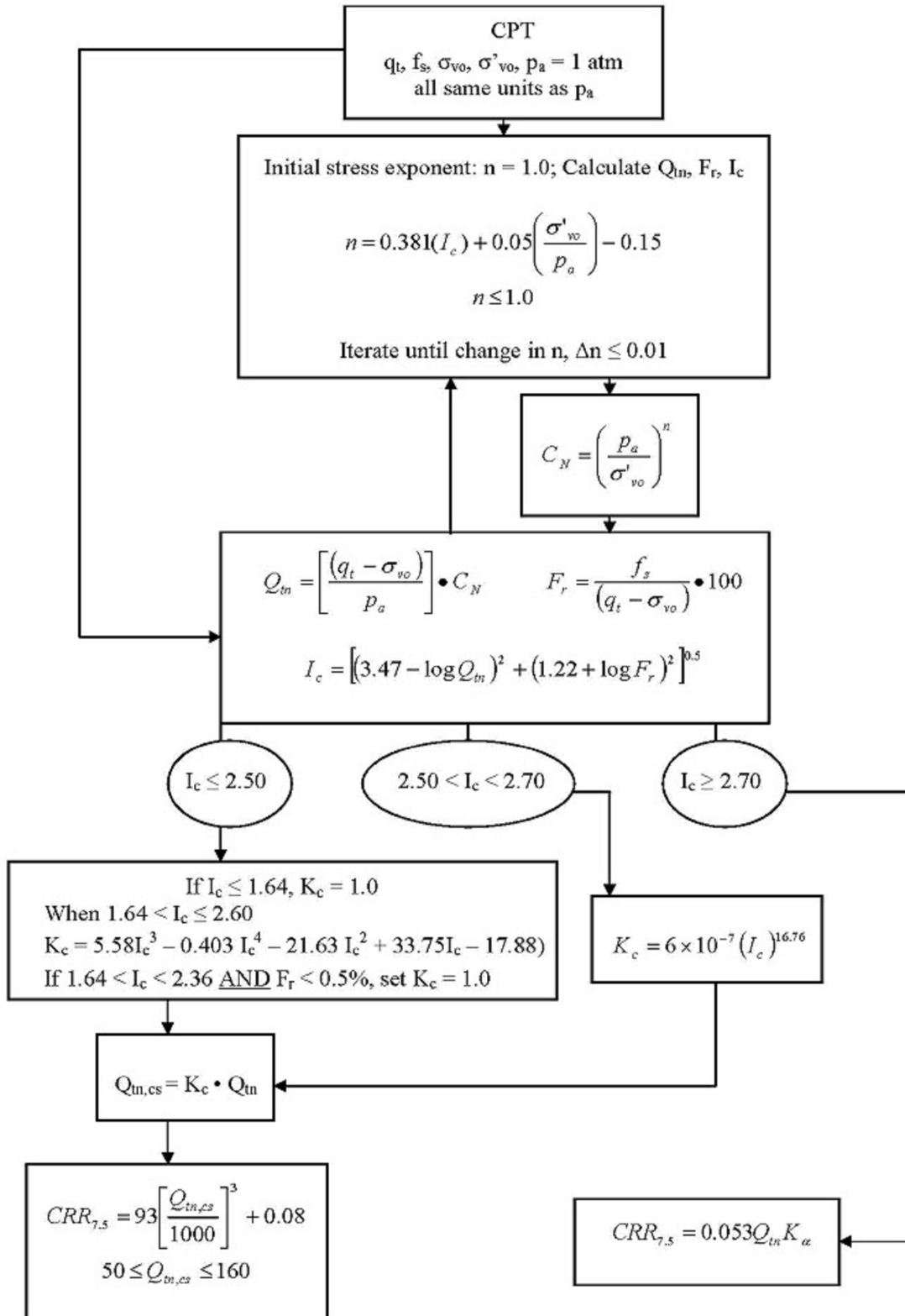
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of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

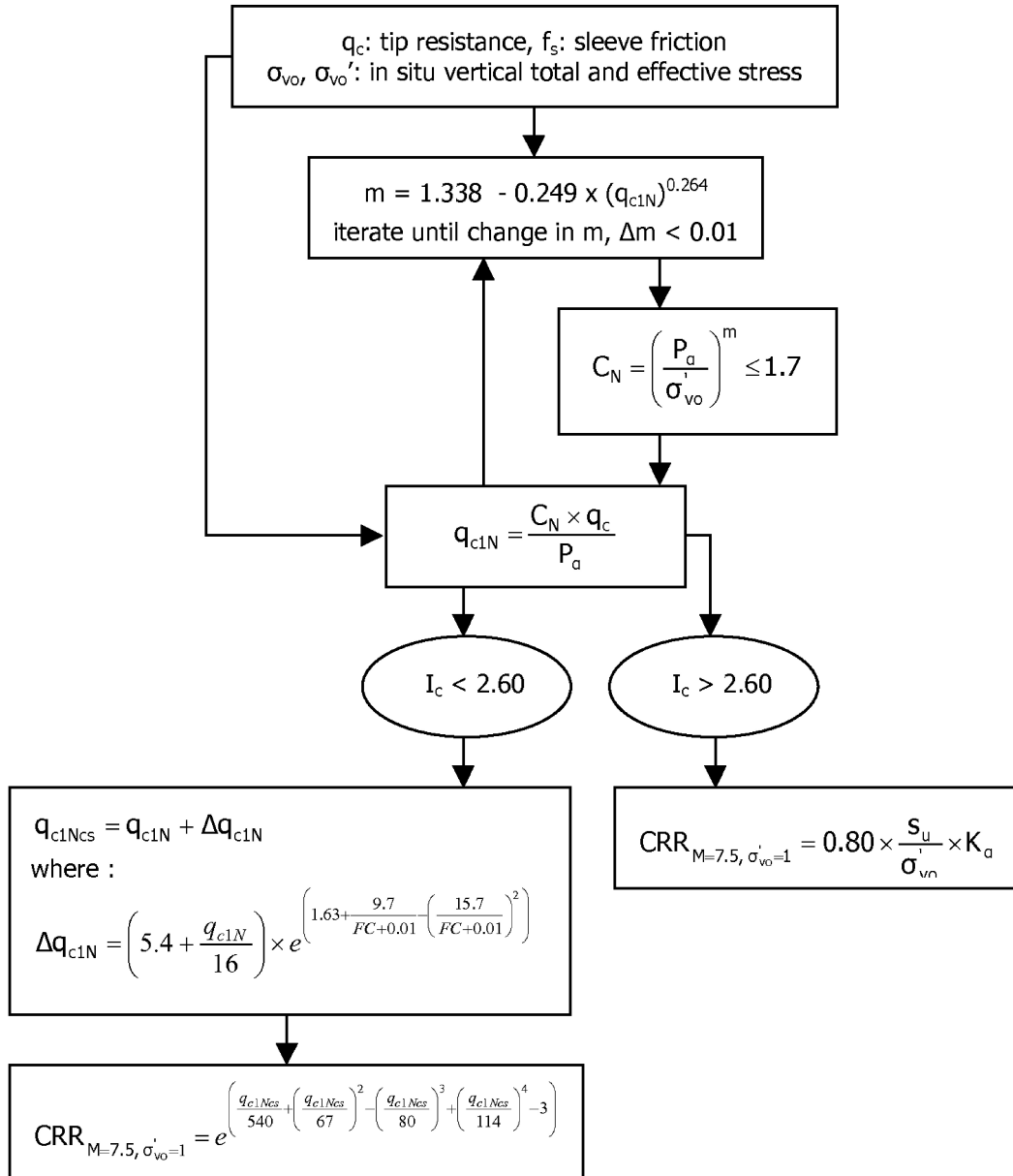
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

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:

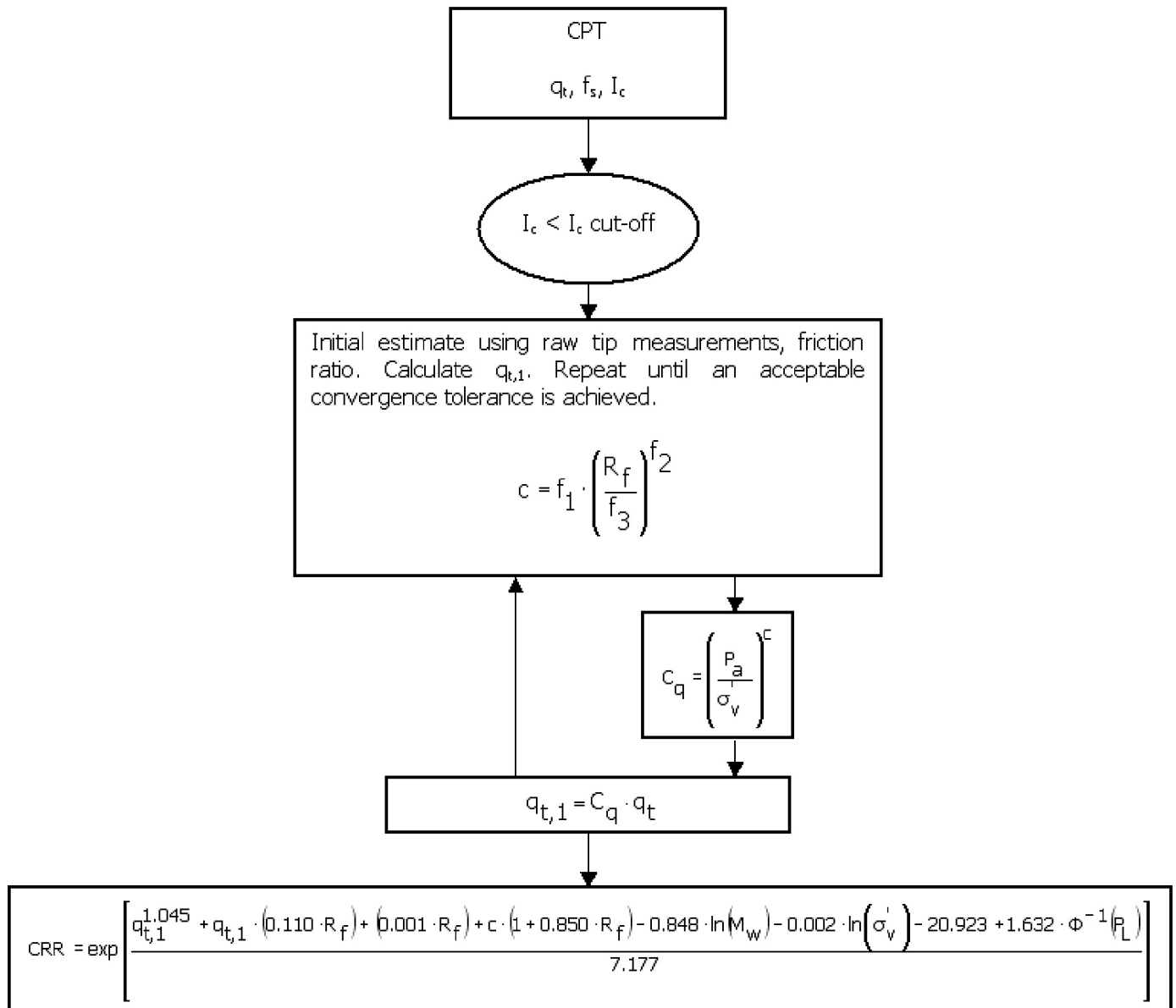


¹ P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

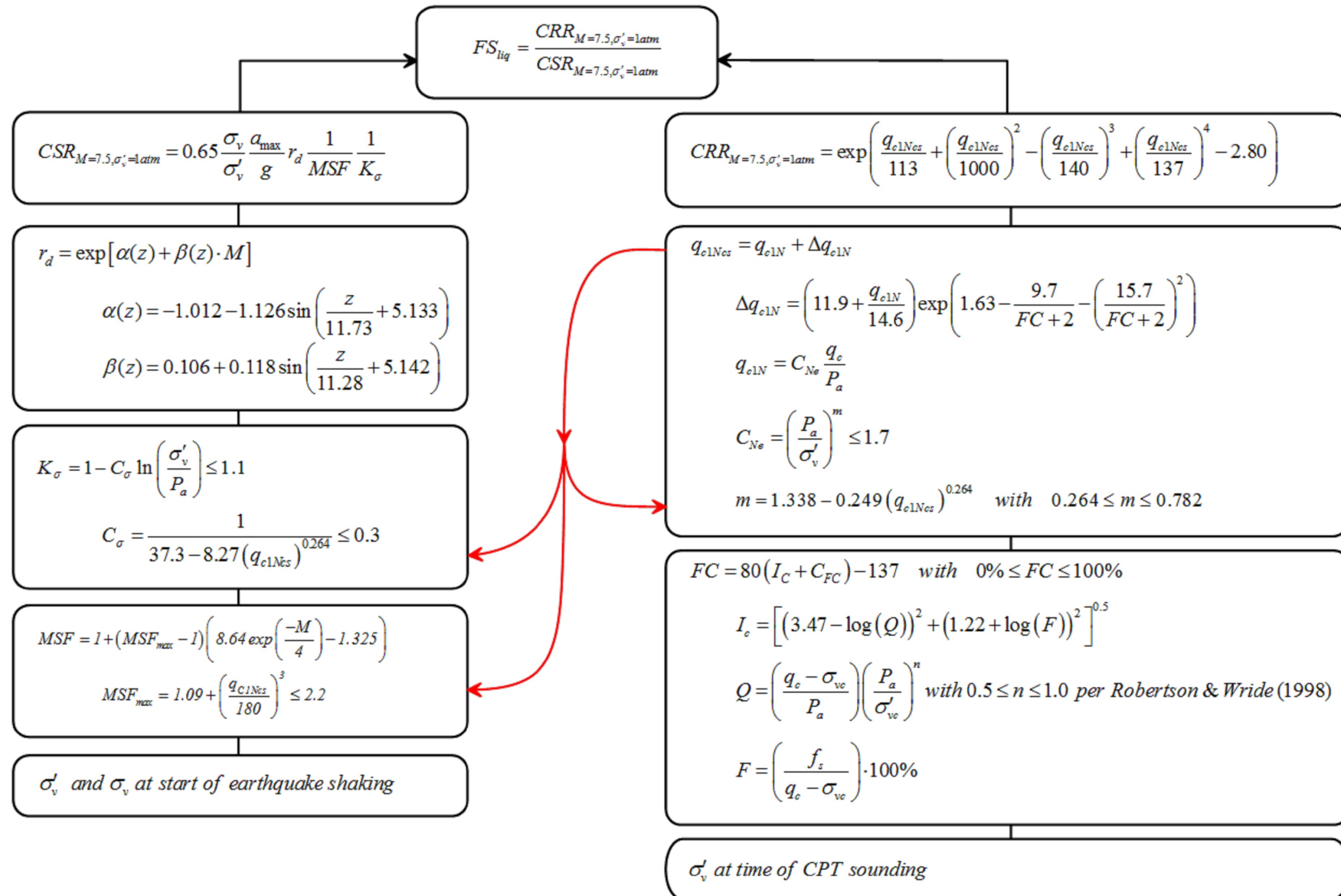
Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



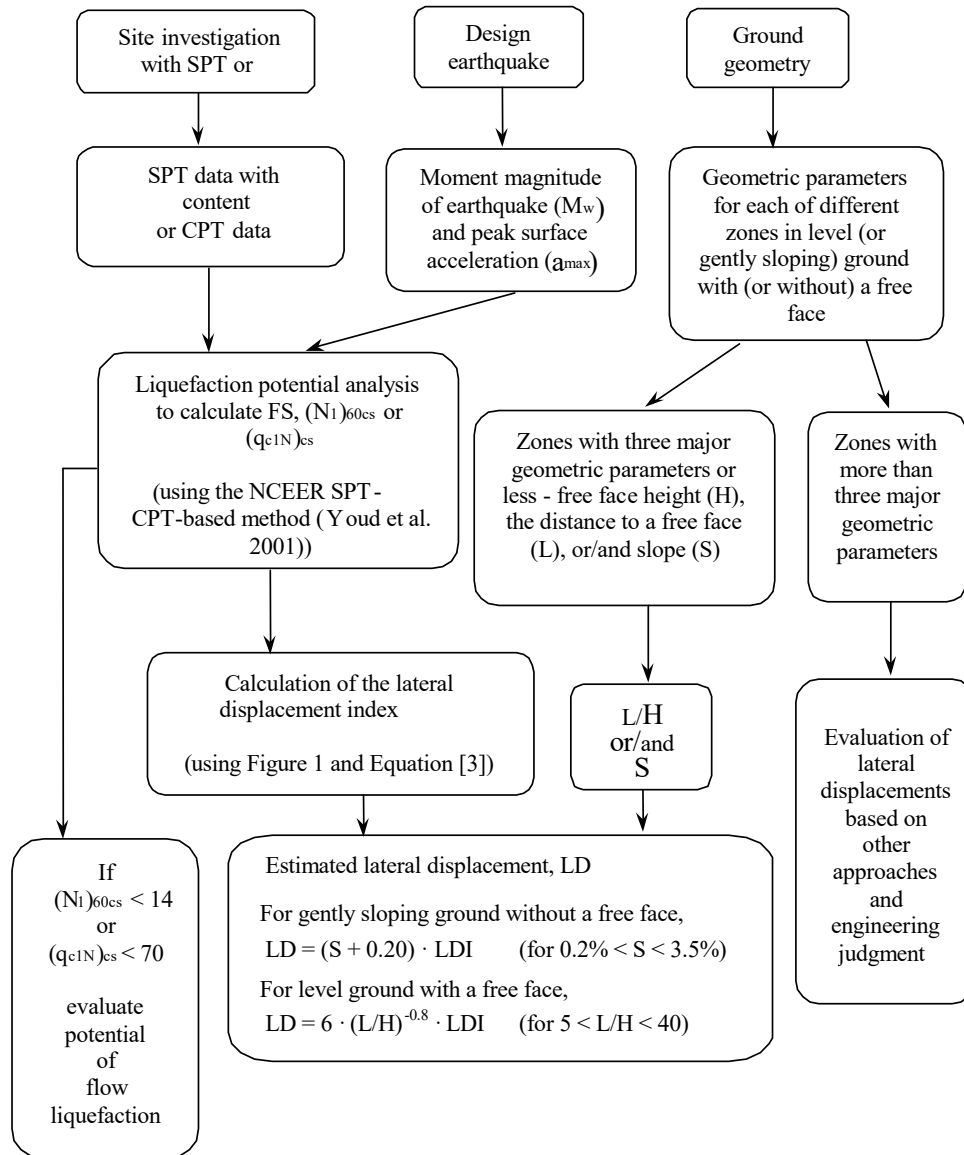
Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



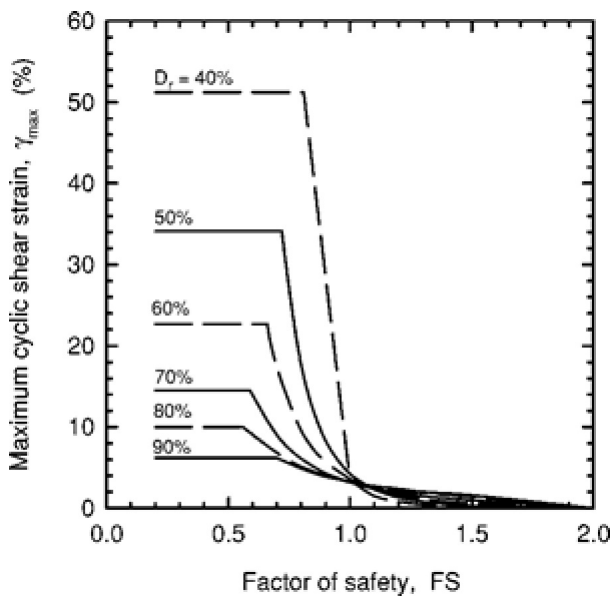
Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)



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



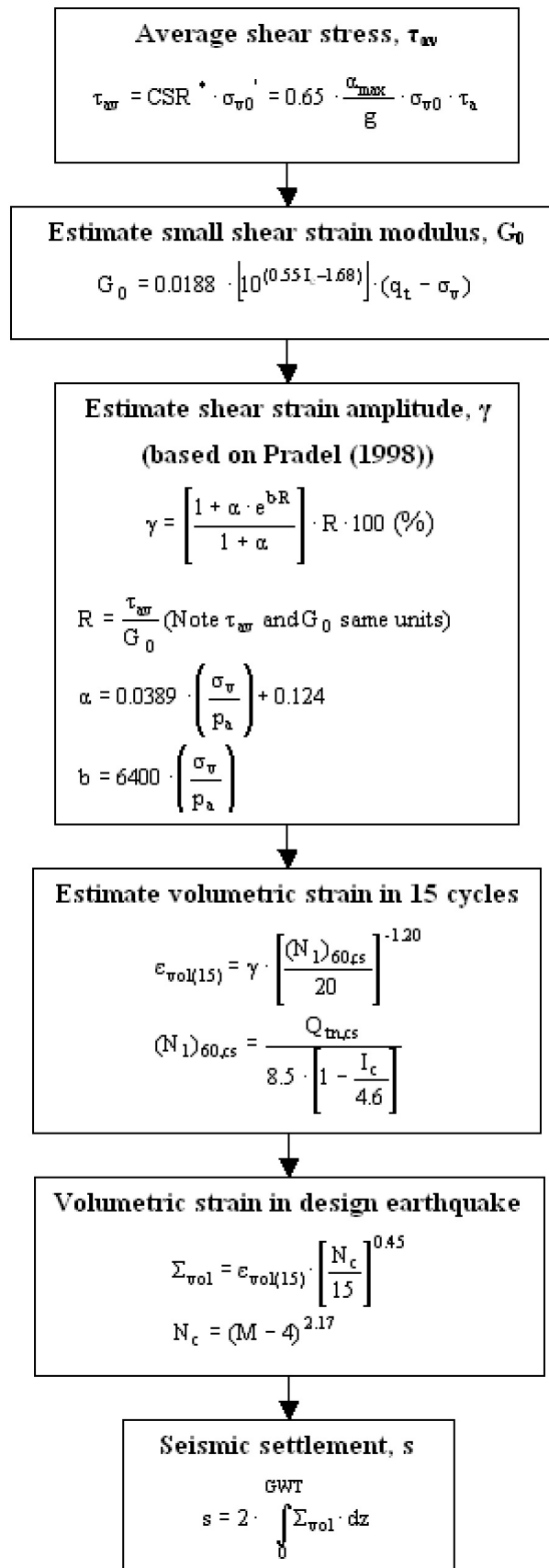
¹ Figure 1

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

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:

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

where:

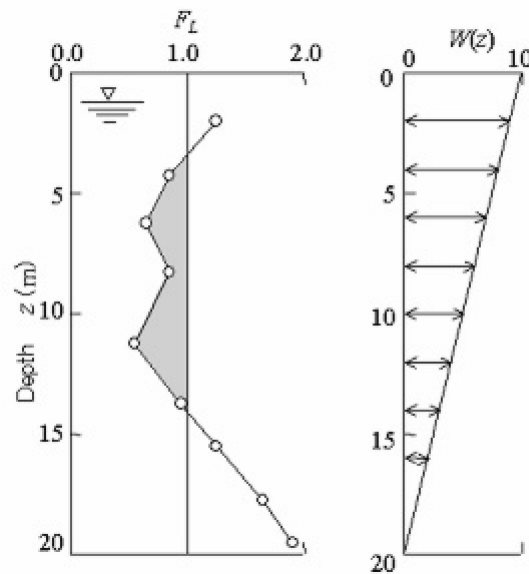
$F_L = 1 - F.S.$ when F.S. less than 1

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

z depth of 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

Shear-Induced Building Settlement (Ds) calculation procedure

The shear-induced building settlement (Ds) due to liquefaction below the building can be estimated using the relationship developed by Bray and Macedo (2017):

$$\begin{aligned} \ln(Ds) = & c1 + c2 * LBS + 0.58 * \ln\left(\tanh\left(\frac{HL}{6}\right)\right) + \\ & 4.59 * \ln(Q) - 0.42 * \ln(Q)^2 - 0.02 * B + \\ & 0.84 * \ln(CAVdp) + 0.41 * \ln(Sa1) + \varepsilon \end{aligned}$$

where Ds is in the units of mm, c1= -8.35 and c2= 0.072 for LBS ≤ 16, and c1= -7.48 and c2= 0.014 otherwise. Q is the building contact pressure in units of kPa, HL is the cumulative thickness of the liquefiable layers in the units of m, B is the building width in the units of m, CAVdp is a standardized version of the cumulative absolute velocity in the units of g-s, Sa1 is 5%-damped pseudo-acceleration response spectral value at a period of 1 s in the units of g, and ε is a normal random variable with zero mean and 0.50 standard deviation in Ln units. The liquefaction-induced building settlement index (LBS) is:

$$LBS = \sum W * \frac{\varepsilon_{shear}}{z} dz$$

where z (m) is the depth measured from the ground surface > 0, w is a foundation-weighting factor wherein W = 0.0 for z less than Df, which is the embedment depth of the foundation, and W = 1.0 otherwise. The shear strain parameter (ε_{shear}) is the liquefaction-induced free-field shear strain (in %) estimated using Zhang et al. (2004). It is calculated based on the estimated Dr of the liquefied soil layer and the calculated safety factor against liquefaction triggering (FSL).

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LIQUEFACTION ANALYSIS REPORT

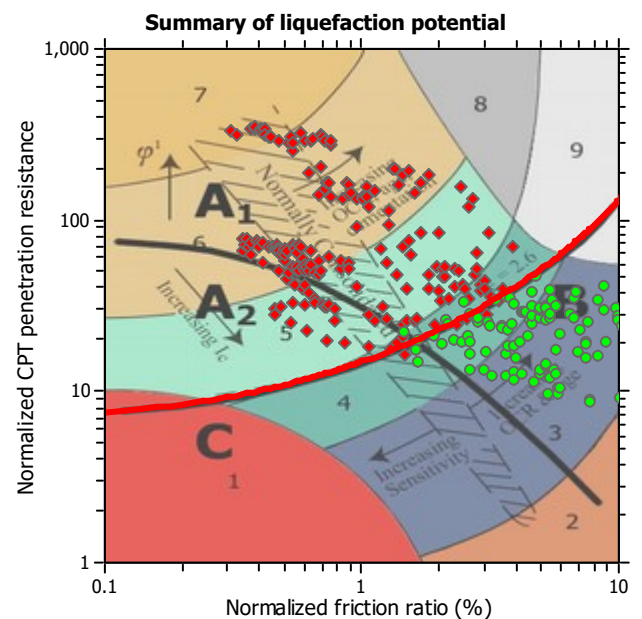
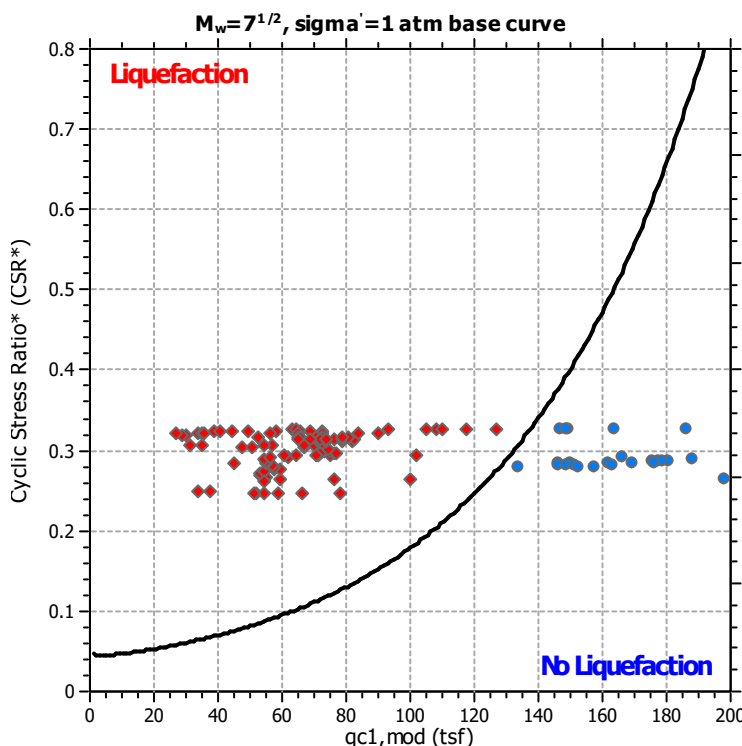
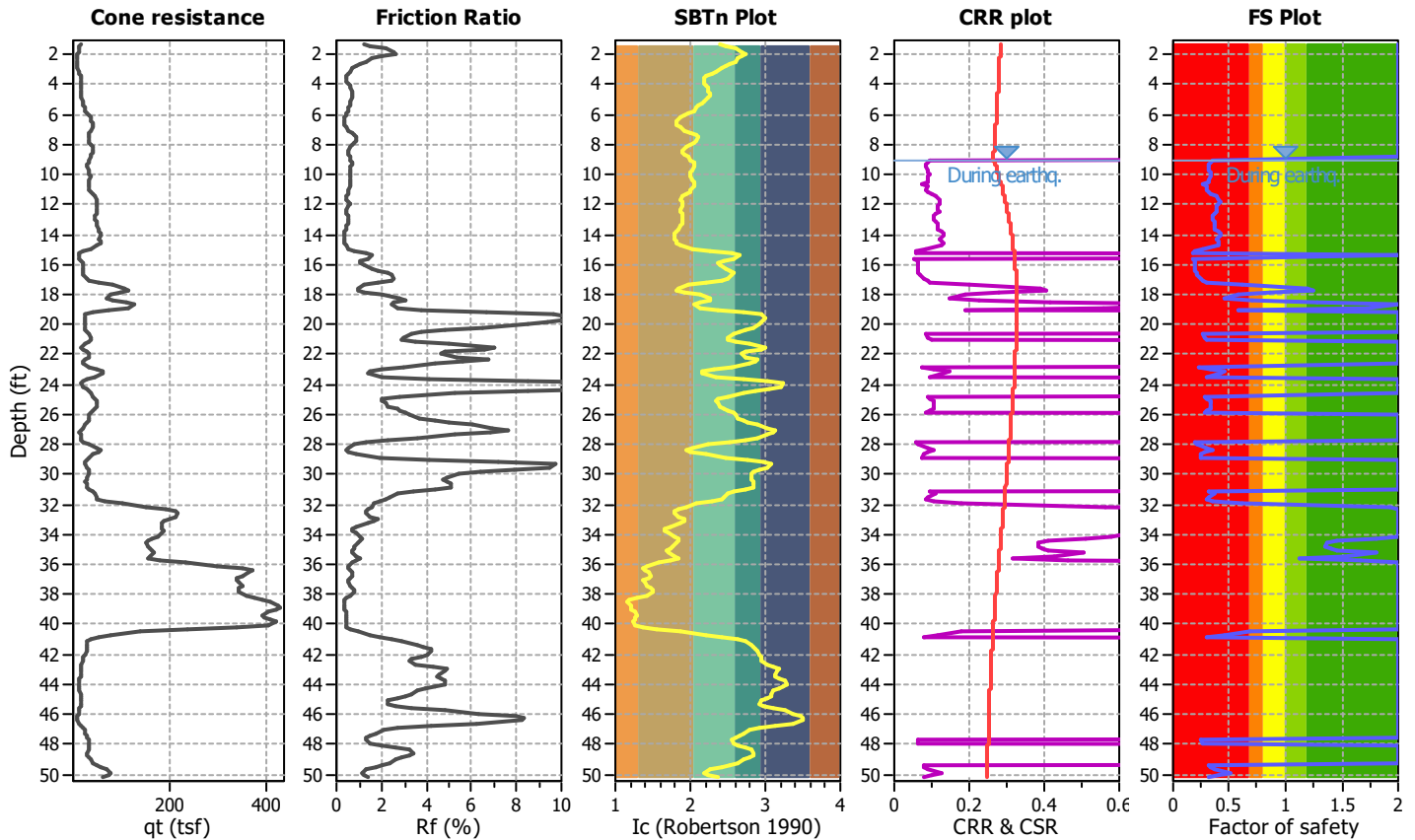
Project title : Manteca WWTP

Location : Manteca, CA

CPT file : CPT 1

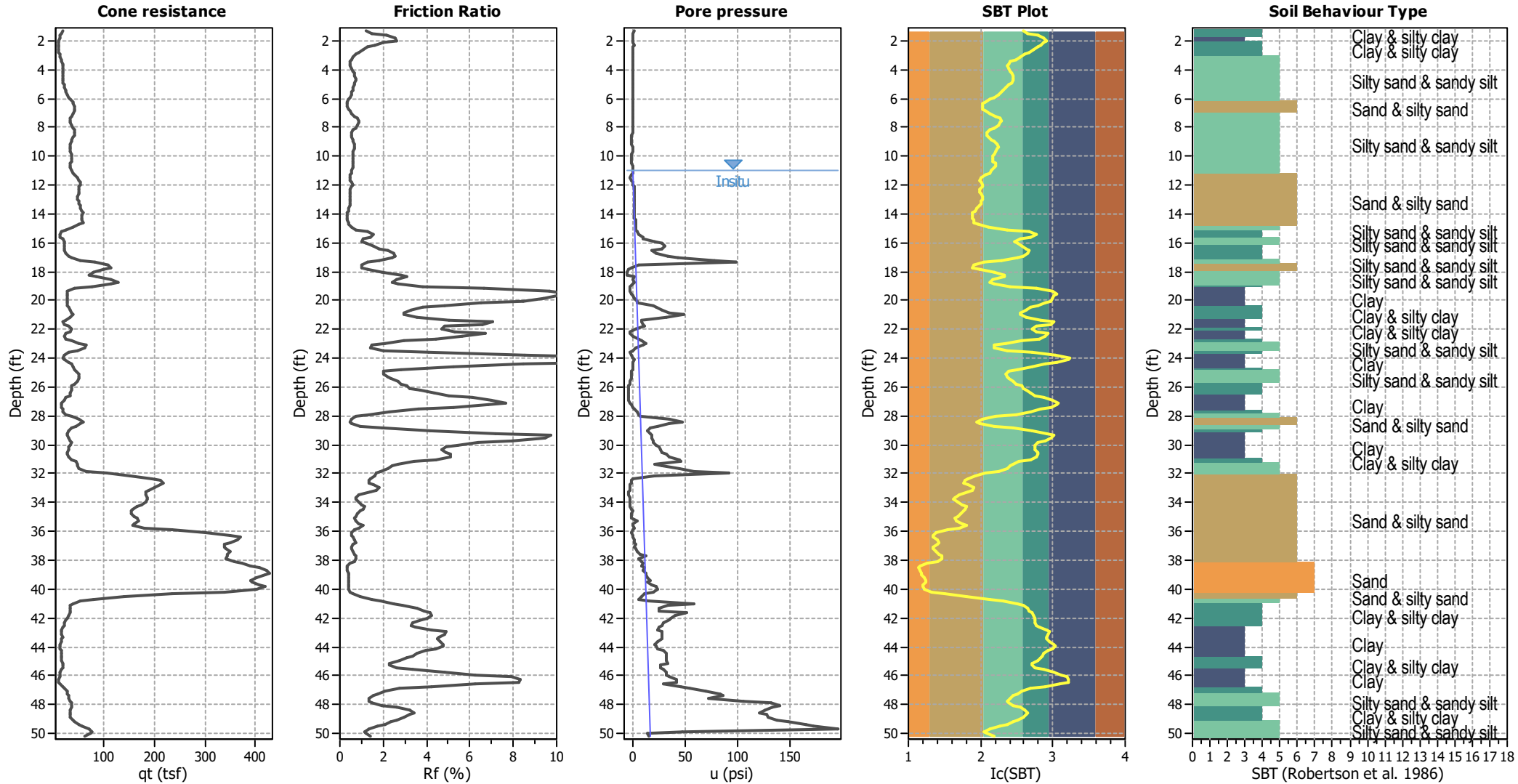
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	11.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	9.00 ft	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	7.13	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_o applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



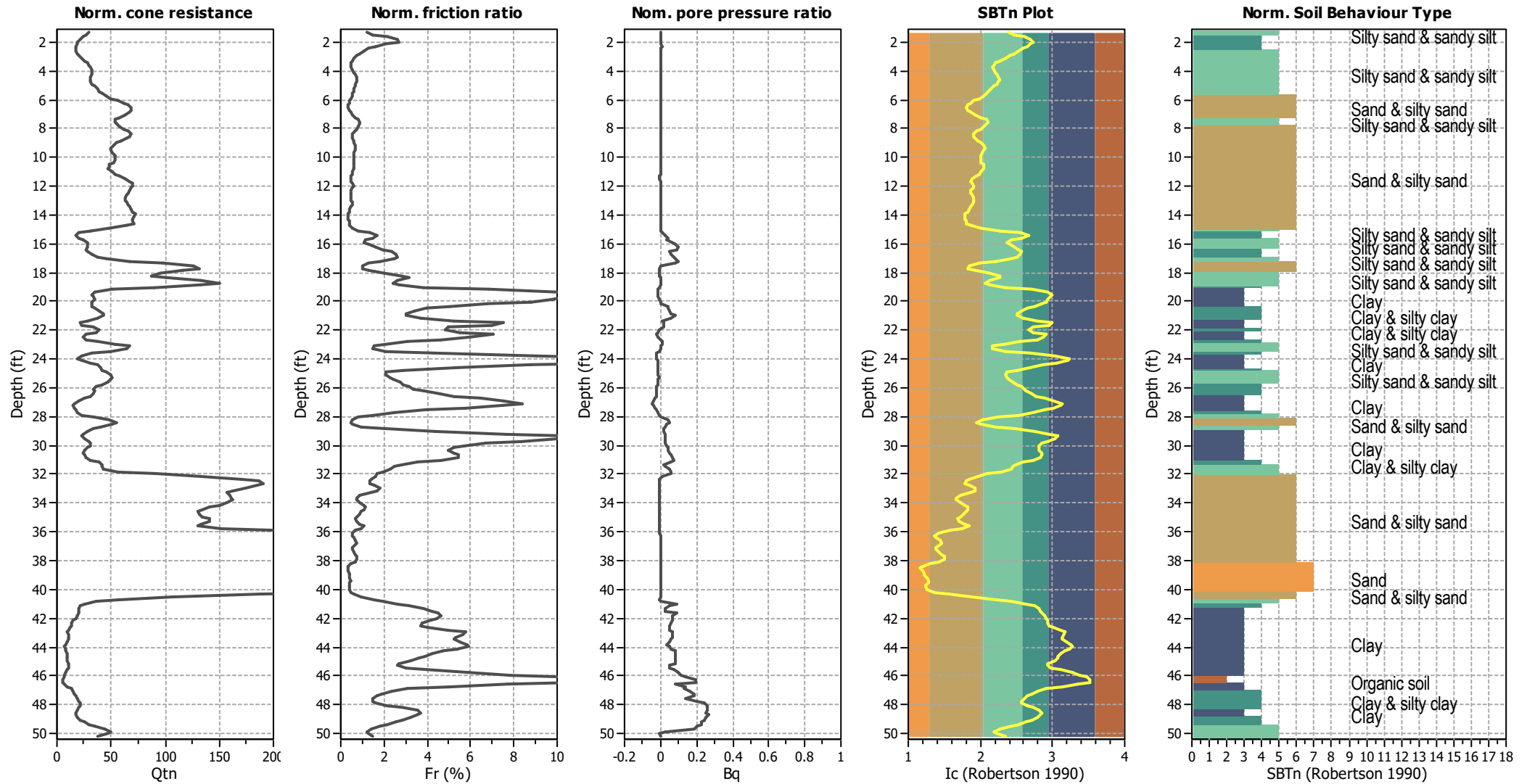
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

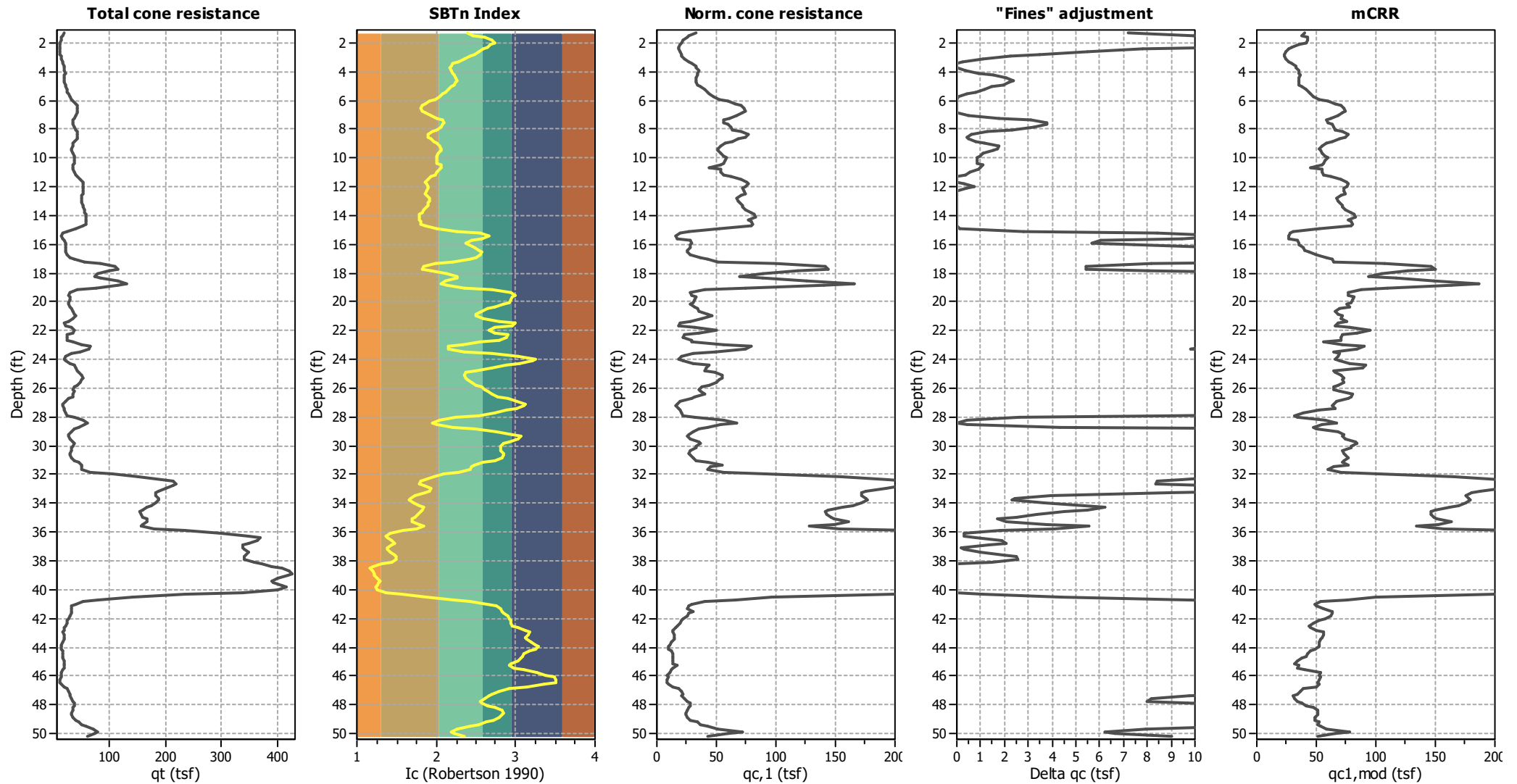
CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

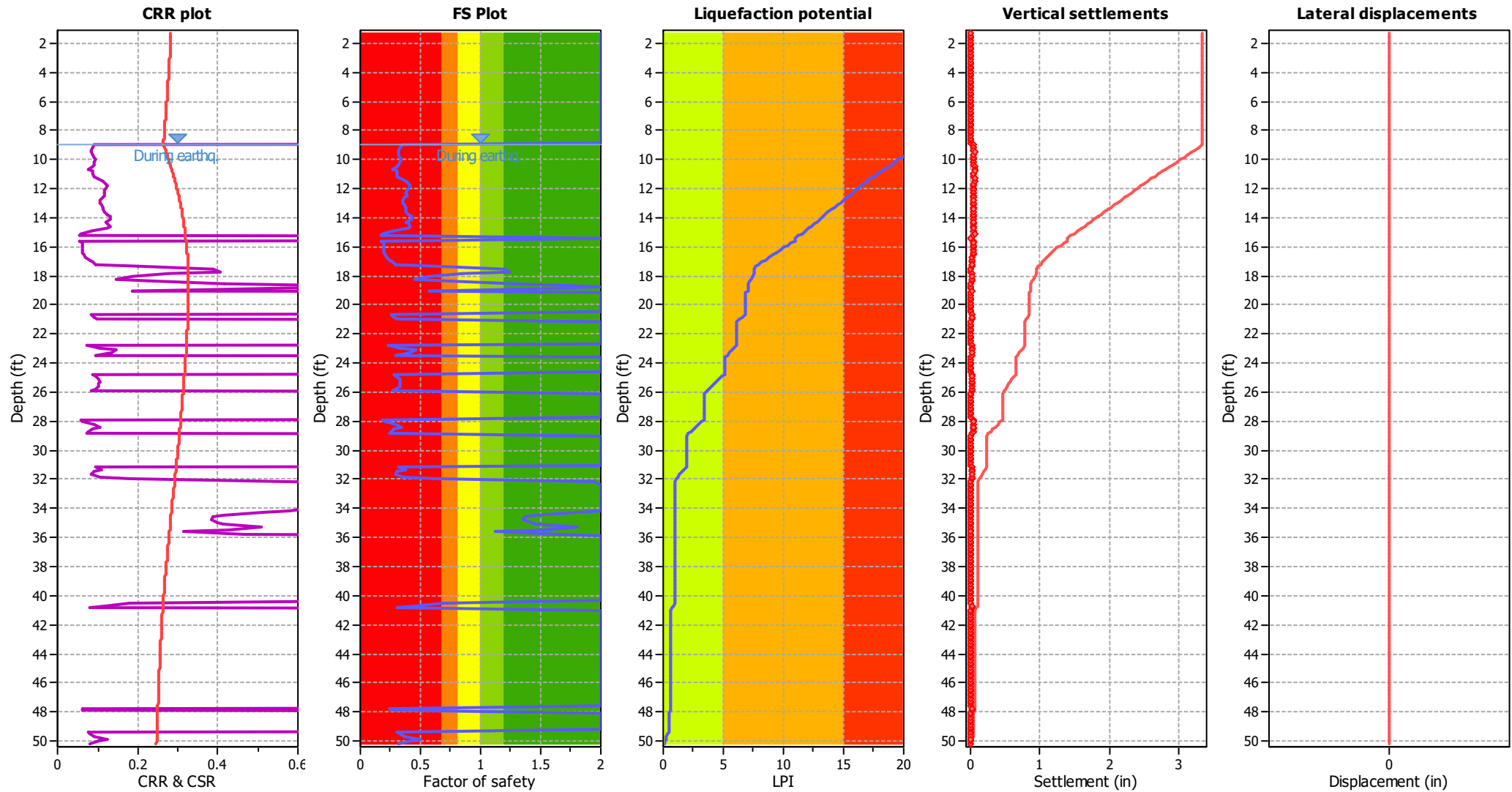
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method: Moss et al. (2006)
 Fines correction method: Moss et al. (2006)
 Points to test: Based on I_c value
 Earthquake magnitude M_w : 7.13
 Peak ground acceleration: 0.43
 Depth to water table (insitu): 11.00 ft

Depth to water table (earthq.): 9.00 ft
 Average results interval: 3
 I_c cut-off value: 2.60
 Unit weight calculation: Based on SBT
 Use fill: No
 Fill height: N/A

Fill weight: N/A
 Transition detect. applied: No
 K_0 applied: Yes
 Clay like behavior applied: Sands only
 Limit depth applied: No
 Limit depth: N/A

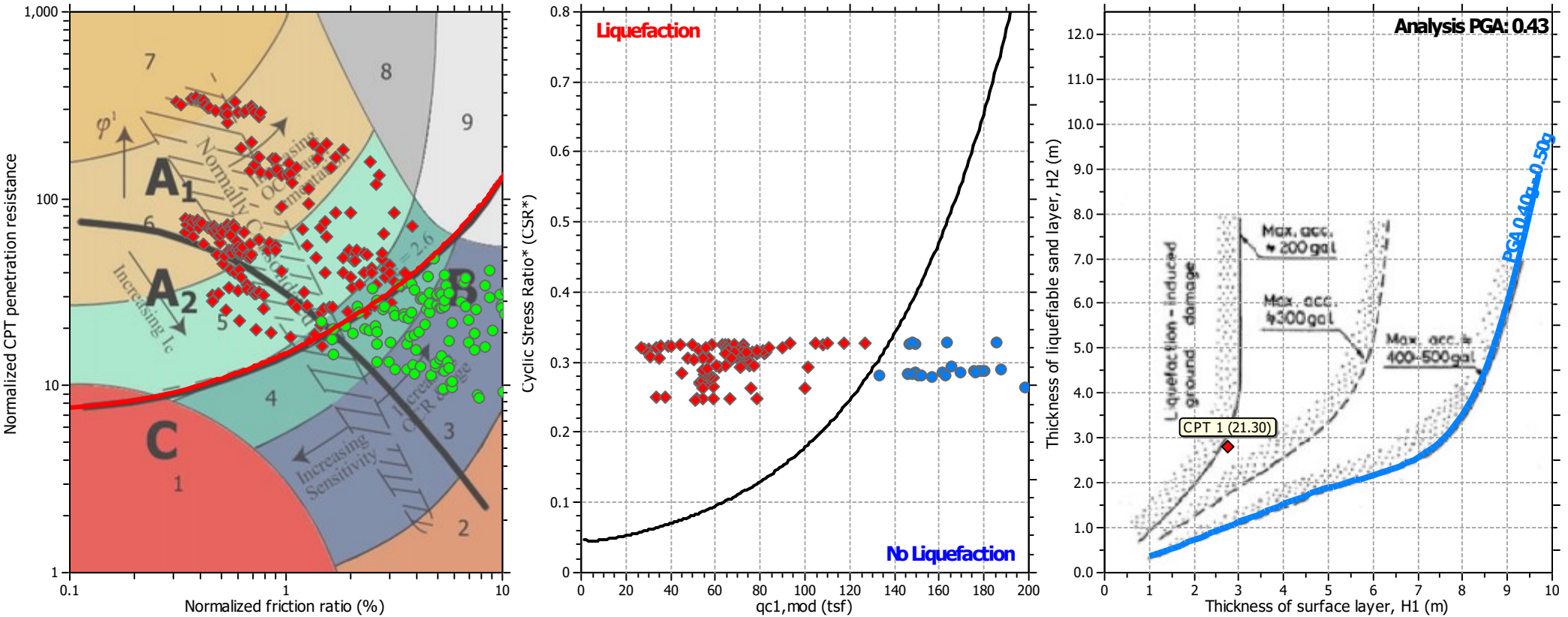
F.S. color scheme

Very high risk
 High risk
 Liquefaction and no liq. are equally likely
 Unlikely to liquefy
 Almost certain it will not liquefy

LPI color scheme

Very high risk
 High risk
 Low risk

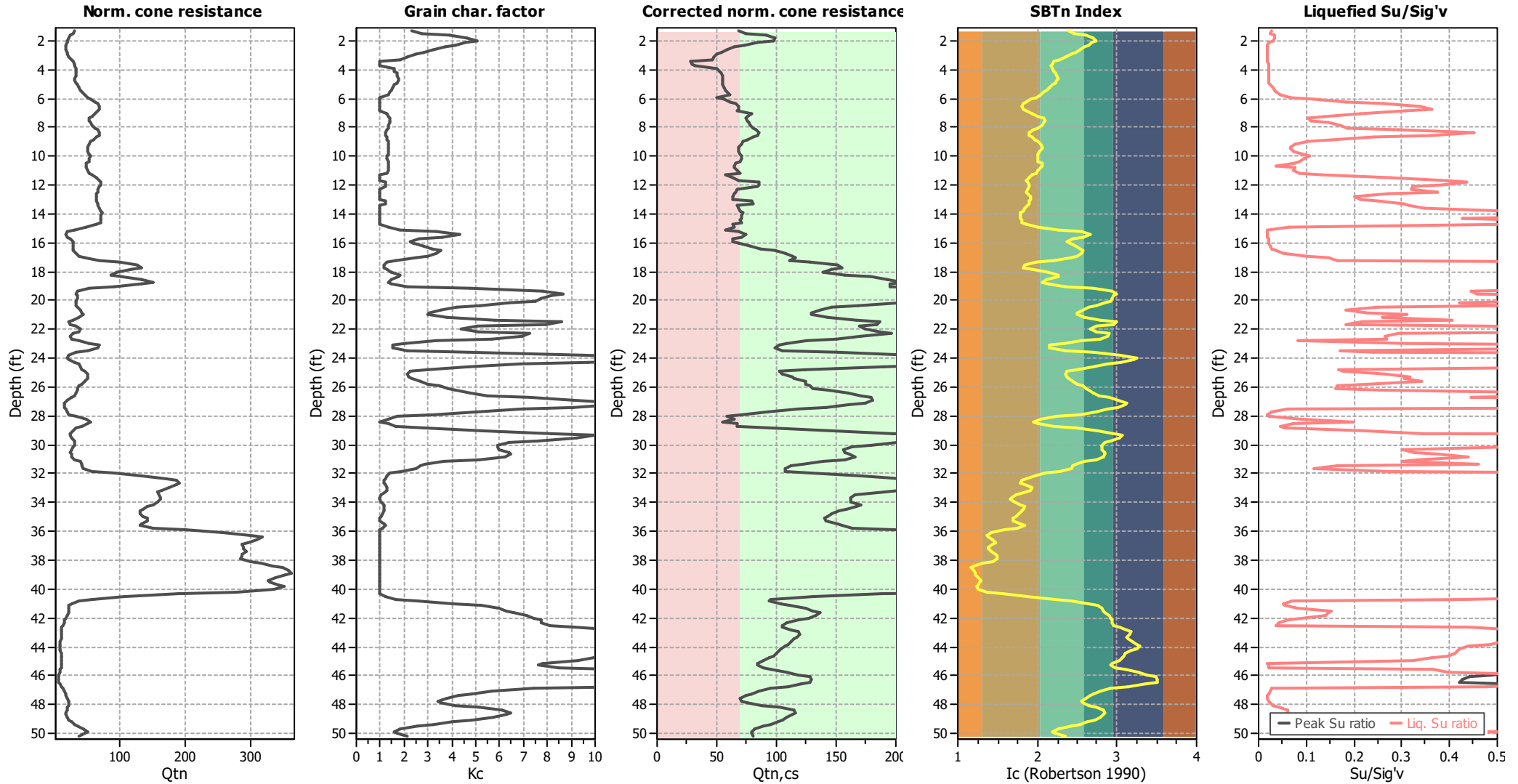
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_0 applied:	Yes
Earthquake magnitude M_w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

:: Field input data ::						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	1.31	19.66	0.22	0.99	25.89	106.41
2	1.48	16.04	0.23	0.58	29.25	107.07
3	1.64	15.14	0.30	0.42	36.05	108.47
4	1.80	12.95	0.42	0.39	40.18	108.78
5	1.97	11.89	0.31	0.25	42.19	108.04
6	2.13	11.69	0.23	0.19	39.89	105.63
7	2.30	10.87	0.17	1.01	37.49	103.64
8	2.46	10.95	0.14	0.57	35.03	101.79
9	2.63	11.30	0.11	0.38	32.41	100.64
10	2.79	11.95	0.10	0.32	29.67	99.47
11	2.95	12.45	0.09	0.32	27.17	99.04
12	3.12	13.96	0.09	0.32	24.36	98.69
13	3.28	15.74	0.08	0.37	21.66	98.71
14	3.44	17.48	0.08	0.56	5.00	98.71
15	3.61	19.05	0.08	0.51	5.00	99.27
16	3.77	19.33	0.09	0.50	5.00	100.26
17	3.94	20.68	0.11	0.38	18.55	101.23
18	4.10	19.92	0.12	0.35	18.96	102.09
19	4.26	20.32	0.13	0.28	19.94	102.65
20	4.43	19.47	0.14	0.25	20.51	103.15
21	4.59	19.71	0.15	0.27	21.05	103.33
22	4.76	19.48	0.14	0.24	20.79	103.27
23	4.92	19.97	0.14	0.21	20.09	103.29
24	5.08	21.59	0.14	0.20	18.77	103.41
25	5.25	23.49	0.14	0.23	17.48	103.76
26	5.41	25.02	0.15	0.21	16.33	103.92
27	5.58	26.13	0.14	0.07	15.29	104.04
28	5.74	27.94	0.14	0.11	14.05	104.28
29	5.91	31.19	0.15	0.13	5.00	104.74
30	6.07	35.40	0.16	0.20	5.00	104.76
31	6.23	38.85	0.13	0.19	5.00	104.89
32	6.40	41.42	0.14	0.18	5.00	104.97
33	6.56	43.21	0.15	0.17	5.00	105.74
34	6.73	43.70	0.17	0.15	5.00	106.48
35	6.89	42.55	0.19	0.11	5.00	107.24
36	7.05	39.64	0.21	0.05	11.18	108.03
37	7.22	35.73	0.24	-0.03	13.27	108.72
38	7.38	32.75	0.28	-0.07	15.15	109.38
39	7.55	32.77	0.30	-0.08	15.83	109.91
40	7.71	34.96	0.31	-0.06	15.40	110.24
41	7.87	36.53	0.30	-0.10	14.46	110.24
42	8.04	37.71	0.29	-0.14	13.10	109.97
43	8.20	41.52	0.26	-0.20	11.47	109.56
44	8.37	45.15	0.24	-0.65	10.43	109.17
45	8.53	43.86	0.23	-1.23	10.38	108.89

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
46	8.69	41.20	0.23	-1.37	10.99	108.42
47	8.86	38.12	0.21	-0.94	11.99	108.16
48	9.02	35.46	0.23	-1.09	13.09	107.92
49	9.19	33.19	0.23	-0.96	14.27	108.03
50	9.35	32.09	0.23	-0.72	14.59	107.66
51	9.51	32.64	0.20	-0.64	14.44	107.51
52	9.68	33.97	0.21	-0.73	13.77	107.45
53	9.84	36.39	0.22	-0.80	13.29	107.81
54	10.01	38.00	0.22	-0.99	13.01	107.97
55	10.17	37.31	0.22	-1.08	13.02	107.95
56	10.34	36.86	0.21	-0.95	13.33	107.81
57	10.50	35.95	0.21	-0.87	14.42	107.35
58	10.66	29.10	0.20	0.58	14.40	107.15
59	10.83	36.65	0.20	-0.28	14.37	107.12
60	10.99	36.61	0.21	-0.20	13.30	107.55
61	11.15	38.29	0.22	-0.09	12.66	107.77
62	11.32	42.47	0.21	-1.73	5.00	108.11
63	11.48	48.98	0.21	-2.77	5.00	108.55
64	11.65	52.37	0.23	-1.52	5.00	109.41
65	11.81	54.03	0.27	-0.05	10.01	110.70
66	11.97	53.15	0.34	0.58	10.43	111.20
67	12.14	51.76	0.30	0.99	10.37	110.68
68	12.30	51.37	0.21	1.05	5.00	109.49
69	12.47	52.86	0.22	1.07	5.00	109.15
70	12.63	50.39	0.26	1.16	5.00	109.29
71	12.79	48.04	0.23	1.53	5.00	109.35
72	12.96	48.69	0.23	1.59	5.00	109.34
73	13.12	50.48	0.26	1.30	10.43	109.79
74	13.29	52.46	0.27	0.92	10.20	109.99
75	13.45	52.68	0.24	0.88	5.00	109.74
76	13.62	53.44	0.23	1.53	5.00	109.32
77	13.78	56.94	0.22	1.60	5.00	109.04
78	13.94	59.02	0.21	1.76	5.00	108.64
79	14.11	59.59	0.19	1.90	5.00	108.26
80	14.27	55.09	0.19	1.84	5.00	108.31
81	14.44	57.73	0.21	2.11	5.00	108.73
82	14.60	59.67	0.23	2.35	5.00	109.31
83	14.76	58.46	0.24	2.46	5.00	108.59
84	14.93	38.93	0.17	2.47	13.35	107.45
85	15.09	19.92	0.19	2.69	21.32	105.87
86	15.26	14.94	0.20	4.04	33.14	105.15
87	15.42	11.29	0.21	5.74	38.43	104.98
88	15.58	12.78	0.21	9.81	34.41	105.49
89	15.75	21.02	0.21	9.78	28.04	105.79
90	15.91	22.72	0.19	20.60	25.47	107.03

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
91	16.08	21.92	0.29	27.98	26.64	108.26
92	16.24	21.72	0.34	29.76	29.61	109.81
93	16.40	20.71	0.39	27.06	31.99	110.95
94	16.57	20.75	0.46	17.34	34.07	112.54
95	16.73	22.94	0.62	22.27	33.17	114.66
96	16.90	30.35	0.79	33.35	30.69	116.62
97	17.06	35.65	0.89	42.45	27.42	118.31
98	17.22	42.48	1.02	78.12	19.39	120.02
99	17.39	84.52	1.07	98.63	12.55	121.42
100	17.55	119.95	1.06	5.99	8.91	122.43
101	17.72	122.76	1.17	-1.71	8.61	122.89
102	17.88	101.92	1.22	-4.48	11.05	123.22
103	18.05	77.68	1.39	-5.61	16.79	124.30
104	18.21	60.49	2.13	-5.28	21.29	125.88
105	18.37	79.73	2.55	1.96	21.04	128.13
106	18.54	112.82	3.18	0.06	16.39	129.73
107	18.70	149.04	3.11	0.97	14.76	130.51
108	18.86	126.57	3.14	0.07	16.78	130.02
109	19.03	67.48	2.93	-2.31	24.68	128.65
110	19.19	35.59	2.64	-2.84	40.62	127.10
111	19.36	25.55	2.98	-3.11	54.42	126.02
112	19.52	26.05	2.78	-1.93	57.94	126.11
113	19.68	30.18	2.93	-0.33	56.03	126.18
114	19.85	29.27	2.93	1.69	54.20	125.89
115	20.01	28.01	2.39	3.77	53.34	124.54
116	20.18	25.02	1.67	4.67	48.49	122.57
117	20.34	28.73	1.29	19.52	42.76	120.72
118	20.50	30.76	1.14	22.11	37.78	119.83
119	20.67	32.17	1.10	27.08	34.20	119.79
120	20.83	38.41	1.15	34.75	31.03	119.98
121	21.00	42.18	1.11	48.90	30.78	120.13
122	21.16	34.22	1.15	32.11	35.37	120.29
123	21.32	24.96	1.37	8.55	45.74	120.17
124	21.49	18.04	1.39	8.24	57.79	120.02
125	21.65	16.19	1.43	9.52	55.13	120.19
126	21.82	28.97	1.38	11.38	42.20	121.46
127	21.98	46.58	1.61	2.03	38.97	122.89
128	22.15	33.17	2.10	-2.69	42.40	123.19
129	22.31	21.88	1.71	-2.38	52.18	122.00
130	22.47	20.72	1.27	0.13	50.81	119.87
131	22.64	26.79	0.92	5.95	45.13	118.84
132	22.80	27.32	1.11	8.43	33.17	119.37
133	22.97	51.96	1.13	12.89	23.58	120.27
134	23.13	74.04	0.93	9.37	17.66	120.27
135	23.29	69.17	0.87	3.21	17.63	119.60

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
136	23.46	45.94	0.90	-0.52	24.32	119.46
137	23.62	28.98	1.12	-2.61	40.33	120.55
138	23.79	19.36	1.85	-1.73	61.17	122.37
139	23.95	17.66	2.62	-0.30	76.34	124.60
140	24.11	20.46	3.48	0.63	74.45	126.70
141	24.28	28.96	3.95	0.59	62.01	128.16
142	24.44	42.09	3.64	0.43	50.67	127.40
143	24.61	39.40	1.78	-0.34	40.49	124.67
144	24.77	38.66	0.86	-0.68	30.74	120.50
145	24.93	47.15	0.86	-0.92	25.53	119.10
146	25.10	52.30	1.07	-2.12	24.26	119.99
147	25.26	52.33	1.13	-1.32	25.11	120.98
148	25.43	51.04	1.28	-1.97	25.91	121.04
149	25.59	48.86	1.13	-2.54	28.61	121.51
150	25.75	43.10	1.44	-2.94	30.71	120.73
151	25.92	36.62	1.02	-3.54	33.85	120.28
152	26.08	34.80	1.05	-3.76	35.73	119.98
153	26.25	35.61	1.37	-3.77	37.37	121.18
154	26.41	39.09	1.60	-3.89	40.73	122.21
155	26.57	31.67	1.70	-4.12	44.18	122.53
156	26.74	28.91	1.69	-4.46	52.15	121.84
157	26.90	19.77	1.50	-4.27	59.68	120.82
158	27.07	16.74	1.36	-3.27	67.51	119.39
159	27.23	16.08	1.16	-1.52	66.21	118.24
160	27.39	17.93	0.95	-0.10	59.58	116.78
161	27.56	19.21	0.69	1.44	50.99	114.83
162	27.72	20.36	0.45	3.40	42.26	112.06
163	27.89	22.01	0.26	5.13	32.15	110.12
164	28.05	31.91	0.29	7.00	20.34	109.70
165	28.21	56.43	0.27	34.60	13.90	110.68
166	28.38	66.87	0.28	46.91	5.00	110.95
167	28.54	54.16	0.29	34.47	13.28	111.23
168	28.71	43.44	0.33	24.11	19.43	113.01
169	28.87	35.76	0.61	16.63	29.70	116.62
170	29.04	30.68	1.20	14.22	43.26	120.57
171	29.20	26.96	2.07	16.12	55.93	123.50
172	29.36	25.41	2.76	17.28	63.22	125.37
173	29.53	27.84	3.04	18.11	60.18	126.27
174	29.69	36.44	2.78	19.84	53.74	126.21
175	29.86	37.73	2.34	19.87	48.48	125.18
176	30.02	33.74	1.84	22.60	46.16	123.76
177	30.18	33.56	1.60	24.54	46.17	122.22
178	30.35	29.16	1.37	26.18	46.68	121.30
179	30.51	28.01	1.36	27.41	48.60	121.10
180	30.68	28.86	1.56	31.77	48.87	121.56

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
181	30.84	30.89	1.62	34.29	47.75	122.25
182	31.00	33.70	1.70	44.58	42.39	122.60
183	31.17	43.59	1.55	45.66	34.66	122.66
184	31.33	56.31	1.33	20.85	30.13	121.86
185	31.50	46.70	1.10	27.32	28.63	121.07
186	31.66	44.47	1.14	44.83	27.40	120.69
187	31.82	58.86	1.13	58.47	22.01	122.25
188	31.99	93.50	1.54	90.90	15.52	125.69
189	32.15	160.96	2.55	21.11	11.90	129.02
190	32.32	201.79	3.18	-0.54	9.29	130.54
191	32.48	218.49	2.54	-2.05	8.14	130.93
192	32.64	219.33	2.73	-1.82	7.96	131.12
193	32.81	217.42	3.33	-2.57	9.19	131.92
194	32.97	202.02	3.62	-2.95	11.01	132.67
195	33.14	184.65	3.98	-3.19	10.88	131.54
196	33.30	181.25	1.96	-3.54	9.56	129.73
197	33.47	183.18	1.61	-3.69	6.64	126.58
198	33.63	187.79	1.33	-3.51	5.54	125.37
199	33.79	189.62	1.19	-3.05	5.45	125.29
200	33.96	185.00	1.57	-2.77	6.53	126.32
201	34.12	175.77	1.98	-2.42	7.92	127.22
202	34.28	167.03	1.89	-2.24	8.84	127.20
203	34.45	155.25	1.66	-1.95	8.77	126.28
204	34.61	153.18	1.40	0.28	8.36	125.35
205	34.78	155.13	1.33	-1.01	7.52	124.48
206	34.94	159.33	1.15	-1.47	6.78	123.92
207	35.10	163.58	1.09	-1.85	5.92	123.57
208	35.27	176.66	1.11	4.12	6.15	123.98
209	35.43	162.35	1.34	-0.69	7.73	125.10
210	35.60	139.95	1.74	-0.40	9.05	126.24
211	35.76	167.80	1.85	1.27	7.07	126.55
212	35.92	235.63	1.32	-0.40	4.01	127.02
213	36.09	301.09	1.64	-0.90	1.80	127.59
214	36.25	363.02	1.82	-0.04	1.18	129.04
215	36.42	383.79	2.07	-0.36	1.31	130.28
216	36.58	364.37	2.53	1.65	2.09	131.39
217	36.74	342.55	2.93	1.61	2.38	131.17
218	36.91	339.18	1.95	2.45	2.03	130.09
219	37.07	336.23	1.58	1.61	1.25	128.55
220	37.24	340.45	1.70	2.40	1.34	128.86
221	37.40	347.21	2.16	3.52	1.71	129.93
222	37.57	358.40	2.40	7.28	2.41	130.87
223	37.73	322.56	2.60	13.08	2.76	131.41
224	37.89	346.65	2.71	5.36	2.82	131.42
225	38.06	353.67	2.41	8.71	1.93	130.75

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
226	38.22	374.50	1.81	9.47	0.43	128.37
227	38.39	390.42	0.72	8.30	0.00	126.56
228	38.55	408.87	1.27	10.76	0.00	126.59
229	38.71	425.29	1.77	10.15	0.00	128.16
230	38.88	429.58	1.57	11.73	0.00	128.66
231	39.04	426.57	1.57	12.87	0.00	128.46
232	39.21	399.99	1.67	14.40	0.00	128.54
233	39.37	377.42	1.69	16.80	0.27	128.66
234	39.53	390.98	1.71	14.44	0.14	128.51
235	39.70	411.33	1.55	17.39	0.00	128.60
236	39.86	421.99	1.70	21.63	0.00	128.77
237	40.03	420.07	1.78	23.68	0.04	128.62
238	40.19	364.72	1.51	19.05	1.06	127.87
239	40.35	230.57	1.48	11.23	3.81	126.28
240	40.52	111.86	1.34	7.80	9.86	124.35
241	40.68	76.79	1.14	4.81	19.66	122.12
242	40.85	47.38	1.05	15.60	27.78	120.06
243	41.01	35.23	0.84	57.86	37.33	118.84
244	41.17	31.35	0.98	33.23	43.15	118.49
245	41.34	30.41	1.06	25.30	46.58	119.90
246	41.50	35.25	1.46	24.35	48.05	120.62
247	41.67	31.69	1.33	51.71	49.31	121.18
248	41.83	30.49	1.37	39.84	51.66	120.38
249	41.99	26.56	1.14	36.44	53.06	119.19
250	42.16	24.34	0.85	34.26	54.30	117.77
251	42.32	23.24	0.87	29.40	54.28	116.21
252	42.49	21.38	0.64	28.09	55.66	115.36
253	42.65	20.03	0.64	25.28	60.00	114.84
254	42.81	16.70	0.79	23.93	66.53	115.42
255	42.98	16.38	0.88	27.06	71.06	116.02
256	43.14	17.55	0.88	27.96	69.61	116.27
257	43.31	18.58	0.84	28.26	67.32	116.15
258	43.47	18.27	0.81	27.02	68.14	115.68
259	43.63	15.78	0.75	23.87	72.09	115.05
260	43.80	13.98	0.71	20.22	76.97	114.24
261	43.96	13.23	0.65	22.09	79.41	113.64
262	44.13	13.22	0.62	23.70	76.31	113.38
263	44.29	15.37	0.62	28.94	70.98	113.46
264	44.45	17.05	0.61	31.20	66.14	113.55
265	44.62	17.30	0.59	31.32	64.08	113.30
266	44.78	16.69	0.54	31.39	63.05	112.72
267	44.95	16.77	0.48	31.50	60.32	112.00
268	45.11	18.31	0.43	33.41	54.50	111.71
269	45.28	22.41	0.44	26.43	53.78	111.90
270	45.44	18.28	0.51	25.77	57.14	112.43

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
271	45.60	15.93	0.56	29.18	66.23	112.82
272	45.77	14.49	0.60	31.62	78.61	114.27
273	45.93	12.05	0.96	32.32	87.78	115.43
274	46.10	12.66	0.98	33.93	97.23	116.42
275	46.26	11.40	1.05	41.01	100.00	116.50
276	46.42	11.01	1.02	40.81	100.00	116.37
277	46.59	12.49	0.94	28.44	85.78	116.00
278	46.75	17.92	0.74	45.02	68.00	115.52
279	46.92	23.00	0.65	53.94	52.95	114.70
280	47.08	27.09	0.53	69.67	45.07	114.19
281	47.24	28.63	0.53	82.45	40.88	113.42
282	47.41	27.84	0.44	86.14	38.19	112.85
283	47.57	30.73	0.40	72.40	35.49	112.56
284	47.74	33.68	0.45	105.29	33.49	113.34
285	47.90	36.10	0.55	131.68	33.98	114.75
286	48.06	35.25	0.67	139.76	37.44	116.79
287	48.23	33.90	0.98	133.42	42.49	118.44
288	48.39	31.76	1.14	126.26	47.25	119.52
289	48.56	30.15	1.16	121.12	48.77	119.54
290	48.72	30.85	1.03	127.89	48.06	119.20
291	48.88	31.81	0.99	128.32	45.30	119.00
292	49.05	35.24	1.02	136.68	41.01	119.36
293	49.21	43.29	1.06	147.76	36.82	119.77
294	49.38	46.61	1.04	165.00	32.30	120.04
295	49.54	53.66	1.00	171.75	27.78	120.13
296	49.70	64.80	0.96	195.26	21.45	120.33
297	49.87	91.08	0.90	46.36	18.90	120.15
298	50.03	75.84	0.85	13.75	20.06	119.88
299	50.20	54.40	0.91	14.88	24.70	119.46

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	1.31	0.07	0.00	0.07	0.99	0.277	1.08	0.258	1.00	1.10	2.000	No
2	1.48	0.08	0.00	0.08	0.99	0.277	1.08	0.257	1.00	1.10	2.000	No
3	1.64	0.09	0.00	0.09	0.99	0.276	1.08	0.257	1.00	1.10	2.000	No
4	1.80	0.10	0.00	0.10	0.99	0.276	1.08	0.257	1.00	1.10	2.000	No
5	1.97	0.11	0.00	0.11	0.99	0.276	1.08	0.256	1.00	1.10	2.000	No
6	2.13	0.11	0.00	0.11	0.99	0.275	1.08	0.256	1.00	1.10	2.000	No
7	2.30	0.12	0.00	0.12	0.98	0.275	1.08	0.256	1.00	1.10	2.000	No
8	2.46	0.13	0.00	0.13	0.98	0.275	1.08	0.256	1.00	1.10	2.000	No
9	2.63	0.14	0.00	0.14	0.98	0.274	1.08	0.255	1.00	1.10	2.000	No
10	2.79	0.15	0.00	0.15	0.98	0.274	1.08	0.255	1.00	1.10	2.000	No
11	2.95	0.16	0.00	0.16	0.98	0.274	1.08	0.255	1.00	1.10	2.000	No
12	3.12	0.16	0.00	0.16	0.98	0.273	1.08	0.254	1.00	1.10	2.000	No
13	3.28	0.17	0.00	0.17	0.98	0.273	1.08	0.254	1.00	1.10	2.000	No
14	3.44	0.18	0.00	0.18	0.98	0.273	1.08	0.254	1.00	1.10	2.000	No
15	3.61	0.19	0.00	0.19	0.97	0.272	1.08	0.253	1.00	1.10	2.000	No
16	3.77	0.20	0.00	0.20	0.97	0.272	1.08	0.253	1.00	1.10	2.000	No
17	3.94	0.20	0.00	0.20	0.97	0.271	1.08	0.253	1.00	1.10	2.000	No
18	4.10	0.21	0.00	0.21	0.97	0.271	1.08	0.252	1.00	1.10	2.000	No
19	4.26	0.22	0.00	0.22	0.97	0.271	1.08	0.252	1.00	1.10	2.000	No
20	4.43	0.23	0.00	0.23	0.97	0.270	1.08	0.251	1.00	1.10	2.000	No
21	4.59	0.24	0.00	0.24	0.97	0.270	1.08	0.251	1.00	1.10	2.000	No
22	4.76	0.25	0.00	0.25	0.96	0.270	1.08	0.251	1.00	1.10	2.000	No
23	4.92	0.25	0.00	0.25	0.96	0.269	1.08	0.250	1.00	1.10	2.000	No
24	5.08	0.26	0.00	0.26	0.96	0.269	1.08	0.250	1.00	1.10	2.000	No
25	5.25	0.27	0.00	0.27	0.96	0.268	1.08	0.250	1.00	1.10	2.000	No
26	5.41	0.28	0.00	0.28	0.96	0.268	1.08	0.249	1.00	1.10	2.000	No
27	5.58	0.29	0.00	0.29	0.96	0.268	1.08	0.249	1.00	1.10	2.000	No
28	5.74	0.30	0.00	0.30	0.96	0.267	1.08	0.248	1.00	1.10	2.000	No
29	5.91	0.31	0.00	0.31	0.95	0.267	1.08	0.248	1.00	1.10	2.000	No
30	6.07	0.31	0.00	0.31	0.95	0.266	1.08	0.248	1.00	1.10	2.000	No
31	6.23	0.32	0.00	0.32	0.95	0.266	1.08	0.247	1.00	1.10	2.000	No
32	6.40	0.33	0.00	0.33	0.95	0.265	1.08	0.247	1.00	1.10	2.000	No
33	6.56	0.34	0.00	0.34	0.95	0.265	1.08	0.247	1.00	1.10	2.000	No
34	6.73	0.35	0.00	0.35	0.95	0.265	1.08	0.246	1.00	1.10	2.000	No
35	6.89	0.36	0.00	0.36	0.95	0.264	1.08	0.246	1.00	1.10	2.000	No
36	7.05	0.37	0.00	0.37	0.94	0.264	1.08	0.245	1.00	1.10	2.000	No
37	7.22	0.38	0.00	0.38	0.94	0.263	1.08	0.245	1.00	1.10	2.000	No
38	7.38	0.38	0.00	0.38	0.94	0.263	1.08	0.244	1.00	1.10	2.000	No
39	7.55	0.39	0.00	0.39	0.94	0.262	1.08	0.244	1.00	1.10	2.000	No
40	7.71	0.40	0.00	0.40	0.94	0.262	1.08	0.244	1.00	1.10	2.000	No
41	7.87	0.41	0.00	0.41	0.94	0.261	1.08	0.243	1.00	1.10	2.000	No
42	8.04	0.42	0.00	0.42	0.93	0.261	1.08	0.243	1.00	1.10	2.000	No
43	8.20	0.43	0.00	0.43	0.93	0.261	1.08	0.242	1.00	1.10	2.000	No
44	8.37	0.44	0.00	0.44	0.93	0.260	1.08	0.242	1.00	1.10	2.000	No
45	8.53	0.45	0.00	0.45	0.93	0.260	1.08	0.241	1.00	1.10	2.000	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
46	8.69	0.46	0.00	0.46	0.93	0.259	1.08	0.241	1.00	1.10	2.000	No
47	8.86	0.47	0.00	0.47	0.93	0.259	1.08	0.241	1.00	1.10	2.000	No
48	9.02	0.47	0.00	0.47	0.92	0.258	1.08	0.240	1.00	1.10	0.264	No
49	9.19	0.48	0.01	0.48	0.92	0.261	1.08	0.243	1.00	1.10	0.267	No
50	9.35	0.49	0.01	0.48	0.92	0.263	1.08	0.245	1.00	1.10	0.269	No
51	9.51	0.50	0.02	0.48	0.92	0.265	1.08	0.247	1.00	1.10	0.271	No
52	9.68	0.51	0.02	0.49	0.92	0.267	1.08	0.249	1.00	1.10	0.273	No
53	9.84	0.52	0.03	0.49	0.91	0.269	1.08	0.250	1.00	1.10	0.275	No
54	10.01	0.53	0.03	0.50	0.91	0.271	1.08	0.252	1.00	1.10	0.278	No
55	10.17	0.54	0.04	0.50	0.91	0.273	1.08	0.254	1.00	1.10	0.280	No
56	10.34	0.55	0.04	0.50	0.91	0.275	1.08	0.256	1.00	1.10	0.281	No
57	10.50	0.55	0.05	0.51	0.91	0.277	1.08	0.258	1.00	1.10	0.283	No
58	10.66	0.56	0.05	0.51	0.91	0.279	1.08	0.259	1.00	1.10	0.285	No
59	10.83	0.57	0.06	0.51	0.90	0.280	1.08	0.261	1.00	1.10	0.287	No
60	10.99	0.58	0.06	0.52	0.90	0.282	1.08	0.262	1.00	1.10	0.289	No
61	11.15	0.59	0.07	0.52	0.90	0.284	1.08	0.264	1.00	1.10	0.290	No
62	11.32	0.60	0.07	0.53	0.90	0.285	1.08	0.265	1.00	1.10	0.292	No
63	11.48	0.61	0.08	0.53	0.90	0.287	1.08	0.267	1.00	1.10	0.294	No
64	11.65	0.62	0.08	0.53	0.89	0.289	1.08	0.268	1.00	1.10	0.295	No
65	11.81	0.63	0.09	0.54	0.89	0.290	1.08	0.270	1.00	1.10	0.297	No
66	11.97	0.63	0.09	0.54	0.89	0.291	1.08	0.271	1.00	1.10	0.298	No
67	12.14	0.64	0.10	0.55	0.89	0.293	1.08	0.272	1.00	1.10	0.300	No
68	12.30	0.65	0.10	0.55	0.89	0.294	1.08	0.274	1.00	1.10	0.301	No
69	12.47	0.66	0.11	0.55	0.88	0.295	1.08	0.275	1.00	1.10	0.302	No
70	12.63	0.67	0.11	0.56	0.88	0.297	1.08	0.276	1.00	1.10	0.304	No
71	12.79	0.68	0.12	0.56	0.88	0.298	1.08	0.277	1.00	1.10	0.305	No
72	12.96	0.69	0.12	0.56	0.88	0.299	1.08	0.278	1.00	1.10	0.306	No
73	13.12	0.70	0.13	0.57	0.88	0.300	1.08	0.279	1.00	1.10	0.307	No
74	13.29	0.71	0.13	0.57	0.87	0.301	1.08	0.280	1.00	1.10	0.308	No
75	13.45	0.72	0.14	0.58	0.87	0.302	1.08	0.281	1.00	1.10	0.309	No
76	13.62	0.72	0.14	0.58	0.87	0.303	1.08	0.282	1.00	1.10	0.310	No
77	13.78	0.73	0.15	0.58	0.87	0.304	1.08	0.283	1.00	1.10	0.311	No
78	13.94	0.74	0.15	0.59	0.87	0.305	1.08	0.284	1.00	1.10	0.312	No
79	14.11	0.75	0.16	0.59	0.86	0.306	1.08	0.285	1.00	1.10	0.313	No
80	14.27	0.76	0.16	0.60	0.86	0.307	1.08	0.286	1.00	1.10	0.314	No
81	14.44	0.77	0.17	0.60	0.86	0.308	1.08	0.287	1.00	1.10	0.315	No
82	14.60	0.78	0.17	0.60	0.86	0.309	1.08	0.287	1.00	1.10	0.316	No
83	14.76	0.79	0.18	0.61	0.85	0.310	1.08	0.288	1.00	1.10	0.317	No
84	14.93	0.80	0.18	0.61	0.85	0.311	1.08	0.289	1.00	1.10	0.318	No
85	15.09	0.80	0.19	0.61	0.85	0.311	1.08	0.290	1.00	1.10	0.319	No
86	15.26	0.81	0.20	0.62	0.85	0.312	1.08	0.290	1.00	1.10	0.319	No
87	15.42	0.82	0.20	0.62	0.85	0.313	1.08	0.291	1.00	1.10	0.320	No
88	15.58	0.83	0.21	0.62	0.84	0.314	1.08	0.292	1.00	1.10	0.321	No
89	15.75	0.84	0.21	0.63	0.84	0.314	1.08	0.292	1.00	1.10	0.321	No
90	15.91	0.85	0.22	0.63	0.84	0.315	1.08	0.293	1.00	1.10	0.322	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
91	16.08	0.86	0.22	0.64	0.84	0.315	1.08	0.293	1.00	1.10	0.323	No
92	16.24	0.87	0.23	0.64	0.84	0.316	1.08	0.294	1.00	1.10	0.323	No
93	16.40	0.87	0.23	0.64	0.83	0.316	1.08	0.294	1.00	1.10	0.324	No
94	16.57	0.88	0.24	0.65	0.83	0.317	1.08	0.295	1.00	1.10	0.324	No
95	16.73	0.89	0.24	0.65	0.83	0.317	1.08	0.295	1.00	1.10	0.325	No
96	16.90	0.90	0.25	0.66	0.83	0.318	1.08	0.295	1.00	1.10	0.325	No
97	17.06	0.91	0.25	0.66	0.82	0.318	1.08	0.296	1.00	1.10	0.325	No
98	17.22	0.92	0.26	0.67	0.82	0.318	1.08	0.296	1.00	1.10	0.326	No
99	17.39	0.93	0.26	0.67	0.82	0.318	1.08	0.296	1.00	1.10	0.326	No
100	17.55	0.94	0.27	0.68	0.82	0.319	1.08	0.296	1.00	1.10	0.326	No
101	17.72	0.95	0.27	0.68	0.81	0.319	1.08	0.297	1.00	1.10	0.326	No
102	17.88	0.96	0.28	0.69	0.81	0.319	1.08	0.297	1.00	1.10	0.326	No
103	18.05	0.97	0.28	0.69	0.81	0.319	1.08	0.297	1.00	1.10	0.326	No
104	18.21	0.98	0.29	0.70	0.81	0.319	1.08	0.297	1.00	1.10	0.327	No
105	18.37	0.99	0.29	0.70	0.81	0.319	1.08	0.297	1.00	1.10	0.327	No
106	18.54	1.00	0.30	0.71	0.80	0.319	1.08	0.297	1.00	1.10	0.327	No
107	18.70	1.01	0.30	0.71	0.80	0.319	1.08	0.297	1.00	1.10	0.326	No
108	18.86	1.03	0.31	0.72	0.80	0.319	1.08	0.297	1.00	1.10	0.326	No
109	19.03	1.04	0.31	0.72	0.80	0.319	1.08	0.297	1.00	1.10	0.326	No
110	19.19	1.05	0.32	0.73	0.79	0.319	1.08	0.297	1.00	1.10	0.326	No
111	19.36	1.06	0.32	0.73	0.79	0.319	1.08	0.297	1.00	1.10	0.326	No
112	19.52	1.07	0.33	0.74	0.79	0.319	1.08	0.296	1.00	1.10	0.326	No
113	19.68	1.08	0.33	0.74	0.79	0.319	1.08	0.296	1.00	1.10	0.326	No
114	19.85	1.09	0.34	0.75	0.78	0.318	1.08	0.296	1.00	1.10	0.326	No
115	20.01	1.10	0.34	0.75	0.78	0.318	1.08	0.296	1.00	1.10	0.326	No
116	20.18	1.11	0.35	0.76	0.78	0.318	1.08	0.296	1.00	1.10	0.326	No
117	20.34	1.12	0.35	0.76	0.78	0.318	1.08	0.296	1.00	1.10	0.325	No
118	20.50	1.13	0.36	0.77	0.78	0.318	1.08	0.296	1.00	1.10	0.325	No
119	20.67	1.14	0.36	0.77	0.77	0.318	1.08	0.296	1.00	1.10	0.325	No
120	20.83	1.15	0.37	0.78	0.77	0.318	1.08	0.295	1.00	1.10	0.325	No
121	21.00	1.16	0.37	0.78	0.77	0.317	1.08	0.295	1.00	1.10	0.325	No
122	21.16	1.17	0.38	0.79	0.77	0.317	1.08	0.295	1.00	1.10	0.325	No
123	21.32	1.18	0.38	0.79	0.76	0.317	1.08	0.295	1.00	1.10	0.324	No
124	21.49	1.19	0.39	0.80	0.76	0.317	1.08	0.295	1.00	1.10	0.324	No
125	21.65	1.20	0.39	0.80	0.76	0.317	1.08	0.294	1.00	1.10	0.324	No
126	21.82	1.21	0.40	0.81	0.76	0.316	1.08	0.294	1.00	1.10	0.324	No
127	21.98	1.22	0.41	0.81	0.75	0.316	1.08	0.294	1.00	1.10	0.323	No
128	22.15	1.23	0.41	0.82	0.75	0.316	1.08	0.294	1.00	1.10	0.323	No
129	22.31	1.24	0.42	0.82	0.75	0.315	1.08	0.293	1.00	1.10	0.323	No
130	22.47	1.25	0.42	0.83	0.75	0.315	1.08	0.293	1.00	1.10	0.322	No
131	22.64	1.26	0.43	0.83	0.74	0.315	1.08	0.293	1.00	1.10	0.322	No
132	22.80	1.27	0.43	0.84	0.74	0.315	1.08	0.293	1.00	1.10	0.322	No
133	22.97	1.28	0.44	0.84	0.74	0.314	1.08	0.292	1.00	1.10	0.321	No
134	23.13	1.29	0.44	0.85	0.74	0.314	1.08	0.292	1.00	1.10	0.321	No
135	23.29	1.30	0.45	0.85	0.74	0.313	1.08	0.292	1.00	1.10	0.321	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
136	23.46	1.31	0.45	0.85	0.73	0.313	1.08	0.291	1.00	1.10	0.320	No
137	23.62	1.32	0.46	0.86	0.73	0.313	1.08	0.291	1.00	1.10	0.320	No
138	23.79	1.33	0.46	0.86	0.73	0.312	1.08	0.290	1.00	1.10	0.320	No
139	23.95	1.34	0.47	0.87	0.73	0.312	1.08	0.290	1.00	1.10	0.319	No
140	24.11	1.35	0.47	0.87	0.72	0.311	1.08	0.290	1.00	1.10	0.319	No
141	24.28	1.36	0.48	0.88	0.72	0.311	1.08	0.289	1.00	1.10	0.318	No
142	24.44	1.37	0.48	0.89	0.72	0.310	1.08	0.289	1.00	1.10	0.318	No
143	24.61	1.38	0.49	0.89	0.72	0.310	1.08	0.288	1.00	1.10	0.317	No
144	24.77	1.39	0.49	0.90	0.71	0.310	1.08	0.288	1.00	1.10	0.317	No
145	24.93	1.40	0.50	0.90	0.71	0.309	1.08	0.287	1.00	1.10	0.316	No
146	25.10	1.41	0.50	0.90	0.71	0.309	1.08	0.287	1.00	1.10	0.316	No
147	25.26	1.42	0.51	0.91	0.71	0.308	1.08	0.287	1.00	1.10	0.315	No
148	25.43	1.43	0.51	0.91	0.71	0.308	1.08	0.286	1.00	1.10	0.315	No
149	25.59	1.44	0.52	0.92	0.70	0.307	1.08	0.286	1.00	1.10	0.314	No
150	25.75	1.45	0.52	0.92	0.70	0.307	1.08	0.285	1.00	1.10	0.314	No
151	25.92	1.46	0.53	0.93	0.70	0.306	1.08	0.285	1.00	1.10	0.313	No
152	26.08	1.47	0.53	0.93	0.70	0.306	1.08	0.284	1.00	1.10	0.313	No
153	26.25	1.48	0.54	0.94	0.69	0.305	1.08	0.284	1.00	1.10	0.312	No
154	26.41	1.49	0.54	0.94	0.69	0.305	1.08	0.283	1.00	1.10	0.312	No
155	26.57	1.50	0.55	0.95	0.69	0.304	1.08	0.283	1.00	1.10	0.311	No
156	26.74	1.51	0.55	0.95	0.69	0.304	1.08	0.282	1.00	1.10	0.311	No
157	26.90	1.52	0.56	0.96	0.69	0.303	1.08	0.282	1.00	1.10	0.310	No
158	27.07	1.53	0.56	0.96	0.68	0.303	1.08	0.282	1.00	1.10	0.310	No
159	27.23	1.54	0.57	0.97	0.68	0.302	1.08	0.281	1.00	1.10	0.309	No
160	27.39	1.55	0.57	0.97	0.68	0.302	1.08	0.281	1.00	1.10	0.309	No
161	27.56	1.55	0.58	0.98	0.68	0.301	1.08	0.280	1.00	1.10	0.308	No
162	27.72	1.56	0.58	0.98	0.67	0.301	1.08	0.280	1.00	1.10	0.308	No
163	27.89	1.57	0.59	0.98	0.67	0.300	1.08	0.279	1.00	1.10	0.307	No
164	28.05	1.58	0.59	0.99	0.67	0.300	1.08	0.279	1.00	1.10	0.307	No
165	28.21	1.59	0.60	0.99	0.67	0.299	1.08	0.279	1.00	1.10	0.306	No
166	28.38	1.60	0.60	1.00	0.67	0.299	1.08	0.278	1.00	1.10	0.306	No
167	28.54	1.61	0.61	1.00	0.66	0.299	1.08	0.278	1.00	1.10	0.305	No
168	28.71	1.62	0.61	1.00	0.66	0.298	1.08	0.277	1.00	1.10	0.305	No
169	28.87	1.63	0.62	1.01	0.66	0.298	1.08	0.277	1.00	1.10	0.304	No
170	29.04	1.64	0.63	1.01	0.66	0.297	1.08	0.276	1.00	1.10	0.304	No
171	29.20	1.65	0.63	1.02	0.65	0.296	1.08	0.276	1.00	1.10	0.303	No
172	29.36	1.66	0.64	1.02	0.65	0.296	1.08	0.275	1.00	1.10	0.303	No
173	29.53	1.67	0.64	1.03	0.65	0.295	1.08	0.275	1.00	1.10	0.302	No
174	29.69	1.68	0.65	1.03	0.65	0.295	1.08	0.274	1.00	1.10	0.301	No
175	29.86	1.69	0.65	1.04	0.65	0.294	1.08	0.273	1.00	1.10	0.301	No
176	30.02	1.70	0.66	1.04	0.64	0.293	1.08	0.273	1.00	1.10	0.300	No
177	30.18	1.71	0.66	1.05	0.64	0.293	1.08	0.272	1.00	1.10	0.299	No
178	30.35	1.72	0.67	1.05	0.64	0.292	1.08	0.272	1.00	1.10	0.299	No
179	30.51	1.73	0.67	1.06	0.64	0.292	1.08	0.271	1.00	1.10	0.298	No
180	30.68	1.74	0.68	1.06	0.64	0.291	1.08	0.271	1.00	1.10	0.298	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
181	30.84	1.75	0.68	1.07	0.63	0.290	1.08	0.270	1.00	1.10	0.297	No
182	31.00	1.76	0.69	1.07	0.63	0.290	1.08	0.270	1.00	1.10	0.297	No
183	31.17	1.77	0.69	1.08	0.63	0.289	1.08	0.269	1.00	1.10	0.296	No
184	31.33	1.78	0.70	1.08	0.63	0.289	1.08	0.268	1.00	1.10	0.295	No
185	31.50	1.79	0.70	1.09	0.63	0.288	1.08	0.268	1.00	1.10	0.295	No
186	31.66	1.80	0.71	1.09	0.62	0.288	1.08	0.267	1.00	1.10	0.294	No
187	31.82	1.81	0.71	1.10	0.62	0.287	1.08	0.267	1.00	1.10	0.294	No
188	31.99	1.82	0.72	1.10	0.62	0.286	1.08	0.266	1.00	1.10	0.293	No
189	32.15	1.83	0.72	1.11	0.62	0.286	1.08	0.266	1.00	1.10	0.292	No
190	32.32	1.84	0.73	1.11	0.62	0.285	1.08	0.265	1.00	1.10	0.292	No
191	32.48	1.85	0.73	1.12	0.61	0.284	1.08	0.265	1.00	1.10	0.291	No
192	32.64	1.86	0.74	1.12	0.61	0.284	1.08	0.264	1.00	1.10	0.290	No
193	32.81	1.87	0.74	1.13	0.61	0.283	1.08	0.263	1.00	1.10	0.290	No
194	32.97	1.88	0.75	1.14	0.61	0.282	1.08	0.263	1.00	1.10	0.289	No
195	33.14	1.89	0.75	1.14	0.61	0.282	1.08	0.262	1.00	1.10	0.288	No
196	33.30	1.91	0.76	1.15	0.61	0.281	1.08	0.262	1.00	1.10	0.288	No
197	33.47	1.92	0.76	1.15	0.60	0.281	1.08	0.261	1.00	1.10	0.287	No
198	33.63	1.93	0.77	1.16	0.60	0.280	1.08	0.260	1.00	1.10	0.286	No
199	33.79	1.94	0.77	1.16	0.60	0.279	1.08	0.260	1.00	1.10	0.286	No
200	33.96	1.95	0.78	1.17	0.60	0.279	1.08	0.259	1.00	1.10	0.285	No
201	34.12	1.96	0.78	1.17	0.60	0.278	1.08	0.259	1.00	1.10	0.285	No
202	34.28	1.97	0.79	1.18	0.60	0.278	1.08	0.258	1.00	1.10	0.284	No
203	34.45	1.98	0.79	1.18	0.59	0.277	1.08	0.258	1.00	1.10	0.283	No
204	34.61	1.99	0.80	1.19	0.59	0.277	1.08	0.257	1.00	1.10	0.283	No
205	34.78	2.00	0.80	1.19	0.59	0.276	1.08	0.257	1.00	1.10	0.282	No
206	34.94	2.01	0.81	1.20	0.59	0.275	1.08	0.256	1.00	1.10	0.282	No
207	35.10	2.02	0.81	1.20	0.59	0.275	1.08	0.256	1.00	1.10	0.281	No
208	35.27	2.03	0.82	1.21	0.58	0.274	1.08	0.255	1.00	1.10	0.281	No
209	35.43	2.04	0.82	1.21	0.58	0.274	1.08	0.255	1.00	1.10	0.280	No
210	35.60	2.05	0.83	1.22	0.58	0.273	1.08	0.254	1.00	1.10	0.279	No
211	35.76	2.06	0.83	1.22	0.58	0.273	1.08	0.254	1.00	1.10	0.279	No
212	35.92	2.07	0.84	1.23	0.58	0.272	1.08	0.253	1.00	1.10	0.278	No
213	36.09	2.08	0.85	1.24	0.58	0.271	1.08	0.253	1.00	1.10	0.278	No
214	36.25	2.09	0.85	1.24	0.58	0.271	1.08	0.252	1.00	1.10	0.277	No
215	36.42	2.10	0.86	1.25	0.57	0.270	1.08	0.251	1.00	1.10	0.277	No
216	36.58	2.11	0.86	1.25	0.57	0.270	1.08	0.251	1.00	1.10	0.276	No
217	36.74	2.12	0.87	1.26	0.57	0.269	1.08	0.250	1.00	1.10	0.275	No
218	36.91	2.13	0.87	1.26	0.57	0.269	1.08	0.250	1.00	1.10	0.275	No
219	37.07	2.14	0.88	1.27	0.57	0.268	1.08	0.249	1.00	1.10	0.274	No
220	37.24	2.16	0.88	1.27	0.57	0.268	1.08	0.249	1.00	1.10	0.274	No
221	37.40	2.17	0.89	1.28	0.56	0.267	1.08	0.248	1.00	1.10	0.273	No
222	37.57	2.18	0.89	1.29	0.56	0.266	1.08	0.248	1.00	1.10	0.273	No
223	37.73	2.19	0.90	1.29	0.56	0.266	1.08	0.247	1.00	1.10	0.272	No
224	37.89	2.20	0.90	1.30	0.56	0.265	1.08	0.247	1.00	1.10	0.272	No
225	38.06	2.21	0.91	1.30	0.56	0.265	1.08	0.246	1.00	1.10	0.271	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
226	38.22	2.22	0.91	1.31	0.56	0.264	1.08	0.246	1.00	1.10	0.270	No
227	38.39	2.23	0.92	1.31	0.56	0.264	1.08	0.245	1.00	1.10	0.270	No
228	38.55	2.24	0.92	1.32	0.55	0.263	1.08	0.245	1.00	1.10	0.269	No
229	38.71	2.25	0.93	1.32	0.55	0.263	1.08	0.244	1.00	1.10	0.269	No
230	38.88	2.26	0.93	1.33	0.55	0.262	1.08	0.244	1.00	1.10	0.268	No
231	39.04	2.27	0.94	1.33	0.55	0.262	1.08	0.244	1.00	1.10	0.268	No
232	39.21	2.28	0.94	1.34	0.55	0.261	1.08	0.243	1.00	1.10	0.267	No
233	39.37	2.29	0.95	1.35	0.55	0.261	1.08	0.243	1.00	1.10	0.267	No
234	39.53	2.30	0.95	1.35	0.55	0.260	1.08	0.242	1.00	1.10	0.266	No
235	39.70	2.31	0.96	1.36	0.54	0.260	1.08	0.242	1.00	1.10	0.266	No
236	39.86	2.32	0.96	1.36	0.54	0.259	1.08	0.241	1.00	1.10	0.265	No
237	40.03	2.34	0.97	1.37	0.54	0.259	1.08	0.241	1.00	1.10	0.265	No
238	40.19	2.35	0.97	1.37	0.54	0.258	1.08	0.240	1.00	1.10	0.264	No
239	40.35	2.36	0.98	1.38	0.54	0.258	1.08	0.240	1.00	1.10	0.264	No
240	40.52	2.37	0.98	1.38	0.54	0.258	1.08	0.240	1.00	1.10	0.264	No
241	40.68	2.38	0.99	1.39	0.54	0.257	1.08	0.239	1.00	1.10	0.263	No
242	40.85	2.39	0.99	1.39	0.54	0.257	1.08	0.239	1.00	1.10	0.263	No
243	41.01	2.40	1.00	1.40	0.53	0.256	1.08	0.238	1.00	1.10	0.262	No
244	41.17	2.41	1.00	1.40	0.53	0.256	1.08	0.238	1.00	1.10	0.262	No
245	41.34	2.42	1.01	1.41	0.53	0.256	1.08	0.238	1.00	1.10	0.262	No
246	41.50	2.43	1.01	1.41	0.53	0.255	1.08	0.237	1.00	1.10	0.261	No
247	41.67	2.44	1.02	1.42	0.53	0.255	1.08	0.237	1.00	1.10	0.261	No
248	41.83	2.45	1.02	1.42	0.53	0.254	1.08	0.237	1.00	1.10	0.260	No
249	41.99	2.45	1.03	1.43	0.53	0.254	1.08	0.236	1.00	1.10	0.260	No
250	42.16	2.46	1.03	1.43	0.53	0.254	1.08	0.236	1.00	1.10	0.260	No
251	42.32	2.47	1.04	1.43	0.53	0.253	1.08	0.236	1.00	1.10	0.259	No
252	42.49	2.48	1.04	1.44	0.52	0.253	1.08	0.235	1.00	1.10	0.259	No
253	42.65	2.49	1.05	1.44	0.52	0.253	1.08	0.235	1.00	1.10	0.259	No
254	42.81	2.50	1.06	1.45	0.52	0.252	1.08	0.235	1.00	1.10	0.258	No
255	42.98	2.51	1.06	1.45	0.52	0.252	1.08	0.235	1.00	1.10	0.258	No
256	43.14	2.52	1.07	1.46	0.52	0.252	1.08	0.234	1.00	1.10	0.258	No
257	43.31	2.53	1.07	1.46	0.52	0.251	1.08	0.234	1.00	1.10	0.257	No
258	43.47	2.54	1.08	1.47	0.52	0.251	1.08	0.234	1.00	1.10	0.257	No
259	43.63	2.55	1.08	1.47	0.52	0.251	1.08	0.233	1.00	1.10	0.257	No
260	43.80	2.56	1.09	1.47	0.52	0.251	1.08	0.233	1.00	1.10	0.256	No
261	43.96	2.57	1.09	1.48	0.52	0.250	1.08	0.233	1.00	1.10	0.256	No
262	44.13	2.58	1.10	1.48	0.51	0.250	1.08	0.233	1.00	1.10	0.256	No
263	44.29	2.59	1.10	1.49	0.51	0.250	1.08	0.232	1.00	1.10	0.256	No
264	44.45	2.60	1.11	1.49	0.51	0.249	1.08	0.232	1.00	1.10	0.255	No
265	44.62	2.61	1.11	1.49	0.51	0.249	1.08	0.232	1.00	1.10	0.255	No
266	44.78	2.62	1.12	1.50	0.51	0.249	1.08	0.232	1.00	1.10	0.255	No
267	44.95	2.62	1.12	1.50	0.51	0.249	1.08	0.231	1.00	1.10	0.254	No
268	45.11	2.63	1.13	1.51	0.51	0.248	1.08	0.231	1.00	1.10	0.254	No
269	45.28	2.64	1.13	1.51	0.51	0.248	1.08	0.231	1.00	1.10	0.254	No
270	45.44	2.65	1.14	1.51	0.51	0.248	1.08	0.231	1.00	1.10	0.254	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
271	45.60	2.66	1.14	1.52	0.51	0.248	1.08	0.230	1.00	1.10	0.253	No
272	45.77	2.67	1.15	1.52	0.50	0.247	1.08	0.230	1.00	1.10	0.253	No
273	45.93	2.68	1.15	1.53	0.50	0.247	1.08	0.230	1.00	1.10	0.253	No
274	46.10	2.69	1.16	1.53	0.50	0.247	1.08	0.230	1.00	1.10	0.253	No
275	46.26	2.70	1.16	1.54	0.50	0.247	1.08	0.229	1.00	1.10	0.252	No
276	46.42	2.71	1.17	1.54	0.50	0.246	1.08	0.229	1.00	1.10	0.252	No
277	46.59	2.72	1.17	1.55	0.50	0.246	1.08	0.229	1.00	1.10	0.252	No
278	46.75	2.73	1.18	1.55	0.50	0.246	1.08	0.229	1.00	1.10	0.252	No
279	46.92	2.74	1.18	1.55	0.50	0.246	1.08	0.228	1.00	1.10	0.251	No
280	47.08	2.75	1.19	1.56	0.50	0.245	1.08	0.228	1.00	1.10	0.251	No
281	47.24	2.76	1.19	1.56	0.50	0.245	1.08	0.228	1.00	1.10	0.251	No
282	47.41	2.76	1.20	1.57	0.50	0.245	1.08	0.228	1.00	1.10	0.251	No
283	47.57	2.77	1.20	1.57	0.50	0.245	1.08	0.228	1.00	1.10	0.250	No
284	47.74	2.78	1.21	1.57	0.50	0.245	1.08	0.227	1.00	1.10	0.250	No
285	47.90	2.79	1.21	1.58	0.49	0.244	1.08	0.227	1.00	1.10	0.250	No
286	48.06	2.80	1.22	1.58	0.49	0.244	1.08	0.227	1.00	1.10	0.250	No
287	48.23	2.81	1.22	1.59	0.49	0.244	1.08	0.227	1.00	1.10	0.250	No
288	48.39	2.82	1.23	1.59	0.49	0.244	1.08	0.227	1.00	1.10	0.249	No
289	48.56	2.83	1.23	1.60	0.49	0.243	1.08	0.226	1.00	1.10	0.249	No
290	48.72	2.84	1.24	1.60	0.49	0.243	1.08	0.226	1.00	1.10	0.249	No
291	48.88	2.85	1.24	1.61	0.49	0.243	1.08	0.226	1.00	1.10	0.249	No
292	49.05	2.86	1.25	1.61	0.49	0.243	1.08	0.226	1.00	1.10	0.248	No
293	49.21	2.87	1.25	1.62	0.49	0.243	1.08	0.226	1.00	1.10	0.248	No
294	49.38	2.88	1.26	1.62	0.49	0.242	1.08	0.225	1.00	1.10	0.248	No
295	49.54	2.89	1.26	1.63	0.49	0.242	1.08	0.225	1.00	1.10	0.248	No
296	49.70	2.90	1.27	1.63	0.49	0.242	1.08	0.225	1.00	1.10	0.248	No
297	49.87	2.91	1.28	1.64	0.49	0.242	1.08	0.225	1.00	1.10	0.247	No
298	50.03	2.92	1.28	1.64	0.49	0.242	1.08	0.225	1.00	1.10	0.247	No
299	50.20	2.93	1.29	1.64	0.48	0.241	1.08	0.224	1.00	1.10	0.247	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_k (tsf)	σ_v' (tsf)	c	C_q	q_{c1} (tsf)	Δq_c	$q_{c1,mod}$ (tsf)	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
1	1.31	18.47	0.07	0.59	1.70	33.42	7.20	40.62	4.000	No	No	2.00
2	1.48	16.96	0.08	0.60	1.70	27.27	9.97	37.24	4.000	No	No	2.00
3	1.64	14.72	0.09	0.56	1.70	25.74	16.91	42.65	4.000	No	Yes	2.00
4	1.80	13.33	0.10	0.57	1.70	22.02	21.09	43.10	4.000	No	Yes	2.00
5	1.97	12.18	0.11	0.58	1.70	20.21	21.60	41.82	4.000	No	Yes	2.00
6	2.13	11.49	0.11	0.62	1.70	19.87	15.66	35.54	4.000	No	Yes	2.00
7	2.30	11.18	0.12	0.66	1.70	18.48	11.31	29.79	4.000	No	Yes	2.00
8	2.46	11.05	0.13	0.69	1.70	18.61	7.84	26.45	4.000	No	No	2.00
9	2.63	11.41	0.14	0.71	1.70	19.21	5.50	24.71	4.000	No	No	2.00
10	2.79	11.90	0.15	0.73	1.70	20.32	3.45	23.76	4.000	No	No	2.00
11	2.95	12.79	0.16	0.75	1.70	21.16	2.23	23.39	4.000	No	No	2.00
12	3.12	14.05	0.16	0.75	1.70	23.73	1.07	24.80	4.000	No	No	2.00
13	3.28	15.73	0.17	0.75	1.70	26.76	0.23	26.98	4.000	No	No	2.00
14	3.44	17.43	0.18	0.76	1.70	29.72	0.00	29.72	4.000	No	No	2.00
15	3.61	18.63	0.19	0.75	1.70	32.38	0.00	32.38	4.000	No	No	2.00
16	3.77	19.69	0.20	0.73	1.70	32.86	0.00	32.86	4.000	No	No	2.00
17	3.94	19.98	0.20	0.70	1.70	35.16	0.36	35.51	4.000	No	No	2.00
18	4.10	20.31	0.21	0.69	1.70	33.86	0.90	34.77	4.000	No	No	2.00
19	4.26	19.91	0.22	0.67	1.70	34.54	1.55	36.09	4.000	No	No	2.00
20	4.43	19.84	0.23	0.67	1.70	33.10	2.04	35.14	4.000	No	No	2.00
21	4.59	19.56	0.24	0.66	1.70	33.51	2.37	35.87	4.000	No	No	2.00
22	4.76	19.72	0.25	0.67	1.70	33.12	2.22	35.34	4.000	No	No	2.00
23	4.92	20.35	0.25	0.67	1.70	33.95	1.94	35.89	4.000	No	No	2.00
24	5.08	21.69	0.26	0.67	1.70	36.70	1.47	38.18	4.000	No	No	2.00
25	5.25	23.37	0.27	0.66	1.70	39.93	1.15	41.08	4.000	No	No	2.00
26	5.41	24.88	0.28	0.66	1.70	42.53	0.78	43.31	4.000	No	No	2.00
27	5.58	26.37	0.29	0.67	1.70	44.42	0.44	44.86	4.000	No	No	2.00
28	5.74	28.42	0.30	0.67	1.70	47.50	0.08	47.58	4.000	No	No	2.00
29	5.91	31.51	0.31	0.67	1.70	53.02	0.00	53.02	4.000	No	No	2.00
30	6.07	35.15	0.31	0.68	1.70	60.18	0.00	60.18	4.000	No	No	2.00
31	6.23	38.56	0.32	0.69	1.70	66.05	0.00	66.05	4.000	No	No	2.00
32	6.40	41.16	0.33	0.69	1.70	70.41	0.00	70.41	4.000	No	No	2.00
33	6.56	42.78	0.34	0.68	1.70	73.46	0.00	73.46	4.000	No	No	2.00
34	6.73	43.16	0.35	0.66	1.70	74.29	0.00	74.29	4.000	No	No	2.00
35	6.89	41.96	0.36	0.64	1.70	72.33	0.00	72.33	4.000	No	No	2.00
36	7.05	39.31	0.37	0.61	1.70	67.39	0.50	67.89	4.000	No	No	2.00
37	7.22	36.04	0.38	0.59	1.70	60.74	1.78	62.52	4.000	No	No	2.00
38	7.38	33.75	0.38	0.57	1.70	55.67	3.10	58.78	4.000	No	No	2.00
39	7.55	33.49	0.39	0.56	1.70	55.71	3.80	59.50	4.000	No	No	2.00
40	7.71	34.75	0.40	0.55	1.70	59.43	3.75	63.19	4.000	No	No	2.00
41	7.87	36.40	0.41	0.56	1.69	61.87	3.23	65.10	4.000	No	No	2.00
42	8.04	38.58	0.42	0.57	1.69	63.90	2.34	66.24	4.000	No	No	2.00
43	8.20	41.46	0.43	0.59	1.69	70.35	1.31	71.66	4.000	No	No	2.00
44	8.37	43.50	0.44	0.60	1.69	76.29	0.62	76.90	4.000	No	No	2.00
45	8.53	43.39	0.45	0.61	1.68	73.81	0.43	74.24	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q_k (tsf)	σ_v' (tsf)	c	C_q	q_{c1} (tsf)	Δq_c	$q_{c1,mod}$ (tsf)	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
46	8.69	41.04	0.46	0.61	1.67	68.85	0.48	69.33	4.000	No	No	2.00
47	8.86	38.24	0.47	0.61	1.65	62.99	0.80	63.80	4.000	No	No	2.00
48	9.02	35.58	0.47	0.61	1.63	57.88	1.19	59.07	0.093	No	No	0.35
49	9.19	33.57	0.48	0.61	1.61	53.37	1.78	55.15	0.087	No	No	0.33
50	9.35	32.63	0.49	0.61	1.60	51.32	1.70	53.02	0.085	No	No	0.31
51	9.51	32.89	0.50	0.62	1.59	51.78	1.50	53.28	0.085	No	No	0.31
52	9.68	34.32	0.51	0.62	1.58	53.55	1.10	54.65	0.087	No	No	0.32
53	9.84	36.11	0.52	0.62	1.56	56.60	0.99	57.59	0.091	No	No	0.33
54	10.01	37.22	0.53	0.62	1.54	58.45	0.88	59.33	0.094	No	No	0.34
55	10.17	37.38	0.54	0.62	1.53	56.97	0.84	57.81	0.092	No	No	0.33
56	10.34	36.69	0.55	0.62	1.51	55.78	0.87	56.65	0.090	No	No	0.32
57	10.50	33.96	0.55	0.62	1.50	53.80	1.12	54.92	0.087	No	No	0.31
58	10.66	33.90	0.56	0.65	1.51	43.96	0.96	44.93	0.075	No	No	0.26
59	10.83	34.12	0.57	0.63	1.47	53.98	0.89	54.87	0.087	No	No	0.30
60	10.99	37.18	0.58	0.64	1.47	53.72	0.57	54.29	0.087	No	No	0.30
61	11.15	39.11	0.58	0.64	1.46	55.98	0.36	56.34	0.090	No	No	0.31
62	11.32	43.22	0.59	0.64	1.46	61.93	0.00	61.93	0.098	No	No	0.34
63	11.48	47.91	0.59	0.64	1.45	71.04	0.00	71.04	0.112	No	No	0.38
64	11.65	51.77	0.60	0.63	1.44	75.27	0.00	75.27	0.120	No	No	0.41
65	11.81	53.18	0.60	0.61	1.41	76.22	0.31	76.53	0.123	No	No	0.41
66	11.97	52.99	0.60	0.60	1.40	74.27	0.73	75.01	0.120	No	No	0.40
67	12.14	52.11	0.61	0.61	1.40	72.48	0.45	72.93	0.116	No	No	0.39
68	12.30	52.01	0.61	0.63	1.42	72.73	0.00	72.73	0.115	No	No	0.38
69	12.47	51.56	0.62	0.64	1.41	74.68	0.00	74.68	0.119	No	No	0.39
70	12.63	50.45	0.62	0.64	1.41	70.80	0.00	70.80	0.112	No	No	0.37
71	12.79	49.06	0.62	0.63	1.40	67.16	0.00	67.16	0.106	No	No	0.35
72	12.96	49.09	0.63	0.63	1.39	67.78	0.00	67.78	0.107	No	No	0.35
73	13.12	50.56	0.63	0.63	1.38	69.75	0.01	69.76	0.111	No	No	0.36
74	13.29	51.89	0.63	0.62	1.37	72.12	0.00	72.12	0.115	No	No	0.37
75	13.45	52.88	0.64	0.63	1.38	72.51	0.00	72.51	0.115	No	No	0.37
76	13.62	54.37	0.64	0.65	1.38	73.81	0.00	73.81	0.117	No	No	0.38
77	13.78	56.49	0.65	0.66	1.38	78.71	0.00	78.71	0.126	No	No	0.40
78	13.94	58.54	0.65	0.67	1.39	81.87	0.00	81.87	0.132	No	No	0.42
79	14.11	57.93	0.65	0.68	1.39	82.60	0.00	82.60	0.133	No	No	0.42
80	14.27	57.50	0.66	0.68	1.38	76.25	0.00	76.25	0.121	No	No	0.38
81	14.44	57.53	0.66	0.67	1.37	79.04	0.00	79.04	0.126	No	No	0.40
82	14.60	58.65	0.67	0.66	1.36	80.92	0.00	80.92	0.130	No	No	0.41
83	14.76	52.39	0.67	0.65	1.35	78.74	0.00	78.74	0.126	No	No	0.40
84	14.93	39.14	0.67	0.66	1.35	52.38	0.13	52.51	0.085	No	No	0.27
85	15.09	24.64	0.68	0.69	1.36	27.13	2.80	29.93	0.059	No	No	0.19
86	15.26	15.44	0.68	0.67	1.35	20.11	8.40	28.51	0.056	No	No	0.18
87	15.42	13.10	0.68	0.71	1.36	15.37	11.40	26.77	4.000	No	Yes	2.00
88	15.58	15.15	0.69	0.70	1.35	17.26	9.46	26.72	0.055	No	No	0.17
89	15.75	19.03	0.69	0.64	1.31	27.61	6.03	33.64	0.061	No	No	0.19
90	15.91	22.17	0.69	0.63	1.30	29.64	5.66	35.30	0.063	No	No	0.20

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q_k (tsf)	σ_v' (tsf)	c	C_q	$q_{c,1}$ (tsf)	Δq_c	$q_{c,1,mod}$ (tsf)	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
91	16.08	22.50	0.70	0.62	1.29	28.35	7.42	35.77	0.063	No	No	0.19
92	16.24	21.86	0.70	0.59	1.27	27.65	11.06	38.71	0.064	No	No	0.20
93	16.40	21.42	0.71	0.57	1.26	26.14	14.37	40.51	0.064	No	No	0.20
94	16.57	21.79	0.71	0.55	1.25	25.87	18.61	44.48	0.066	No	No	0.20
95	16.73	25.03	0.71	0.52	1.23	28.20	21.24	49.44	0.070	No	No	0.21
96	16.90	30.12	0.72	0.48	1.20	36.55	21.85	58.40	0.080	No	No	0.25
97	17.06	36.90	0.72	0.46	1.19	42.52	20.79	63.31	0.088	No	No	0.27
98	17.22	55.27	0.73	0.48	1.20	50.77	13.91	64.67	0.094	No	No	0.29
99	17.39	83.19	0.73	0.45	1.18	99.74	8.17	107.91	0.201	No	No	0.62
100	17.55	109.57	0.74	0.45	1.18	141.30	5.41	146.70	0.389	No	No	1.19
101	17.72	114.88	0.74	0.45	1.17	144.10	5.40	149.50	0.408	No	No	1.25
102	17.88	100.73	0.75	0.44	1.16	118.65	8.05	126.70	0.278	No	No	0.85
103	18.05	79.96	0.75	0.41	1.15	89.18	15.80	104.98	0.188	No	No	0.58
104	18.21	72.59	0.76	0.39	1.14	68.93	24.50	93.43	0.146	No	No	0.45
105	18.37	84.33	0.76	0.36	1.12	89.55	27.92	117.47	0.227	No	No	0.69
106	18.54	113.88	0.77	0.35	1.12	126.08	22.36	148.44	0.417	No	No	1.28
107	18.70	129.48	0.77	0.34	1.11	165.56	20.65	186.21	0.857	No	No	2.00
108	18.86	114.36	0.78	0.34	1.11	140.28	23.32	163.59	0.559	No	No	1.71
109	19.03	76.52	0.79	0.35	1.11	74.94	35.30	110.23	0.188	No	No	0.58
110	19.19	42.83	0.79	0.37	1.11	39.64	48.20	87.84	4.000	No	Yes	2.00
111	19.36	29.03	0.80	0.39	1.12	28.51	48.20	76.71	4.000	No	Yes	2.00
112	19.52	27.23	0.80	0.37	1.11	28.91	48.19	77.10	4.000	No	Yes	2.00
113	19.68	28.50	0.81	0.36	1.10	33.26	48.18	81.45	4.000	No	Yes	2.00
114	19.85	29.18	0.81	0.37	1.10	32.27	48.18	80.45	4.000	No	Yes	2.00
115	20.01	27.48	0.82	0.38	1.10	30.94	48.17	79.11	4.000	No	Yes	2.00
116	20.18	27.39	0.82	0.43	1.11	27.86	48.16	76.02	4.000	No	Yes	2.00
117	20.34	28.39	0.83	0.43	1.11	31.97	46.17	78.14	4.000	No	Yes	2.00
118	20.50	30.88	0.83	0.45	1.11	34.25	35.45	69.70	4.000	No	Yes	2.00
119	20.67	34.18	0.84	0.45	1.11	35.80	30.05	65.86	0.085	No	No	0.26
120	20.83	38.12	0.84	0.44	1.11	42.53	26.10	68.62	0.092	No	No	0.28
121	21.00	38.83	0.85	0.43	1.10	46.47	25.96	72.43	0.099	No	No	0.30
122	21.16	34.22	0.85	0.44	1.10	37.67	32.52	70.19	4.000	No	Yes	2.00
123	21.32	25.97	0.85	0.45	1.10	27.49	48.10	75.59	4.000	No	Yes	2.00
124	21.49	19.86	0.86	0.48	1.10	19.93	48.08	68.01	4.000	No	Yes	2.00
125	21.65	21.21	0.86	0.51	1.11	17.94	48.07	66.01	4.000	No	Yes	2.00
126	21.82	30.69	0.87	0.43	1.09	31.55	45.93	77.49	4.000	No	Yes	2.00
127	21.98	36.29	0.87	0.37	1.07	50.03	44.53	94.56	4.000	No	Yes	2.00
128	22.15	33.86	0.88	0.41	1.08	35.76	48.02	83.78	4.000	No	Yes	2.00
129	22.31	25.23	0.88	0.45	1.08	23.72	48.00	71.73	4.000	No	Yes	2.00
130	22.47	23.15	0.89	0.48	1.09	22.52	47.99	70.51	4.000	No	Yes	2.00
131	22.64	25.01	0.89	0.46	1.08	28.95	41.65	70.60	4.000	No	Yes	2.00
132	22.80	35.49	0.90	0.50	1.08	29.64	26.34	55.98	0.074	No	No	0.23
133	22.97	51.25	0.90	0.45	1.07	55.80	16.62	72.42	0.106	No	No	0.33
134	23.13	65.18	0.91	0.45	1.07	79.34	10.60	89.93	0.147	No	No	0.46
135	23.29	63.11	0.91	0.46	1.07	74.09	9.84	83.93	0.134	No	No	0.42

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q_k (tsf)	σ_v' (tsf)	c	C_q	$q_{c,1}$ (tsf)	Δq_c	$q_{c,1,mod}$ (tsf)	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
136	23.46	48.03	0.92	0.47	1.07	49.12	16.06	65.18	0.094	No	No	0.29
137	23.62	31.40	0.92	0.45	1.06	30.85	38.42	69.28	4.000	No	Yes	2.00
138	23.79	21.98	0.93	0.46	1.06	20.57	47.83	68.40	4.000	No	Yes	2.00
139	23.95	19.15	0.93	0.43	1.06	18.66	47.80	66.46	4.000	No	Yes	2.00
140	24.11	22.36	0.94	0.40	1.05	21.47	47.78	69.25	4.000	No	Yes	2.00
141	24.28	30.51	0.94	0.36	1.04	30.19	47.75	77.93	4.000	No	Yes	2.00
142	24.44	36.82	0.95	0.34	1.04	43.68	47.72	91.40	4.000	No	Yes	2.00
143	24.61	40.05	0.95	0.39	1.04	41.04	47.69	88.73	4.000	No	Yes	2.00
144	24.77	41.73	0.96	0.45	1.05	40.46	24.32	64.78	0.087	No	No	0.28
145	24.93	46.02	0.96	0.47	1.05	49.28	16.17	65.45	0.094	No	No	0.30
146	25.10	50.57	0.97	0.45	1.04	54.48	16.06	70.55	0.103	No	No	0.33
147	25.26	51.86	0.97	0.44	1.04	54.34	18.36	72.69	0.105	No	No	0.33
148	25.43	50.72	0.98	0.44	1.04	52.88	19.26	72.14	0.104	No	No	0.33
149	25.59	47.63	0.98	0.43	1.03	50.47	23.13	73.60	0.103	No	No	0.33
150	25.75	42.82	0.99	0.44	1.03	44.46	24.16	68.63	0.094	No	No	0.30
151	25.92	38.12	0.99	0.45	1.03	37.73	27.03	64.76	0.086	No	No	0.27
152	26.08	35.62	1.00	0.46	1.03	35.78	28.62	64.40	4.000	No	Yes	2.00
153	26.25	36.45	1.00	0.44	1.02	36.50	33.47	69.97	4.000	No	Yes	2.00
154	26.41	35.40	1.01	0.41	1.02	39.92	41.03	80.95	4.000	No	Yes	2.00
155	26.57	33.16	1.01	0.43	1.02	32.30	47.36	79.66	4.000	No	Yes	2.00
156	26.74	26.72	1.02	0.42	1.02	29.42	47.33	76.75	4.000	No	Yes	2.00
157	26.90	21.75	1.02	0.48	1.02	20.12	47.30	67.42	4.000	No	Yes	2.00
158	27.07	17.49	1.02	0.51	1.02	17.01	47.27	64.28	4.000	No	Yes	2.00
159	27.23	16.89	1.03	0.53	1.01	16.32	47.24	63.56	4.000	No	Yes	2.00
160	27.39	17.74	1.03	0.53	1.01	18.15	47.21	65.36	4.000	No	Yes	2.00
161	27.56	19.19	1.04	0.55	1.01	19.42	32.81	52.22	4.000	No	Yes	2.00
162	27.72	20.57	1.04	0.60	1.01	20.55	18.51	39.06	4.000	No	Yes	2.00
163	27.89	24.83	1.05	0.65	1.01	22.17	8.93	31.11	0.058	No	No	0.19
164	28.05	37.01	1.05	0.66	1.01	32.08	2.61	34.69	0.064	No	No	0.21
165	28.21	52.16	1.05	0.64	1.00	56.58	0.45	57.02	0.091	No	No	0.30
166	28.38	59.71	1.06	0.64	1.00	66.88	0.00	66.88	0.106	No	No	0.34
167	28.54	55.33	1.06	0.64	1.00	54.04	0.43	54.46	0.087	No	No	0.29
168	28.71	44.81	1.07	0.59	1.00	43.25	4.32	47.57	0.076	No	No	0.25
169	28.87	36.89	1.07	0.52	0.99	35.55	15.01	50.56	0.074	No	No	0.24
170	29.04	31.36	1.08	0.46	0.99	30.46	37.90	68.35	4.000	No	Yes	2.00
171	29.20	27.91	1.08	0.42	0.99	26.73	46.89	73.62	4.000	No	Yes	2.00
172	29.36	26.98	1.09	0.41	0.99	25.15	46.85	72.00	4.000	No	Yes	2.00
173	29.53	30.16	1.09	0.39	0.99	27.51	46.82	74.33	4.000	No	Yes	2.00
174	29.69	34.28	1.10	0.37	0.99	35.97	46.78	82.75	4.000	No	Yes	2.00
175	29.86	36.27	1.10	0.38	0.98	37.16	46.74	83.90	4.000	No	Yes	2.00
176	30.02	35.33	1.11	0.41	0.98	33.13	46.71	79.83	4.000	No	Yes	2.00
177	30.18	32.51	1.11	0.43	0.98	32.87	45.97	78.84	4.000	No	Yes	2.00
178	30.35	30.62	1.12	0.45	0.98	28.47	43.63	72.10	4.000	No	Yes	2.00
179	30.51	29.09	1.12	0.46	0.97	27.29	45.70	72.99	4.000	No	Yes	2.00
180	30.68	29.70	1.13	0.45	0.97	28.07	46.57	74.64	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q_k (tsf)	σ_v' (tsf)	c	C_q	$q_{c,1}$ (tsf)	Δq_c	$q_{c,1,mod}$ (tsf)	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
181	30.84	31.68	1.13	0.44	0.97	30.01	46.53	76.54	4.000	No	Yes	2.00
182	31.00	36.66	1.14	0.44	0.97	32.68	40.57	73.25	4.000	No	Yes	2.00
183	31.17	45.07	1.14	0.43	0.97	42.22	29.85	72.07	0.096	No	No	0.32
184	31.33	49.32	1.14	0.42	0.97	54.47	22.65	77.12	0.111	No	No	0.38
185	31.50	49.61	1.15	0.46	0.96	44.95	19.60	64.55	0.091	No	No	0.31
186	31.66	50.64	1.15	0.47	0.96	42.67	17.67	60.34	0.086	No	No	0.29
187	31.82	66.54	1.16	0.46	0.96	56.45	14.49	70.94	0.105	No	No	0.36
188	31.99	105.26	1.16	0.43	0.96	89.75	11.88	101.63	0.181	No	No	0.62
189	32.15	152.62	1.17	0.39	0.96	154.78	11.20	165.98	0.566	No	No	1.93
190	32.32	193.84	1.18	0.39	0.96	193.69	9.48	203.17	1.085	No	No	2.00
191	32.48	213.18	1.18	0.39	0.96	209.23	8.42	217.65	1.386	No	No	2.00
192	32.64	218.38	1.19	0.39	0.96	209.62	8.33	217.95	1.392	No	No	2.00
193	32.81	212.89	1.19	0.38	0.96	207.83	10.40	218.23	1.440	No	No	2.00
194	32.97	201.32	1.20	0.36	0.96	193.16	13.40	206.56	1.208	No	No	2.00
195	33.14	189.26	1.20	0.37	0.95	175.94	12.10	188.04	0.850	No	No	2.00
196	33.30	182.98	1.21	0.40	0.95	171.80	8.95	180.75	0.725	No	No	2.00
197	33.47	184.02	1.21	0.46	0.94	171.93	3.96	175.89	0.636	No	No	2.00
198	33.63	186.81	1.22	0.48	0.93	175.26	2.42	177.68	0.647	No	No	2.00
199	33.79	187.43	1.23	0.49	0.93	176.56	2.31	178.87	0.659	No	No	2.00
200	33.96	183.42	1.23	0.46	0.93	172.52	3.67	176.19	0.638	No	No	2.00
201	34.12	175.90	1.24	0.44	0.93	164.14	5.38	169.52	0.578	No	No	2.00
202	34.28	165.98	1.24	0.43	0.93	155.85	6.19	162.04	0.511	No	No	1.80
203	34.45	158.47	1.25	0.45	0.93	144.27	5.49	149.75	0.412	No	No	1.45
204	34.61	154.51	1.25	0.46	0.93	141.74	4.53	146.27	0.387	No	No	1.37
205	34.78	155.87	1.26	0.48	0.92	142.82	3.36	146.18	0.384	No	No	1.36
206	34.94	159.33	1.26	0.49	0.92	146.04	2.51	148.56	0.397	No	No	1.41
207	35.10	166.53	1.27	0.51	0.91	149.24	1.74	150.98	0.412	No	No	1.46
208	35.27	167.54	1.27	0.50	0.91	161.23	2.07	163.30	0.507	No	No	1.81
209	35.43	159.67	1.28	0.47	0.92	148.62	3.81	152.43	0.427	No	No	1.53
210	35.60	156.70	1.28	0.46	0.92	128.23	5.55	133.78	0.314	No	No	1.12
211	35.76	181.13	1.29	0.46	0.91	153.21	4.07	157.28	0.465	No	No	1.67
212	35.92	234.84	1.29	0.48	0.91	213.84	1.83	215.67	1.220	No	No	2.00
213	36.09	299.91	1.30	0.51	0.90	271.21	0.31	271.52	3.047	No	No	2.00
214	36.25	349.29	1.30	0.50	0.90	326.88	0.28	327.17	4.000	No	No	2.00
215	36.42	370.40	1.31	0.48	0.90	346.17	0.79	346.96	4.000	No	No	2.00
216	36.58	363.58	1.31	0.46	0.91	329.79	1.92	331.71	4.000	No	No	2.00
217	36.74	348.73	1.32	0.46	0.90	309.48	2.09	311.58	4.000	No	No	2.00
218	36.91	339.35	1.33	0.48	0.90	304.61	1.35	305.96	4.000	No	No	2.00
219	37.07	338.65	1.33	0.51	0.89	298.96	0.15	299.12	4.000	No	No	2.00
220	37.24	341.33	1.34	0.51	0.89	302.49	0.32	302.81	4.000	No	No	2.00
221	37.40	348.75	1.34	0.48	0.89	309.36	0.98	310.34	4.000	No	No	2.00
222	37.57	342.84	1.35	0.46	0.89	320.67	1.96	322.63	4.000	No	No	2.00
223	37.73	342.66	1.35	0.45	0.89	288.47	2.50	290.97	4.000	No	No	2.00
224	37.89	341.09	1.36	0.45	0.89	309.79	2.55	312.33	4.000	No	No	2.00
225	38.06	358.39	1.36	0.47	0.89	313.59	1.45	315.04	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)												
Point ID	Depth (ft)	q_k (tsf)	σ_v' (tsf)	c	C_q	q_{c1} (tsf)	Δq_c	$q_{c1,mod}$ (tsf)	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
226	38.22	372.99	1.37	0.53	0.87	326.22	0.00	326.22	4.000	No	No	2.00
227	38.39	391.40	1.38	0.59	0.86	334.35	0.00	334.35	4.000	No	No	2.00
228	38.55	408.33	1.38	0.60	0.85	348.58	0.00	348.58	4.000	No	No	2.00
229	38.71	421.40	1.39	0.56	0.86	365.26	0.00	365.26	4.000	No	No	2.00
230	38.88	427.31	1.39	0.55	0.86	369.12	0.00	369.12	4.000	No	No	2.00
231	39.04	418.90	1.40	0.55	0.86	365.69	0.00	365.69	4.000	No	No	2.00
232	39.21	401.54	1.40	0.54	0.86	343.07	0.00	343.07	4.000	No	No	2.00
233	39.37	389.68	1.41	0.54	0.86	323.72	0.00	323.72	4.000	No	No	2.00
234	39.53	393.48	1.41	0.54	0.85	334.21	0.00	334.21	4.000	No	No	2.00
235	39.70	408.36	1.42	0.55	0.85	350.44	0.00	350.44	4.000	No	No	2.00
236	39.86	418.10	1.42	0.55	0.85	358.71	0.00	358.71	4.000	No	No	2.00
237	40.03	402.57	1.43	0.54	0.85	356.92	0.00	356.92	4.000	No	No	2.00
238	40.19	338.71	1.43	0.53	0.85	310.77	0.00	310.77	4.000	No	No	2.00
239	40.35	235.90	1.44	0.51	0.86	197.25	1.10	198.35	0.903	No	No	2.00
240	40.52	139.85	1.45	0.49	0.86	95.88	4.38	100.26	0.179	No	No	0.68
241	40.68	78.81	1.45	0.47	0.86	66.24	9.81	76.05	0.118	No	No	0.45
242	40.85	53.51	1.45	0.50	0.85	40.39	13.69	54.08	0.080	No	No	0.31
243	41.01	38.50	1.46	0.52	0.85	29.85	19.52	49.37	4.000	No	Yes	2.00
244	41.17	32.89	1.46	0.52	0.85	26.50	23.79	50.29	4.000	No	Yes	2.00
245	41.34	32.73	1.47	0.50	0.85	25.81	30.10	55.91	4.000	No	Yes	2.00
246	41.50	32.94	1.47	0.46	0.86	30.24	33.35	63.59	4.000	No	Yes	2.00
247	41.67	33.03	1.48	0.47	0.85	27.04	36.26	63.30	4.000	No	Yes	2.00
248	41.83	30.19	1.48	0.48	0.85	25.92	36.65	62.57	4.000	No	Yes	2.00
249	41.99	27.66	1.49	0.51	0.84	22.29	34.76	57.05	4.000	No	Yes	2.00
250	42.16	25.19	1.49	0.54	0.83	20.21	32.08	52.29	4.000	No	Yes	2.00
251	42.32	23.43	1.50	0.57	0.82	19.10	28.00	47.10	4.000	No	Yes	2.00
252	42.49	21.95	1.50	0.59	0.81	17.40	27.07	44.47	4.000	No	Yes	2.00
253	42.65	19.74	1.51	0.60	0.81	16.22	29.36	45.59	4.000	No	Yes	2.00
254	42.81	18.07	1.51	0.62	0.80	13.38	36.79	50.16	4.000	No	Yes	2.00
255	42.98	17.26	1.51	0.61	0.80	13.15	43.23	56.37	4.000	No	Yes	2.00
256	43.14	17.90	1.52	0.60	0.81	14.15	42.48	56.63	4.000	No	Yes	2.00
257	43.31	18.53	1.52	0.59	0.81	15.00	39.60	54.59	4.000	No	Yes	2.00
258	43.47	17.92	1.53	0.60	0.80	14.68	38.74	53.42	4.000	No	Yes	2.00
259	43.63	16.35	1.53	0.63	0.79	12.48	40.30	52.78	4.000	No	Yes	2.00
260	43.80	14.65	1.54	0.67	0.78	10.89	41.91	52.80	4.000	No	Yes	2.00
261	43.96	13.79	1.54	0.69	0.77	10.21	41.86	52.07	4.000	No	Yes	2.00
262	44.13	14.30	1.54	0.70	0.77	10.14	38.05	48.19	4.000	No	Yes	2.00
263	44.29	15.62	1.55	0.66	0.78	11.94	33.71	45.65	4.000	No	Yes	2.00
264	44.45	17.01	1.55	0.64	0.78	13.31	29.95	43.26	4.000	No	Yes	2.00
265	44.62	17.46	1.56	0.65	0.78	13.46	27.60	41.07	4.000	No	Yes	2.00
266	44.78	17.37	1.56	0.67	0.77	12.86	25.34	38.21	4.000	No	Yes	2.00
267	44.95	17.72	1.57	0.68	0.76	12.83	21.79	34.61	4.000	No	Yes	2.00
268	45.11	19.60	1.57	0.68	0.76	13.99	17.53	31.52	4.000	No	Yes	2.00
269	45.28	20.08	1.57	0.63	0.78	17.46	17.38	34.84	4.000	No	Yes	2.00
270	45.44	19.26	1.58	0.67	0.77	14.00	20.42	34.42	4.000	No	Yes	2.00

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

Point ID	Depth (ft)	q_t (tsf)	σ_v' (tsf)	c	C_q	q_{c1} (tsf)	Δq_c	$q_{c1,mod}$ (tsf)	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
271	45.60	16.65	1.58	0.68	0.76	12.13	27.51	39.64	4.000	No	Yes	2.00
272	45.77	14.60	1.59	0.66	0.76	11.07	42.08	53.15	4.000	No	Yes	2.00
273	45.93	13.54	1.59	0.70	0.75	9.05	43.65	52.70	4.000	No	Yes	2.00
274	46.10	12.55	1.59	0.66	0.76	9.67	43.63	53.30	4.000	No	Yes	2.00
275	46.26	12.25	1.60	0.70	0.75	8.55	43.61	52.16	4.000	No	Yes	2.00
276	46.42	12.16	1.60	0.71	0.74	8.19	43.59	51.78	4.000	No	Yes	2.00
277	46.59	14.36	1.61	0.69	0.75	9.35	43.58	52.93	4.000	No	Yes	2.00
278	46.75	18.41	1.61	0.62	0.77	13.82	35.94	49.76	4.000	No	Yes	2.00
279	46.92	23.48	1.62	0.60	0.77	17.80	21.51	39.31	4.000	No	Yes	2.00
280	47.08	27.23	1.62	0.60	0.77	20.96	15.32	36.28	4.000	No	Yes	2.00
281	47.24	29.00	1.62	0.62	0.77	21.98	11.86	33.84	4.000	No	Yes	2.00
282	47.41	30.22	1.63	0.64	0.76	21.11	9.78	30.89	4.000	No	Yes	2.00
283	47.57	32.02	1.63	0.64	0.76	23.30	8.16	31.47	4.000	No	Yes	2.00
284	47.74	34.99	1.64	0.62	0.76	25.69	8.00	33.69	0.061	No	No	0.24
285	47.90	36.82	1.64	0.59	0.77	27.87	9.71	37.58	0.064	No	No	0.25
286	48.06	37.03	1.65	0.56	0.78	27.57	14.24	41.81	4.000	No	Yes	2.00
287	48.23	35.55	1.65	0.53	0.79	26.81	20.39	47.20	4.000	No	Yes	2.00
288	48.39	33.76	1.66	0.51	0.79	25.23	26.45	51.69	4.000	No	Yes	2.00
289	48.56	32.72	1.66	0.52	0.79	23.86	27.87	51.73	4.000	No	Yes	2.00
290	48.72	32.75	1.66	0.52	0.79	24.37	26.36	50.73	4.000	No	Yes	2.00
291	48.88	34.52	1.67	0.53	0.79	25.02	23.45	48.46	4.000	No	Yes	2.00
292	49.05	38.76	1.67	0.52	0.79	27.76	20.61	48.36	4.000	No	Yes	2.00
293	49.21	43.87	1.68	0.50	0.79	34.40	17.97	52.37	4.000	No	Yes	2.00
294	49.38	50.18	1.68	0.50	0.79	36.88	14.95	51.82	0.077	No	No	0.31
295	49.54	57.58	1.69	0.51	0.79	42.38	11.84	54.22	0.082	No	No	0.33
296	49.70	71.83	1.69	0.52	0.78	50.86	7.93	58.78	0.090	No	No	0.36
297	49.87	78.47	1.70	0.49	0.79	72.10	6.24	78.33	0.125	No	No	0.50
298	50.03	74.13	1.70	0.51	0.78	59.50	6.67	66.16	0.102	No	No	0.41
299	50.20	61.76	1.71	0.53	0.78	42.23	9.01	51.24	0.079	No	No	0.32

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
1.31	2.00	0.00	0.00	0.16	0.00		1.48	2.00	0.00	0.00	0.16	0.00
1.64	2.00	0.00	0.00	0.16	0.00		1.80	2.00	0.00	0.00	0.16	0.00
1.97	2.00	0.00	0.00	0.17	0.00		2.13	2.00	0.00	0.00	0.16	0.00
2.30	2.00	0.00	0.00	0.16	0.00		2.46	2.00	0.00	0.00	0.16	0.00
2.63	2.00	0.00	0.00	0.16	0.00		2.79	2.00	0.00	0.00	0.16	0.00
2.95	2.00	0.00	0.00	0.16	0.00		3.12	2.00	0.00	0.00	0.16	0.00
3.28	2.00	0.00	0.00	0.16	0.00		3.44	2.00	0.00	0.00	0.16	0.00
3.61	2.00	0.00	0.00	0.16	0.00		3.77	2.00	0.00	0.00	0.16	0.00
3.94	2.00	0.00	0.00	0.16	0.00		4.10	2.00	0.00	0.00	0.16	0.00
4.26	2.00	0.00	0.00	0.16	0.00		4.43	2.00	0.00	0.00	0.16	0.00
4.59	2.00	0.00	0.00	0.16	0.00		4.76	2.00	0.00	0.00	0.16	0.00
4.92	2.00	0.00	0.00	0.16	0.00		5.08	2.00	0.00	0.00	0.16	0.00
5.25	2.00	0.00	0.00	0.16	0.00		5.41	2.00	0.00	0.00	0.16	0.00
5.58	2.00	0.00	0.00	0.16	0.00		5.74	2.00	0.00	0.00	0.16	0.00
5.91	2.00	0.00	0.00	0.17	0.00		6.07	2.00	0.00	0.00	0.16	0.00
6.23	2.00	0.00	0.00	0.16	0.00		6.40	2.00	0.00	0.00	0.16	0.00
6.56	2.00	0.00	0.00	0.16	0.00		6.73	2.00	0.00	0.00	0.16	0.00
6.89	2.00	0.00	0.00	0.16	0.00		7.05	2.00	0.00	0.00	0.16	0.00
7.22	2.00	0.00	0.00	0.16	0.00		7.38	2.00	0.00	0.00	0.16	0.00
7.55	2.00	0.00	0.00	0.16	0.00		7.71	2.00	0.00	0.00	0.16	0.00
7.87	2.00	0.00	0.00	0.16	0.00		8.04	2.00	0.00	0.00	0.16	0.00
8.20	2.00	0.00	0.00	0.16	0.00		8.37	2.00	0.00	0.00	0.16	0.00
8.53	2.00	0.00	0.00	0.16	0.00		8.69	2.00	0.00	0.00	0.16	0.00
8.86	2.00	0.00	0.00	0.16	0.00		9.02	0.35	0.65	0.35	0.16	0.28
9.19	0.33	0.67	0.34	0.16	0.29		9.35	0.31	0.69	0.33	0.16	0.29
9.51	0.31	0.69	0.33	0.16	0.29		9.68	0.32	0.68	0.33	0.16	0.29
9.84	0.33	0.67	0.34	0.16	0.29		10.01	0.34	0.66	0.34	0.16	0.28
10.17	0.33	0.67	0.34	0.16	0.28		10.34	0.32	0.68	0.33	0.16	0.29
10.50	0.31	0.69	0.33	0.16	0.29		10.66	0.26	0.74	0.30	0.16	0.31
10.83	0.30	0.70	0.32	0.16	0.29		10.99	0.30	0.70	0.32	0.16	0.29
11.15	0.31	0.69	0.33	0.16	0.29		11.32	0.34	0.66	0.34	0.16	0.27
11.48	0.38	0.62	0.37	0.16	0.25		11.65	0.41	0.59	0.39	0.16	0.24
11.81	0.41	0.59	0.40	0.16	0.24		11.97	0.40	0.60	0.39	0.16	0.24
12.14	0.39	0.61	0.38	0.16	0.25		12.30	0.38	0.62	0.37	0.16	0.25
12.47	0.39	0.61	0.38	0.16	0.25		12.63	0.37	0.63	0.36	0.16	0.25
12.79	0.35	0.65	0.35	0.16	0.26		12.96	0.35	0.65	0.35	0.16	0.26
13.12	0.36	0.64	0.36	0.16	0.26		13.29	0.37	0.63	0.37	0.16	0.25
13.45	0.37	0.63	0.37	0.16	0.25		13.62	0.38	0.62	0.37	0.16	0.25
13.78	0.40	0.60	0.39	0.16	0.24		13.94	0.42	0.58	0.40	0.16	0.23
14.11	0.42	0.58	0.40	0.16	0.23		14.27	0.38	0.62	0.37	0.16	0.24
14.44	0.40	0.60	0.39	0.16	0.23		14.60	0.41	0.59	0.39	0.16	0.23
14.76	0.40	0.60	0.38	0.16	0.23		14.93	0.27	0.73	0.31	0.16	0.28
15.09	0.19	0.81	0.27	0.16	0.31		15.26	0.18	0.82	0.27	0.16	0.32
15.42	2.00	0.00	0.00	0.16	0.00		15.58	0.17	0.83	0.27	0.16	0.32
15.75	0.19	0.81	0.27	0.16	0.31		15.91	0.20	0.80	0.28	0.16	0.30
16.08	0.19	0.81	0.27	0.16	0.30		16.24	0.20	0.80	0.28	0.16	0.30
16.40	0.20	0.80	0.28	0.16	0.30		16.57	0.20	0.80	0.28	0.16	0.30
16.73	0.21	0.79	0.28	0.16	0.29		16.90	0.25	0.75	0.30	0.16	0.28

:: 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
17.06	0.27	0.73	0.31	0.16	0.27	17.22	0.29	0.71	0.32	0.16	0.26
17.39	0.62	0.38	0.67	0.16	0.14	17.55	1.19	0.00	0.00	0.16	0.00
17.72	1.25	0.00	0.00	0.16	0.00	17.88	0.85	0.00	0.00	0.16	0.05
18.05	0.58	0.42	0.59	0.16	0.15	18.21	0.45	0.55	0.42	0.16	0.20
18.37	0.69	0.31	0.89	0.16	0.11	18.54	1.28	0.00	0.00	0.16	0.00
18.70	2.00	0.00	0.00	0.16	0.00	18.86	1.71	0.00	0.00	0.16	0.00
19.03	0.58	0.42	0.59	0.16	0.15	19.19	2.00	0.00	0.00	0.16	0.00
19.36	2.00	0.00	0.00	0.16	0.00	19.52	2.00	0.00	0.00	0.16	0.00
19.68	2.00	0.00	0.00	0.16	0.00	19.85	2.00	0.00	0.00	0.16	0.00
20.01	2.00	0.00	0.00	0.16	0.00	20.18	2.00	0.00	0.00	0.16	0.00
20.34	2.00	0.00	0.00	0.16	0.00	20.50	2.00	0.00	0.00	0.16	0.00
20.67	0.26	0.74	0.30	0.16	0.25	20.83	0.28	0.72	0.31	0.16	0.24
21.00	0.30	0.70	0.32	0.16	0.24	21.16	2.00	0.00	0.00	0.16	0.00
21.32	2.00	0.00	0.00	0.16	0.00	21.49	2.00	0.00	0.00	0.16	0.00
21.65	2.00	0.00	0.00	0.16	0.00	21.82	2.00	0.00	0.00	0.16	0.00
21.98	2.00	0.00	0.00	0.16	0.00	22.15	2.00	0.00	0.00	0.16	0.00
22.31	2.00	0.00	0.00	0.16	0.00	22.47	2.00	0.00	0.00	0.16	0.00
22.64	2.00	0.00	0.00	0.16	0.00	22.80	0.23	0.77	0.29	0.16	0.25
22.97	0.33	0.67	0.34	0.16	0.22	23.13	0.46	0.54	0.44	0.16	0.17
23.29	0.42	0.58	0.40	0.16	0.19	23.46	0.29	0.71	0.32	0.16	0.23
23.62	2.00	0.00	0.00	0.16	0.00	23.79	2.00	0.00	0.00	0.16	0.00
23.95	2.00	0.00	0.00	0.16	0.00	24.11	2.00	0.00	0.00	0.16	0.00
24.28	2.00	0.00	0.00	0.16	0.00	24.44	2.00	0.00	0.00	0.16	0.00
24.61	2.00	0.00	0.00	0.16	0.00	24.77	0.28	0.72	0.31	0.16	0.23
24.93	0.30	0.70	0.32	0.16	0.22	25.10	0.33	0.67	0.34	0.16	0.21
25.26	0.33	0.67	0.34	0.16	0.20	25.43	0.33	0.67	0.34	0.16	0.21
25.59	0.33	0.67	0.34	0.16	0.20	25.75	0.30	0.70	0.32	0.16	0.21
25.92	0.27	0.73	0.31	0.16	0.22	26.08	2.00	0.00	0.00	0.16	0.00
26.25	2.00	0.00	0.00	0.16	0.00	26.41	2.00	0.00	0.00	0.16	0.00
26.57	2.00	0.00	0.00	0.16	0.00	26.74	2.00	0.00	0.00	0.16	0.00
26.90	2.00	0.00	0.00	0.16	0.00	27.07	2.00	0.00	0.00	0.16	0.00
27.23	2.00	0.00	0.00	0.16	0.00	27.39	2.00	0.00	0.00	0.16	0.00
27.56	2.00	0.00	0.00	0.16	0.00	27.72	2.00	0.00	0.00	0.16	0.00
27.89	0.19	0.81	0.27	0.16	0.23	28.05	0.21	0.79	0.28	0.16	0.23
28.21	0.30	0.70	0.32	0.16	0.20	28.38	0.34	0.66	0.35	0.16	0.19
28.54	0.29	0.71	0.31	0.16	0.20	28.71	0.25	0.75	0.30	0.16	0.21
28.87	0.24	0.76	0.30	0.16	0.21	29.04	2.00	0.00	0.00	0.16	0.00
29.20	2.00	0.00	0.00	0.16	0.00	29.36	2.00	0.00	0.00	0.16	0.00
29.53	2.00	0.00	0.00	0.16	0.00	29.69	2.00	0.00	0.00	0.16	0.00
29.86	2.00	0.00	0.00	0.16	0.00	30.02	2.00	0.00	0.00	0.16	0.00
30.18	2.00	0.00	0.00	0.16	0.00	30.35	2.00	0.00	0.00	0.16	0.00
30.51	2.00	0.00	0.00	0.16	0.00	30.68	2.00	0.00	0.00	0.16	0.00
30.84	2.00	0.00	0.00	0.16	0.00	31.00	2.00	0.00	0.00	0.16	0.00
31.17	0.32	0.68	0.33	0.16	0.18	31.33	0.38	0.62	0.37	0.16	0.16
31.50	0.31	0.69	0.33	0.16	0.18	31.66	0.29	0.71	0.32	0.16	0.18
31.82	0.36	0.64	0.36	0.16	0.17	31.99	0.62	0.38	0.67	0.16	0.10
32.15	1.93	0.00	0.00	0.16	0.00	32.32	2.00	0.00	0.00	0.16	0.00
32.48	2.00	0.00	0.00	0.16	0.00	32.64	2.00	0.00	0.00	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
32.81	2.00	0.00	0.00	0.16	0.00		32.97	2.00	0.00	0.00	0.16	0.00
33.14	2.00	0.00	0.00	0.16	0.00		33.30	2.00	0.00	0.00	0.16	0.00
33.47	2.00	0.00	0.00	0.16	0.00		33.63	2.00	0.00	0.00	0.16	0.00
33.79	2.00	0.00	0.00	0.16	0.00		33.96	2.00	0.00	0.00	0.16	0.00
34.12	2.00	0.00	0.00	0.16	0.00		34.28	1.80	0.00	0.00	0.16	0.00
34.45	1.45	0.00	0.00	0.16	0.00		34.61	1.37	0.00	0.00	0.16	0.00
34.78	1.36	0.00	0.00	0.16	0.00		34.94	1.41	0.00	0.00	0.16	0.00
35.10	1.46	0.00	0.00	0.16	0.00		35.27	1.81	0.00	0.00	0.16	0.00
35.43	1.53	0.00	0.00	0.16	0.00		35.60	1.12	0.00	0.00	0.16	0.00
35.76	1.67	0.00	0.00	0.16	0.00		35.92	2.00	0.00	0.00	0.16	0.00
36.09	2.00	0.00	0.00	0.16	0.00		36.25	2.00	0.00	0.00	0.16	0.00
36.42	2.00	0.00	0.00	0.16	0.00		36.58	2.00	0.00	0.00	0.16	0.00
36.74	2.00	0.00	0.00	0.16	0.00		36.91	2.00	0.00	0.00	0.16	0.00
37.07	2.00	0.00	0.00	0.16	0.00		37.24	2.00	0.00	0.00	0.16	0.00
37.40	2.00	0.00	0.00	0.16	0.00		37.57	2.00	0.00	0.00	0.16	0.00
37.73	2.00	0.00	0.00	0.16	0.00		37.89	2.00	0.00	0.00	0.16	0.00
38.06	2.00	0.00	0.00	0.16	0.00		38.22	2.00	0.00	0.00	0.16	0.00
38.39	2.00	0.00	0.00	0.16	0.00		38.55	2.00	0.00	0.00	0.16	0.00
38.71	2.00	0.00	0.00	0.16	0.00		38.88	2.00	0.00	0.00	0.16	0.00
39.04	2.00	0.00	0.00	0.16	0.00		39.21	2.00	0.00	0.00	0.16	0.00
39.37	2.00	0.00	0.00	0.16	0.00		39.53	2.00	0.00	0.00	0.16	0.00
39.70	2.00	0.00	0.00	0.16	0.00		39.86	2.00	0.00	0.00	0.16	0.00
40.03	2.00	0.00	0.00	0.16	0.00		40.19	2.00	0.00	0.00	0.16	0.00
40.35	2.00	0.00	0.00	0.16	0.00		40.52	0.68	0.32	0.84	0.16	0.06
40.68	0.45	0.55	0.43	0.16	0.10		40.85	0.31	0.69	0.33	0.16	0.13
41.01	2.00	0.00	0.00	0.17	0.00		41.17	2.00	0.00	0.00	0.16	0.00
41.34	2.00	0.00	0.00	0.16	0.00		41.50	2.00	0.00	0.00	0.16	0.00
41.67	2.00	0.00	0.00	0.16	0.00		41.83	2.00	0.00	0.00	0.16	0.00
41.99	2.00	0.00	0.00	0.16	0.00		42.16	2.00	0.00	0.00	0.16	0.00
42.32	2.00	0.00	0.00	0.16	0.00		42.49	2.00	0.00	0.00	0.16	0.00
42.65	2.00	0.00	0.00	0.16	0.00		42.81	2.00	0.00	0.00	0.16	0.00
42.98	2.00	0.00	0.00	0.16	0.00		43.14	2.00	0.00	0.00	0.16	0.00
43.31	2.00	0.00	0.00	0.16	0.00		43.47	2.00	0.00	0.00	0.16	0.00
43.63	2.00	0.00	0.00	0.16	0.00		43.80	2.00	0.00	0.00	0.16	0.00
43.96	2.00	0.00	0.00	0.16	0.00		44.13	2.00	0.00	0.00	0.16	0.00
44.29	2.00	0.00	0.00	0.16	0.00		44.45	2.00	0.00	0.00	0.16	0.00
44.62	2.00	0.00	0.00	0.16	0.00		44.78	2.00	0.00	0.00	0.16	0.00
44.95	2.00	0.00	0.00	0.16	0.00		45.11	2.00	0.00	0.00	0.16	0.00
45.28	2.00	0.00	0.00	0.16	0.00		45.44	2.00	0.00	0.00	0.16	0.00
45.60	2.00	0.00	0.00	0.16	0.00		45.77	2.00	0.00	0.00	0.16	0.00
45.93	2.00	0.00	0.00	0.16	0.00		46.10	2.00	0.00	0.00	0.16	0.00
46.26	2.00	0.00	0.00	0.16	0.00		46.42	2.00	0.00	0.00	0.16	0.00
46.59	2.00	0.00	0.00	0.16	0.00		46.75	2.00	0.00	0.00	0.16	0.00
46.92	2.00	0.00	0.00	0.16	0.00		47.08	2.00	0.00	0.00	0.16	0.00
47.24	2.00	0.00	0.00	0.16	0.00		47.41	2.00	0.00	0.00	0.16	0.00
47.57	2.00	0.00	0.00	0.16	0.00		47.74	0.24	0.76	0.29	0.16	0.10
47.90	0.25	0.75	0.30	0.16	0.10		48.06	2.00	0.00	0.00	0.16	0.00
48.23	2.00	0.00	0.00	0.16	0.00		48.39	2.00	0.00	0.00	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
48.56	2.00	0.00	0.00	0.16	0.00	48.72	2.00	0.00	0.00	0.16	0.00
48.88	2.00	0.00	0.00	0.16	0.00	49.05	2.00	0.00	0.00	0.16	0.00
49.21	2.00	0.00	0.00	0.16	0.00	49.38	0.31	0.69	0.33	0.16	0.09
49.54	0.33	0.67	0.34	0.16	0.08	49.70	0.36	0.64	0.36	0.16	0.08
49.87	0.50	0.50	0.48	0.16	0.06	50.03	0.41	0.59	0.39	0.16	0.07
50.20	0.32	0.68	0.33	0.16	0.08						

Overall liquefaction potential: 21.30

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

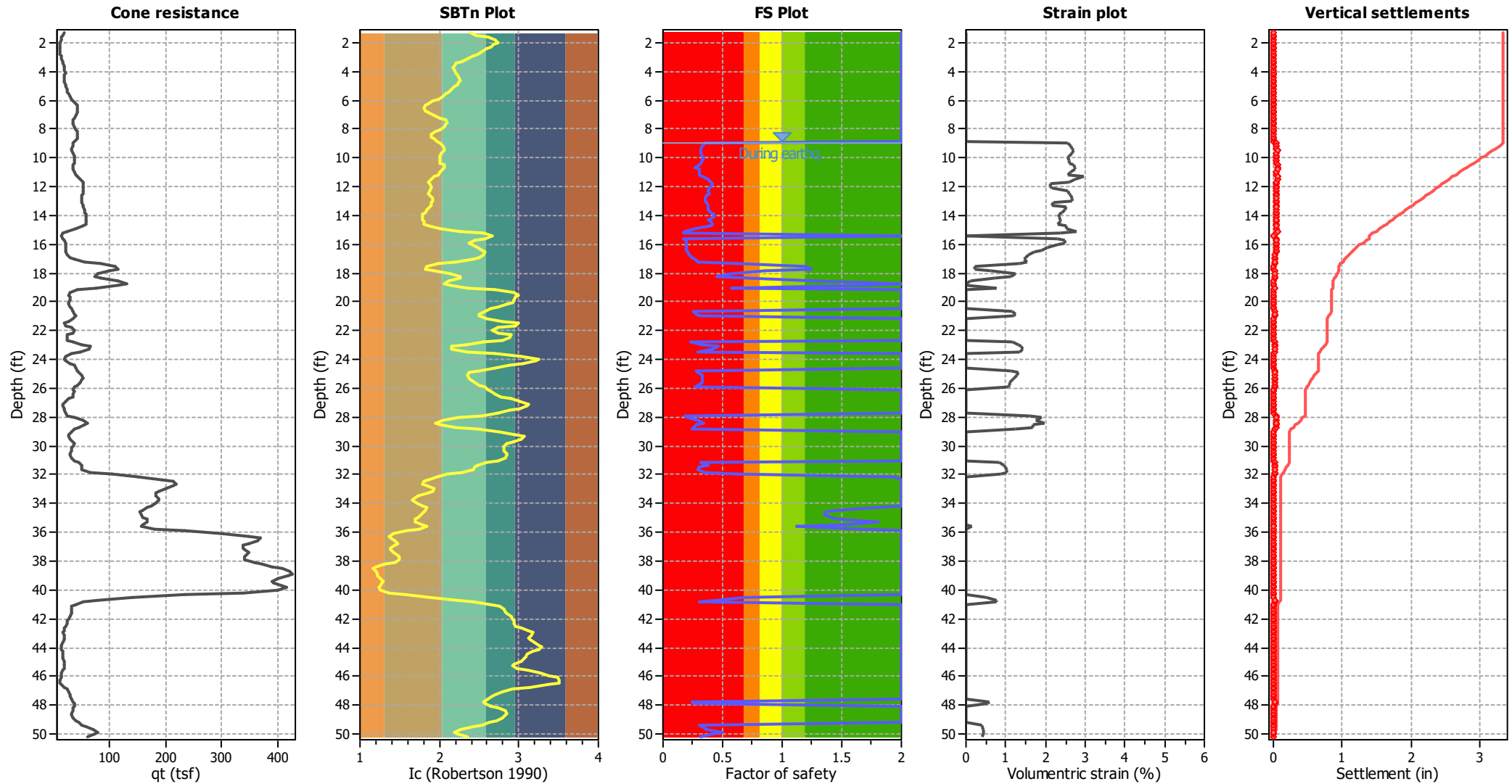
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point

F_L: 1 - FSw_z: Function value of the extend of soil liquefaction according to depthd_z: Layer thickness (ft)

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 due to soil liquefaction ::													
Depth (ft)	$q_{c,1,mod}$ (tsf)	$q_{c,1N,mod}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c,1,mod}$ (tsf)	$q_{c,1N,mod}$	FS	e_v (%)	DF	Settlement (in)
9.02	59.07	55.82	0.35	2.58	0.85	0.05	9.19	55.15	52.12	0.33	2.63	0.84	0.05
9.35	53.02	50.11	0.31	2.68	0.84	0.05	9.51	53.28	50.35	0.31	2.69	0.84	0.05
9.68	54.65	51.65	0.32	2.67	0.84	0.05	9.84	57.59	54.42	0.33	2.61	0.83	0.05
10.01	59.33	56.07	0.34	2.58	0.83	0.05	10.17	57.81	54.63	0.33	2.58	0.83	0.05
10.34	56.65	53.54	0.32	2.61	0.82	0.05	10.50	54.92	51.90	0.31	2.71	0.82	0.05
10.66	44.93	42.46	0.26	2.73	0.82	0.05	10.83	54.87	51.86	0.30	2.73	0.82	0.05
10.99	54.29	51.31	0.30	2.64	0.81	0.05	11.15	56.34	53.24	0.31	2.57	0.81	0.05
11.32	61.93	58.53	0.34	2.96	0.81	0.06	11.48	71.04	67.14	0.38	2.74	0.81	0.05
11.65	75.27	71.14	0.41	2.58	0.80	0.05	11.81	76.53	72.33	0.41	2.13	0.80	0.04
11.97	75.01	70.89	0.40	2.11	0.80	0.04	12.14	72.93	68.93	0.39	2.14	0.79	0.04
12.30	72.73	68.74	0.38	2.57	0.79	0.05	12.47	74.68	70.58	0.39	2.58	0.79	0.05
12.63	70.80	66.92	0.37	2.62	0.79	0.05	12.79	67.16	63.48	0.35	2.67	0.78	0.05
12.96	67.78	64.06	0.35	2.67	0.78	0.05	13.12	69.76	65.93	0.36	2.19	0.78	0.04
13.29	72.12	68.16	0.37	2.15	0.77	0.04	13.45	72.51	68.52	0.37	2.52	0.77	0.05
13.62	73.81	69.76	0.38	2.47	0.77	0.05	13.78	78.71	74.39	0.40	2.40	0.77	0.05
13.94	81.87	77.38	0.42	2.34	0.76	0.05	14.11	82.60	78.06	0.42	2.36	0.76	0.05
14.27	76.25	72.06	0.38	2.37	0.76	0.05	14.44	79.04	74.70	0.40	2.36	0.76	0.05
14.60	80.92	76.48	0.41	2.32	0.75	0.05	14.76	78.74	74.42	0.40	2.53	0.75	0.05
14.93	52.51	49.62	0.27	2.51	0.75	0.05	15.09	29.93	28.29	0.19	2.76	0.74	0.05
15.26	28.51	26.95	0.18	2.38	0.74	0.05	15.42	26.77	25.30	2.00	0.00	0.74	0.00
15.58	26.72	25.25	0.17	2.29	0.74	0.05	15.75	33.64	31.79	0.19	2.50	0.73	0.05
15.91	35.30	33.36	0.20	2.48	0.73	0.05	16.08	35.77	33.80	0.19	2.32	0.73	0.05
16.24	38.71	36.59	0.20	2.07	0.72	0.04	16.40	40.51	38.28	0.20	1.89	0.72	0.04
16.57	44.48	42.04	0.20	1.70	0.72	0.03	16.73	49.44	46.72	0.21	1.57	0.72	0.03
16.90	58.40	55.19	0.25	1.50	0.71	0.03	17.06	63.31	59.84	0.27	1.47	0.71	0.03
17.22	64.67	61.12	0.29	1.52	0.71	0.03	17.39	107.91	101.98	0.62	1.35	0.71	0.03
17.55	146.70	138.65	1.19	0.21	0.70	0.00	17.72	149.50	141.29	1.25	0.21	0.70	0.00
17.88	126.70	119.74	0.85	0.62	0.70	0.01	18.05	104.98	99.21	0.58	1.24	0.69	0.02
18.21	93.43	88.30	0.45	1.12	0.69	0.02	18.37	117.47	111.02	0.69	0.74	0.69	0.01
18.54	148.44	140.29	1.28	0.12	0.69	0.00	18.70	186.21	175.98	2.00	0.00	0.68	0.00
18.86	163.59	154.61	1.71	0.00	0.68	0.00	19.03	110.23	104.18	0.58	0.78	0.68	0.02
19.19	87.84	83.02	2.00	0.00	0.67	0.00	19.36	76.71	72.50	2.00	0.00	0.67	0.00
19.52	77.10	72.87	2.00	0.00	0.67	0.00	19.68	81.45	76.97	2.00	0.00	0.67	0.00
19.85	80.45	76.03	2.00	0.00	0.66	0.00	20.01	79.11	74.76	2.00	0.00	0.66	0.00
20.18	76.02	71.85	2.00	0.00	0.66	0.00	20.34	78.14	73.85	2.00	0.00	0.66	0.00
20.50	69.70	65.88	2.00	0.00	0.65	0.00	20.67	65.86	62.24	0.26	1.18	0.65	0.02
20.83	68.62	64.85	0.28	1.23	0.65	0.02	21.00	72.43	68.45	0.30	1.22	0.64	0.02
21.16	70.19	66.34	2.00	0.00	0.64	0.00	21.32	75.59	71.44	2.00	0.00	0.64	0.00
21.49	68.01	64.28	2.00	0.00	0.64	0.00	21.65	66.01	62.39	2.00	0.00	0.63	0.00
21.82	77.49	73.23	2.00	0.00	0.63	0.00	21.98	94.56	89.36	2.00	0.00	0.63	0.00
22.15	83.78	79.18	2.00	0.00	0.62	0.00	22.31	71.73	67.79	2.00	0.00	0.62	0.00
22.47	70.51	66.63	2.00	0.00	0.62	0.00	22.64	70.60	66.72	2.00	0.00	0.62	0.00
22.80	55.98	52.90	0.23	1.19	0.61	0.02	22.97	72.42	68.44	0.33	1.33	0.61	0.03
23.13	89.93	84.99	0.46	1.39	0.61	0.03	23.29	83.93	79.32	0.42	1.43	0.61	0.03
23.46	65.18	61.60	0.29	1.35	0.60	0.03	23.62	69.28	65.47	2.00	0.00	0.60	0.00
23.79	68.40	64.64	2.00	0.00	0.60	0.00	23.95	66.46	62.81	2.00	0.00	0.59	0.00
24.11	69.25	65.45	2.00	0.00	0.59	0.00	24.28	77.93	73.65	2.00	0.00	0.59	0.00
24.44	91.40	86.38	2.00	0.00	0.59	0.00	24.61	88.73	83.86	2.00	0.00	0.58	0.00

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

Depth (ft)	$q_{c,1,mod}$ (tsf)	$q_{c,1N,mod}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c,1,mod}$ (tsf)	$q_{c,1N,mod}$	FS	e_v (%)	DF	Settlement (in)
24.77	64.78	61.22	0.28	1.14	0.58	0.02	24.93	65.45	61.86	0.30	1.32	0.58	0.03
25.10	70.55	66.67	0.33	1.29	0.57	0.03	25.26	72.69	68.70	0.33	1.21	0.57	0.02
25.43	72.14	68.17	0.33	1.19	0.57	0.02	25.59	73.60	69.56	0.33	1.11	0.57	0.02
25.75	68.63	64.86	0.30	1.11	0.56	0.02	25.92	64.76	61.20	0.27	1.07	0.56	0.02
26.08	64.40	60.87	2.00	0.00	0.56	0.00	26.25	69.97	66.13	2.00	0.00	0.56	0.00
26.41	80.95	76.50	2.00	0.00	0.55	0.00	26.57	79.66	75.29	2.00	0.00	0.55	0.00
26.74	76.75	72.53	2.00	0.00	0.55	0.00	26.90	67.42	63.72	2.00	0.00	0.54	0.00
27.07	64.28	60.75	2.00	0.00	0.54	0.00	27.23	63.56	60.07	2.00	0.00	0.54	0.00
27.39	65.36	61.77	2.00	0.00	0.54	0.00	27.56	52.22	49.36	2.00	0.00	0.53	0.00
27.72	39.06	36.91	2.00	0.00	0.53	0.00	27.89	31.11	29.40	0.19	1.63	0.53	0.03
28.05	34.69	32.78	0.21	1.92	0.52	0.04	28.21	57.02	53.89	0.30	1.75	0.52	0.03
28.38	66.88	63.21	0.34	1.98	0.52	0.04	28.54	54.46	51.47	0.29	1.68	0.52	0.03
28.71	47.57	44.96	0.25	1.67	0.51	0.03	28.87	50.56	47.78	0.24	1.26	0.51	0.02
29.04	68.35	64.60	2.00	0.00	0.51	0.00	29.20	73.62	69.57	2.00	0.00	0.51	0.00
29.36	72.00	68.05	2.00	0.00	0.50	0.00	29.53	74.33	70.25	2.00	0.00	0.50	0.00
29.69	82.75	78.21	2.00	0.00	0.50	0.00	29.86	83.90	79.30	2.00	0.00	0.49	0.00
30.02	79.83	75.45	2.00	0.00	0.49	0.00	30.18	78.84	74.51	2.00	0.00	0.49	0.00
30.35	72.10	68.14	2.00	0.00	0.49	0.00	30.51	72.99	68.98	2.00	0.00	0.48	0.00
30.68	74.64	70.54	2.00	0.00	0.48	0.00	30.84	76.54	72.34	2.00	0.00	0.48	0.00
31.00	73.25	69.23	2.00	0.00	0.47	0.00	31.17	72.07	68.11	0.32	0.84	0.47	0.02
31.33	77.12	72.88	0.38	0.93	0.47	0.02	31.50	64.55	61.01	0.31	0.99	0.47	0.02
31.66	60.34	57.02	0.29	1.02	0.46	0.02	31.82	70.94	67.04	0.36	1.02	0.46	0.02
31.99	101.63	96.05	0.62	0.87	0.46	0.02	32.15	165.98	156.87	1.93	0.00	0.46	0.00
32.32	203.17	192.01	2.00	0.00	0.45	0.00	32.48	217.65	205.70	2.00	0.00	0.45	0.00
32.64	217.95	205.98	2.00	0.00	0.45	0.00	32.81	218.23	206.25	2.00	0.00	0.44	0.00
32.97	206.56	195.22	2.00	0.00	0.44	0.00	33.14	188.04	177.71	2.00	0.00	0.44	0.00
33.30	180.75	170.82	2.00	0.00	0.44	0.00	33.47	175.89	166.23	2.00	0.00	0.43	0.00
33.63	177.68	167.92	2.00	0.00	0.43	0.00	33.79	178.87	169.05	2.00	0.00	0.43	0.00
33.96	176.19	166.51	2.00	0.00	0.42	0.00	34.12	169.52	160.21	2.00	0.00	0.42	0.00
34.28	162.04	153.14	1.80	0.00	0.42	0.00	34.45	149.75	141.53	1.45	0.00	0.42	0.00
34.61	146.27	138.24	1.37	0.00	0.41	0.00	34.78	146.18	138.15	1.36	0.00	0.41	0.00
34.94	148.56	140.40	1.41	0.00	0.41	0.00	35.10	150.98	142.69	1.46	0.00	0.41	0.00
35.27	163.30	154.34	1.81	0.00	0.40	0.00	35.43	152.43	144.06	1.53	0.00	0.40	0.00
35.60	133.78	126.43	1.12	0.16	0.40	0.00	35.76	157.28	148.64	1.67	0.00	0.39	0.00
35.92	215.67	203.83	2.00	0.00	0.39	0.00	36.09	271.52	256.61	2.00	0.00	0.39	0.00
36.25	327.17	309.20	2.00	0.00	0.39	0.00	36.42	346.96	327.91	2.00	0.00	0.38	0.00
36.58	331.71	313.49	2.00	0.00	0.38	0.00	36.74	311.58	294.47	2.00	0.00	0.38	0.00
36.91	305.96	289.16	2.00	0.00	0.37	0.00	37.07	299.12	282.69	2.00	0.00	0.37	0.00
37.24	302.81	286.18	2.00	0.00	0.37	0.00	37.40	310.34	293.30	2.00	0.00	0.37	0.00
37.57	322.63	304.91	2.00	0.00	0.36	0.00	37.73	290.97	274.99	2.00	0.00	0.36	0.00
37.89	312.33	295.18	2.00	0.00	0.36	0.00	38.06	315.04	297.74	2.00	0.00	0.35	0.00
38.22	326.22	308.31	2.00	0.00	0.35	0.00	38.39	334.35	315.99	2.00	0.00	0.35	0.00
38.55	348.58	329.44	2.00	0.00	0.35	0.00	38.71	365.26	345.20	2.00	0.00	0.34	0.00
38.88	369.12	348.85	2.00	0.00	0.34	0.00	39.04	365.69	345.61	2.00	0.00	0.34	0.00
39.21	343.07	324.23	2.00	0.00	0.34	0.00	39.37	323.72	305.94	2.00	0.00	0.33	0.00
39.53	334.21	315.86	2.00	0.00	0.33	0.00	39.70	350.44	331.19	2.00	0.00	0.33	0.00
39.86	358.71	339.01	2.00	0.00	0.32	0.00	40.03	356.92	337.32	2.00	0.00	0.32	0.00
40.19	310.77	293.70	2.00	0.00	0.32	0.00	40.35	198.35	187.45	2.00	0.00	0.32	0.00

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

Depth (ft)	q _{c, 1, mod} (tsf)	q _{c, 1N, mod}	FS	e _v (%)	DF	Settlement (in)	Depth (ft)	q _{c, 1, mod} (tsf)	q _{c, 1N, mod}	FS	e _v (%)	DF	Settlement (in)
40.52	100.26	94.75	0.68	0.53	0.31	0.01	40.68	76.05	71.88	0.45	0.76	0.31	0.01
40.85	54.08	51.11	0.31	0.75	0.31	0.01	41.01	49.37	46.65	2.00	0.00	0.30	0.00
41.17	50.29	47.53	2.00	0.00	0.30	0.00	41.34	55.91	52.84	2.00	0.00	0.30	0.00
41.50	63.59	60.10	2.00	0.00	0.30	0.00	41.67	63.30	59.83	2.00	0.00	0.29	0.00
41.83	62.57	59.14	2.00	0.00	0.29	0.00	41.99	57.05	53.92	2.00	0.00	0.29	0.00
42.16	52.29	49.42	2.00	0.00	0.29	0.00	42.32	47.10	44.51	2.00	0.00	0.28	0.00
42.49	44.47	42.03	2.00	0.00	0.28	0.00	42.65	45.59	43.08	2.00	0.00	0.28	0.00
42.81	50.16	47.41	2.00	0.00	0.27	0.00	42.98	56.37	53.28	2.00	0.00	0.27	0.00
43.14	56.63	53.52	2.00	0.00	0.27	0.00	43.31	54.59	51.60	2.00	0.00	0.27	0.00
43.47	53.42	50.49	2.00	0.00	0.26	0.00	43.63	52.78	49.88	2.00	0.00	0.26	0.00
43.80	52.80	49.90	2.00	0.00	0.26	0.00	43.96	52.07	49.21	2.00	0.00	0.25	0.00
44.13	48.19	45.55	2.00	0.00	0.25	0.00	44.29	45.65	43.14	2.00	0.00	0.25	0.00
44.45	43.26	40.89	2.00	0.00	0.25	0.00	44.62	41.07	38.81	2.00	0.00	0.24	0.00
44.78	38.21	36.11	2.00	0.00	0.24	0.00	44.95	34.61	32.71	2.00	0.00	0.24	0.00
45.11	31.52	29.79	2.00	0.00	0.24	0.00	45.28	34.84	32.92	2.00	0.00	0.23	0.00
45.44	34.42	32.53	2.00	0.00	0.23	0.00	45.60	39.64	37.47	2.00	0.00	0.23	0.00
45.77	53.15	50.23	2.00	0.00	0.22	0.00	45.93	52.70	49.81	2.00	0.00	0.22	0.00
46.10	53.30	50.37	2.00	0.00	0.22	0.00	46.26	52.16	49.30	2.00	0.00	0.22	0.00
46.42	51.78	48.94	2.00	0.00	0.21	0.00	46.59	52.93	50.02	2.00	0.00	0.21	0.00
46.75	49.76	47.03	2.00	0.00	0.21	0.00	46.92	39.31	37.15	2.00	0.00	0.20	0.00
47.08	36.28	34.29	2.00	0.00	0.20	0.00	47.24	33.84	31.98	2.00	0.00	0.20	0.00
47.41	30.89	29.19	2.00	0.00	0.20	0.00	47.57	31.47	29.74	2.00	0.00	0.19	0.00
47.74	33.69	31.84	0.24	0.60	0.19	0.01	47.90	37.58	35.51	0.25	0.55	0.19	0.01
48.06	41.81	39.51	2.00	0.00	0.19	0.00	48.23	47.20	44.61	2.00	0.00	0.18	0.00
48.39	51.69	48.85	2.00	0.00	0.18	0.00	48.56	51.73	48.89	2.00	0.00	0.18	0.00
48.72	50.73	47.94	2.00	0.00	0.17	0.00	48.88	48.46	45.80	2.00	0.00	0.17	0.00
49.05	48.36	45.71	2.00	0.00	0.17	0.00	49.21	52.37	49.49	2.00	0.00	0.17	0.00
49.38	51.82	48.98	0.31	0.40	0.16	0.01	49.54	54.22	51.24	0.33	0.41	0.16	0.01
49.70	58.78	55.55	0.36	0.43	0.16	0.01	49.87	78.33	74.03	0.50	0.43	0.15	0.01
50.03	66.16	62.53	0.41	0.43	0.15	0.01	50.20	51.24	48.42	0.32	0.41	0.15	0.01

Total estimated settlement: 3.33

Abbreviations

- q_{c, 1, mod}: Equivalent clean sand cone resistance
- q_{c, 1N, mod}: Equivalent dean 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

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
1.31	18.47	29.56	2.31	68.19	2.39	0.03	0.62
1.48	16.96	27.12	2.76	74.96	2.47	0.02	0.62
1.64	14.72	23.50	3.88	91.11	2.61	0.03	0.62
1.80	13.33	21.26	4.65	98.94	2.69	0.03	0.62
1.97	12.18	19.40	5.05	98.04	2.73	0.03	0.62
2.13	11.49	18.28	4.60	84.01	2.69	0.02	0.62
2.30	11.18	17.76	4.14	73.53	2.64	0.02	0.62
2.46	11.05	17.54	3.69	64.81	2.59	0.02	0.62
2.63	11.41	18.10	3.25	58.87	2.54	0.02	0.62
2.79	11.90	18.89	2.83	53.37	2.48	0.02	0.62
2.95	12.79	20.30	2.47	50.21	2.42	0.02	0.62
3.12	14.05	22.32	2.12	47.40	2.35	0.02	0.62
3.28	15.73	25.00	1.84	46.00	2.28	0.02	0.62
3.44	17.43	27.72	1.00	27.72	2.21	0.02	0.62
3.61	18.63	29.63	1.00	29.63	2.18	0.02	0.62
3.77	19.69	31.33	1.00	31.33	2.17	0.02	0.62
3.94	19.98	31.78	1.58	50.27	2.19	0.02	0.62
4.10	20.31	32.29	1.61	52.04	2.20	0.02	0.62
4.26	19.91	31.63	1.69	53.37	2.23	0.02	0.62
4.43	19.84	31.50	1.74	54.68	2.24	0.02	0.62
4.59	19.56	31.04	1.78	55.34	2.26	0.02	0.62
4.76	19.72	31.29	1.76	55.09	2.25	0.02	0.62
4.92	20.35	32.29	1.70	54.88	2.23	0.02	0.62
5.08	21.69	34.42	1.60	55.00	2.19	0.03	0.62
5.25	23.37	37.11	1.51	56.08	2.15	0.03	0.62
5.41	24.88	39.53	1.45	57.13	2.12	0.03	0.62
5.58	26.37	41.90	1.39	58.41	2.08	0.04	0.62
5.74	28.42	45.19	1.34	60.73	2.04	0.04	0.62
5.91	31.51	50.14	1.00	50.14	1.98	0.07	0.64
6.07	35.15	55.97	1.00	55.97	1.91	0.11	0.66
6.23	38.56	61.43	1.00	61.43	1.86	0.18	0.67
6.40	41.16	65.60	1.00	65.60	1.82	0.26	0.68
6.56	42.78	68.18	1.00	68.18	1.81	0.34	0.69
6.73	43.16	68.77	1.00	68.77	1.83	0.36	0.69
6.89	41.96	66.85	1.00	66.85	1.87	0.31	0.69
7.05	39.31	62.56	1.26	78.70	1.93	0.21	0.68
7.22	36.04	57.30	1.32	75.47	2.01	0.14	0.66
7.38	33.75	53.60	1.39	74.41	2.08	0.10	0.65
7.55	33.49	53.18	1.42	75.50	2.10	0.11	0.66
7.71	34.75	55.19	1.40	77.22	2.09	0.15	0.67
7.87	36.40	57.82	1.36	78.62	2.05	0.17	0.67
8.04	38.58	61.32	1.31	80.44	2.01	0.19	0.67
8.20	41.46	65.91	1.27	83.42	1.94	0.29	0.69
8.37	43.50	68.71	1.24	85.06	1.90	0.45	0.70
8.53	43.39	67.70	1.24	83.72	1.90	0.36	0.69
8.69	41.04	63.77	1.25	79.91	1.92	0.24	0.68
8.86	38.24	59.42	1.28	76.03	1.96	0.15	0.67
9.02	35.58	55.28	1.31	72.50	2.01	0.11	0.65

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
9.19	33.57	52.16	1.35	70.53	2.05	0.08	0.64
9.35	32.63	50.26	1.36	68.58	2.06	0.07	0.64
9.51	32.89	50.02	1.36	67.97	2.05	0.07	0.64
9.68	34.32	51.31	1.33	68.44	2.03	0.07	0.64
9.84	36.11	53.13	1.32	70.02	2.01	0.09	0.65
10.01	37.22	54.05	1.31	70.75	2.00	0.11	0.65
10.17	37.38	53.71	1.31	70.34	2.00	0.10	0.65
10.34	36.69	52.32	1.32	69.01	2.01	0.09	0.65
10.50	33.96	48.34	1.36	65.64	2.05	0.08	0.64
10.66	33.90	47.74	1.36	64.79	2.05	0.04	0.62
10.83	34.12	47.55	1.36	64.48	2.05	0.08	0.64
10.99	37.18	50.93	1.32	67.14	2.01	0.07	0.64
11.15	39.11	53.09	1.30	68.93	1.99	0.08	0.65
11.32	43.22	57.84	1.00	57.84	1.94	0.13	0.66
11.48	47.91	63.24	1.00	63.24	1.89	0.28	0.69
11.65	51.77	67.78	1.00	67.78	1.86	0.39	0.70
11.81	53.18	69.66	1.23	85.39	1.88	0.44	0.70
11.97	52.99	69.39	1.24	85.91	1.90	0.39	0.70
12.14	52.11	67.91	1.24	83.95	1.90	0.32	0.69
12.30	52.01	67.11	1.00	67.11	1.87	0.32	0.69
12.47	51.56	66.23	1.00	66.23	1.87	0.38	0.69
12.63	50.45	64.79	1.00	64.79	1.89	0.27	0.69
12.79	49.06	63.00	1.00	63.00	1.91	0.20	0.68
12.96	49.09	62.81	1.00	62.81	1.91	0.21	0.68
13.12	50.56	64.41	1.24	79.74	1.90	0.25	0.68
13.29	51.89	65.75	1.23	80.98	1.89	0.30	0.69
13.45	52.88	66.55	1.00	66.55	1.88	0.31	0.69
13.62	54.37	67.86	1.00	67.86	1.85	0.35	0.69
13.78	56.49	69.91	1.00	69.91	1.82	0.52	0.70
13.94	58.54	71.83	1.00	71.83	1.79	0.68	0.71
14.11	57.93	70.81	1.00	70.81	1.79	0.71	0.71
14.27	57.50	70.13	1.00	70.13	1.79	0.43	0.70
14.44	57.53	70.08	1.00	70.08	1.81	0.54	0.70
14.60	58.65	71.27	1.00	71.27	1.81	0.63	0.71
14.76	52.39	63.93	1.00	63.93	1.86	0.53	0.70
14.93	39.14	48.62	1.32	64.18	2.01	0.06	0.63
15.09	24.64	31.45	1.81	56.85	2.27	0.02	0.62
15.26	15.44	20.19	3.37	68.06	2.55	0.02	0.62
15.42	13.10	17.17	4.32	74.10	2.66	0.02	0.62
15.58	15.15	19.68	3.59	70.59	2.58	0.02	0.62
15.75	19.03	24.32	2.59	63.02	2.44	0.02	0.62
15.91	22.17	28.09	2.26	63.37	2.38	0.02	0.62
16.08	22.50	28.53	2.40	68.56	2.41	0.02	0.62
16.24	21.86	27.85	2.82	78.44	2.48	0.03	0.62
16.40	21.42	27.36	3.18	87.12	2.53	0.03	0.62
16.57	21.79	27.89	3.53	98.43	2.57	0.04	0.62
16.73	25.03	31.95	3.38	107.92	2.55	0.05	0.62
16.90	30.12	38.17	2.98	113.70	2.50	0.10	0.65

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

Depth (ft)	q _t (tsf)	Q _{tn}	K _c	Q _{tn,cs}	I _c	S _{u(liq)'/σ'_v}	S _{u(peak)'/σ'_v}
17.06	36.90	46.26	2.51	115.95	2.42	0.15	0.67
17.22	55.27	67.41	1.64	110.80	2.21	0.16	0.67
17.39	83.19	98.39	1.30	127.44	1.99	0.76	0.76
17.55	109.57	126.76	1.19	150.72	1.84	0.82	0.82
17.72	114.88	132.18	1.18	155.48	1.82	0.83	0.83
17.88	100.73	116.92	1.25	146.69	1.93	0.79	0.79
18.05	79.96	94.67	1.47	139.17	2.13	0.76	0.76
18.21	72.59	86.91	1.81	156.90	2.27	0.74	0.74
18.37	84.33	100.52	1.78	179.14	2.26	0.78	0.78
18.54	113.88	133.13	1.45	192.79	2.12	0.82	0.82
18.70	129.48	149.80	1.37	205.50	2.06	0.87	0.87
18.86	114.36	132.57	1.47	194.82	2.13	0.84	0.84
19.03	76.52	90.15	2.16	194.80	2.36	0.77	0.77
19.19	42.83	51.59	4.74	244.46	2.70	0.72	0.72
19.36	29.03	35.14	7.78	273.41	2.94	0.44	0.70
19.52	27.23	32.66	8.65	282.46	2.99	0.46	0.70
19.68	28.50	34.00	8.17	277.94	2.96	0.66	0.71
19.85	29.18	34.61	7.73	267.48	2.93	0.61	0.71
20.01	27.48	32.31	7.52	243.04	2.92	0.54	0.71
20.18	27.39	31.76	6.40	203.35	2.84	0.42	0.70
20.34	28.39	32.47	5.17	167.92	2.74	0.50	0.70
20.50	30.88	34.94	4.19	146.51	2.65	0.25	0.68
20.67	34.18	38.35	3.55	136.18	2.58	0.18	0.67
20.83	38.12	42.45	3.03	128.73	2.51	0.23	0.68
21.00	38.83	43.02	2.99	128.79	2.50	0.31	0.69
21.16	34.22	37.88	3.76	142.26	2.60	0.26	0.68
21.32	25.97	28.74	5.80	166.65	2.80	0.40	0.70
21.49	19.86	21.72	8.61	187.03	2.99	0.22	0.68
21.65	21.21	23.15	7.95	184.15	2.95	0.18	0.67
21.82	30.69	33.47	5.06	169.24	2.73	0.47	0.70
21.98	36.29	39.44	4.42	174.24	2.67	0.74	0.74
22.15	33.86	36.68	5.10	186.90	2.74	0.72	0.72
22.31	25.23	27.14	7.25	196.67	2.90	0.29	0.69
22.47	23.15	24.60	6.93	170.46	2.88	0.27	0.68
22.64	25.01	26.39	5.67	149.53	2.78	0.27	0.68
22.80	35.49	37.28	3.38	125.90	2.55	0.08	0.64
22.97	51.25	53.46	2.04	108.89	2.33	0.31	0.69
23.13	65.18	67.40	1.52	102.63	2.16	0.73	0.73
23.29	63.11	64.97	1.52	98.77	2.16	0.72	0.72
23.46	48.03	49.44	2.12	104.76	2.35	0.17	0.67
23.62	31.40	32.30	4.68	151.23	2.70	0.24	0.68
23.79	21.98	22.29	9.47	211.12	3.04	2.14	1.59
23.95	19.15	19.13	13.73	262.52	3.24	3.02	1.37
24.11	22.36	22.44	13.16	295.27	3.22	3.97	1.60
24.28	30.51	30.94	9.69	299.83	3.05	4.49	2.21
24.44	36.82	37.38	6.90	257.83	2.88	0.73	0.73
24.61	40.05	40.27	4.71	189.81	2.70	0.73	0.73
24.77	41.73	41.50	2.99	123.97	2.50	0.17	0.67

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
24.93	46.02	45.51	2.26	102.97	2.38	0.18	0.67
25.10	50.57	49.90	2.11	105.37	2.35	0.27	0.68
25.26	51.86	51.03	2.21	112.91	2.37	0.32	0.69
25.43	50.72	49.70	2.31	114.77	2.39	0.30	0.69
25.59	47.63	46.48	2.67	124.19	2.45	0.34	0.69
25.75	42.82	41.51	2.98	123.80	2.50	0.23	0.68
25.92	38.12	36.71	3.49	128.17	2.57	0.17	0.67
26.08	35.62	34.08	3.82	130.17	2.61	0.16	0.67
26.25	36.45	34.77	4.12	143.14	2.64	0.25	0.68
26.41	35.40	33.61	4.76	160.02	2.71	0.63	0.71
26.57	33.16	31.28	5.47	170.96	2.77	0.57	0.71
26.74	26.72	24.84	7.24	179.86	2.90	0.45	0.70
26.90	21.75	19.84	9.09	180.27	3.02	1.56	1.42
27.07	17.49	15.58	11.17	174.04	3.13	1.42	1.11
27.23	16.89	14.92	10.81	161.36	3.11	1.20	1.07
27.39	17.74	15.67	9.06	141.99	3.02	0.98	1.12
27.56	19.19	16.99	6.97	118.45	2.88	0.06	0.63
27.72	20.57	18.23	5.07	92.38	2.73	0.03	0.62
27.89	24.83	22.21	3.21	71.28	2.53	0.02	0.62
28.05	37.01	33.68	1.72	57.96	2.24	0.02	0.62
28.21	52.16	47.93	1.34	64.15	2.03	0.09	0.65
28.38	59.71	54.93	1.00	54.93	1.95	0.20	0.68
28.54	55.33	50.66	1.32	66.75	2.01	0.07	0.64
28.71	44.81	40.60	1.65	66.88	2.21	0.04	0.62
28.87	36.89	33.01	2.83	93.43	2.48	0.05	0.63
29.04	31.36	27.67	5.27	145.89	2.75	0.22	0.68
29.20	27.91	24.32	8.15	198.17	2.96	0.34	0.69
29.36	26.98	23.34	10.01	233.58	3.07	2.70	1.67
29.53	30.16	26.13	9.22	240.81	3.02	2.96	1.87
29.69	34.28	29.75	7.62	226.69	2.93	0.71	0.71
29.86	36.27	31.43	6.40	201.17	2.84	0.72	0.72
30.02	35.33	30.45	5.89	179.35	2.80	0.58	0.71
30.18	32.51	27.76	5.89	163.54	2.80	0.53	0.70
30.35	30.62	25.94	6.00	155.68	2.81	0.30	0.69
30.51	29.09	24.43	6.43	157.03	2.84	0.33	0.69
30.68	29.70	24.87	6.49	161.30	2.85	0.37	0.69
30.84	31.68	26.52	6.24	165.39	2.83	0.44	0.70
31.00	36.66	30.86	5.10	157.25	2.74	0.33	0.69
31.17	45.07	38.29	3.63	139.02	2.59	0.30	0.69
31.33	49.32	42.01	2.89	121.57	2.49	0.46	0.70
31.50	49.61	42.15	2.67	112.72	2.45	0.16	0.67
31.66	50.64	42.94	2.50	107.50	2.42	0.12	0.66
31.82	66.54	56.99	1.87	106.75	2.29	0.28	0.69
31.99	105.26	91.40	1.40	128.39	2.09	0.75	0.75
32.15	152.62	133.45	1.28	170.45	1.96	0.85	0.85
32.32	193.84	170.13	1.20	204.65	1.85	0.89	0.89
32.48	213.18	187.12	1.15	215.93	1.80	0.91	0.91
32.64	218.38	191.24	1.14	218.83	1.79	0.91	0.91

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

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
32.81	212.89	185.37	1.20	222.35	1.85	0.91	0.91
32.97	201.32	174.04	1.25	218.18	1.93	0.89	0.89
33.14	189.26	163.05	1.25	203.83	1.92	0.87	0.87
33.30	182.98	157.55	1.21	190.99	1.86	0.87	0.87
33.47	184.02	159.17	1.04	166.17	1.73	0.86	0.86
33.63	186.81	161.72	1.00	161.72	1.67	0.86	0.86
33.79	187.43	161.91	1.00	161.91	1.66	0.86	0.86
33.96	183.42	157.51	1.03	162.66	1.72	0.86	0.86
34.12	175.90	149.99	1.14	171.22	1.79	0.85	0.85
34.28	165.98	140.70	1.19	166.90	1.83	0.84	0.84
34.45	158.47	133.92	1.18	158.46	1.83	0.83	0.83
34.61	154.51	130.35	1.17	151.86	1.81	0.82	0.82
34.78	155.87	131.52	1.12	146.85	1.77	0.82	0.82
34.94	159.33	134.48	1.06	142.16	1.73	0.83	0.83
35.10	166.53	140.74	1.00	140.74	1.69	0.83	0.83
35.27	167.54	141.16	1.00	141.16	1.70	0.84	0.84
35.43	159.67	133.36	1.13	150.78	1.78	0.83	0.83
35.60	156.70	129.94	1.19	155.18	1.84	0.80	0.80
35.76	181.13	151.11	1.08	163.71	1.75	0.84	0.84
35.92	234.84	198.53	1.00	198.53	1.58	0.90	0.90
36.09	299.91	256.57	1.00	256.57	1.42	0.95	0.95
36.25	349.29	299.74	1.00	299.74	1.37	1.00	1.00
36.42	370.40	317.08	1.00	317.08	1.38	1.01	1.01
36.58	363.58	308.97	1.00	308.97	1.45	1.00	1.00
36.74	348.73	295.12	1.00	295.12	1.47	0.99	0.99
36.91	339.35	287.19	1.00	287.19	1.44	0.98	0.98
37.07	338.65	287.62	1.00	287.62	1.38	0.98	0.98
37.24	341.33	289.17	1.00	289.17	1.38	0.98	0.98
37.40	348.75	294.12	1.00	294.12	1.41	0.99	0.99
37.57	342.84	287.08	1.00	287.08	1.47	1.00	1.00
37.73	342.66	285.66	1.00	285.66	1.49	0.97	0.97
37.89	341.09	283.63	1.00	283.63	1.50	0.99	0.99
38.06	358.39	299.39	1.00	299.39	1.43	0.99	0.99
38.22	372.99	315.08	1.00	315.08	1.30	1.00	1.00
38.39	391.40	333.68	1.00	333.68	1.20	1.00	1.00
38.55	408.33	348.70	1.00	348.70	1.17	1.01	1.01
38.71	421.40	357.98	1.00	357.98	1.21	1.03	1.03
38.88	427.31	362.07	1.00	362.07	1.22	1.03	1.03
39.04	418.90	354.08	1.00	354.08	1.22	1.03	1.03
39.21	401.54	337.52	1.00	337.52	1.26	1.01	1.01
39.37	389.68	325.97	1.00	325.97	1.29	1.00	1.00
39.53	393.48	329.08	1.00	329.08	1.27	1.00	1.00
39.70	408.36	341.92	1.00	341.92	1.25	1.02	1.02
39.86	418.10	349.96	1.00	349.96	1.24	1.02	1.02
40.03	402.57	335.48	1.00	335.48	1.26	1.02	1.02
40.19	338.71	278.32	1.00	278.32	1.36	0.99	0.99
40.35	235.90	188.35	1.00	188.35	1.57	0.89	0.89
40.52	139.85	106.64	1.22	130.26	1.88	0.75	0.75

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

Depth (ft)	q _t (tsf)	Q _{tn}	K _c	Q _{tn,cs}	I _c	S _{u(liq)} /σ' _v	S _{u(peak)} /σ' _v
40.68	78.81	56.77	1.67	94.52	2.22	0.42	0.70
40.85	53.51	36.90	2.56	94.33	2.43	0.07	0.64
41.01	38.50	25.34	4.11	104.11	2.64	0.05	0.62
41.17	32.89	21.04	5.25	110.50	2.75	0.05	0.63
41.34	32.73	20.71	5.98	123.82	2.81	0.08	0.64
41.50	32.94	20.71	6.30	130.53	2.84	0.15	0.67
41.67	33.03	20.70	6.59	136.33	2.86	0.15	0.67
41.83	30.19	18.71	7.13	133.31	2.89	0.14	0.66
41.99	27.66	16.94	7.46	126.30	2.92	0.09	0.65
42.16	25.19	15.23	7.75	118.05	2.94	0.06	0.63
42.32	23.43	14.00	7.75	108.46	2.94	0.04	0.62
42.49	21.95	12.97	8.08	104.79	2.96	0.04	0.62
42.65	19.74	11.46	9.17	105.06	3.02	0.44	0.82
42.81	18.07	10.31	10.90	112.38	3.11	0.55	0.74
42.98	17.26	9.74	12.17	118.51	3.17	0.61	0.70
43.14	17.90	10.13	11.76	119.11	3.16	0.60	0.72
43.31	18.53	10.51	11.12	116.83	3.13	0.58	0.75
43.47	17.92	10.07	11.35	114.26	3.14	0.55	0.72
43.63	16.35	9.01	12.47	112.33	3.19	0.51	0.64
43.80	14.65	7.87	13.92	109.52	3.25	0.48	0.56
43.96	13.79	7.29	14.67	106.89	3.28	0.44	0.52
44.13	14.30	7.59	13.72	104.11	3.24	0.42	0.54
44.29	15.62	8.41	12.15	102.22	3.17	0.42	0.60
44.45	17.01	9.28	10.79	100.22	3.11	0.41	0.66
44.62	17.46	9.54	10.24	97.71	3.08	0.40	0.68
44.78	17.37	9.45	9.96	94.19	3.07	0.36	0.68
44.95	17.72	9.64	9.25	89.23	3.03	0.32	0.69
45.11	19.60	10.81	7.80	84.34	2.94	0.02	0.62
45.28	20.08	11.08	7.63	84.54	2.93	0.02	0.62
45.44	19.26	10.53	8.45	88.95	2.98	0.02	0.62
45.60	16.65	8.84	10.82	95.70	3.11	0.37	0.63
45.77	14.60	7.53	14.42	108.50	3.27	0.39	0.54
45.93	13.54	6.83	17.38	118.65	3.38	0.63	0.49
46.10	12.55	6.18	20.72	128.15	3.48	0.64	0.44
46.26	12.25	5.97	21.64	129.22	3.51	0.68	0.43
46.42	12.16	5.90	21.74	128.17	3.51	0.66	0.42
46.59	14.36	7.24	16.71	120.95	3.36	0.61	0.52
46.75	18.41	9.73	11.31	110.02	3.13	0.48	0.70
46.92	23.48	12.83	7.43	95.34	2.92	0.03	0.62
47.08	27.23	15.19	5.65	85.88	2.78	0.02	0.62
47.24	29.00	16.44	4.79	78.74	2.71	0.02	0.62
47.41	30.22	17.30	4.27	73.89	2.66	0.02	0.62
47.57	32.02	18.55	3.78	70.04	2.60	0.02	0.62
47.74	34.99	20.52	3.43	70.38	2.56	0.02	0.62
47.90	36.82	21.59	3.51	75.84	2.57	0.02	0.62
48.06	37.03	21.40	4.13	88.40	2.64	0.03	0.62
48.23	35.55	20.09	5.11	102.77	2.74	0.04	0.62
48.39	33.76	18.69	6.13	114.53	2.82	0.06	0.63

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

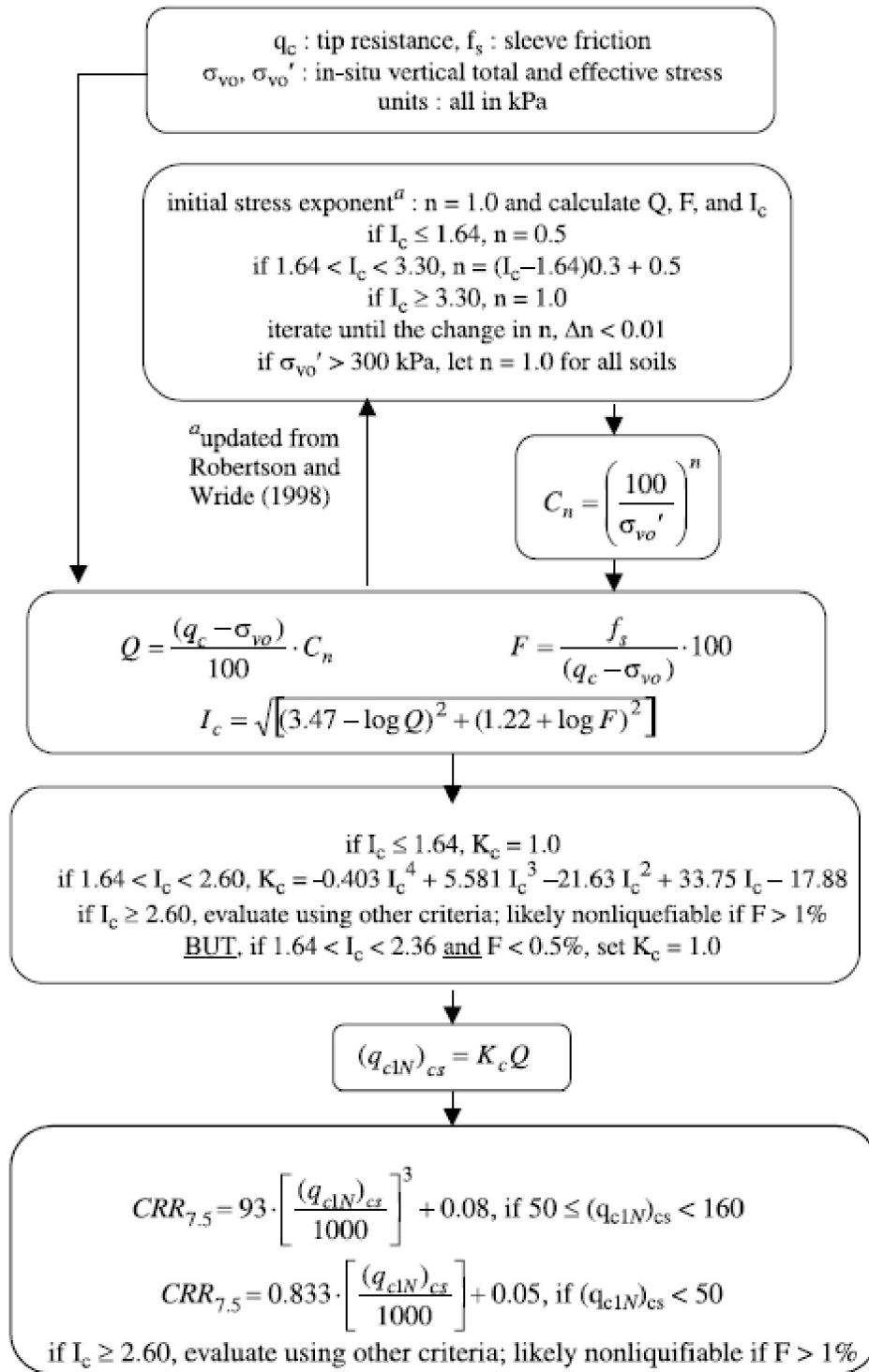
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
48.56	32.72	18.01	6.47	116.42	2.85	0.06	0.63
48.72	32.75	17.97	6.31	113.31	2.84	0.06	0.63
48.88	34.52	19.04	5.70	108.62	2.79	0.05	0.62
49.05	38.76	21.82	4.82	105.14	2.71	0.05	0.62
49.21	43.87	25.21	4.01	101.20	2.63	0.06	0.63
49.38	50.18	29.49	3.23	95.36	2.54	0.06	0.63
49.54	57.58	34.63	2.56	88.50	2.43	0.07	0.64
49.70	71.83	44.83	1.82	81.59	2.27	0.10	0.65
49.87	78.47	49.68	1.61	79.84	2.20	0.51	0.70
50.03	74.13	46.43	1.70	78.83	2.23	0.19	0.67
50.20	61.76	37.40	2.16	80.89	2.36	0.06	0.63

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)

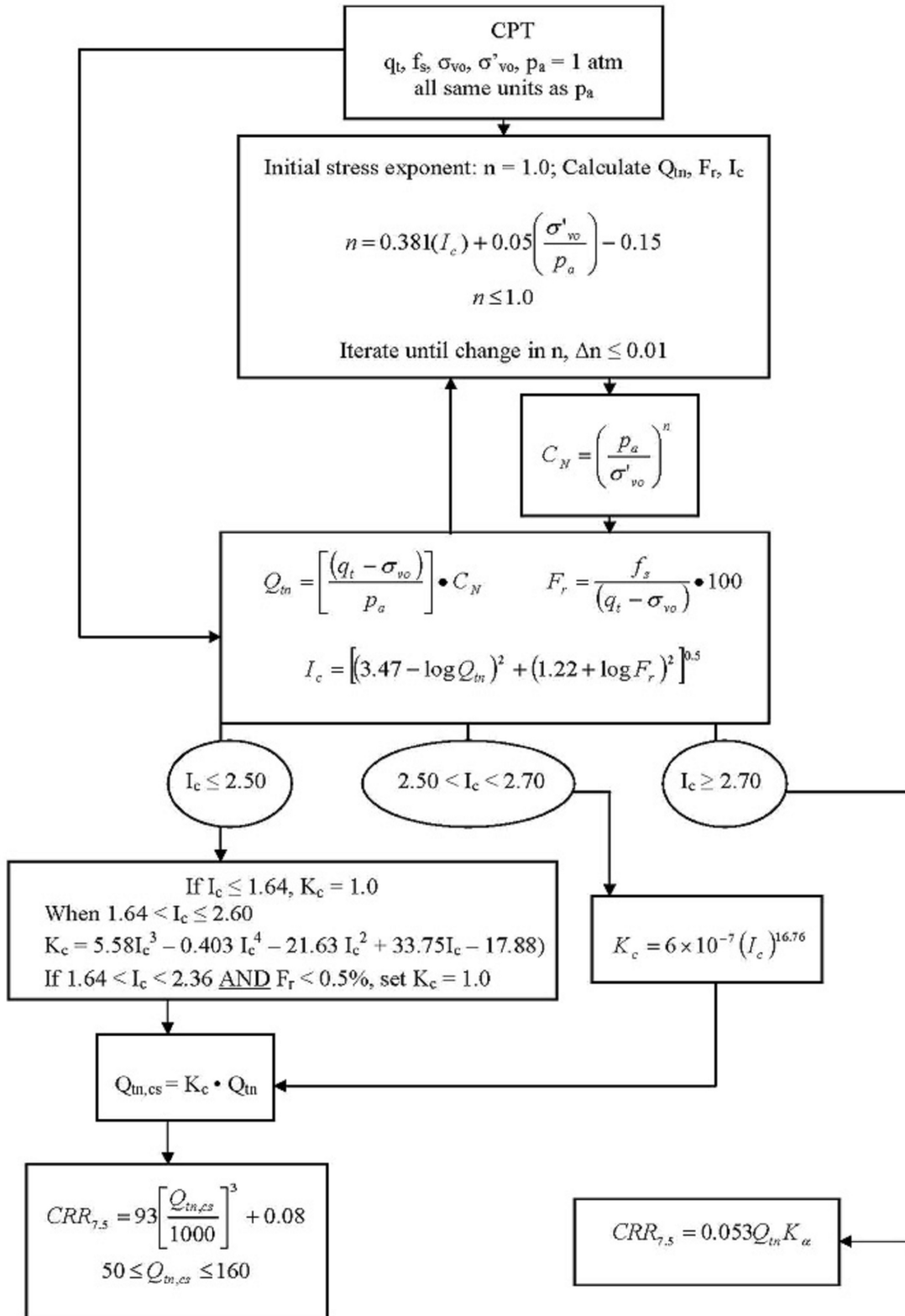
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of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

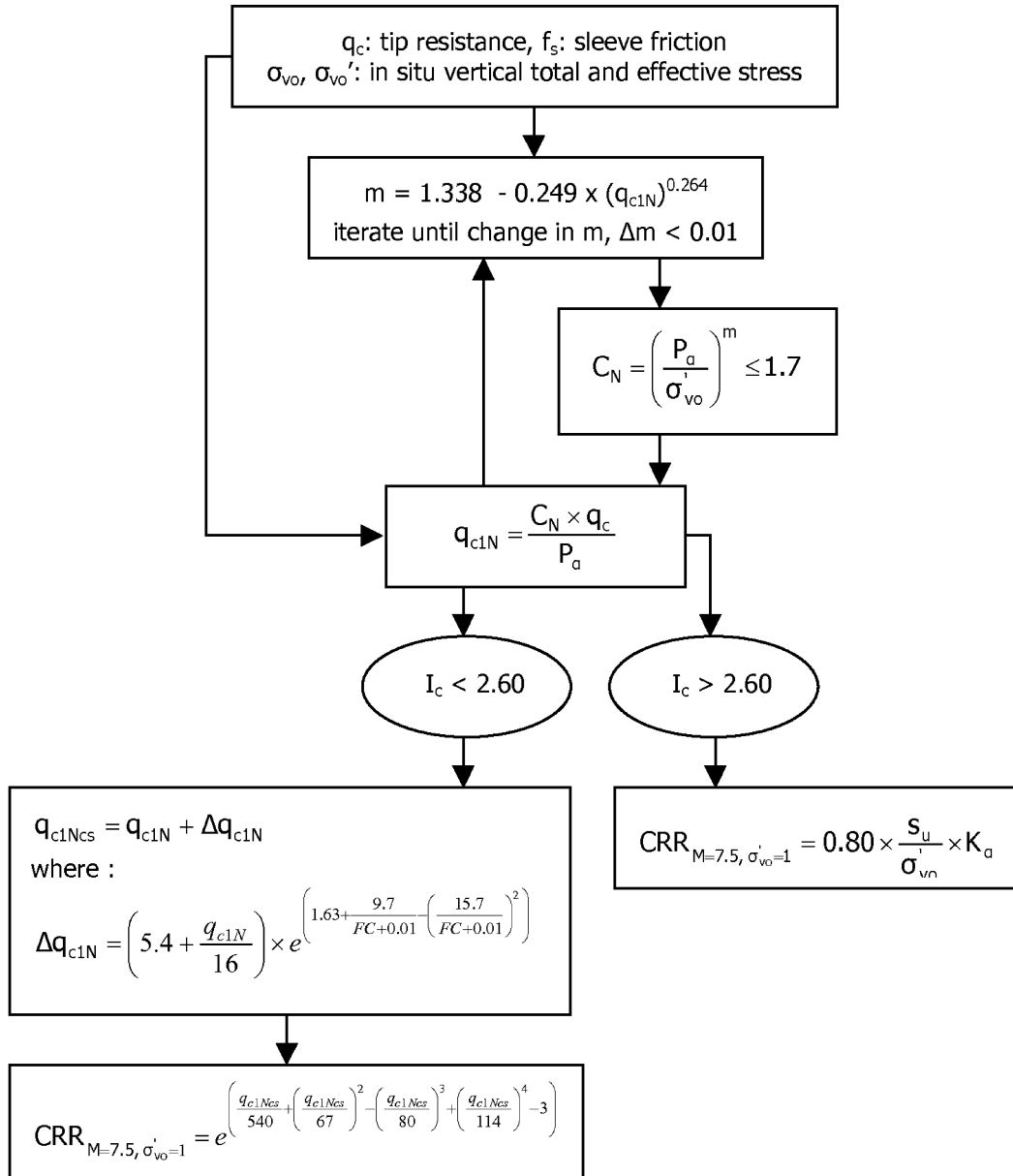
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

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:

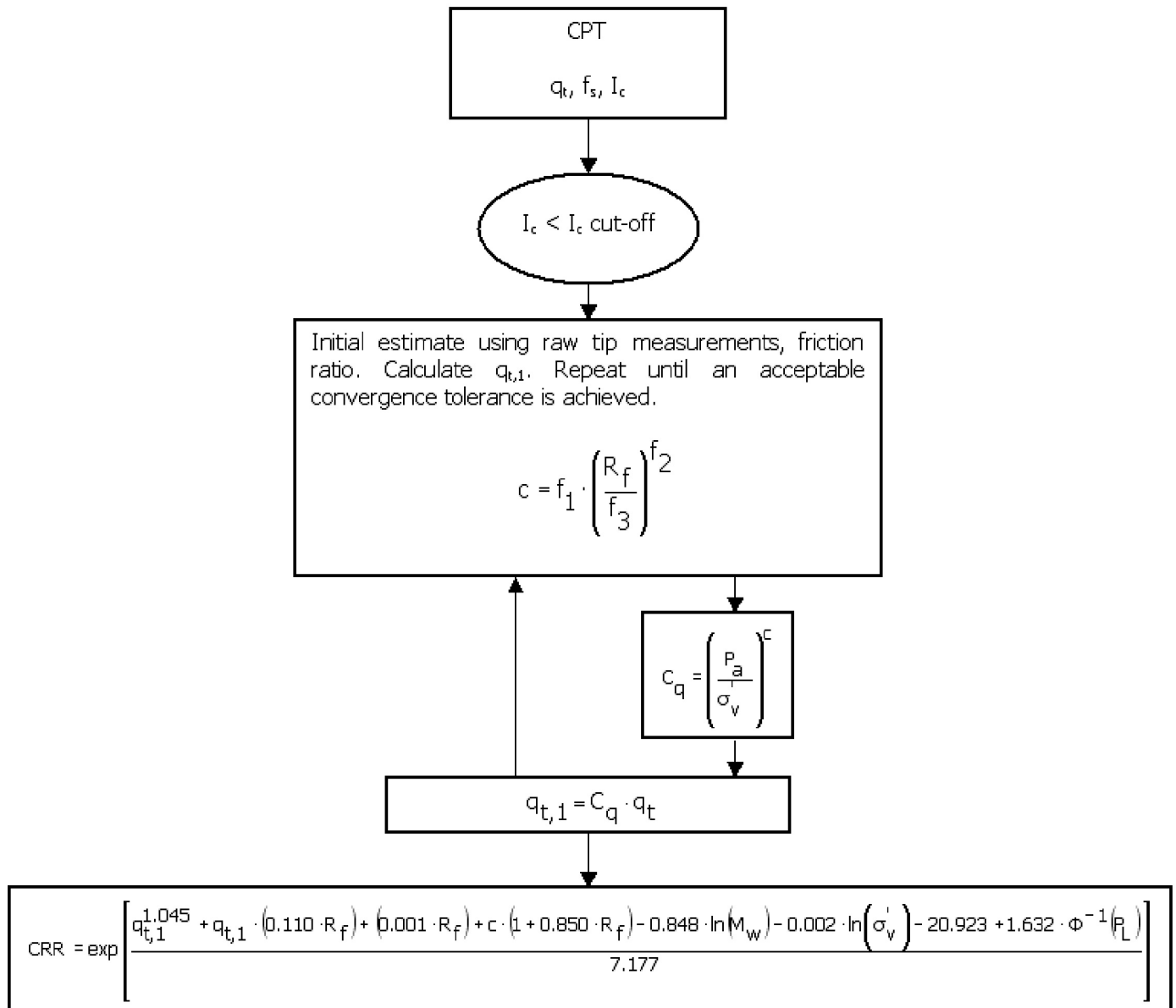


¹ P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

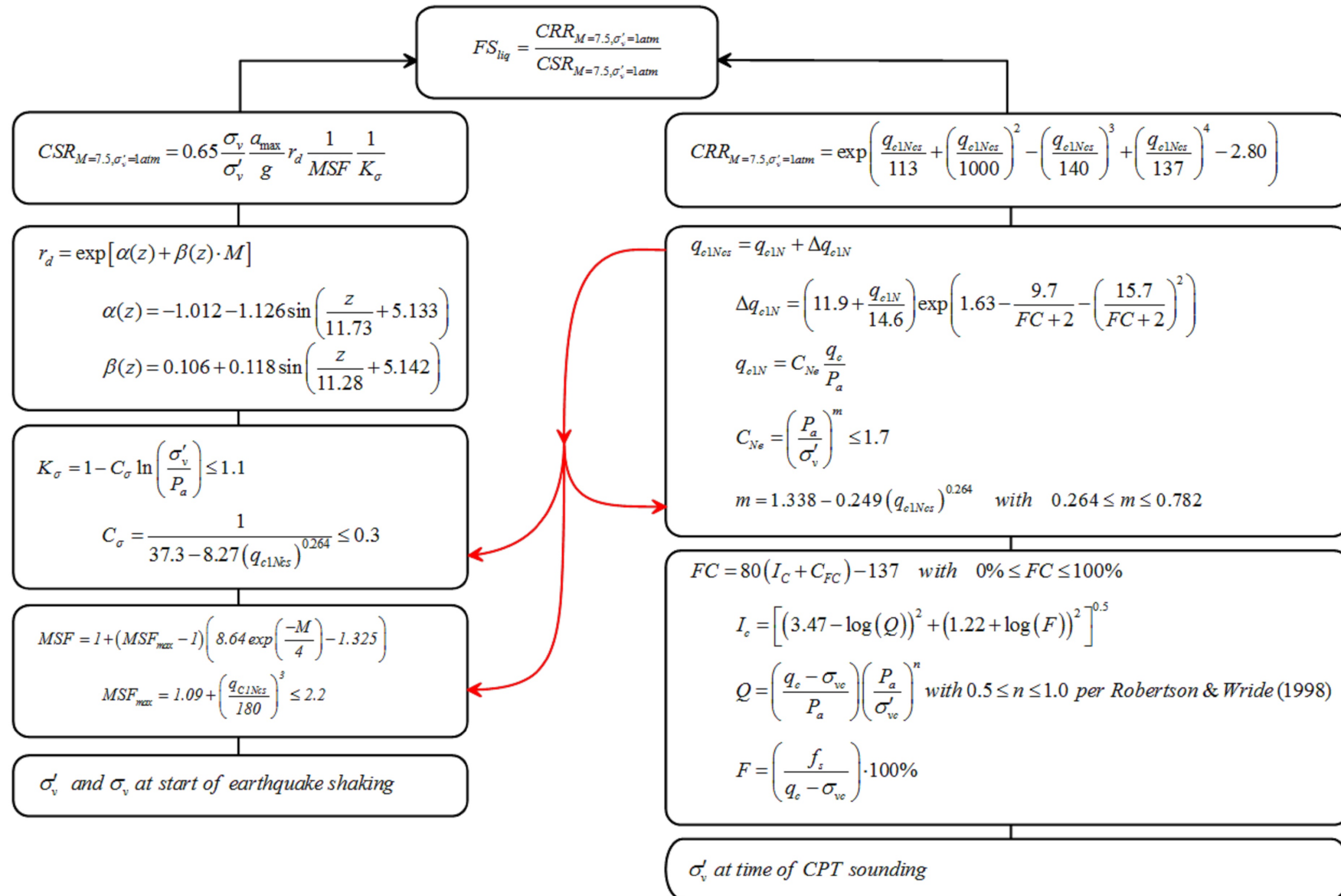
Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



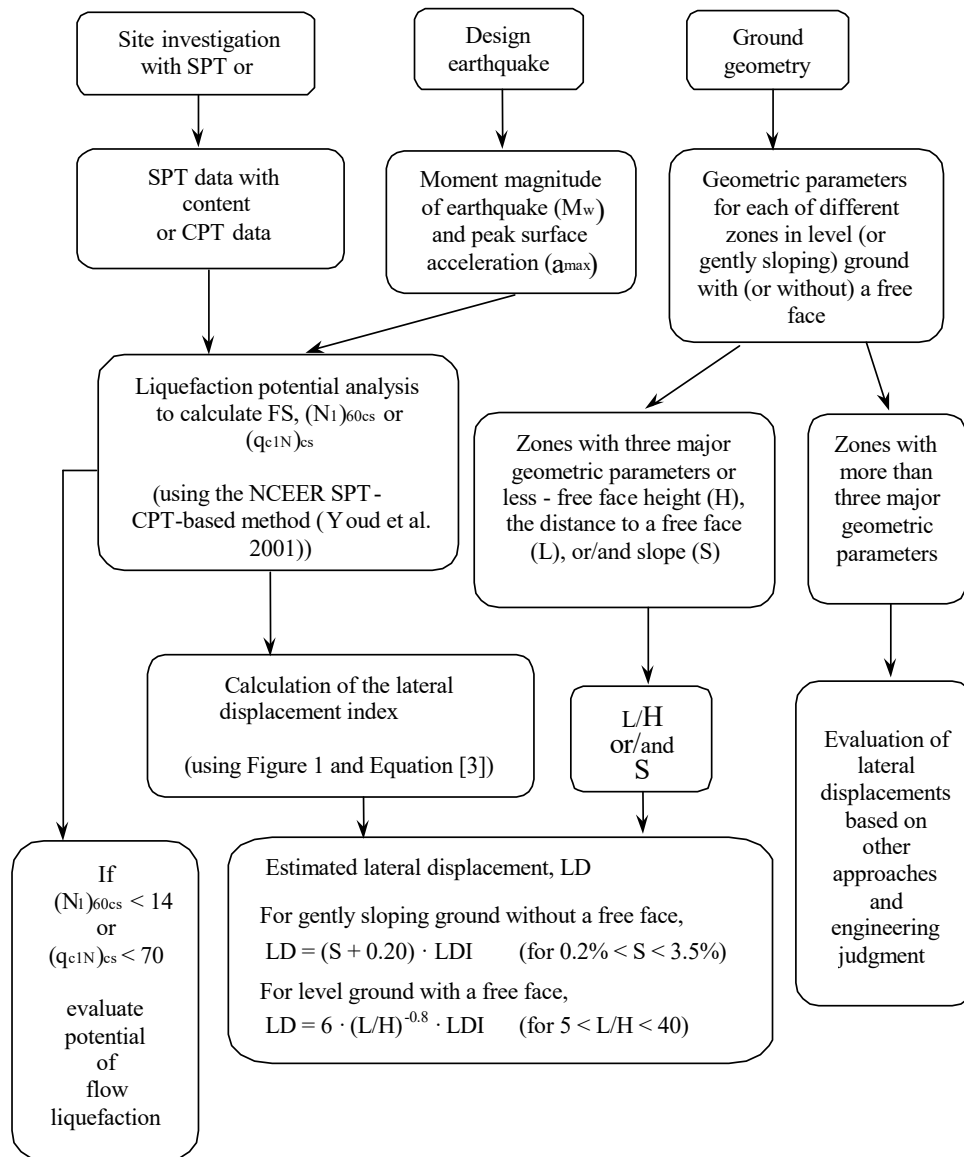
Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



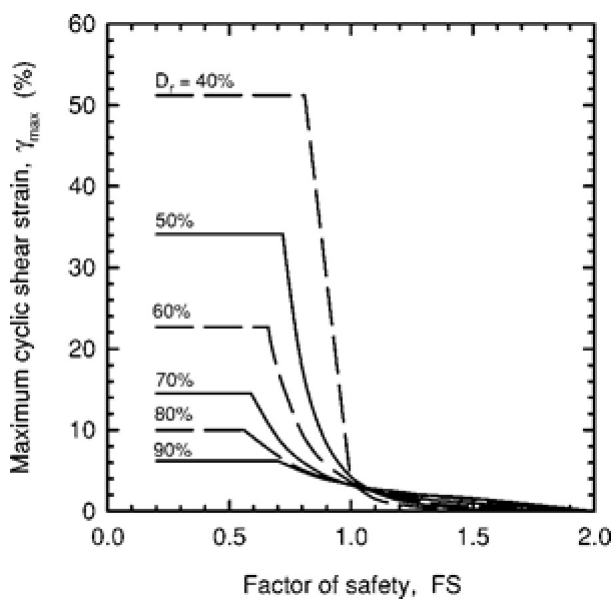
Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)



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



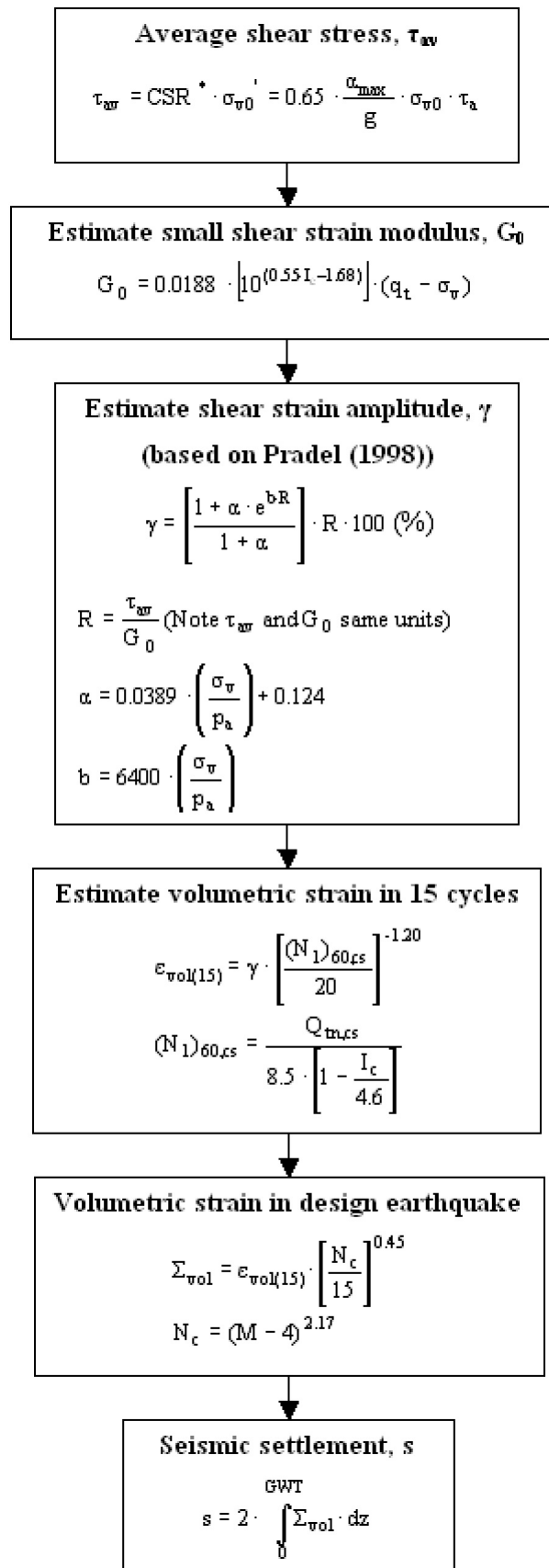
¹ Figure 1

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

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:

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

where:

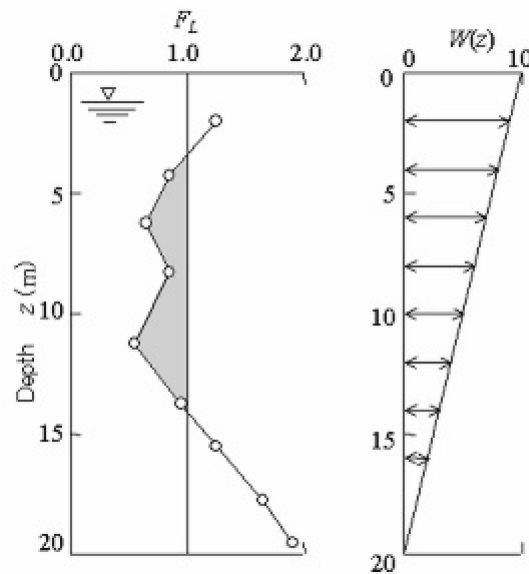
$F_L = 1 - F.S.$ when F.S. less than 1

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

z depth of 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

Shear-Induced Building Settlement (Ds) calculation procedure

The shear-induced building settlement (Ds) due to liquefaction below the building can be estimated using the relationship developed by Bray and Macedo (2017):

$$\begin{aligned} \ln(Ds) = & c1 + c2 * LBS + 0.58 * \ln\left(\tanh\left(\frac{HL}{6}\right)\right) + \\ & 4.59 * \ln(Q) - 0.42 * \ln(Q)^2 - 0.02 * B + \\ & 0.84 * \ln(CAVdp) + 0.41 * \ln(Sa1) + \varepsilon \end{aligned}$$

where Ds is in the units of mm, c1= -8.35 and c2= 0.072 for LBS ≤ 16, and c1= -7.48 and c2= 0.014 otherwise. Q is the building contact pressure in units of kPa, HL is the cumulative thickness of the liquefiable layers in the units of m, B is the building width in the units of m, CAVdp is a standardized version of the cumulative absolute velocity in the units of g-s, Sa1 is 5%-damped pseudo-acceleration response spectral value at a period of 1 s in the units of g, and ε is a normal random variable with zero mean and 0.50 standard deviation in Ln units. The liquefaction-induced building settlement index (LBS) is:

$$LBS = \sum W * \frac{\varepsilon_{shear}}{z} dz$$

where z (m) is the depth measured from the ground surface > 0, w is a foundation-weighting factor wherein W = 0.0 for z less than Df, which is the embedment depth of the foundation, and W = 1.0 otherwise. The shear strain parameter (ε_{shear}) is the liquefaction-induced free-field shear strain (in %) estimated using Zhang et al. (2004). It is calculated based on the estimated Dr of the liquefied soil layer and the calculated safety factor against liquefaction triggering (FSL).

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LIQUEFACTION ANALYSIS REPORT

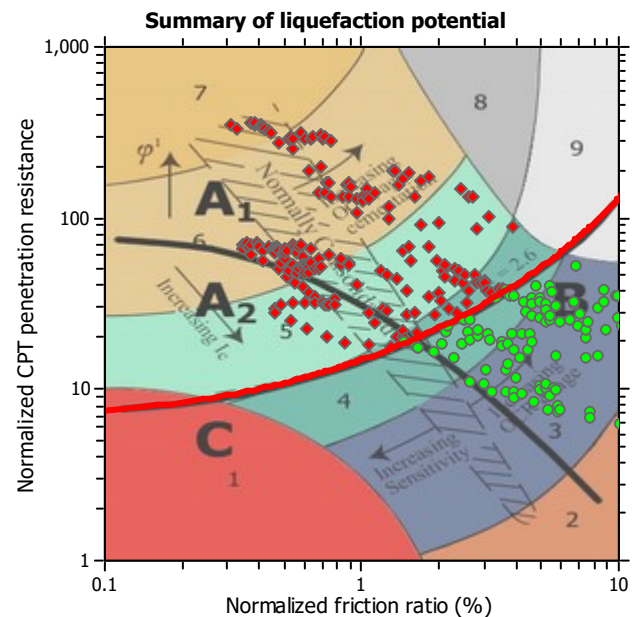
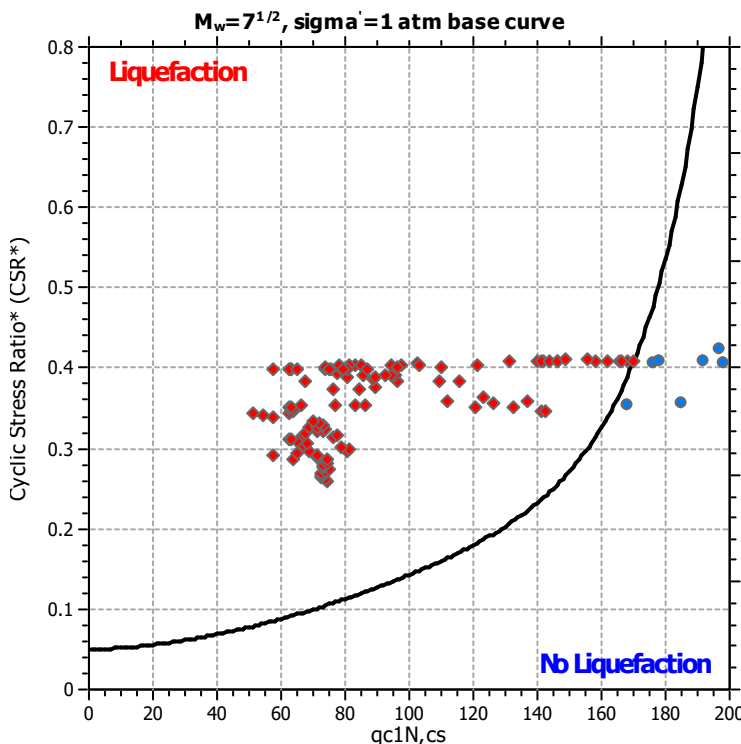
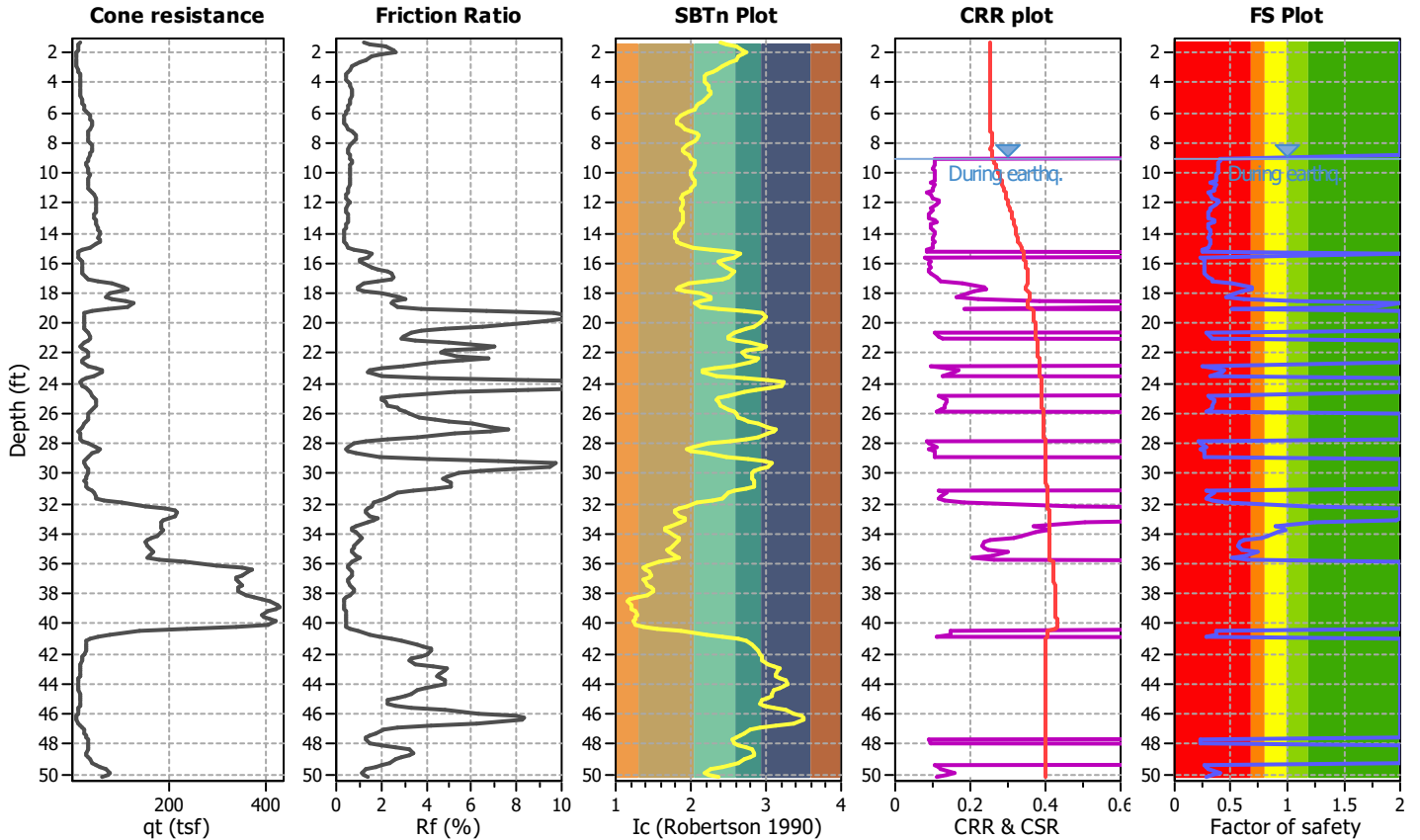
Project title : Manteca WWTP

Location : Manteca, CA

CPT file : CPT 1

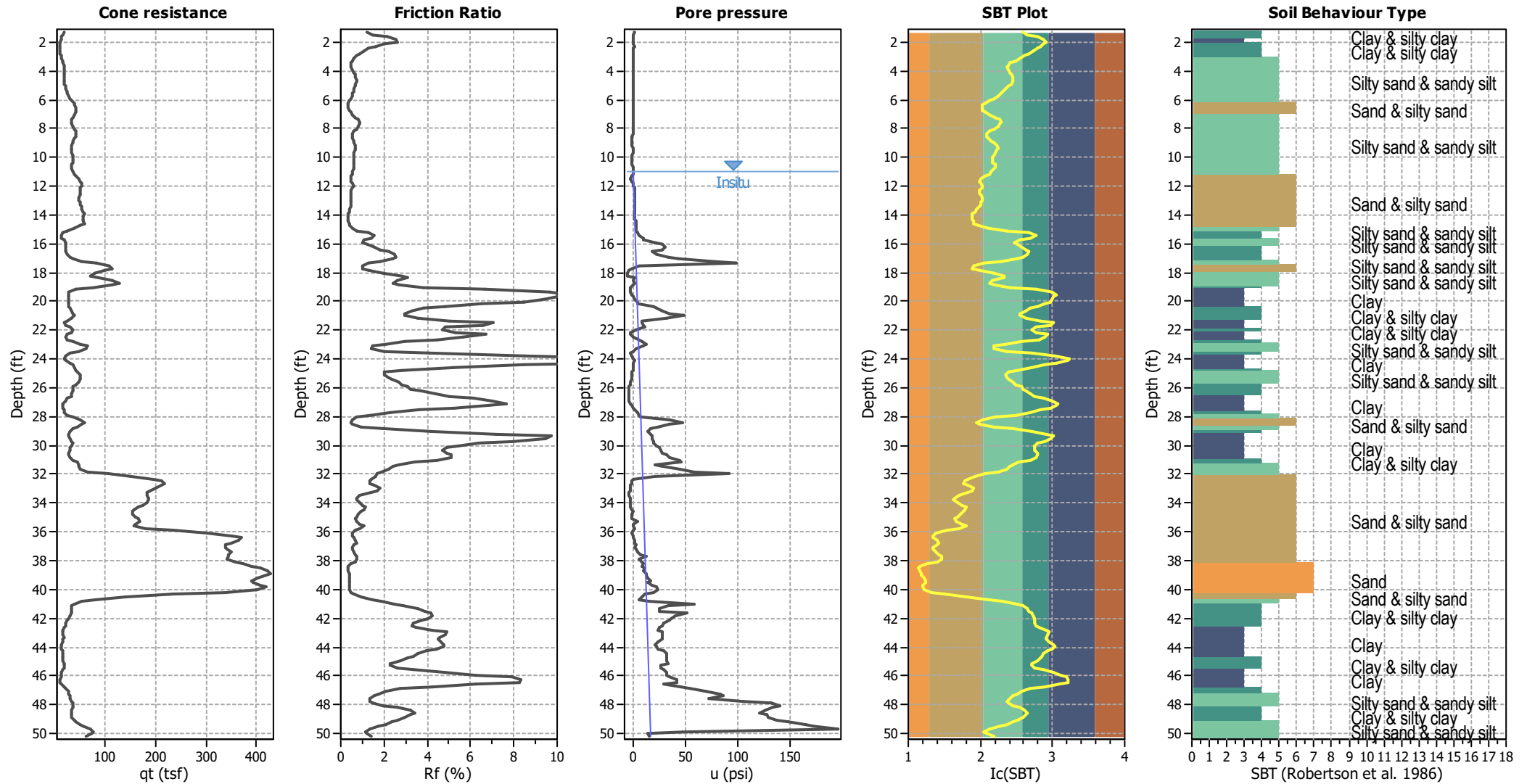
Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	11.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	9.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.13	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



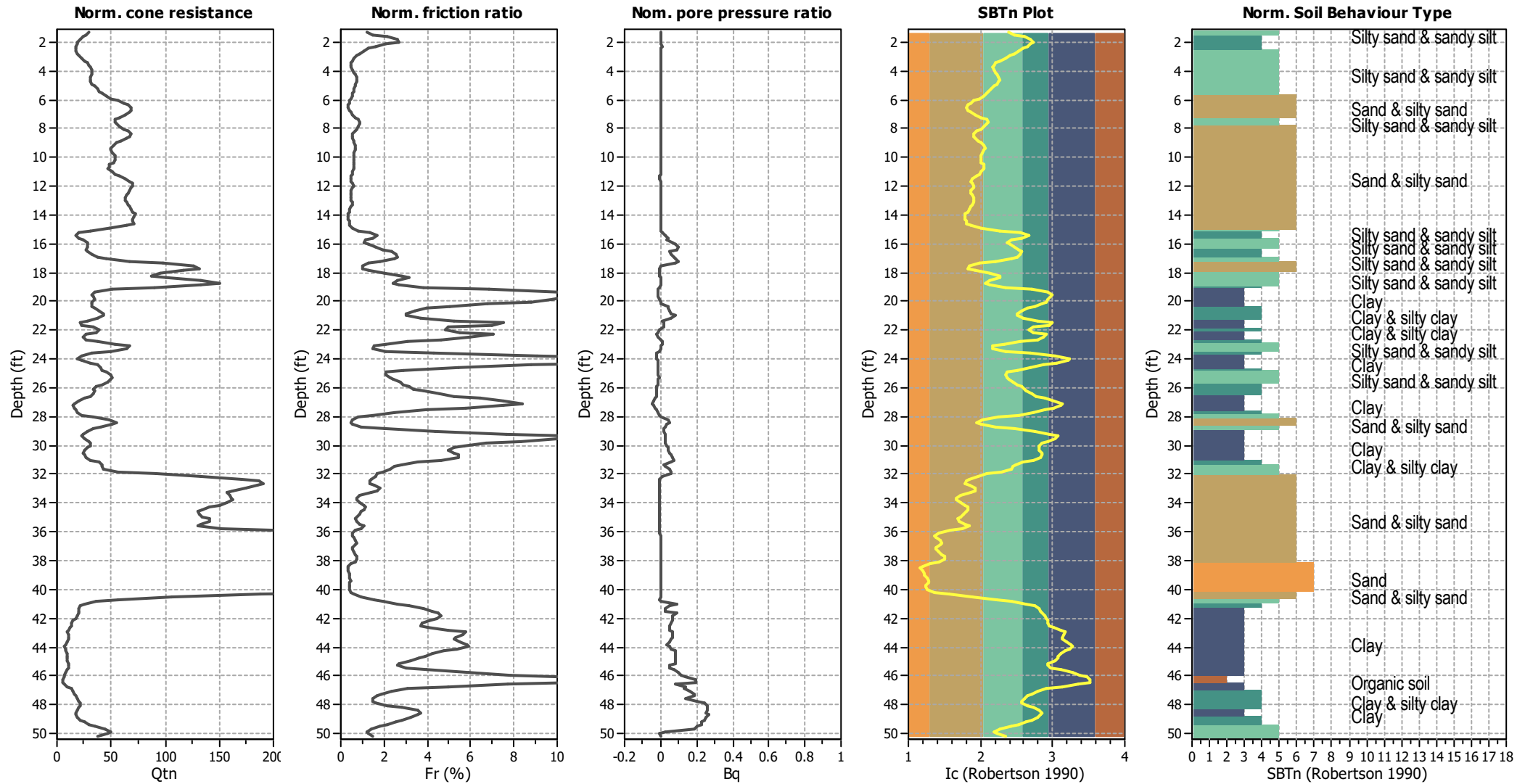
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)

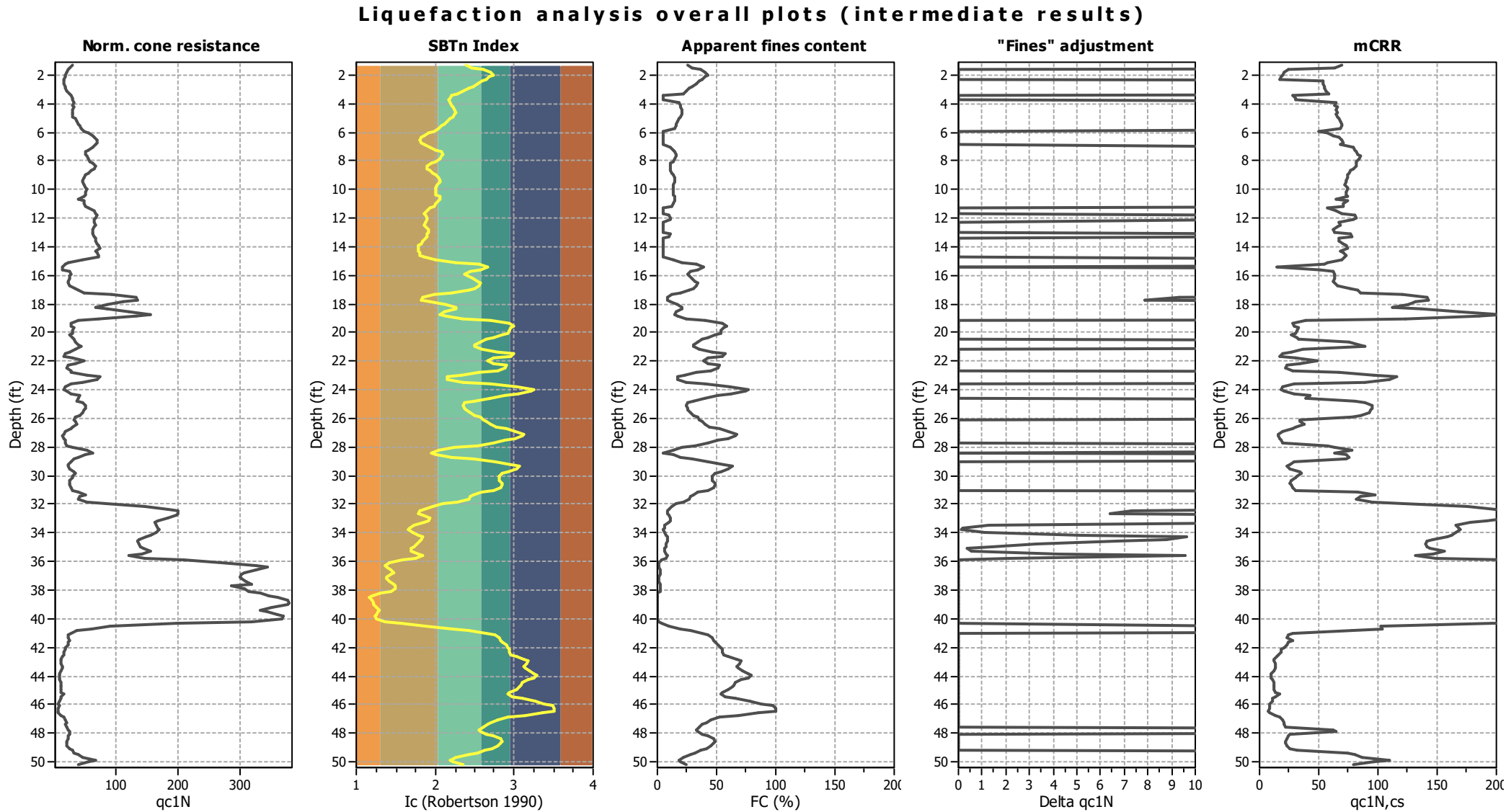


Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

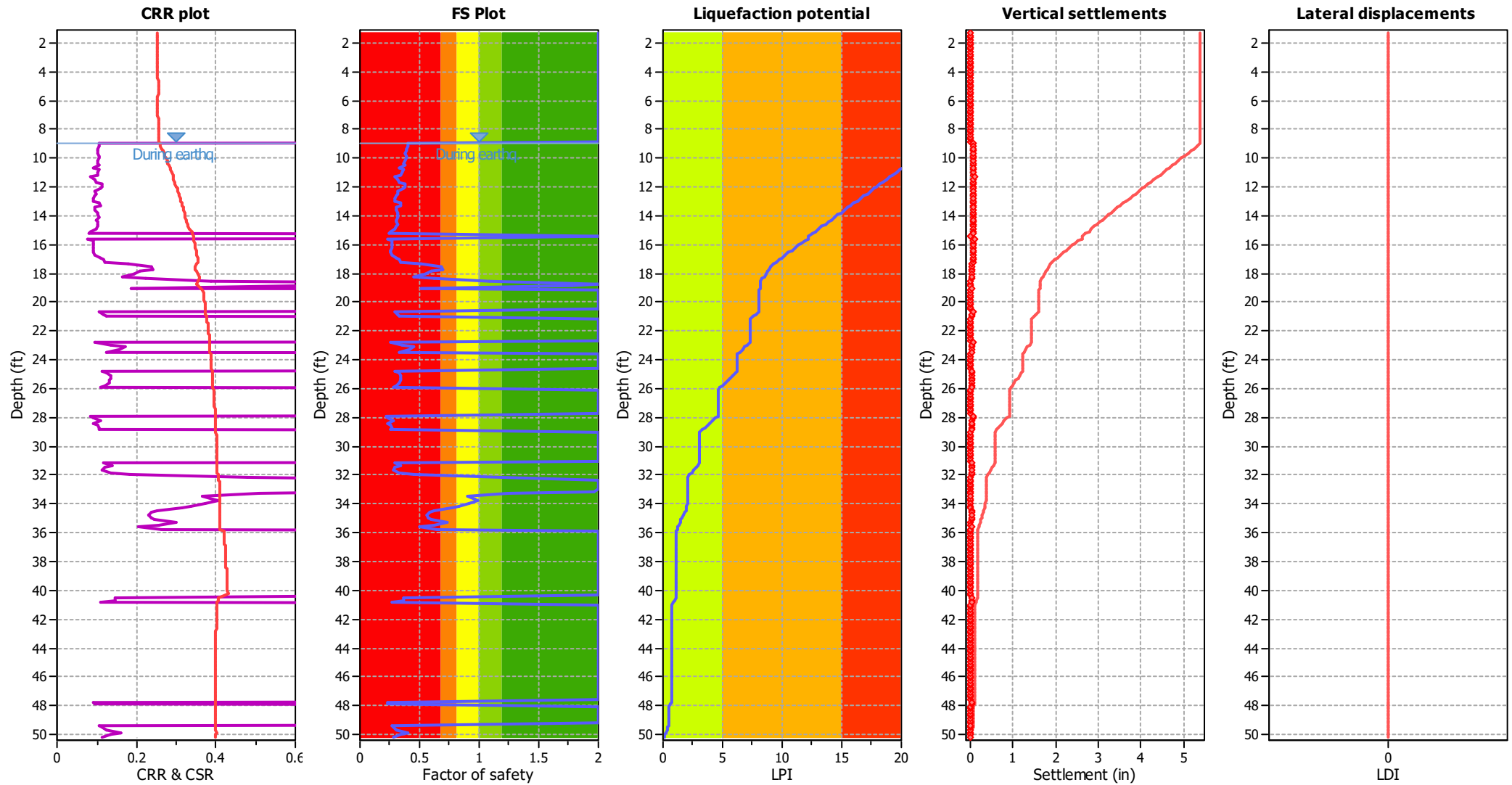
1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (earthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_0 applied:	Yes
Earthquake magnitude M_w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

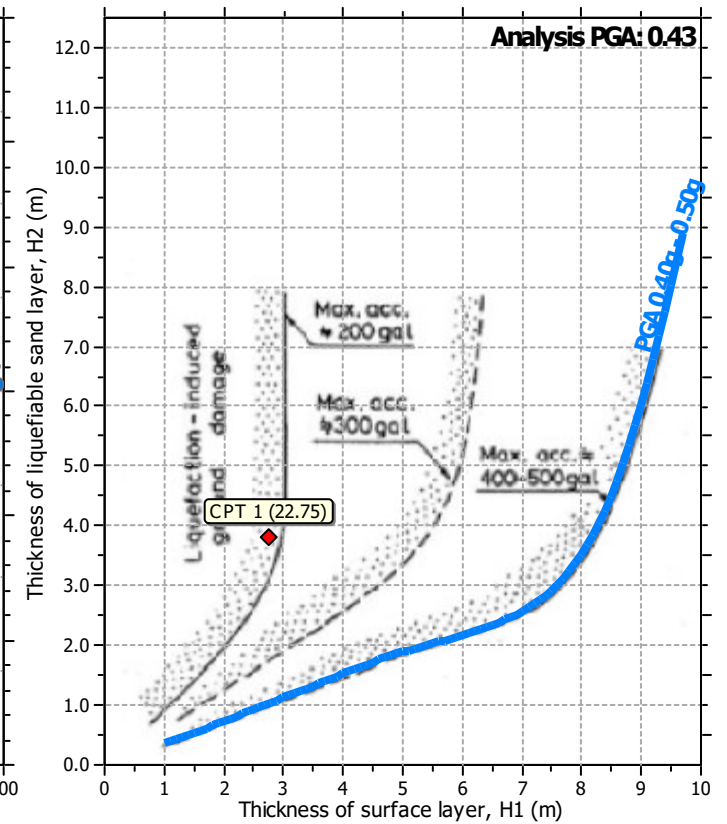
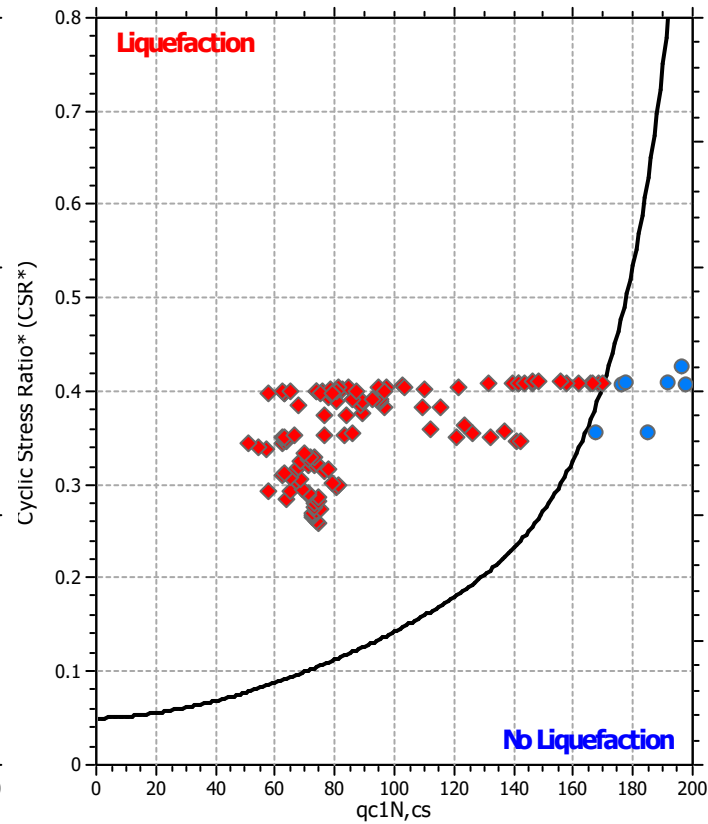
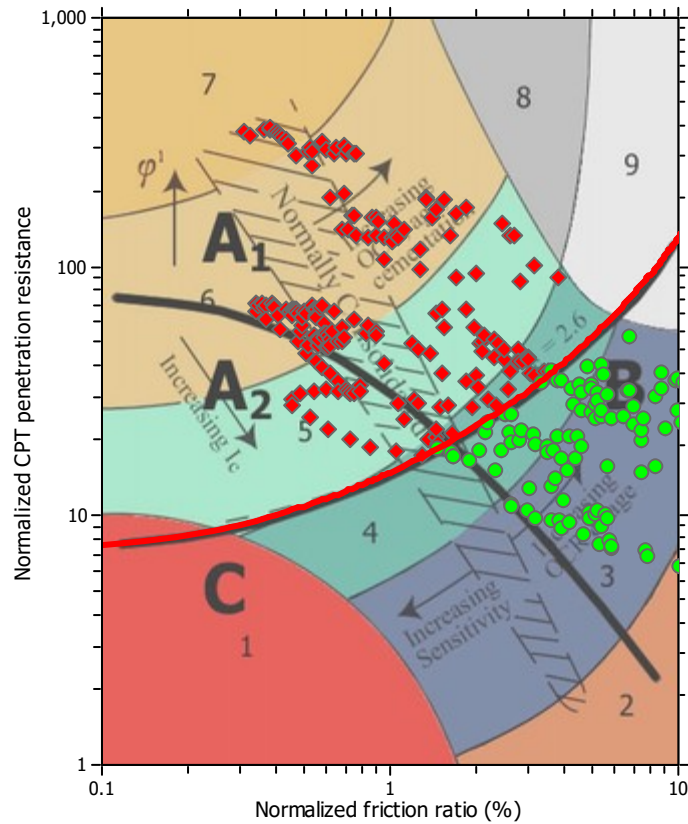
F.S. color scheme

Very high risk	Almost certain it will liquefy
High risk	Very likely to liquefy
Low risk	Liquefaction and no liq. are equally likely
	Unlike to liquefy
	Almost certain it will not liquefy

LPI color scheme

Very high risk
High risk
Low risk

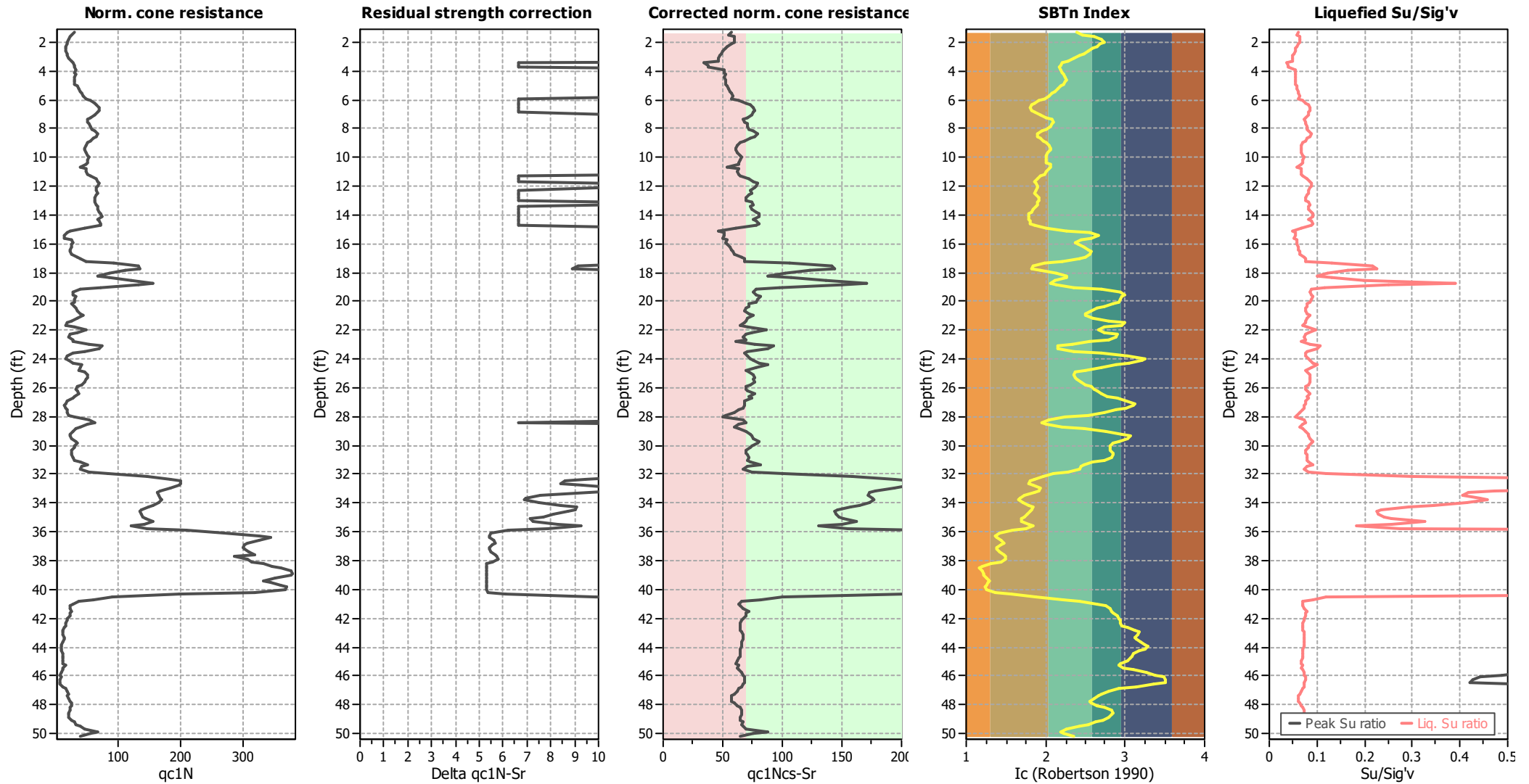
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_o applied:	Yes
Earthquake magnitude M_w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

:: Field input data ::						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	1.31	19.66	0.22	0.99	25.89	106.41
2	1.48	16.04	0.23	0.58	29.25	107.07
3	1.64	15.14	0.30	0.42	36.05	108.47
4	1.80	12.95	0.42	0.39	40.18	108.78
5	1.97	11.89	0.31	0.25	42.19	108.04
6	2.13	11.69	0.23	0.19	39.89	105.63
7	2.30	10.87	0.17	1.01	37.49	103.64
8	2.46	10.95	0.14	0.57	35.03	101.79
9	2.63	11.30	0.11	0.38	32.41	100.64
10	2.79	11.95	0.10	0.32	29.67	99.47
11	2.95	12.45	0.09	0.32	27.17	99.04
12	3.12	13.96	0.09	0.32	24.36	98.69
13	3.28	15.74	0.08	0.37	21.66	98.71
14	3.44	17.48	0.08	0.56	5.00	98.71
15	3.61	19.05	0.08	0.51	5.00	99.27
16	3.77	19.33	0.09	0.50	5.00	100.26
17	3.94	20.68	0.11	0.38	18.55	101.23
18	4.10	19.92	0.12	0.35	18.96	102.09
19	4.26	20.32	0.13	0.28	19.94	102.65
20	4.43	19.47	0.14	0.25	20.51	103.15
21	4.59	19.71	0.15	0.27	21.05	103.33
22	4.76	19.48	0.14	0.24	20.79	103.27
23	4.92	19.97	0.14	0.21	20.09	103.29
24	5.08	21.59	0.14	0.20	18.77	103.41
25	5.25	23.49	0.14	0.23	17.48	103.76
26	5.41	25.02	0.15	0.21	16.33	103.92
27	5.58	26.13	0.14	0.07	15.29	104.04
28	5.74	27.94	0.14	0.11	14.05	104.28
29	5.91	31.19	0.15	0.13	5.00	104.74
30	6.07	35.40	0.16	0.20	5.00	104.76
31	6.23	38.85	0.13	0.19	5.00	104.89
32	6.40	41.42	0.14	0.18	5.00	104.97
33	6.56	43.21	0.15	0.17	5.00	105.74
34	6.73	43.70	0.17	0.15	5.00	106.48
35	6.89	42.55	0.19	0.11	5.00	107.24
36	7.05	39.64	0.21	0.05	11.18	108.03
37	7.22	35.73	0.24	-0.03	13.27	108.72
38	7.38	32.75	0.28	-0.07	15.15	109.38
39	7.55	32.77	0.30	-0.08	15.83	109.91
40	7.71	34.96	0.31	-0.06	15.40	110.24
41	7.87	36.53	0.30	-0.10	14.46	110.24
42	8.04	37.71	0.29	-0.14	13.10	109.97
43	8.20	41.52	0.26	-0.20	11.47	109.56
44	8.37	45.15	0.24	-0.65	10.43	109.17
45	8.53	43.86	0.23	-1.23	10.38	108.89
46	8.69	41.20	0.23	-1.37	10.99	108.42
47	8.86	38.12	0.21	-0.94	11.99	108.16
48	9.02	35.46	0.23	-1.09	13.09	107.92

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	9.19	33.19	0.23	-0.96	14.27	108.03
50	9.35	32.09	0.23	-0.72	14.59	107.66
51	9.51	32.64	0.20	-0.64	14.44	107.51
52	9.68	33.97	0.21	-0.73	13.77	107.45
53	9.84	36.39	0.22	-0.80	13.29	107.81
54	10.01	38.00	0.22	-0.99	13.01	107.97
55	10.17	37.31	0.22	-1.08	13.02	107.95
56	10.34	36.86	0.21	-0.95	13.33	107.81
57	10.50	35.95	0.21	-0.87	14.42	107.35
58	10.66	29.10	0.20	0.58	14.40	107.15
59	10.83	36.65	0.20	-0.28	14.37	107.12
60	10.99	36.61	0.21	-0.20	13.30	107.55
61	11.15	38.29	0.22	-0.09	12.66	107.77
62	11.32	42.47	0.21	-1.73	5.00	108.11
63	11.48	48.98	0.21	-2.77	5.00	108.55
64	11.65	52.37	0.23	-1.52	5.00	109.41
65	11.81	54.03	0.27	-0.05	10.01	110.70
66	11.97	53.15	0.34	0.58	10.43	111.20
67	12.14	51.76	0.30	0.99	10.37	110.68
68	12.30	51.37	0.21	1.05	5.00	109.49
69	12.47	52.86	0.22	1.07	5.00	109.15
70	12.63	50.39	0.26	1.16	5.00	109.29
71	12.79	48.04	0.23	1.53	5.00	109.35
72	12.96	48.69	0.23	1.59	5.00	109.34
73	13.12	50.48	0.26	1.30	10.43	109.79
74	13.29	52.46	0.27	0.92	10.20	109.99
75	13.45	52.68	0.24	0.88	5.00	109.74
76	13.62	53.44	0.23	1.53	5.00	109.32
77	13.78	56.94	0.22	1.60	5.00	109.04
78	13.94	59.02	0.21	1.76	5.00	108.64
79	14.11	59.59	0.19	1.90	5.00	108.26
80	14.27	55.09	0.19	1.84	5.00	108.31
81	14.44	57.73	0.21	2.11	5.00	108.73
82	14.60	59.67	0.23	2.35	5.00	109.31
83	14.76	58.46	0.24	2.46	5.00	108.59
84	14.93	38.93	0.17	2.47	13.35	107.45
85	15.09	19.92	0.19	2.69	21.32	105.87
86	15.26	14.94	0.20	4.04	33.14	105.15
87	15.42	11.29	0.21	5.74	38.43	104.98
88	15.58	12.78	0.21	9.81	34.41	105.49
89	15.75	21.02	0.21	9.78	28.04	105.79
90	15.91	22.72	0.19	20.60	25.47	107.03
91	16.08	21.92	0.29	27.98	26.64	108.26
92	16.24	21.72	0.34	29.76	29.61	109.81
93	16.40	20.71	0.39	27.06	31.99	110.95
94	16.57	20.75	0.46	17.34	34.07	112.54
95	16.73	22.94	0.62	22.27	33.17	114.66
96	16.90	30.35	0.79	33.35	30.69	116.62

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	17.06	35.65	0.89	42.45	27.42	118.31
98	17.22	42.48	1.02	78.12	19.39	120.02
99	17.39	84.52	1.07	98.63	12.55	121.42
100	17.55	119.95	1.06	5.99	8.91	122.43
101	17.72	122.76	1.17	-1.71	8.61	122.89
102	17.88	101.92	1.22	-4.48	11.05	123.22
103	18.05	77.68	1.39	-5.61	16.79	124.30
104	18.21	60.49	2.13	-5.28	21.29	125.88
105	18.37	79.73	2.55	1.96	21.04	128.13
106	18.54	112.82	3.18	0.06	16.39	129.73
107	18.70	149.04	3.11	0.97	14.76	130.51
108	18.86	126.57	3.14	0.07	16.78	130.02
109	19.03	67.48	2.93	-2.31	24.68	128.65
110	19.19	35.59	2.64	-2.84	40.62	127.10
111	19.36	25.55	2.98	-3.11	54.42	126.02
112	19.52	26.05	2.78	-1.93	57.94	126.11
113	19.68	30.18	2.93	-0.33	56.03	126.18
114	19.85	29.27	2.93	1.69	54.20	125.89
115	20.01	28.01	2.39	3.77	53.34	124.54
116	20.18	25.02	1.67	4.67	48.49	122.57
117	20.34	28.73	1.29	19.52	42.76	120.72
118	20.50	30.76	1.14	22.11	37.78	119.83
119	20.67	32.17	1.10	27.08	34.20	119.79
120	20.83	38.41	1.15	34.75	31.03	119.98
121	21.00	42.18	1.11	48.90	30.78	120.13
122	21.16	34.22	1.15	32.11	35.37	120.29
123	21.32	24.96	1.37	8.55	45.74	120.17
124	21.49	18.04	1.39	8.24	57.79	120.02
125	21.65	16.19	1.43	9.52	55.13	120.19
126	21.82	28.97	1.38	11.38	42.20	121.46
127	21.98	46.58	1.61	2.03	38.97	122.89
128	22.15	33.17	2.10	-2.69	42.40	123.19
129	22.31	21.88	1.71	-2.38	52.18	122.00
130	22.47	20.72	1.27	0.13	50.81	119.87
131	22.64	26.79	0.92	5.95	45.13	118.84
132	22.80	27.32	1.11	8.43	33.17	119.37
133	22.97	51.96	1.13	12.89	23.58	120.27
134	23.13	74.04	0.93	9.37	17.66	120.27
135	23.29	69.17	0.87	3.21	17.63	119.60
136	23.46	45.94	0.90	-0.52	24.32	119.46
137	23.62	28.98	1.12	-2.61	40.33	120.55
138	23.79	19.36	1.85	-1.73	61.17	122.37
139	23.95	17.66	2.62	-0.30	76.34	124.60
140	24.11	20.46	3.48	0.63	74.45	126.70
141	24.28	28.96	3.95	0.59	62.01	128.16
142	24.44	42.09	3.64	0.43	50.67	127.40
143	24.61	39.40	1.78	-0.34	40.49	124.67
144	24.77	38.66	0.86	-0.68	30.74	120.50

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	24.93	47.15	0.86	-0.92	25.53	119.10
146	25.10	52.30	1.07	-2.12	24.26	119.99
147	25.26	52.33	1.13	-1.32	25.11	120.98
148	25.43	51.04	1.28	-1.97	25.91	121.04
149	25.59	48.86	1.13	-2.54	28.61	121.51
150	25.75	43.10	1.44	-2.94	30.71	120.73
151	25.92	36.62	1.02	-3.54	33.85	120.28
152	26.08	34.80	1.05	-3.76	35.73	119.98
153	26.25	35.61	1.37	-3.77	37.37	121.18
154	26.41	39.09	1.60	-3.89	40.73	122.21
155	26.57	31.67	1.70	-4.12	44.18	122.53
156	26.74	28.91	1.69	-4.46	52.15	121.84
157	26.90	19.77	1.50	-4.27	59.68	120.82
158	27.07	16.74	1.36	-3.27	67.51	119.39
159	27.23	16.08	1.16	-1.52	66.21	118.24
160	27.39	17.93	0.95	-0.10	59.58	116.78
161	27.56	19.21	0.69	1.44	50.99	114.83
162	27.72	20.36	0.45	3.40	42.26	112.06
163	27.89	22.01	0.26	5.13	32.15	110.12
164	28.05	31.91	0.29	7.00	20.34	109.70
165	28.21	56.43	0.27	34.60	13.90	110.68
166	28.38	66.87	0.28	46.91	5.00	110.95
167	28.54	54.16	0.29	34.47	13.28	111.23
168	28.71	43.44	0.33	24.11	19.43	113.01
169	28.87	35.76	0.61	16.63	29.70	116.62
170	29.04	30.68	1.20	14.22	43.26	120.57
171	29.20	26.96	2.07	16.12	55.93	123.50
172	29.36	25.41	2.76	17.28	63.22	125.37
173	29.53	27.84	3.04	18.11	60.18	126.27
174	29.69	36.44	2.78	19.84	53.74	126.21
175	29.86	37.73	2.34	19.87	48.48	125.18
176	30.02	33.74	1.84	22.60	46.16	123.76
177	30.18	33.56	1.60	24.54	46.17	122.22
178	30.35	29.16	1.37	26.18	46.68	121.30
179	30.51	28.01	1.36	27.41	48.60	121.10
180	30.68	28.86	1.56	31.77	48.87	121.56
181	30.84	30.89	1.62	34.29	47.75	122.25
182	31.00	33.70	1.70	44.58	42.39	122.60
183	31.17	43.59	1.55	45.66	34.66	122.66
184	31.33	56.31	1.33	20.85	30.13	121.86
185	31.50	46.70	1.10	27.32	28.63	121.07
186	31.66	44.47	1.14	44.83	27.40	120.69
187	31.82	58.86	1.13	58.47	22.01	122.25
188	31.99	93.50	1.54	90.90	15.52	125.69
189	32.15	160.96	2.55	21.11	11.90	129.02
190	32.32	201.79	3.18	-0.54	9.29	130.54
191	32.48	218.49	2.54	-2.05	8.14	130.93
192	32.64	219.33	2.73	-1.82	7.96	131.12

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	32.81	217.42	3.33	-2.57	9.19	131.92
194	32.97	202.02	3.62	-2.95	11.01	132.67
195	33.14	184.65	3.98	-3.19	10.88	131.54
196	33.30	181.25	1.96	-3.54	9.56	129.73
197	33.47	183.18	1.61	-3.69	6.64	126.58
198	33.63	187.79	1.33	-3.51	5.54	125.37
199	33.79	189.62	1.19	-3.05	5.45	125.29
200	33.96	185.00	1.57	-2.77	6.53	126.32
201	34.12	175.77	1.98	-2.42	7.92	127.22
202	34.28	167.03	1.89	-2.24	8.84	127.20
203	34.45	155.25	1.66	-1.95	8.77	126.28
204	34.61	153.18	1.40	0.28	8.36	125.35
205	34.78	155.13	1.33	-1.01	7.52	124.48
206	34.94	159.33	1.15	-1.47	6.78	123.92
207	35.10	163.58	1.09	-1.85	5.92	123.57
208	35.27	176.66	1.11	4.12	6.15	123.98
209	35.43	162.35	1.34	-0.69	7.73	125.10
210	35.60	139.95	1.74	-0.40	9.05	126.24
211	35.76	167.80	1.85	1.27	7.07	126.55
212	35.92	235.63	1.32	-0.40	4.01	127.02
213	36.09	301.09	1.64	-0.90	1.80	127.59
214	36.25	363.02	1.82	-0.04	1.18	129.04
215	36.42	383.79	2.07	-0.36	1.31	130.28
216	36.58	364.37	2.53	1.65	2.09	131.39
217	36.74	342.55	2.93	1.61	2.38	131.17
218	36.91	339.18	1.95	2.45	2.03	130.09
219	37.07	336.23	1.58	1.61	1.25	128.55
220	37.24	340.45	1.70	2.40	1.34	128.86
221	37.40	347.21	2.16	3.52	1.71	129.93
222	37.57	358.40	2.40	7.28	2.41	130.87
223	37.73	322.56	2.60	13.08	2.76	131.41
224	37.89	346.65	2.71	5.36	2.82	131.42
225	38.06	353.67	2.41	8.71	1.93	130.75
226	38.22	374.50	1.81	9.47	0.43	128.37
227	38.39	390.42	0.72	8.30	0.00	126.56
228	38.55	408.87	1.27	10.76	0.00	126.59
229	38.71	425.29	1.77	10.15	0.00	128.16
230	38.88	429.58	1.57	11.73	0.00	128.66
231	39.04	426.57	1.57	12.87	0.00	128.46
232	39.21	399.99	1.67	14.40	0.00	128.54
233	39.37	377.42	1.69	16.80	0.27	128.66
234	39.53	390.98	1.71	14.44	0.14	128.51
235	39.70	411.33	1.55	17.39	0.00	128.60
236	39.86	421.99	1.70	21.63	0.00	128.77
237	40.03	420.07	1.78	23.68	0.04	128.62
238	40.19	364.72	1.51	19.05	1.06	127.87
239	40.35	230.57	1.48	11.23	3.81	126.28
240	40.52	111.86	1.34	7.80	9.86	124.35

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	40.68	76.79	1.14	4.81	19.66	122.12
242	40.85	47.38	1.05	15.60	27.78	120.06
243	41.01	35.23	0.84	57.86	37.33	118.84
244	41.17	31.35	0.98	33.23	43.15	118.49
245	41.34	30.41	1.06	25.30	46.58	119.90
246	41.50	35.25	1.46	24.35	48.05	120.62
247	41.67	31.69	1.33	51.71	49.31	121.18
248	41.83	30.49	1.37	39.84	51.66	120.38
249	41.99	26.56	1.14	36.44	53.06	119.19
250	42.16	24.34	0.85	34.26	54.30	117.77
251	42.32	23.24	0.87	29.40	54.28	116.21
252	42.49	21.38	0.64	28.09	55.66	115.36
253	42.65	20.03	0.64	25.28	60.00	114.84
254	42.81	16.70	0.79	23.93	66.53	115.42
255	42.98	16.38	0.88	27.06	71.06	116.02
256	43.14	17.55	0.88	27.96	69.61	116.27
257	43.31	18.58	0.84	28.26	67.32	116.15
258	43.47	18.27	0.81	27.02	68.14	115.68
259	43.63	15.78	0.75	23.87	72.09	115.05
260	43.80	13.98	0.71	20.22	76.97	114.24
261	43.96	13.23	0.65	22.09	79.41	113.64
262	44.13	13.22	0.62	23.70	76.31	113.38
263	44.29	15.37	0.62	28.94	70.98	113.46
264	44.45	17.05	0.61	31.20	66.14	113.55
265	44.62	17.30	0.59	31.32	64.08	113.30
266	44.78	16.69	0.54	31.39	63.05	112.72
267	44.95	16.77	0.48	31.50	60.32	112.00
268	45.11	18.31	0.43	33.41	54.50	111.71
269	45.28	22.41	0.44	26.43	53.78	111.90
270	45.44	18.28	0.51	25.77	57.14	112.43
271	45.60	15.93	0.56	29.18	66.23	112.82
272	45.77	14.49	0.60	31.62	78.61	114.27
273	45.93	12.05	0.96	32.32	87.78	115.43
274	46.10	12.66	0.98	33.93	97.23	116.42
275	46.26	11.40	1.05	41.01	100.00	116.50
276	46.42	11.01	1.02	40.81	100.00	116.37
277	46.59	12.49	0.94	28.44	85.78	116.00
278	46.75	17.92	0.74	45.02	68.00	115.52
279	46.92	23.00	0.65	53.94	52.95	114.70
280	47.08	27.09	0.53	69.67	45.07	114.19
281	47.24	28.63	0.53	82.45	40.88	113.42
282	47.41	27.84	0.44	86.14	38.19	112.85
283	47.57	30.73	0.40	72.40	35.49	112.56
284	47.74	33.68	0.45	105.29	33.49	113.34
285	47.90	36.10	0.55	131.68	33.98	114.75
286	48.06	35.25	0.67	139.76	37.44	116.79
287	48.23	33.90	0.98	133.42	42.49	118.44
288	48.39	31.76	1.14	126.26	47.25	119.52

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	48.56	30.15	1.16	121.12	48.77	119.54
290	48.72	30.85	1.03	127.89	48.06	119.20
291	48.88	31.81	0.99	128.32	45.30	119.00
292	49.05	35.24	1.02	136.68	41.01	119.36
293	49.21	43.29	1.06	147.76	36.82	119.77
294	49.38	46.61	1.04	165.00	32.30	120.04
295	49.54	53.66	1.00	171.75	27.78	120.13
296	49.70	64.80	0.96	195.26	21.45	120.33
297	49.87	91.08	0.90	46.36	18.90	120.15
298	50.03	75.84	0.85	13.75	20.06	119.88
299	50.20	54.40	0.91	14.88	24.70	119.46

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	1.31	0.07	0.00	0.07	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
2	1.48	0.08	0.00	0.08	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
3	1.64	0.09	0.00	0.09	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
4	1.80	0.10	0.00	0.10	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
5	1.97	0.11	0.00	0.11	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
6	2.13	0.11	0.00	0.11	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
7	2.30	0.12	0.00	0.12	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
8	2.46	0.13	0.00	0.13	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
9	2.63	0.14	0.00	0.14	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
10	2.79	0.15	0.00	0.15	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
11	2.95	0.16	0.00	0.16	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
12	3.12	0.16	0.00	0.16	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
13	3.28	0.17	0.00	0.17	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
14	3.44	0.18	0.00	0.18	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
15	3.61	0.19	0.00	0.19	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
16	3.77	0.20	0.00	0.20	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
17	3.94	0.20	0.00	0.20	1.00	0.278	1.10	0.252	1.10	1.10	2.000	No
18	4.10	0.21	0.00	0.21	1.00	0.278	1.10	0.252	1.10	1.10	2.000	No
19	4.26	0.22	0.00	0.22	0.99	0.278	1.10	0.252	1.09	1.10	2.000	No
20	4.43	0.23	0.00	0.23	0.99	0.278	1.10	0.252	1.09	1.10	2.000	No
21	4.59	0.24	0.00	0.24	0.99	0.278	1.10	0.252	1.09	1.10	2.000	No
22	4.76	0.25	0.00	0.25	0.99	0.278	1.10	0.252	1.09	1.10	2.000	No
23	4.92	0.25	0.00	0.25	0.99	0.278	1.10	0.252	1.09	1.10	2.000	No
24	5.08	0.26	0.00	0.26	0.99	0.277	1.10	0.252	1.09	1.10	2.000	No
25	5.25	0.27	0.00	0.27	0.99	0.277	1.10	0.251	1.09	1.10	2.000	No
26	5.41	0.28	0.00	0.28	0.99	0.277	1.10	0.251	1.09	1.10	2.000	No
27	5.58	0.29	0.00	0.29	0.99	0.277	1.10	0.251	1.09	1.10	2.000	No
28	5.74	0.30	0.00	0.30	0.99	0.277	1.10	0.251	1.09	1.10	2.000	No
29	5.91	0.31	0.00	0.31	0.99	0.277	1.10	0.251	1.09	1.10	2.000	No
30	6.07	0.31	0.00	0.31	0.99	0.277	1.10	0.251	1.09	1.10	2.000	No
31	6.23	0.32	0.00	0.32	0.99	0.276	1.10	0.251	1.09	1.10	2.000	No
32	6.40	0.33	0.00	0.33	0.99	0.276	1.10	0.250	1.09	1.10	2.000	No
33	6.56	0.34	0.00	0.34	0.99	0.276	1.10	0.250	1.09	1.10	2.000	No
34	6.73	0.35	0.00	0.35	0.99	0.276	1.10	0.250	1.09	1.10	2.000	No
35	6.89	0.36	0.00	0.36	0.99	0.276	1.10	0.250	1.09	1.10	2.000	No
36	7.05	0.37	0.00	0.37	0.99	0.276	1.10	0.250	1.08	1.10	2.000	No
37	7.22	0.38	0.00	0.38	0.99	0.275	1.10	0.250	1.08	1.10	2.000	No
38	7.38	0.38	0.00	0.38	0.98	0.275	1.10	0.250	1.07	1.10	2.000	No
39	7.55	0.39	0.00	0.39	0.98	0.275	1.10	0.250	1.07	1.10	2.000	No
40	7.71	0.40	0.00	0.40	0.98	0.275	1.10	0.249	1.07	1.10	2.000	No
41	7.87	0.41	0.00	0.41	0.98	0.275	1.10	0.249	1.07	1.10	2.000	No
42	8.04	0.42	0.00	0.42	0.98	0.275	1.10	0.249	1.07	1.10	2.000	No
43	8.20	0.43	0.00	0.43	0.98	0.275	1.10	0.249	1.07	1.10	2.000	No
44	8.37	0.44	0.00	0.44	0.98	0.274	1.10	0.249	1.07	1.10	2.000	No
45	8.53	0.45	0.00	0.45	0.98	0.274	1.10	0.249	1.07	1.10	2.000	No
46	8.69	0.46	0.00	0.46	0.98	0.274	1.10	0.249	1.07	1.10	2.000	No
47	8.86	0.47	0.00	0.47	0.98	0.274	1.10	0.248	1.06	1.10	2.000	No
48	9.02	0.47	0.00	0.47	0.98	0.274	1.10	0.249	1.06	1.10	0.258	No

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

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR _{eq}	K_σ	User FS	CSR*	Belongs to transition
49	9.19	0.48	0.01	0.48	0.98	0.277	1.10	0.251	1.06	1.10	0.262	No
50	9.35	0.49	0.01	0.48	0.98	0.280	1.10	0.254	1.05	1.10	0.265	No
51	9.51	0.50	0.02	0.48	0.98	0.282	1.10	0.256	1.05	1.10	0.267	No
52	9.68	0.51	0.02	0.49	0.98	0.285	1.10	0.258	1.05	1.10	0.270	No
53	9.84	0.52	0.03	0.49	0.98	0.287	1.10	0.261	1.05	1.10	0.272	No
54	10.01	0.53	0.03	0.50	0.98	0.290	1.10	0.263	1.06	1.10	0.274	No
55	10.17	0.54	0.04	0.50	0.98	0.292	1.10	0.265	1.05	1.10	0.277	No
56	10.34	0.55	0.04	0.50	0.97	0.295	1.10	0.267	1.05	1.10	0.279	No
57	10.50	0.55	0.05	0.51	0.97	0.297	1.10	0.270	1.05	1.10	0.282	No
58	10.66	0.56	0.05	0.51	0.97	0.300	1.10	0.272	1.05	1.10	0.285	No
59	10.83	0.57	0.06	0.51	0.97	0.302	1.10	0.274	1.05	1.10	0.287	No
60	10.99	0.58	0.06	0.52	0.97	0.304	1.10	0.276	1.05	1.10	0.289	No
61	11.15	0.59	0.07	0.52	0.97	0.306	1.10	0.278	1.05	1.10	0.291	No
62	11.32	0.60	0.07	0.53	0.97	0.309	1.10	0.280	1.05	1.10	0.292	No
63	11.48	0.61	0.08	0.53	0.97	0.311	1.10	0.282	1.06	1.10	0.294	No
64	11.65	0.62	0.08	0.53	0.97	0.313	1.10	0.284	1.06	1.10	0.295	No
65	11.81	0.63	0.09	0.54	0.97	0.315	1.10	0.286	1.06	1.10	0.297	No
66	11.97	0.63	0.09	0.54	0.97	0.317	1.10	0.288	1.06	1.10	0.300	No
67	12.14	0.64	0.10	0.55	0.97	0.319	1.10	0.289	1.05	1.10	0.302	No
68	12.30	0.65	0.10	0.55	0.97	0.321	1.10	0.291	1.05	1.10	0.304	No
69	12.47	0.66	0.11	0.55	0.97	0.323	1.10	0.293	1.05	1.10	0.306	No
70	12.63	0.67	0.11	0.56	0.97	0.325	1.10	0.295	1.05	1.10	0.308	No
71	12.79	0.68	0.12	0.56	0.97	0.327	1.10	0.296	1.05	1.10	0.310	No
72	12.96	0.69	0.12	0.56	0.96	0.329	1.10	0.298	1.05	1.10	0.312	No
73	13.12	0.70	0.13	0.57	0.96	0.330	1.10	0.300	1.05	1.10	0.314	No
74	13.29	0.71	0.13	0.57	0.96	0.332	1.10	0.301	1.05	1.10	0.316	No
75	13.45	0.72	0.14	0.58	0.96	0.334	1.10	0.303	1.05	1.10	0.317	No
76	13.62	0.72	0.14	0.58	0.96	0.336	1.10	0.304	1.05	1.10	0.319	No
77	13.78	0.73	0.15	0.58	0.96	0.337	1.10	0.306	1.05	1.10	0.320	No
78	13.94	0.74	0.15	0.59	0.96	0.339	1.10	0.307	1.05	1.10	0.322	No
79	14.11	0.75	0.16	0.59	0.96	0.341	1.10	0.309	1.05	1.10	0.323	No
80	14.27	0.76	0.16	0.60	0.96	0.342	1.10	0.310	1.05	1.10	0.326	No
81	14.44	0.77	0.17	0.60	0.96	0.344	1.10	0.312	1.05	1.10	0.327	No
82	14.60	0.78	0.17	0.60	0.96	0.345	1.10	0.313	1.05	1.10	0.329	No
83	14.76	0.79	0.18	0.61	0.96	0.347	1.10	0.314	1.05	1.10	0.330	No
84	14.93	0.80	0.18	0.61	0.96	0.348	1.10	0.316	1.04	1.10	0.335	No
85	15.09	0.80	0.19	0.61	0.96	0.350	1.10	0.317	1.03	1.10	0.339	No
86	15.26	0.81	0.20	0.62	0.96	0.351	1.10	0.319	1.03	1.10	0.341	No
87	15.42	0.82	0.20	0.62	0.95	0.353	1.10	0.320	1.03	1.10	0.343	No
88	15.58	0.83	0.21	0.62	0.95	0.354	1.10	0.321	1.03	1.10	0.344	No
89	15.75	0.84	0.21	0.63	0.95	0.356	1.10	0.323	1.03	1.10	0.345	No
90	15.91	0.85	0.22	0.63	0.95	0.357	1.10	0.324	1.03	1.10	0.346	No
91	16.08	0.86	0.22	0.64	0.95	0.358	1.10	0.325	1.03	1.10	0.347	No
92	16.24	0.87	0.23	0.64	0.95	0.360	1.10	0.326	1.03	1.10	0.349	No
93	16.40	0.87	0.23	0.64	0.95	0.361	1.10	0.327	1.03	1.10	0.350	No
94	16.57	0.88	0.24	0.65	0.95	0.362	1.10	0.328	1.03	1.10	0.352	No
95	16.73	0.89	0.24	0.65	0.95	0.363	1.10	0.329	1.03	1.10	0.353	No
96	16.90	0.90	0.25	0.66	0.95	0.364	1.10	0.331	1.03	1.10	0.353	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)												
Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR _{eq}	K_σ	User FS	CSR*	Belongs to transition
97	17.06	0.91	0.25	0.66	0.95	0.366	1.10	0.332	1.03	1.10	0.354	No
98	17.22	0.92	0.26	0.67	0.95	0.367	1.10	0.332	1.03	1.10	0.354	No
99	17.39	0.93	0.26	0.67	0.95	0.368	1.10	0.333	1.05	1.10	0.350	No
100	17.55	0.94	0.27	0.68	0.95	0.369	1.10	0.334	1.06	1.10	0.346	No
101	17.72	0.95	0.27	0.68	0.94	0.370	1.10	0.335	1.06	1.10	0.347	No
102	17.88	0.96	0.28	0.69	0.94	0.370	1.10	0.336	1.05	1.10	0.352	No
103	18.05	0.97	0.28	0.69	0.94	0.371	1.10	0.337	1.04	1.10	0.356	No
104	18.21	0.98	0.29	0.70	0.94	0.372	1.10	0.338	1.03	1.10	0.359	No
105	18.37	0.99	0.29	0.70	0.94	0.373	1.10	0.338	1.04	1.10	0.358	No
106	18.54	1.00	0.30	0.71	0.94	0.374	1.10	0.339	1.05	1.10	0.355	No
107	18.70	1.01	0.30	0.71	0.94	0.374	1.10	0.340	1.07	1.10	0.350	No
108	18.86	1.03	0.31	0.72	0.94	0.375	1.10	0.340	1.05	1.10	0.355	No
109	19.03	1.04	0.31	0.72	0.94	0.376	1.10	0.341	1.03	1.10	0.363	No
110	19.19	1.05	0.32	0.73	0.94	0.377	1.10	0.342	1.02	1.10	0.367	No
111	19.36	1.06	0.32	0.73	0.94	0.377	1.10	0.342	1.02	1.10	0.369	No
112	19.52	1.07	0.33	0.74	0.94	0.378	1.10	0.343	1.02	1.10	0.369	No
113	19.68	1.08	0.33	0.74	0.94	0.379	1.10	0.343	1.02	1.10	0.370	No
114	19.85	1.09	0.34	0.75	0.93	0.379	1.10	0.344	1.02	1.10	0.371	No
115	20.01	1.10	0.34	0.75	0.93	0.380	1.10	0.345	1.02	1.10	0.372	No
116	20.18	1.11	0.35	0.76	0.93	0.381	1.10	0.345	1.02	1.10	0.373	No
117	20.34	1.12	0.35	0.76	0.93	0.381	1.10	0.346	1.02	1.10	0.373	No
118	20.50	1.13	0.36	0.77	0.93	0.382	1.10	0.347	1.02	1.10	0.374	No
119	20.67	1.14	0.36	0.77	0.93	0.383	1.10	0.347	1.02	1.10	0.375	No
120	20.83	1.15	0.37	0.78	0.93	0.383	1.10	0.348	1.02	1.10	0.375	No
121	21.00	1.16	0.37	0.78	0.93	0.384	1.10	0.348	1.02	1.10	0.375	No
122	21.16	1.17	0.38	0.79	0.93	0.385	1.10	0.349	1.02	1.10	0.377	No
123	21.32	1.18	0.38	0.79	0.93	0.385	1.10	0.349	1.02	1.10	0.378	No
124	21.49	1.19	0.39	0.80	0.93	0.386	1.10	0.350	1.01	1.10	0.379	No
125	21.65	1.20	0.39	0.80	0.93	0.387	1.10	0.351	1.01	1.10	0.380	No
126	21.82	1.21	0.40	0.81	0.93	0.387	1.10	0.351	1.02	1.10	0.380	No
127	21.98	1.22	0.41	0.81	0.93	0.388	1.10	0.352	1.02	1.10	0.380	No
128	22.15	1.23	0.41	0.82	0.92	0.388	1.10	0.352	1.02	1.10	0.381	No
129	22.31	1.24	0.42	0.82	0.92	0.389	1.10	0.352	1.01	1.10	0.382	No
130	22.47	1.25	0.42	0.83	0.92	0.389	1.10	0.353	1.01	1.10	0.383	No
131	22.64	1.26	0.43	0.83	0.92	0.390	1.10	0.353	1.01	1.10	0.383	No
132	22.80	1.27	0.43	0.84	0.92	0.390	1.10	0.354	1.01	1.10	0.384	No
133	22.97	1.28	0.44	0.84	0.92	0.391	1.10	0.354	1.02	1.10	0.383	No
134	23.13	1.29	0.44	0.85	0.92	0.391	1.10	0.355	1.02	1.10	0.383	No
135	23.29	1.30	0.45	0.85	0.92	0.392	1.10	0.355	1.02	1.10	0.384	No
136	23.46	1.31	0.45	0.85	0.92	0.392	1.10	0.356	1.01	1.10	0.385	No
137	23.62	1.32	0.46	0.86	0.92	0.393	1.10	0.356	1.01	1.10	0.387	No
138	23.79	1.33	0.46	0.86	0.92	0.393	1.10	0.356	1.01	1.10	0.388	No
139	23.95	1.34	0.47	0.87	0.92	0.393	1.10	0.357	1.01	1.10	0.388	No
140	24.11	1.35	0.47	0.87	0.91	0.394	1.10	0.357	1.01	1.10	0.389	No
141	24.28	1.36	0.48	0.88	0.91	0.394	1.10	0.357	1.01	1.10	0.389	No
142	24.44	1.37	0.48	0.89	0.91	0.394	1.10	0.358	1.01	1.10	0.389	No
143	24.61	1.38	0.49	0.89	0.91	0.395	1.10	0.358	1.01	1.10	0.389	No
144	24.77	1.39	0.49	0.90	0.91	0.395	1.10	0.358	1.01	1.10	0.390	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	24.93	1.40	0.50	0.90	0.91	0.395	1.10	0.358	1.01	1.10	0.390	No
146	25.10	1.41	0.50	0.90	0.91	0.396	1.10	0.359	1.01	1.10	0.390	No
147	25.26	1.42	0.51	0.91	0.91	0.396	1.10	0.359	1.01	1.10	0.391	No
148	25.43	1.43	0.51	0.91	0.91	0.396	1.10	0.359	1.01	1.10	0.391	No
149	25.59	1.44	0.52	0.92	0.91	0.397	1.10	0.360	1.01	1.10	0.392	No
150	25.75	1.45	0.52	0.92	0.91	0.397	1.10	0.360	1.01	1.10	0.392	No
151	25.92	1.46	0.53	0.93	0.91	0.397	1.10	0.360	1.01	1.10	0.393	No
152	26.08	1.47	0.53	0.93	0.91	0.398	1.10	0.361	1.01	1.10	0.394	No
153	26.25	1.48	0.54	0.94	0.90	0.398	1.10	0.361	1.01	1.10	0.394	No
154	26.41	1.49	0.54	0.94	0.90	0.398	1.10	0.361	1.01	1.10	0.394	No
155	26.57	1.50	0.55	0.95	0.90	0.398	1.10	0.361	1.01	1.10	0.395	No
156	26.74	1.51	0.55	0.95	0.90	0.399	1.10	0.361	1.01	1.10	0.395	No
157	26.90	1.52	0.56	0.96	0.90	0.399	1.10	0.362	1.01	1.10	0.396	No
158	27.07	1.53	0.56	0.96	0.90	0.399	1.10	0.362	1.00	1.10	0.396	No
159	27.23	1.54	0.57	0.97	0.90	0.399	1.10	0.362	1.00	1.10	0.397	No
160	27.39	1.55	0.57	0.97	0.90	0.400	1.10	0.362	1.00	1.10	0.397	No
161	27.56	1.55	0.58	0.98	0.90	0.400	1.10	0.363	1.00	1.10	0.397	No
162	27.72	1.56	0.58	0.98	0.90	0.400	1.10	0.363	1.00	1.10	0.398	No
163	27.89	1.57	0.59	0.98	0.90	0.401	1.10	0.363	1.00	1.10	0.398	No
164	28.05	1.58	0.59	0.99	0.90	0.401	1.10	0.364	1.00	1.10	0.398	No
165	28.21	1.59	0.60	0.99	0.89	0.401	1.10	0.364	1.00	1.10	0.398	No
166	28.38	1.60	0.60	1.00	0.89	0.402	1.10	0.364	1.00	1.10	0.399	No
167	28.54	1.61	0.61	1.00	0.89	0.402	1.10	0.364	1.00	1.10	0.399	No
168	28.71	1.62	0.61	1.00	0.89	0.402	1.10	0.365	1.00	1.10	0.400	No
169	28.87	1.63	0.62	1.01	0.89	0.402	1.10	0.365	1.00	1.10	0.400	No
170	29.04	1.64	0.63	1.01	0.89	0.403	1.10	0.365	1.00	1.10	0.401	No
171	29.20	1.65	0.63	1.02	0.89	0.403	1.10	0.365	1.00	1.10	0.401	No
172	29.36	1.66	0.64	1.02	0.89	0.403	1.10	0.365	1.00	1.10	0.401	No
173	29.53	1.67	0.64	1.03	0.89	0.403	1.10	0.365	1.00	1.10	0.401	No
174	29.69	1.68	0.65	1.03	0.89	0.403	1.10	0.365	1.00	1.10	0.401	No
175	29.86	1.69	0.65	1.04	0.89	0.403	1.10	0.365	1.00	1.10	0.402	No
176	30.02	1.70	0.66	1.04	0.89	0.403	1.10	0.366	1.00	1.10	0.402	No
177	30.18	1.71	0.66	1.05	0.88	0.403	1.10	0.366	1.00	1.10	0.402	No
178	30.35	1.72	0.67	1.05	0.88	0.403	1.10	0.366	1.00	1.10	0.402	No
179	30.51	1.73	0.67	1.06	0.88	0.403	1.10	0.366	1.00	1.10	0.402	No
180	30.68	1.74	0.68	1.06	0.88	0.403	1.10	0.366	1.00	1.10	0.403	No
181	30.84	1.75	0.68	1.07	0.88	0.404	1.10	0.366	1.00	1.10	0.403	No
182	31.00	1.76	0.69	1.07	0.88	0.404	1.10	0.366	1.00	1.10	0.403	No
183	31.17	1.77	0.69	1.08	0.88	0.404	1.10	0.366	1.00	1.10	0.403	No
184	31.33	1.78	0.70	1.08	0.88	0.404	1.10	0.366	1.00	1.10	0.403	No
185	31.50	1.79	0.70	1.09	0.88	0.404	1.10	0.366	1.00	1.10	0.404	No
186	31.66	1.80	0.71	1.09	0.88	0.404	1.10	0.366	1.00	1.10	0.404	No
187	31.82	1.81	0.71	1.10	0.88	0.404	1.10	0.366	1.00	1.10	0.404	No
188	31.99	1.82	0.72	1.10	0.88	0.404	1.10	0.366	1.00	1.10	0.404	No
189	32.15	1.83	0.72	1.11	0.87	0.404	1.10	0.366	0.99	1.10	0.406	No
190	32.32	1.84	0.73	1.11	0.87	0.404	1.10	0.366	0.99	1.10	0.407	No
191	32.48	1.85	0.73	1.12	0.87	0.404	1.10	0.366	0.99	1.10	0.409	No
192	32.64	1.86	0.74	1.12	0.87	0.404	1.10	0.366	0.98	1.10	0.409	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	32.81	1.87	0.74	1.13	0.87	0.404	1.10	0.366	0.98	1.10	0.409	No
194	32.97	1.88	0.75	1.14	0.87	0.403	1.10	0.366	0.98	1.10	0.409	No
195	33.14	1.89	0.75	1.14	0.87	0.403	1.10	0.366	0.99	1.10	0.408	No
196	33.30	1.91	0.76	1.15	0.87	0.403	1.10	0.366	0.99	1.10	0.408	No
197	33.47	1.92	0.76	1.15	0.87	0.403	1.10	0.366	0.98	1.10	0.409	No
198	33.63	1.93	0.77	1.16	0.87	0.403	1.10	0.366	0.98	1.10	0.409	No
199	33.79	1.94	0.77	1.16	0.87	0.403	1.10	0.366	0.98	1.10	0.409	No
200	33.96	1.95	0.78	1.17	0.87	0.403	1.10	0.365	0.98	1.10	0.409	No
201	34.12	1.96	0.78	1.17	0.86	0.403	1.10	0.365	0.98	1.10	0.409	No
202	34.28	1.97	0.79	1.18	0.86	0.403	1.10	0.365	0.98	1.10	0.409	No
203	34.45	1.98	0.79	1.18	0.86	0.403	1.10	0.365	0.98	1.10	0.408	No
204	34.61	1.99	0.80	1.19	0.86	0.403	1.10	0.365	0.98	1.10	0.408	No
205	34.78	2.00	0.80	1.19	0.86	0.403	1.10	0.365	0.98	1.10	0.409	No
206	34.94	2.01	0.81	1.20	0.86	0.403	1.10	0.365	0.98	1.10	0.409	No
207	35.10	2.02	0.81	1.20	0.86	0.403	1.10	0.365	0.98	1.10	0.410	No
208	35.27	2.03	0.82	1.21	0.86	0.402	1.10	0.365	0.98	1.10	0.411	No
209	35.43	2.04	0.82	1.21	0.86	0.402	1.10	0.365	0.98	1.10	0.410	No
210	35.60	2.05	0.83	1.22	0.86	0.402	1.10	0.365	0.98	1.10	0.409	No
211	35.76	2.06	0.83	1.22	0.86	0.402	1.10	0.365	0.98	1.10	0.411	No
212	35.92	2.07	0.84	1.23	0.85	0.402	1.10	0.365	0.96	1.10	0.420	No
213	36.09	2.08	0.85	1.24	0.85	0.402	1.10	0.365	0.95	1.10	0.421	No
214	36.25	2.09	0.85	1.24	0.85	0.402	1.10	0.364	0.95	1.10	0.421	No
215	36.42	2.10	0.86	1.25	0.85	0.402	1.10	0.364	0.95	1.10	0.421	No
216	36.58	2.11	0.86	1.25	0.85	0.401	1.10	0.364	0.95	1.10	0.422	No
217	36.74	2.12	0.87	1.26	0.85	0.401	1.10	0.364	0.95	1.10	0.422	No
218	36.91	2.13	0.87	1.26	0.85	0.401	1.10	0.364	0.95	1.10	0.423	No
219	37.07	2.14	0.88	1.27	0.85	0.401	1.10	0.364	0.95	1.10	0.423	No
220	37.24	2.16	0.88	1.27	0.85	0.401	1.10	0.363	0.94	1.10	0.423	No
221	37.40	2.17	0.89	1.28	0.85	0.401	1.10	0.363	0.94	1.10	0.424	No
222	37.57	2.18	0.89	1.29	0.85	0.400	1.10	0.363	0.94	1.10	0.424	No
223	37.73	2.19	0.90	1.29	0.85	0.400	1.10	0.363	0.94	1.10	0.425	No
224	37.89	2.20	0.90	1.30	0.84	0.400	1.10	0.363	0.94	1.10	0.425	No
225	38.06	2.21	0.91	1.30	0.84	0.400	1.10	0.363	0.94	1.10	0.425	No
226	38.22	2.22	0.91	1.31	0.84	0.400	1.10	0.362	0.94	1.10	0.426	No
227	38.39	2.23	0.92	1.31	0.84	0.400	1.10	0.362	0.94	1.10	0.426	No
228	38.55	2.24	0.92	1.32	0.84	0.399	1.10	0.362	0.93	1.10	0.427	No
229	38.71	2.25	0.93	1.32	0.84	0.399	1.10	0.362	0.93	1.10	0.427	No
230	38.88	2.26	0.93	1.33	0.84	0.399	1.10	0.362	0.93	1.10	0.427	No
231	39.04	2.27	0.94	1.33	0.84	0.399	1.10	0.362	0.93	1.10	0.428	No
232	39.21	2.28	0.94	1.34	0.84	0.399	1.10	0.362	0.93	1.10	0.428	No
233	39.37	2.29	0.95	1.35	0.84	0.398	1.10	0.361	0.93	1.10	0.428	No
234	39.53	2.30	0.95	1.35	0.84	0.398	1.10	0.361	0.93	1.10	0.429	No
235	39.70	2.31	0.96	1.36	0.83	0.398	1.10	0.361	0.93	1.10	0.429	No
236	39.86	2.32	0.96	1.36	0.83	0.398	1.10	0.361	0.92	1.10	0.429	No
237	40.03	2.34	0.97	1.37	0.83	0.398	1.10	0.361	0.92	1.10	0.430	No
238	40.19	2.35	0.97	1.37	0.83	0.398	1.10	0.360	0.92	1.10	0.430	No
239	40.35	2.36	0.98	1.38	0.83	0.397	1.10	0.360	0.93	1.10	0.425	No
240	40.52	2.37	0.98	1.38	0.83	0.397	1.10	0.360	0.97	1.10	0.407	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	40.68	2.38	0.99	1.39	0.83	0.397	1.10	0.360	0.98	1.10	0.405	No
242	40.85	2.39	0.99	1.39	0.83	0.397	1.10	0.360	0.98	1.10	0.403	No
243	41.01	2.40	1.00	1.40	0.83	0.397	1.10	0.360	0.98	1.10	0.402	No
244	41.17	2.41	1.00	1.40	0.83	0.397	1.10	0.360	0.98	1.10	0.402	No
245	41.34	2.42	1.01	1.41	0.83	0.397	1.10	0.360	0.98	1.10	0.402	No
246	41.50	2.43	1.01	1.41	0.83	0.396	1.10	0.359	0.98	1.10	0.402	No
247	41.67	2.44	1.02	1.42	0.82	0.396	1.10	0.359	0.98	1.10	0.402	No
248	41.83	2.45	1.02	1.42	0.82	0.396	1.10	0.359	0.98	1.10	0.402	No
249	41.99	2.45	1.03	1.43	0.82	0.396	1.10	0.359	0.98	1.10	0.401	No
250	42.16	2.46	1.03	1.43	0.82	0.396	1.10	0.359	0.98	1.10	0.401	No
251	42.32	2.47	1.04	1.43	0.82	0.396	1.10	0.359	0.98	1.10	0.401	No
252	42.49	2.48	1.04	1.44	0.82	0.396	1.10	0.359	0.98	1.10	0.401	No
253	42.65	2.49	1.05	1.44	0.82	0.396	1.10	0.359	0.98	1.10	0.401	No
254	42.81	2.50	1.06	1.45	0.82	0.395	1.10	0.359	0.99	1.10	0.400	No
255	42.98	2.51	1.06	1.45	0.82	0.395	1.10	0.358	0.99	1.10	0.400	No
256	43.14	2.52	1.07	1.46	0.82	0.395	1.10	0.358	0.98	1.10	0.400	No
257	43.31	2.53	1.07	1.46	0.82	0.395	1.10	0.358	0.98	1.10	0.400	No
258	43.47	2.54	1.08	1.47	0.81	0.395	1.10	0.358	0.98	1.10	0.400	No
259	43.63	2.55	1.08	1.47	0.81	0.395	1.10	0.358	0.98	1.10	0.400	No
260	43.80	2.56	1.09	1.47	0.81	0.395	1.10	0.358	0.98	1.10	0.400	No
261	43.96	2.57	1.09	1.48	0.81	0.395	1.10	0.358	0.98	1.10	0.400	No
262	44.13	2.58	1.10	1.48	0.81	0.394	1.10	0.358	0.98	1.10	0.400	No
263	44.29	2.59	1.10	1.49	0.81	0.394	1.10	0.358	0.98	1.10	0.400	No
264	44.45	2.60	1.11	1.49	0.81	0.394	1.10	0.357	0.98	1.10	0.400	No
265	44.62	2.61	1.11	1.49	0.81	0.394	1.10	0.357	0.98	1.10	0.400	No
266	44.78	2.62	1.12	1.50	0.81	0.394	1.10	0.357	0.98	1.10	0.400	No
267	44.95	2.62	1.12	1.50	0.81	0.394	1.10	0.357	0.98	1.10	0.399	No
268	45.11	2.63	1.13	1.51	0.81	0.394	1.10	0.357	0.98	1.10	0.400	No
269	45.28	2.64	1.13	1.51	0.81	0.394	1.10	0.357	0.98	1.10	0.400	No
270	45.44	2.65	1.14	1.51	0.80	0.394	1.10	0.357	0.98	1.10	0.399	No
271	45.60	2.66	1.14	1.52	0.80	0.393	1.10	0.357	0.98	1.10	0.399	No
272	45.77	2.67	1.15	1.52	0.80	0.393	1.10	0.357	0.98	1.10	0.399	No
273	45.93	2.68	1.15	1.53	0.80	0.393	1.10	0.356	0.98	1.10	0.399	No
274	46.10	2.69	1.16	1.53	0.80	0.393	1.10	0.356	0.98	1.10	0.399	No
275	46.26	2.70	1.16	1.54	0.80	0.393	1.10	0.356	0.98	1.10	0.398	No
276	46.42	2.71	1.17	1.54	0.80	0.393	1.10	0.356	0.98	1.10	0.398	No
277	46.59	2.72	1.17	1.55	0.80	0.392	1.10	0.356	0.98	1.10	0.398	No
278	46.75	2.73	1.18	1.55	0.80	0.392	1.10	0.356	0.98	1.10	0.398	No
279	46.92	2.74	1.18	1.55	0.80	0.392	1.10	0.356	0.98	1.10	0.399	No
280	47.08	2.75	1.19	1.56	0.80	0.392	1.10	0.355	0.98	1.10	0.399	No
281	47.24	2.76	1.19	1.56	0.79	0.392	1.10	0.355	0.98	1.10	0.399	No
282	47.41	2.76	1.20	1.57	0.79	0.392	1.10	0.355	0.98	1.10	0.399	No
283	47.57	2.77	1.20	1.57	0.79	0.391	1.10	0.355	0.98	1.10	0.399	No
284	47.74	2.78	1.21	1.57	0.79	0.391	1.10	0.355	0.98	1.10	0.399	No
285	47.90	2.79	1.21	1.58	0.79	0.391	1.10	0.355	0.98	1.10	0.399	No
286	48.06	2.80	1.22	1.58	0.79	0.391	1.10	0.355	0.98	1.10	0.399	No
287	48.23	2.81	1.22	1.59	0.79	0.391	1.10	0.354	0.98	1.10	0.399	No
288	48.39	2.82	1.23	1.59	0.79	0.391	1.10	0.354	0.98	1.10	0.398	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	48.56	2.83	1.23	1.60	0.79	0.390	1.10	0.354	0.98	1.10	0.398	No
290	48.72	2.84	1.24	1.60	0.79	0.390	1.10	0.354	0.98	1.10	0.398	No
291	48.88	2.85	1.24	1.61	0.79	0.390	1.10	0.354	0.98	1.10	0.398	No
292	49.05	2.86	1.25	1.61	0.79	0.390	1.10	0.353	0.98	1.10	0.398	No
293	49.21	2.87	1.25	1.62	0.78	0.389	1.10	0.353	0.97	1.10	0.399	No
294	49.38	2.88	1.26	1.62	0.78	0.389	1.10	0.353	0.97	1.10	0.399	No
295	49.54	2.89	1.26	1.63	0.78	0.389	1.10	0.353	0.97	1.10	0.399	No
296	49.70	2.90	1.27	1.63	0.78	0.389	1.10	0.353	0.97	1.10	0.400	No
297	49.87	2.91	1.28	1.64	0.78	0.388	1.10	0.352	0.96	1.10	0.402	No
298	50.03	2.92	1.28	1.64	0.78	0.388	1.10	0.352	0.97	1.10	0.400	No
299	50.20	2.93	1.29	1.64	0.78	0.388	1.10	0.352	0.97	1.10	0.398	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_c (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
1	1.31	18.47	25.89	2.39	0.58	1.70	31.59	37.90	69.49	4.000	No	No	2.00
2	1.48	16.96	29.25	2.47	0.59	1.70	25.77	37.38	63.15	4.000	No	No	2.00
3	1.64	14.72	36.05	2.61	0.60	1.70	24.32	0.00	24.32	4.000	No	Yes	2.00
4	1.80	13.33	40.18	2.69	0.61	1.70	20.81	0.00	20.81	4.000	No	Yes	2.00
5	1.97	12.18	42.19	2.73	0.62	1.70	19.10	0.00	19.10	4.000	No	Yes	2.00
6	2.13	11.49	39.89	2.69	0.62	1.70	18.78	0.00	18.78	4.000	No	Yes	2.00
7	2.30	11.18	37.49	2.64	0.63	1.70	17.46	0.00	17.46	4.000	No	Yes	2.00
8	2.46	11.05	35.03	2.59	0.63	1.70	17.59	35.79	53.39	4.000	No	No	2.00
9	2.63	11.41	32.41	2.54	0.63	1.70	18.16	35.58	53.74	4.000	No	No	2.00
10	2.79	11.90	29.67	2.48	0.62	1.70	19.20	35.31	54.51	4.000	No	No	2.00
11	2.95	12.79	27.17	2.42	0.62	1.70	20.00	34.74	54.74	4.000	No	No	2.00
12	3.12	14.05	24.36	2.35	0.62	1.70	22.43	34.13	56.56	4.000	No	No	2.00
13	3.28	15.73	21.66	2.28	0.61	1.70	25.29	32.98	58.27	4.000	No	No	2.00
14	3.44	17.43	5.00	2.21	0.74	1.70	28.08	0.01	28.10	4.000	No	No	2.00
15	3.61	18.63	5.00	2.18	0.72	1.70	30.61	0.01	30.62	4.000	No	No	2.00
16	3.77	19.69	5.00	2.17	0.72	1.70	31.06	0.01	31.07	4.000	No	No	2.00
17	3.94	19.98	18.55	2.19	0.59	1.70	33.23	31.46	64.69	4.000	No	No	2.00
18	4.10	20.31	18.96	2.20	0.59	1.70	32.00	31.75	63.76	4.000	No	No	2.00
19	4.26	19.91	19.94	2.23	0.59	1.70	32.65	33.24	65.89	4.000	No	No	2.00
20	4.43	19.84	20.51	2.24	0.59	1.70	31.28	33.54	64.82	4.000	No	No	2.00
21	4.59	19.56	21.05	2.26	0.59	1.70	31.67	34.24	65.91	4.000	No	No	2.00
22	4.76	19.72	20.79	2.25	0.59	1.70	31.30	33.86	65.16	4.000	No	No	2.00
23	4.92	20.35	20.09	2.23	0.59	1.70	32.08	33.27	65.35	4.000	No	No	2.00
24	5.08	21.69	18.77	2.19	0.58	1.70	34.69	32.19	66.88	4.000	No	No	2.00
25	5.25	23.37	17.48	2.15	0.58	1.70	37.74	30.81	68.55	4.000	No	No	2.00
26	5.41	24.88	16.33	2.12	0.58	1.70	40.20	29.05	69.25	4.000	No	No	2.00
27	5.58	26.37	15.29	2.08	0.58	1.70	41.98	26.93	68.91	4.000	No	No	2.00
28	5.74	28.42	14.05	2.04	0.58	1.70	44.89	23.99	68.88	4.000	No	No	2.00
29	5.91	31.51	5.00	1.98	0.64	1.70	50.11	0.02	50.13	4.000	No	No	2.00
30	6.07	35.15	5.00	1.91	0.61	1.70	56.88	0.02	56.89	4.000	No	No	2.00
31	6.23	38.56	5.00	1.86	0.60	1.70	62.42	0.02	62.44	4.000	No	No	2.00
32	6.40	41.16	5.00	1.82	0.58	1.70	66.55	0.02	66.57	4.000	No	No	2.00
33	6.56	42.78	5.00	1.81	0.58	1.70	69.42	0.02	69.44	4.000	No	No	2.00
34	6.73	43.16	5.00	1.83	0.57	1.70	70.21	0.02	70.23	4.000	No	No	2.00
35	6.89	41.96	5.00	1.87	0.58	1.70	68.36	0.02	68.38	4.000	No	No	2.00
36	7.05	39.31	11.18	1.93	0.55	1.70	63.69	15.89	79.58	4.000	No	No	2.00
37	7.22	36.04	13.27	2.01	0.54	1.70	57.41	23.52	80.93	4.000	No	No	2.00
38	7.38	33.75	15.15	2.08	0.54	1.70	52.62	28.76	81.38	4.000	No	No	2.00
39	7.55	33.49	15.83	2.10	0.54	1.70	52.65	30.64	83.29	4.000	No	No	2.00
40	7.71	34.75	15.40	2.09	0.53	1.67	55.21	30.01	85.22	4.000	No	No	2.00
41	7.87	36.40	14.46	2.05	0.53	1.65	57.09	27.59	84.67	4.000	No	No	2.00
42	8.04	38.58	13.10	2.01	0.54	1.65	58.64	23.11	81.75	4.000	No	No	2.00
43	8.20	41.46	11.47	1.94	0.54	1.63	63.92	17.20	81.12	4.000	No	No	2.00
44	8.37	43.50	10.43	1.90	0.54	1.61	68.65	13.04	81.69	4.000	No	No	2.00
45	8.53	43.39	10.38	1.90	0.55	1.60	66.36	12.64	79.00	4.000	No	No	2.00
46	8.69	41.04	10.99	1.92	0.55	1.59	61.96	14.90	76.86	4.000	No	No	2.00
47	8.86	38.24	11.99	1.96	0.56	1.58	56.91	18.51	75.42	4.000	No	No	2.00
48	9.02	35.58	13.09	2.01	0.56	1.57	52.49	22.09	74.58	0.105	No	No	0.41

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

Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
49	9.19	33.57	14.27	2.05	0.56	1.55	48.68	25.37	74.06	0.105	No	No	0.40
50	9.35	32.63	14.59	2.06	0.56	1.54	46.73	25.96	72.69	0.103	No	No	0.39
51	9.51	32.89	14.44	2.05	0.57	1.53	47.06	25.60	72.66	0.103	No	No	0.39
52	9.68	34.32	13.77	2.03	0.57	1.51	48.54	23.76	72.29	0.102	No	No	0.38
53	9.84	36.11	13.29	2.01	0.56	1.49	51.32	22.63	73.95	0.105	No	No	0.38
54	10.01	37.22	13.01	2.00	0.56	1.48	52.99	21.87	74.86	0.106	No	No	0.39
55	10.17	37.38	13.02	2.00	0.56	1.47	51.69	21.73	73.42	0.104	No	No	0.38
56	10.34	36.69	13.33	2.01	0.56	1.45	50.62	22.62	73.24	0.104	No	No	0.37
57	10.50	33.96	14.42	2.05	0.56	1.44	48.80	25.85	74.66	0.106	No	No	0.37
58	10.66	33.90	14.40	2.05	0.59	1.45	39.93	24.11	64.04	0.092	No	No	0.32
59	10.83	34.12	14.37	2.05	0.56	1.41	48.90	25.72	74.62	0.105	No	No	0.37
60	10.99	37.18	13.30	2.01	0.57	1.41	48.72	22.23	70.96	0.101	No	No	0.35
61	11.15	39.11	12.66	1.99	0.57	1.40	50.76	20.26	71.01	0.101	No	No	0.35
62	11.32	43.22	5.00	1.94	0.61	1.43	57.51	0.02	57.52	0.085	No	No	0.29
63	11.48	47.91	5.00	1.89	0.59	1.41	65.14	0.02	65.15	0.094	No	No	0.32
64	11.65	51.77	5.00	1.86	0.58	1.39	68.89	0.02	68.90	0.098	No	No	0.33
65	11.81	53.18	10.01	1.88	0.54	1.36	69.52	11.22	80.75	0.114	No	No	0.38
66	11.97	52.99	10.43	1.90	0.54	1.36	68.11	13.02	81.13	0.114	No	No	0.38
67	12.14	52.11	10.37	1.90	0.55	1.36	66.31	12.58	78.88	0.111	No	No	0.37
68	12.30	52.01	5.00	1.87	0.58	1.38	66.79	0.02	66.81	0.096	No	No	0.31
69	12.47	51.56	5.00	1.87	0.58	1.37	68.31	0.02	68.33	0.098	No	No	0.32
70	12.63	50.45	5.00	1.89	0.59	1.37	65.24	0.02	65.26	0.094	No	No	0.30
71	12.79	49.06	5.00	1.91	0.60	1.37	62.28	0.02	62.29	0.090	No	No	0.29
72	12.96	49.09	5.00	1.91	0.60	1.37	62.83	0.02	62.85	0.091	No	No	0.29
73	13.12	50.56	10.43	1.90	0.56	1.33	63.59	12.63	76.22	0.108	No	No	0.34
74	13.29	51.89	10.20	1.89	0.55	1.33	65.74	11.81	77.55	0.109	No	No	0.35
75	13.45	52.88	5.00	1.88	0.58	1.34	66.79	0.02	66.81	0.096	No	No	0.30
76	13.62	54.37	5.00	1.85	0.58	1.34	67.46	0.02	67.47	0.097	No	No	0.30
77	13.78	56.49	5.00	1.82	0.57	1.32	71.24	0.02	71.26	0.101	No	No	0.32
78	13.94	58.54	5.00	1.79	0.56	1.32	73.39	0.02	73.41	0.104	No	No	0.32
79	14.11	57.93	5.00	1.79	0.56	1.31	73.81	0.02	73.83	0.104	No	No	0.32
80	14.27	57.50	5.00	1.79	0.58	1.32	68.51	0.02	68.53	0.098	No	No	0.30
81	14.44	57.53	5.00	1.81	0.57	1.31	71.28	0.02	71.30	0.101	No	No	0.31
82	14.60	58.65	5.00	1.81	0.56	1.30	73.25	0.02	73.27	0.104	No	No	0.32
83	14.76	52.39	5.00	1.86	0.57	1.30	71.68	0.02	71.70	0.102	No	No	0.31
84	14.93	39.14	13.35	2.01	0.57	1.30	47.70	22.23	69.93	0.100	No	No	0.30
85	15.09	24.64	21.32	2.27	0.61	1.32	24.77	32.50	57.27	0.085	No	No	0.25
86	15.26	15.44	33.14	2.55	0.62	1.32	18.60	35.86	54.45	0.082	No	No	0.24
87	15.42	13.10	38.43	2.66	0.64	1.32	14.13	0.00	14.13	4.000	No	Yes	2.00
88	15.58	15.15	34.41	2.58	0.63	1.32	15.89	35.13	51.02	0.078	No	No	0.23
89	15.75	19.03	28.04	2.44	0.60	1.29	25.62	36.91	62.53	0.091	No	No	0.26
90	15.91	22.17	25.47	2.38	0.59	1.28	27.55	36.39	63.94	0.092	No	No	0.27
91	16.08	22.50	26.64	2.41	0.59	1.28	26.53	36.64	63.16	0.091	No	No	0.26
92	16.24	21.86	29.61	2.48	0.59	1.28	26.18	37.62	63.80	0.092	No	No	0.26
93	16.40	21.42	31.99	2.53	0.60	1.27	24.91	37.79	62.70	0.091	No	No	0.26
94	16.57	21.79	34.07	2.57	0.59	1.27	24.86	38.16	63.02	0.091	No	No	0.26
95	16.73	25.03	33.17	2.55	0.58	1.26	27.29	38.83	66.12	0.095	No	No	0.27
96	16.90	30.12	30.69	2.50	0.55	1.24	35.55	41.08	76.63	0.108	No	No	0.31

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

Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
97	17.06	36.90	27.42	2.42	0.54	1.23	41.35	41.82	83.17	0.117	No	No	0.33
98	17.22	55.27	19.39	2.21	0.53	1.22	48.97	36.98	85.95	0.121	No	No	0.34
99	17.39	83.19	12.55	1.99	0.46	1.18	94.44	26.17	120.61	0.181	No	No	0.52
100	17.55	109.57	8.91	1.84	0.42	1.16	131.85	9.33	141.18	0.236	No	No	0.68
101	17.72	114.88	8.61	1.82	0.42	1.16	134.46	7.85	142.31	0.240	No	No	0.69
102	17.88	100.73	11.05	1.93	0.43	1.16	112.00	20.29	132.29	0.209	No	No	0.59
103	18.05	79.96	16.79	2.13	0.45	1.16	85.43	40.76	126.19	0.194	No	No	0.54
104	18.21	72.59	21.29	2.27	0.47	1.17	66.95	44.80	111.75	0.163	No	No	0.45
105	18.37	84.33	21.04	2.26	0.43	1.15	86.60	50.16	136.76	0.222	No	No	0.62
106	18.54	113.88	16.39	2.12	0.38	1.13	120.22	47.61	167.83	0.387	No	No	1.09
107	18.70	129.48	14.76	2.06	0.32	1.11	155.85	48.16	204.01	1.380	No	No	2.00
108	18.86	114.36	16.78	2.13	0.35	1.11	133.09	52.03	185.12	0.631	No	No	1.78
109	19.03	76.52	24.68	2.36	0.45	1.14	72.94	50.25	123.19	0.187	No	No	0.51
110	19.19	42.83	40.62	2.70	0.54	1.17	39.34	0.00	39.34	4.000	No	Yes	2.00
111	19.36	29.03	54.42	2.94	0.58	1.18	28.46	0.00	28.46	4.000	No	Yes	2.00
112	19.52	27.23	57.94	2.99	0.58	1.17	28.89	0.00	28.89	4.000	No	Yes	2.00
113	19.68	28.50	56.03	2.96	0.56	1.16	33.20	0.00	33.20	4.000	No	Yes	2.00
114	19.85	29.18	54.20	2.93	0.56	1.16	32.12	0.00	32.12	4.000	No	Yes	2.00
115	20.01	27.48	53.34	2.92	0.57	1.16	30.67	0.00	30.67	4.000	No	Yes	2.00
116	20.18	27.39	48.49	2.84	0.58	1.16	27.39	0.00	27.39	4.000	No	Yes	2.00
117	20.34	28.39	42.76	2.74	0.57	1.15	31.24	0.00	31.24	4.000	No	Yes	2.00
118	20.50	30.88	37.78	2.65	0.56	1.14	33.28	0.00	33.28	4.000	No	Yes	2.00
119	20.67	34.18	34.20	2.58	0.56	1.14	34.67	41.54	76.21	0.108	No	No	0.29
120	20.83	38.12	31.03	2.51	0.54	1.13	41.06	43.03	84.10	0.118	No	No	0.32
121	21.00	38.83	30.78	2.50	0.52	1.12	44.84	44.23	89.07	0.126	No	No	0.33
122	21.16	34.22	35.37	2.60	0.55	1.13	36.47	0.00	36.47	4.000	No	Yes	2.00
123	21.32	25.97	45.74	2.80	0.58	1.13	26.72	0.00	26.72	4.000	No	Yes	2.00
124	21.49	19.86	57.79	2.99	0.62	1.14	19.38	0.00	19.38	4.000	No	Yes	2.00
125	21.65	21.21	55.13	2.95	0.63	1.13	17.36	0.00	17.36	4.000	No	Yes	2.00
126	21.82	30.69	42.20	2.73	0.57	1.12	30.62	0.00	30.62	4.000	No	Yes	2.00
127	21.98	36.29	38.97	2.67	0.51	1.10	48.52	0.00	48.52	4.000	No	Yes	2.00
128	22.15	33.86	42.40	2.74	0.55	1.11	34.74	0.00	34.74	4.000	No	Yes	2.00
129	22.31	25.23	52.18	2.90	0.60	1.11	23.03	0.00	23.03	4.000	No	Yes	2.00
130	22.47	23.15	50.81	2.88	0.60	1.11	21.76	0.00	21.76	4.000	No	Yes	2.00
131	22.64	25.01	45.13	2.78	0.58	1.10	27.93	0.00	27.93	4.000	No	Yes	2.00
132	22.80	35.49	33.17	2.55	0.58	1.10	28.40	39.22	67.62	0.097	No	No	0.25
133	22.97	51.25	23.58	2.33	0.51	1.08	53.22	43.15	96.37	0.137	No	No	0.36
134	23.13	65.18	17.66	2.16	0.47	1.07	75.16	40.53	115.68	0.171	No	No	0.45
135	23.29	63.11	17.63	2.16	0.48	1.07	70.18	39.20	109.38	0.159	No	No	0.41
136	23.46	48.03	24.32	2.35	0.52	1.08	46.81	41.75	88.55	0.125	No	No	0.32
137	23.62	31.40	40.33	2.70	0.57	1.08	29.65	0.00	29.65	4.000	No	Yes	2.00
138	23.79	21.98	61.17	3.04	0.61	1.08	19.85	0.00	19.85	4.000	No	Yes	2.00
139	23.95	19.15	76.34	3.24	0.62	1.08	18.07	0.00	18.07	4.000	No	Yes	2.00
140	24.11	22.36	74.45	3.22	0.61	1.08	20.83	0.00	20.83	4.000	No	Yes	2.00
141	24.28	30.51	62.01	3.05	0.57	1.07	29.26	0.00	29.26	4.000	No	Yes	2.00
142	24.44	36.82	50.67	2.88	0.53	1.06	42.16	0.00	42.16	4.000	No	Yes	2.00
143	24.61	40.05	40.49	2.70	0.54	1.06	39.40	0.00	39.40	4.000	No	Yes	2.00
144	24.77	41.73	30.74	2.50	0.54	1.06	38.58	42.11	80.69	0.114	No	No	0.29

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

Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
145	24.93	46.02	25.53	2.38	0.52	1.05	46.83	42.58	89.41	0.126	No	No	0.32
146	25.10	50.57	24.26	2.35	0.51	1.05	51.75	43.25	95.00	0.135	No	No	0.34
147	25.26	51.86	25.11	2.37	0.51	1.04	51.65	43.84	95.49	0.135	No	No	0.35
148	25.43	50.72	25.91	2.39	0.51	1.04	50.26	43.91	94.17	0.133	No	No	0.34
149	25.59	47.63	28.61	2.45	0.52	1.04	48.00	44.54	92.54	0.131	No	No	0.33
150	25.75	42.82	30.71	2.50	0.53	1.04	42.29	43.35	85.64	0.121	No	No	0.31
151	25.92	38.12	33.85	2.57	0.55	1.04	35.89	41.90	77.79	0.110	No	No	0.28
152	26.08	35.62	35.73	2.61	0.56	1.03	34.03	0.00	34.03	4.000	No	Yes	2.00
153	26.25	36.45	37.37	2.64	0.55	1.03	34.72	0.00	34.72	4.000	No	Yes	2.00
154	26.41	35.40	40.73	2.71	0.54	1.03	37.98	0.00	37.98	4.000	No	Yes	2.00
155	26.57	33.16	44.18	2.77	0.57	1.03	30.73	0.00	30.73	4.000	No	Yes	2.00
156	26.74	26.72	52.15	2.90	0.58	1.02	27.99	0.00	27.99	4.000	No	Yes	2.00
157	26.90	21.75	59.68	3.02	0.62	1.02	19.11	0.00	19.11	4.000	No	Yes	2.00
158	27.07	17.49	67.51	3.13	0.63	1.02	16.15	0.00	16.15	4.000	No	Yes	2.00
159	27.23	16.89	66.21	3.11	0.63	1.02	15.47	0.00	15.47	4.000	No	Yes	2.00
160	27.39	17.74	59.58	3.02	0.63	1.01	17.20	0.00	17.20	4.000	No	Yes	2.00
161	27.56	19.19	50.99	2.88	0.62	1.01	18.37	0.00	18.37	4.000	No	Yes	2.00
162	27.72	20.57	42.26	2.73	0.62	1.01	19.43	0.00	19.43	4.000	No	Yes	2.00
163	27.89	24.83	32.15	2.53	0.61	1.01	20.95	36.48	57.43	0.085	No	No	0.21
164	28.05	37.01	20.34	2.24	0.59	1.00	30.30	33.06	63.36	0.092	No	No	0.23
165	28.21	52.16	13.90	2.03	0.55	1.00	53.45	25.06	78.51	0.111	No	No	0.28
166	28.38	59.71	5.00	1.95	0.59	1.00	63.21	0.02	63.23	0.092	No	No	0.23
167	28.54	55.33	13.28	2.01	0.56	1.00	51.09	22.55	73.64	0.104	No	No	0.26
168	28.71	44.81	19.43	2.21	0.56	1.00	40.89	34.84	75.72	0.107	No	No	0.27
169	28.87	36.89	29.70	2.48	0.56	0.99	33.58	40.12	73.70	0.104	No	No	0.26
170	29.04	31.36	43.26	2.75	0.58	0.99	28.73	0.00	28.73	4.000	No	Yes	2.00
171	29.20	27.91	55.93	2.96	0.59	0.99	25.17	0.00	25.17	4.000	No	Yes	2.00
172	29.36	26.98	63.22	3.07	0.60	0.98	23.65	0.00	23.65	4.000	No	Yes	2.00
173	29.53	30.16	60.18	3.02	0.59	0.98	25.85	0.00	25.85	4.000	No	Yes	2.00
174	29.69	34.28	53.74	2.93	0.56	0.98	33.78	0.00	33.78	4.000	No	Yes	2.00
175	29.86	36.27	48.48	2.84	0.55	0.98	34.89	0.00	34.89	4.000	No	Yes	2.00
176	30.02	35.33	46.16	2.80	0.57	0.98	31.10	0.00	31.10	4.000	No	Yes	2.00
177	30.18	32.51	46.17	2.80	0.57	0.97	30.85	0.00	30.85	4.000	No	Yes	2.00
178	30.35	30.62	46.68	2.81	0.58	0.97	26.72	0.00	26.72	4.000	No	Yes	2.00
179	30.51	29.09	48.60	2.84	0.59	0.97	25.59	0.00	25.59	4.000	No	Yes	2.00
180	30.68	29.70	48.87	2.85	0.59	0.96	26.31	0.00	26.31	4.000	No	Yes	2.00
181	30.84	31.68	47.75	2.83	0.58	0.96	28.10	0.00	28.10	4.000	No	Yes	2.00
182	31.00	36.66	42.39	2.74	0.57	0.96	30.60	0.00	30.60	4.000	No	Yes	2.00
183	31.17	45.07	34.66	2.59	0.54	0.96	39.57	43.30	82.87	0.117	No	No	0.29
184	31.33	49.32	30.13	2.49	0.50	0.96	51.14	46.15	97.29	0.138	No	No	0.34
185	31.50	49.61	28.63	2.45	0.53	0.96	42.22	42.63	84.85	0.119	No	No	0.30
186	31.66	50.64	27.40	2.42	0.54	0.95	40.09	41.40	81.49	0.115	No	No	0.28
187	31.82	66.54	22.01	2.29	0.51	0.95	53.09	41.58	94.67	0.134	No	No	0.33
188	31.99	105.26	15.52	2.09	0.45	0.96	84.60	36.65	121.24	0.182	No	No	0.45
189	32.15	152.62	11.90	1.96	0.36	0.96	146.67	29.55	176.22	0.480	No	No	1.18
190	32.32	193.84	9.29	1.85	0.33	0.97	184.15	14.15	198.30	1.054	No	No	2.00
191	32.48	213.18	8.14	1.80	0.32	0.97	199.32	7.34	206.66	1.580	No	No	2.00
192	32.64	218.38	7.96	1.79	0.32	0.96	199.76	6.38	206.14	1.538	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)													
Point ID	Depth (ft)	q_c (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
193	32.81	212.89	9.19	1.85	0.31	0.96	197.90	14.15	212.05	2.133	No	No	2.00
194	32.97	201.32	11.01	1.93	0.32	0.96	183.57	27.30	210.87	1.992	No	No	2.00
195	33.14	189.26	10.88	1.92	0.34	0.96	166.99	24.65	191.64	0.799	No	No	1.96
196	33.30	182.98	9.56	1.86	0.36	0.95	163.24	14.90	178.14	0.507	No	No	1.24
197	33.47	184.02	6.64	1.73	0.38	0.95	164.29	1.30	165.60	0.367	No	No	0.90
198	33.63	186.81	5.54	1.67	0.37	0.95	168.26	0.15	168.42	0.392	No	No	0.96
199	33.79	187.43	5.45	1.66	0.37	0.95	169.68	0.13	169.81	0.406	No	No	0.99
200	33.96	183.42	6.53	1.72	0.38	0.94	165.15	1.11	166.26	0.373	No	No	0.91
201	34.12	175.90	7.92	1.79	0.38	0.94	156.49	5.21	161.70	0.338	No	No	0.83
202	34.28	165.98	8.84	1.83	0.39	0.94	148.32	9.64	157.96	0.313	No	No	0.77
203	34.45	158.47	8.77	1.83	0.41	0.94	137.20	8.79	145.99	0.254	No	No	0.62
204	34.61	154.51	8.36	1.81	0.42	0.93	134.97	6.68	141.65	0.238	No	No	0.58
205	34.78	155.87	7.52	1.77	0.42	0.93	136.38	3.32	139.70	0.231	No	No	0.57
206	34.94	159.33	6.78	1.73	0.42	0.93	139.90	1.43	141.33	0.237	No	No	0.58
207	35.10	166.53	5.92	1.69	0.41	0.93	143.51	0.34	143.85	0.246	No	No	0.60
208	35.27	167.54	6.15	1.70	0.39	0.93	155.29	0.56	155.85	0.301	No	No	0.73
209	35.43	159.67	7.73	1.78	0.41	0.93	142.07	4.18	146.25	0.255	No	No	0.62
210	35.60	156.70	9.05	1.84	0.44	0.92	121.65	9.60	131.25	0.206	No	No	0.50
211	35.76	181.13	7.07	1.75	0.41	0.92	146.45	2.15	148.60	0.265	No	No	0.65
212	35.92	234.84	4.01	1.58	0.32	0.94	208.94	0.00	208.94	1.788	No	No	2.00
213	36.09	299.91	1.80	1.42	0.26	0.95	269.61	0.00	269.61	4.000	No	No	2.00
214	36.25	349.29	1.18	1.37	0.26	0.95	324.71	0.00	324.71	4.000	No	No	2.00
215	36.42	370.40	1.31	1.38	0.26	0.95	342.90	0.00	342.90	4.000	No	No	2.00
216	36.58	363.58	2.09	1.45	0.26	0.94	325.18	0.00	325.18	4.000	No	No	2.00
217	36.74	348.73	2.38	1.47	0.26	0.94	305.36	0.00	305.36	4.000	No	No	2.00
218	36.91	339.35	2.03	1.44	0.26	0.94	302.02	0.00	302.02	4.000	No	No	2.00
219	37.07	338.65	1.25	1.38	0.26	0.94	299.07	0.00	299.07	4.000	No	No	2.00
220	37.24	341.33	1.34	1.38	0.26	0.94	302.50	0.00	302.50	4.000	No	No	2.00
221	37.40	348.75	1.71	1.41	0.26	0.94	308.17	0.00	308.17	4.000	No	No	2.00
222	37.57	342.84	2.41	1.47	0.26	0.94	317.75	0.00	317.75	4.000	No	No	2.00
223	37.73	342.66	2.76	1.49	0.26	0.94	285.66	0.00	285.66	4.000	No	No	2.00
224	37.89	341.09	2.82	1.50	0.26	0.94	306.65	0.00	306.65	4.000	No	No	2.00
225	38.06	358.39	1.93	1.43	0.26	0.94	312.52	0.00	312.52	4.000	No	No	2.00
226	38.22	372.99	0.43	1.30	0.26	0.93	330.58	0.00	330.58	4.000	No	No	2.00
227	38.39	391.40	0.00	1.20	0.26	0.93	344.29	0.00	344.29	4.000	No	No	2.00
228	38.55	408.33	0.00	1.17	0.26	0.93	360.20	0.00	360.20	4.000	No	No	2.00
229	38.71	421.40	0.00	1.21	0.26	0.93	374.28	0.00	374.28	4.000	No	No	2.00
230	38.88	427.31	0.00	1.22	0.26	0.93	377.66	0.00	377.66	4.000	No	No	2.00
231	39.04	418.90	0.00	1.22	0.26	0.93	374.63	0.00	374.63	4.000	No	No	2.00
232	39.21	401.54	0.00	1.26	0.26	0.93	350.93	0.00	350.93	4.000	No	No	2.00
233	39.37	389.68	0.27	1.29	0.26	0.93	330.79	0.00	330.79	4.000	No	No	2.00
234	39.53	393.48	0.14	1.27	0.26	0.93	342.33	0.00	342.33	4.000	No	No	2.00
235	39.70	408.36	0.00	1.25	0.26	0.93	359.78	0.00	359.78	4.000	No	No	2.00
236	39.86	418.10	0.00	1.24	0.26	0.92	368.73	0.00	368.73	4.000	No	No	2.00
237	40.03	402.57	0.04	1.26	0.26	0.92	366.68	0.00	366.68	4.000	No	No	2.00
238	40.19	338.71	1.06	1.36	0.26	0.92	318.05	0.00	318.05	4.000	No	No	2.00
239	40.35	235.90	3.81	1.57	0.33	0.90	196.57	0.00	196.57	0.977	No	No	2.00
240	40.52	139.85	9.86	1.88	0.49	0.86	90.66	12.00	102.66	0.147	No	No	0.36

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)													
Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
241	40.68	78.81	19.66	2.22	0.49	0.86	62.15	41.03	103.19	0.148	No	No	0.37
242	40.85	53.51	27.78	2.43	0.55	0.84	37.58	40.75	78.33	0.110	No	No	0.27
243	41.01	38.50	37.33	2.64	0.58	0.83	27.61	0.00	27.61	4.000	No	Yes	2.00
244	41.17	32.89	43.15	2.75	0.59	0.82	24.43	0.00	24.43	4.000	No	Yes	2.00
245	41.34	32.73	46.58	2.81	0.60	0.82	23.63	0.00	23.63	4.000	No	Yes	2.00
246	41.50	32.94	48.05	2.84	0.58	0.82	27.48	0.00	27.48	4.000	No	Yes	2.00
247	41.67	33.03	49.31	2.86	0.59	0.82	24.56	0.00	24.56	4.000	No	Yes	2.00
248	41.83	30.19	51.66	2.89	0.60	0.82	23.55	0.00	23.55	4.000	No	Yes	2.00
249	41.99	27.66	53.06	2.92	0.61	0.81	20.38	0.00	20.38	4.000	No	Yes	2.00
250	42.16	25.19	54.30	2.94	0.62	0.81	18.59	0.00	18.59	4.000	No	Yes	2.00
251	42.32	23.43	54.28	2.94	0.62	0.81	17.69	0.00	17.69	4.000	No	Yes	2.00
252	42.49	21.95	55.66	2.96	0.63	0.80	16.21	0.00	16.21	4.000	No	Yes	2.00
253	42.65	19.74	60.00	3.02	0.64	0.80	15.13	0.00	15.13	4.000	No	Yes	2.00
254	42.81	18.07	66.53	3.11	0.65	0.79	12.53	0.00	12.53	4.000	No	Yes	2.00
255	42.98	17.26	71.06	3.17	0.65	0.79	12.26	0.00	12.26	4.000	No	Yes	2.00
256	43.14	17.90	69.61	3.16	0.65	0.79	13.13	0.00	13.13	4.000	No	Yes	2.00
257	43.31	18.53	67.32	3.13	0.64	0.79	13.90	0.00	13.90	4.000	No	Yes	2.00
258	43.47	17.92	68.14	3.14	0.64	0.79	13.63	0.00	13.63	4.000	No	Yes	2.00
259	43.63	16.35	72.09	3.19	0.65	0.79	11.71	0.00	11.71	4.000	No	Yes	2.00
260	43.80	14.65	76.97	3.25	0.66	0.78	10.32	0.00	10.32	4.000	No	Yes	2.00
261	43.96	13.79	79.41	3.28	0.67	0.78	9.74	0.00	9.74	4.000	No	Yes	2.00
262	44.13	14.30	76.31	3.24	0.67	0.78	9.71	0.00	9.71	4.000	No	Yes	2.00
263	44.29	15.62	70.98	3.17	0.66	0.78	11.31	0.00	11.31	4.000	No	Yes	2.00
264	44.45	17.01	66.14	3.11	0.65	0.78	12.56	0.00	12.56	4.000	No	Yes	2.00
265	44.62	17.46	64.08	3.08	0.65	0.78	12.73	0.00	12.73	4.000	No	Yes	2.00
266	44.78	17.37	63.05	3.07	0.65	0.78	12.25	0.00	12.25	4.000	No	Yes	2.00
267	44.95	17.72	60.32	3.03	0.65	0.78	12.29	0.00	12.29	4.000	No	Yes	2.00
268	45.11	19.60	54.50	2.94	0.64	0.78	13.42	0.00	13.42	4.000	No	Yes	2.00
269	45.28	20.08	53.78	2.93	0.63	0.78	16.50	0.00	16.50	4.000	No	Yes	2.00
270	45.44	19.26	57.14	2.98	0.64	0.77	13.36	0.00	13.36	4.000	No	Yes	2.00
271	45.60	16.65	66.23	3.11	0.65	0.77	11.57	0.00	11.57	4.000	No	Yes	2.00
272	45.77	14.60	78.61	3.27	0.66	0.77	10.48	0.00	10.48	4.000	No	Yes	2.00
273	45.93	13.54	87.78	3.38	0.67	0.76	8.66	0.00	8.66	4.000	No	Yes	2.00
274	46.10	12.55	97.23	3.48	0.67	0.76	9.09	0.00	9.09	4.000	No	Yes	2.00
275	46.26	12.25	100.00	3.51	0.68	0.76	8.15	0.00	8.15	4.000	No	Yes	2.00
276	46.42	12.16	100.00	3.51	0.68	0.75	7.85	0.00	7.85	4.000	No	Yes	2.00
277	46.59	14.36	85.78	3.36	0.67	0.76	8.92	0.00	8.92	4.000	No	Yes	2.00
278	46.75	18.41	68.00	3.13	0.65	0.76	12.89	0.00	12.89	4.000	No	Yes	2.00
279	46.92	23.48	52.95	2.92	0.63	0.77	16.66	0.00	16.66	4.000	No	Yes	2.00
280	47.08	27.23	45.07	2.78	0.61	0.77	19.70	0.00	19.70	4.000	No	Yes	2.00
281	47.24	29.00	40.88	2.71	0.61	0.77	20.83	0.00	20.83	4.000	No	Yes	2.00
282	47.41	30.22	38.19	2.66	0.61	0.77	20.20	0.00	20.20	4.000	No	Yes	2.00
283	47.57	32.02	35.49	2.60	0.60	0.77	22.34	0.00	22.34	4.000	No	Yes	2.00
284	47.74	34.99	33.49	2.56	0.60	0.77	24.54	37.95	62.49	0.091	No	No	0.23
285	47.90	36.82	33.98	2.57	0.59	0.77	26.35	38.65	65.00	0.094	No	No	0.23
286	48.06	37.03	37.44	2.64	0.59	0.77	25.67	0.00	25.67	4.000	No	Yes	2.00
287	48.23	35.55	42.49	2.74	0.59	0.77	24.61	0.00	24.61	4.000	No	Yes	2.00
288	48.39	33.76	47.25	2.82	0.60	0.76	22.95	0.00	22.95	4.000	No	Yes	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)													
Point ID	Depth (ft)	q _t (tsf)	FC (%)	I _c	m	C _N	q _{c1N}	Δq _{c1N}	q _{c1N,cs}	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
289	48.56	32.72	48.77	2.85	0.61	0.76	21.70	0.00	21.70	4.000	No	Yes	2.00
290	48.72	32.75	48.06	2.84	0.60	0.76	22.18	0.00	22.18	4.000	No	Yes	2.00
291	48.88	34.52	45.30	2.79	0.60	0.76	22.87	0.00	22.87	4.000	No	Yes	2.00
292	49.05	38.76	41.01	2.71	0.59	0.76	25.41	0.00	25.41	4.000	No	Yes	2.00
293	49.21	43.87	36.82	2.63	0.57	0.77	31.49	0.00	31.49	4.000	No	Yes	2.00
294	49.38	50.18	32.30	2.54	0.56	0.77	33.97	40.94	74.91	0.106	No	No	0.27
295	49.54	57.58	27.78	2.43	0.54	0.78	39.33	41.32	80.65	0.114	No	No	0.28
296	49.70	71.83	21.45	2.27	0.53	0.78	47.79	39.39	87.17	0.123	No	No	0.31
297	49.87	78.47	18.90	2.20	0.48	0.80	68.72	41.48	110.20	0.160	No	No	0.40
298	50.03	74.13	20.06	2.23	0.51	0.79	56.35	40.05	96.40	0.137	No	No	0.34
299	50.20	61.76	24.70	2.36	0.55	0.77	39.56	39.73	79.29	0.112	No	No	0.28

Abbreviations

- Depth: Depth from free surface, at which CPT was performed (ft)
q_t: Total cone resistance
FC: Fines content (%)
I_c: Soil behavior type index
m: Stress exponent
C_N: Overburden correction factor
q_{c1N}: Normalized and adjusted cone resistance
Δq_{c1N}: Cone resistance correction factor due to fines
q_{c1N,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	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}	Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}
1.31	2.00	0.00	0.00	0.16	0.00	1.48	2.00	0.00	0.00	0.16	0.00
1.64	2.00	0.00	0.00	0.16	0.00	1.80	2.00	0.00	0.00	0.16	0.00
1.97	2.00	0.00	0.00	0.17	0.00	2.13	2.00	0.00	0.00	0.16	0.00
2.30	2.00	0.00	0.00	0.16	0.00	2.46	2.00	0.00	0.00	0.16	0.00
2.63	2.00	0.00	0.00	0.16	0.00	2.79	2.00	0.00	0.00	0.16	0.00
2.95	2.00	0.00	0.00	0.16	0.00	3.12	2.00	0.00	0.00	0.16	0.00
3.28	2.00	0.00	0.00	0.16	0.00	3.44	2.00	0.00	0.00	0.16	0.00
3.61	2.00	0.00	0.00	0.16	0.00	3.77	2.00	0.00	0.00	0.16	0.00
3.94	2.00	0.00	0.00	0.16	0.00	4.10	2.00	0.00	0.00	0.16	0.00
4.26	2.00	0.00	0.00	0.16	0.00	4.43	2.00	0.00	0.00	0.16	0.00
4.59	2.00	0.00	0.00	0.16	0.00	4.76	2.00	0.00	0.00	0.16	0.00
4.92	2.00	0.00	0.00	0.16	0.00	5.08	2.00	0.00	0.00	0.16	0.00
5.25	2.00	0.00	0.00	0.16	0.00	5.41	2.00	0.00	0.00	0.16	0.00
5.58	2.00	0.00	0.00	0.16	0.00	5.74	2.00	0.00	0.00	0.16	0.00
5.91	2.00	0.00	0.00	0.17	0.00	6.07	2.00	0.00	0.00	0.16	0.00
6.23	2.00	0.00	0.00	0.16	0.00	6.40	2.00	0.00	0.00	0.16	0.00
6.56	2.00	0.00	0.00	0.16	0.00	6.73	2.00	0.00	0.00	0.16	0.00
6.89	2.00	0.00	0.00	0.16	0.00	7.05	2.00	0.00	0.00	0.16	0.00
7.22	2.00	0.00	0.00	0.16	0.00	7.38	2.00	0.00	0.00	0.16	0.00
7.55	2.00	0.00	0.00	0.16	0.00	7.71	2.00	0.00	0.00	0.16	0.00
7.87	2.00	0.00	0.00	0.16	0.00	8.04	2.00	0.00	0.00	0.16	0.00
8.20	2.00	0.00	0.00	0.16	0.00	8.37	2.00	0.00	0.00	0.16	0.00
8.53	2.00	0.00	0.00	0.16	0.00	8.69	2.00	0.00	0.00	0.16	0.00
8.86	2.00	0.00	0.00	0.16	0.00	9.02	0.41	0.59	0.39	0.16	0.26
9.19	0.40	0.60	0.39	0.16	0.26	9.35	0.39	0.61	0.38	0.16	0.26
9.51	0.39	0.61	0.37	0.16	0.26	9.68	0.38	0.62	0.37	0.16	0.26
9.84	0.38	0.62	0.37	0.16	0.26	10.01	0.39	0.61	0.38	0.16	0.26
10.17	0.38	0.62	0.37	0.16	0.26	10.34	0.37	0.63	0.36	0.16	0.26
10.50	0.37	0.63	0.37	0.16	0.26	10.66	0.32	0.68	0.34	0.16	0.28
10.83	0.37	0.63	0.36	0.16	0.26	10.99	0.35	0.65	0.35	0.16	0.27
11.15	0.35	0.65	0.35	0.16	0.27	11.32	0.29	0.71	0.32	0.16	0.29
11.48	0.32	0.68	0.33	0.16	0.28	11.65	0.33	0.67	0.34	0.16	0.27
11.81	0.38	0.62	0.37	0.16	0.25	11.97	0.38	0.62	0.37	0.16	0.25
12.14	0.37	0.63	0.36	0.16	0.26	12.30	0.31	0.69	0.33	0.16	0.28
12.47	0.32	0.68	0.33	0.16	0.28	12.63	0.30	0.70	0.32	0.16	0.28
12.79	0.29	0.71	0.32	0.16	0.29	12.96	0.29	0.71	0.32	0.16	0.28
13.12	0.34	0.66	0.35	0.16	0.26	13.29	0.35	0.65	0.35	0.16	0.26
13.45	0.30	0.70	0.32	0.16	0.28	13.62	0.30	0.70	0.32	0.16	0.28
13.78	0.32	0.68	0.33	0.16	0.27	13.94	0.32	0.68	0.33	0.16	0.27
14.11	0.32	0.68	0.33	0.16	0.27	14.27	0.30	0.70	0.32	0.16	0.27
14.44	0.31	0.69	0.33	0.16	0.27	14.60	0.32	0.68	0.33	0.16	0.27
14.76	0.31	0.69	0.33	0.16	0.27	14.93	0.30	0.70	0.32	0.16	0.27
15.09	0.25	0.75	0.30	0.16	0.29	15.26	0.24	0.76	0.29	0.16	0.29
15.42	2.00	0.00	0.00	0.16	0.00	15.58	0.23	0.77	0.29	0.16	0.29
15.75	0.26	0.74	0.30	0.16	0.28	15.91	0.27	0.73	0.31	0.16	0.28
16.08	0.26	0.74	0.30	0.16	0.28	16.24	0.26	0.74	0.30	0.16	0.28
16.40	0.26	0.74	0.30	0.16	0.28	16.57	0.26	0.74	0.30	0.16	0.28
16.73	0.27	0.73	0.31	0.16	0.27	16.90	0.31	0.69	0.33	0.16	0.26

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}	Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}
17.06	0.33	0.67	0.34	0.16	0.25	17.22	0.34	0.66	0.35	0.16	0.24
17.39	0.52	0.48	0.50	0.16	0.18	17.55	0.68	0.32	0.85	0.16	0.12
17.72	0.69	0.31	0.89	0.16	0.11	17.88	0.59	0.41	0.62	0.16	0.15
18.05	0.54	0.46	0.54	0.16	0.17	18.21	0.45	0.55	0.43	0.16	0.20
18.37	0.62	0.38	0.67	0.16	0.14	18.54	1.09	0.00	0.00	0.16	0.00
18.70	2.00	0.00	0.00	0.16	0.00	18.86	1.78	0.00	0.00	0.16	0.00
19.03	0.51	0.49	0.50	0.16	0.17	19.19	2.00	0.00	0.00	0.16	0.00
19.36	2.00	0.00	0.00	0.16	0.00	19.52	2.00	0.00	0.00	0.16	0.00
19.68	2.00	0.00	0.00	0.16	0.00	19.85	2.00	0.00	0.00	0.16	0.00
20.01	2.00	0.00	0.00	0.16	0.00	20.18	2.00	0.00	0.00	0.16	0.00
20.34	2.00	0.00	0.00	0.16	0.00	20.50	2.00	0.00	0.00	0.16	0.00
20.67	0.29	0.71	0.32	0.16	0.24	20.83	0.32	0.68	0.33	0.16	0.23
21.00	0.33	0.67	0.34	0.16	0.23	21.16	2.00	0.00	0.00	0.16	0.00
21.32	2.00	0.00	0.00	0.16	0.00	21.49	2.00	0.00	0.00	0.16	0.00
21.65	2.00	0.00	0.00	0.16	0.00	21.82	2.00	0.00	0.00	0.16	0.00
21.98	2.00	0.00	0.00	0.16	0.00	22.15	2.00	0.00	0.00	0.16	0.00
22.31	2.00	0.00	0.00	0.16	0.00	22.47	2.00	0.00	0.00	0.16	0.00
22.64	2.00	0.00	0.00	0.16	0.00	22.80	0.25	0.75	0.30	0.16	0.24
22.97	0.36	0.64	0.36	0.16	0.21	23.13	0.45	0.55	0.42	0.16	0.18
23.29	0.41	0.59	0.40	0.16	0.19	23.46	0.32	0.68	0.34	0.16	0.22
23.62	2.00	0.00	0.00	0.16	0.00	23.79	2.00	0.00	0.00	0.16	0.00
23.95	2.00	0.00	0.00	0.16	0.00	24.11	2.00	0.00	0.00	0.16	0.00
24.28	2.00	0.00	0.00	0.16	0.00	24.44	2.00	0.00	0.00	0.16	0.00
24.61	2.00	0.00	0.00	0.16	0.00	24.77	0.29	0.71	0.32	0.16	0.22
24.93	0.32	0.68	0.34	0.16	0.21	25.10	0.34	0.66	0.35	0.16	0.20
25.26	0.35	0.65	0.35	0.16	0.20	25.43	0.34	0.66	0.35	0.16	0.20
25.59	0.33	0.67	0.34	0.16	0.20	25.75	0.31	0.69	0.33	0.16	0.21
25.92	0.28	0.72	0.31	0.16	0.22	26.08	2.00	0.00	0.00	0.16	0.00
26.25	2.00	0.00	0.00	0.16	0.00	26.41	2.00	0.00	0.00	0.16	0.00
26.57	2.00	0.00	0.00	0.16	0.00	26.74	2.00	0.00	0.00	0.16	0.00
26.90	2.00	0.00	0.00	0.16	0.00	27.07	2.00	0.00	0.00	0.16	0.00
27.23	2.00	0.00	0.00	0.16	0.00	27.39	2.00	0.00	0.00	0.16	0.00
27.56	2.00	0.00	0.00	0.16	0.00	27.72	2.00	0.00	0.00	0.16	0.00
27.89	0.21	0.79	0.28	0.16	0.23	28.05	0.23	0.77	0.29	0.16	0.22
28.21	0.28	0.72	0.31	0.16	0.21	28.38	0.23	0.77	0.29	0.16	0.22
28.54	0.26	0.74	0.30	0.16	0.21	28.71	0.27	0.73	0.31	0.16	0.21
28.87	0.26	0.74	0.30	0.16	0.21	29.04	2.00	0.00	0.00	0.16	0.00
29.20	2.00	0.00	0.00	0.16	0.00	29.36	2.00	0.00	0.00	0.16	0.00
29.53	2.00	0.00	0.00	0.16	0.00	29.69	2.00	0.00	0.00	0.16	0.00
29.86	2.00	0.00	0.00	0.16	0.00	30.02	2.00	0.00	0.00	0.16	0.00
30.18	2.00	0.00	0.00	0.16	0.00	30.35	2.00	0.00	0.00	0.16	0.00
30.51	2.00	0.00	0.00	0.16	0.00	30.68	2.00	0.00	0.00	0.16	0.00
30.84	2.00	0.00	0.00	0.16	0.00	31.00	2.00	0.00	0.00	0.16	0.00
31.17	0.29	0.71	0.32	0.16	0.19	31.33	0.34	0.66	0.35	0.16	0.17
31.50	0.30	0.70	0.32	0.16	0.18	31.66	0.28	0.72	0.31	0.16	0.19
31.82	0.33	0.67	0.34	0.16	0.17	31.99	0.45	0.55	0.43	0.16	0.14
32.15	1.18	0.00	0.00	0.16	0.00	32.32	2.00	0.00	0.00	0.16	0.00
32.48	2.00	0.00	0.00	0.16	0.00	32.64	2.00	0.00	0.00	0.16	0.00

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}	Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}
32.81	2.00	0.00	0.00	0.16	0.00	32.97	2.00	0.00	0.00	0.16	0.00
33.14	1.96	0.00	0.00	0.16	0.00	33.30	1.24	0.00	0.00	0.16	0.00
33.47	0.90	0.00	0.00	0.16	0.02	33.63	0.96	0.00	0.00	0.16	0.01
33.79	0.99	0.00	0.00	0.16	0.00	33.96	0.91	0.00	0.00	0.16	0.02
34.12	0.83	0.00	0.00	0.16	0.04	34.28	0.77	0.00	0.00	0.16	0.06
34.45	0.62	0.38	0.68	0.16	0.09	34.61	0.58	0.42	0.60	0.16	0.10
34.78	0.57	0.43	0.57	0.16	0.10	34.94	0.58	0.42	0.59	0.16	0.10
35.10	0.60	0.40	0.63	0.16	0.09	35.27	0.73	0.27	1.08	0.16	0.06
35.43	0.62	0.38	0.68	0.16	0.09	35.60	0.50	0.50	0.48	0.16	0.11
35.76	0.65	0.35	0.74	0.16	0.08	35.92	2.00	0.00	0.00	0.16	0.00
36.09	2.00	0.00	0.00	0.16	0.00	36.25	2.00	0.00	0.00	0.16	0.00
36.42	2.00	0.00	0.00	0.16	0.00	36.58	2.00	0.00	0.00	0.16	0.00
36.74	2.00	0.00	0.00	0.16	0.00	36.91	2.00	0.00	0.00	0.16	0.00
37.07	2.00	0.00	0.00	0.16	0.00	37.24	2.00	0.00	0.00	0.16	0.00
37.40	2.00	0.00	0.00	0.16	0.00	37.57	2.00	0.00	0.00	0.16	0.00
37.73	2.00	0.00	0.00	0.16	0.00	37.89	2.00	0.00	0.00	0.16	0.00
38.06	2.00	0.00	0.00	0.16	0.00	38.22	2.00	0.00	0.00	0.16	0.00
38.39	2.00	0.00	0.00	0.16	0.00	38.55	2.00	0.00	0.00	0.16	0.00
38.71	2.00	0.00	0.00	0.16	0.00	38.88	2.00	0.00	0.00	0.16	0.00
39.04	2.00	0.00	0.00	0.16	0.00	39.21	2.00	0.00	0.00	0.16	0.00
39.37	2.00	0.00	0.00	0.16	0.00	39.53	2.00	0.00	0.00	0.16	0.00
39.70	2.00	0.00	0.00	0.16	0.00	39.86	2.00	0.00	0.00	0.16	0.00
40.03	2.00	0.00	0.00	0.16	0.00	40.19	2.00	0.00	0.00	0.16	0.00
40.35	2.00	0.00	0.00	0.16	0.00	40.52	0.36	0.64	0.36	0.16	0.12
40.68	0.37	0.63	0.36	0.16	0.12	40.85	0.27	0.73	0.31	0.16	0.14
41.01	2.00	0.00	0.00	0.17	0.00	41.17	2.00	0.00	0.00	0.16	0.00
41.34	2.00	0.00	0.00	0.16	0.00	41.50	2.00	0.00	0.00	0.16	0.00
41.67	2.00	0.00	0.00	0.16	0.00	41.83	2.00	0.00	0.00	0.16	0.00
41.99	2.00	0.00	0.00	0.16	0.00	42.16	2.00	0.00	0.00	0.16	0.00
42.32	2.00	0.00	0.00	0.16	0.00	42.49	2.00	0.00	0.00	0.16	0.00
42.65	2.00	0.00	0.00	0.16	0.00	42.81	2.00	0.00	0.00	0.16	0.00
42.98	2.00	0.00	0.00	0.16	0.00	43.14	2.00	0.00	0.00	0.16	0.00
43.31	2.00	0.00	0.00	0.16	0.00	43.47	2.00	0.00	0.00	0.16	0.00
43.63	2.00	0.00	0.00	0.16	0.00	43.80	2.00	0.00	0.00	0.16	0.00
43.96	2.00	0.00	0.00	0.16	0.00	44.13	2.00	0.00	0.00	0.16	0.00
44.29	2.00	0.00	0.00	0.16	0.00	44.45	2.00	0.00	0.00	0.16	0.00
44.62	2.00	0.00	0.00	0.16	0.00	44.78	2.00	0.00	0.00	0.16	0.00
44.95	2.00	0.00	0.00	0.16	0.00	45.11	2.00	0.00	0.00	0.16	0.00
45.28	2.00	0.00	0.00	0.16	0.00	45.44	2.00	0.00	0.00	0.16	0.00
45.60	2.00	0.00	0.00	0.16	0.00	45.77	2.00	0.00	0.00	0.16	0.00
45.93	2.00	0.00	0.00	0.16	0.00	46.10	2.00	0.00	0.00	0.16	0.00
46.26	2.00	0.00	0.00	0.16	0.00	46.42	2.00	0.00	0.00	0.16	0.00
46.59	2.00	0.00	0.00	0.16	0.00	46.75	2.00	0.00	0.00	0.16	0.00
46.92	2.00	0.00	0.00	0.16	0.00	47.08	2.00	0.00	0.00	0.16	0.00
47.24	2.00	0.00	0.00	0.16	0.00	47.41	2.00	0.00	0.00	0.16	0.00
47.57	2.00	0.00	0.00	0.16	0.00	47.74	0.23	0.77	0.29	0.16	0.11
47.90	0.23	0.77	0.29	0.16	0.10	48.06	2.00	0.00	0.00	0.16	0.00
48.23	2.00	0.00	0.00	0.16	0.00	48.39	2.00	0.00	0.00	0.16	0.00

:: Liquefaction Potential Index calculation data ::												
Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}		Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}
48.56	2.00	0.00	0.00	0.16	0.00		48.72	2.00	0.00	0.00	0.16	0.00
48.88	2.00	0.00	0.00	0.16	0.00		49.05	2.00	0.00	0.00	0.16	0.00
49.21	2.00	0.00	0.00	0.16	0.00		49.38	0.27	0.73	0.31	0.16	0.09
49.54	0.28	0.72	0.31	0.16	0.09		49.70	0.31	0.69	0.33	0.16	0.08
49.87	0.40	0.60	0.38	0.16	0.07		50.03	0.34	0.66	0.35	0.16	0.08
50.20	0.28	0.72	0.31	0.16	0.08							

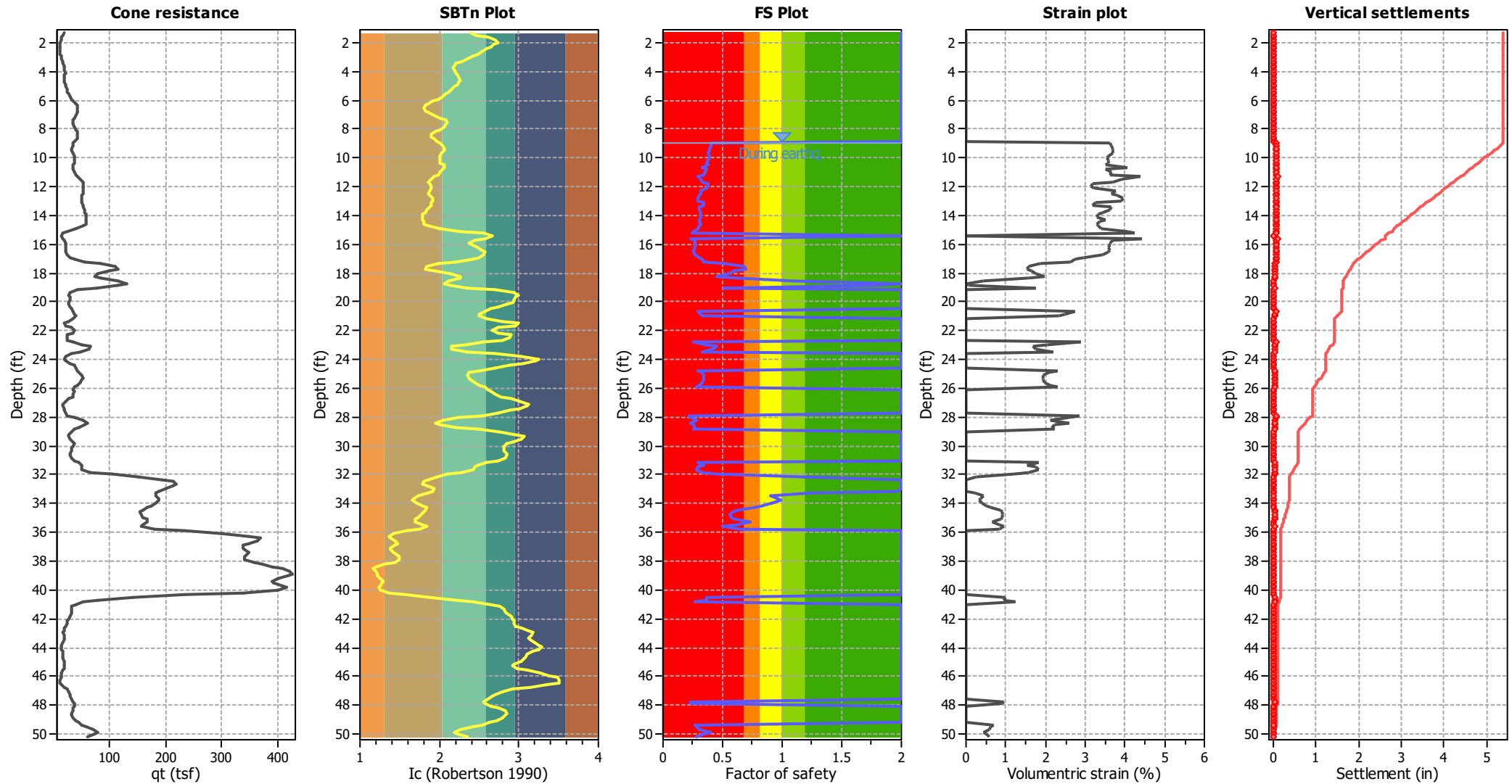
Overall liquefaction potential: 22.75

LPI_{ISH} > 5.0 - Liquefaction manifestation is expected

Abbreviations

- FS: Calculated factor of safety for test point
- 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 due to soil liquefaction ::

Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)	Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)
9.02	74.58	0.41	3.63	0.85	0.07	9.19	74.06	0.40	3.64	0.84	0.07
9.35	72.69	0.39	3.70	0.84	0.07	9.51	72.66	0.39	3.68	0.84	0.07
9.68	72.29	0.38	3.69	0.84	0.07	9.84	73.95	0.38	3.60	0.83	0.07
10.01	74.86	0.39	3.55	0.83	0.07	10.17	73.42	0.38	3.60	0.83	0.07
10.34	73.24	0.37	3.60	0.82	0.07	10.50	74.66	0.37	3.52	0.82	0.07
10.66	64.04	0.32	4.04	0.82	0.08	10.83	74.62	0.37	3.50	0.82	0.07
10.99	70.96	0.35	3.65	0.81	0.07	11.15	71.01	0.35	3.64	0.81	0.07
11.32	57.52	0.29	4.39	0.81	0.09	11.48	65.15	0.32	3.91	0.81	0.08
11.65	68.90	0.33	3.70	0.80	0.07	11.81	80.75	0.38	3.18	0.80	0.06
11.97	81.13	0.38	3.15	0.80	0.06	12.14	78.88	0.37	3.23	0.79	0.06
12.30	66.81	0.31	3.76	0.79	0.07	12.47	68.33	0.32	3.67	0.79	0.07
12.63	65.26	0.30	3.81	0.79	0.08	12.79	62.29	0.29	3.96	0.78	0.08
12.96	62.85	0.29	3.92	0.78	0.08	13.12	76.22	0.34	3.26	0.78	0.06
13.29	77.55	0.35	3.20	0.77	0.06	13.45	66.81	0.30	3.67	0.77	0.07
13.62	67.47	0.30	3.62	0.77	0.07	13.78	71.26	0.32	3.43	0.77	0.07
13.94	73.41	0.32	3.32	0.76	0.07	14.11	73.83	0.32	3.29	0.76	0.06
14.27	68.53	0.30	3.52	0.76	0.07	14.44	71.30	0.31	3.38	0.76	0.07
14.60	73.27	0.32	3.28	0.75	0.06	14.76	71.70	0.31	3.34	0.75	0.07
14.93	69.93	0.30	3.40	0.75	0.07	15.09	57.27	0.25	4.06	0.74	0.08
15.26	54.45	0.24	4.23	0.74	0.08	15.42	14.13	2.00	0.00	0.74	0.00
15.58	51.02	0.23	4.44	0.74	0.09	15.75	62.53	0.26	3.70	0.73	0.07
15.91	63.94	0.27	3.61	0.73	0.07	16.08	63.16	0.26	3.64	0.73	0.07
16.24	63.80	0.26	3.59	0.72	0.07	16.40	62.70	0.26	3.63	0.72	0.07
16.57	63.02	0.26	3.60	0.72	0.07	16.73	66.12	0.27	3.43	0.72	0.07
16.90	76.63	0.31	2.98	0.71	0.06	17.06	83.17	0.33	2.74	0.71	0.05
17.22	85.95	0.34	2.65	0.71	0.05	17.39	120.61	0.52	1.86	0.71	0.04
17.55	141.18	0.68	1.56	0.70	0.03	17.72	142.31	0.69	1.54	0.70	0.03
17.88	132.29	0.59	1.66	0.70	0.03	18.05	126.19	0.54	1.75	0.69	0.03
18.21	111.75	0.45	1.98	0.69	0.04	18.37	136.76	0.62	1.59	0.69	0.03
18.54	167.83	1.09	0.46	0.69	0.01	18.70	204.01	2.00	0.00	0.68	0.00
18.86	185.12	1.78	0.07	0.68	0.00	19.03	123.19	0.51	1.75	0.68	0.03
19.19	39.34	2.00	0.00	0.67	0.00	19.36	28.46	2.00	0.00	0.67	0.00
19.52	28.89	2.00	0.00	0.67	0.00	19.68	33.20	2.00	0.00	0.67	0.00
19.85	32.12	2.00	0.00	0.66	0.00	20.01	30.67	2.00	0.00	0.66	0.00
20.18	27.39	2.00	0.00	0.66	0.00	20.34	31.24	2.00	0.00	0.66	0.00
20.50	33.28	2.00	0.00	0.65	0.00	20.67	76.21	0.29	2.73	0.65	0.05
20.83	84.10	0.32	2.47	0.65	0.05	21.00	89.07	0.33	2.33	0.64	0.05
21.16	36.47	2.00	0.00	0.64	0.00	21.32	26.72	2.00	0.00	0.64	0.00
21.49	19.38	2.00	0.00	0.64	0.00	21.65	17.36	2.00	0.00	0.63	0.00
21.82	30.62	2.00	0.00	0.63	0.00	21.98	48.52	2.00	0.00	0.63	0.00
22.15	34.74	2.00	0.00	0.62	0.00	22.31	23.03	2.00	0.00	0.62	0.00
22.47	21.76	2.00	0.00	0.62	0.00	22.64	27.93	2.00	0.00	0.62	0.00
22.80	67.62	0.25	2.88	0.61	0.06	22.97	96.37	0.36	2.04	0.61	0.04
23.13	115.68	0.45	1.68	0.61	0.03	23.29	109.38	0.41	1.77	0.61	0.03
23.46	88.55	0.32	2.19	0.60	0.04	23.62	29.65	2.00	0.00	0.60	0.00
23.79	19.85	2.00	0.00	0.60	0.00	23.95	18.07	2.00	0.00	0.59	0.00
24.11	20.83	2.00	0.00	0.59	0.00	24.28	29.26	2.00	0.00	0.59	0.00
24.44	42.16	2.00	0.00	0.59	0.00	24.61	39.40	2.00	0.00	0.58	0.00

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

Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)	Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)
24.77	80.69	0.29	2.31	0.58	0.05	24.93	89.41	0.32	2.08	0.58	0.04
25.10	95.00	0.34	1.94	0.57	0.04	25.26	95.49	0.35	1.93	0.57	0.04
25.43	94.17	0.34	1.94	0.57	0.04	25.59	92.54	0.33	1.97	0.57	0.04
25.75	85.64	0.31	2.11	0.56	0.04	25.92	77.79	0.28	2.31	0.56	0.05
26.08	34.03	2.00	0.00	0.56	0.00	26.25	34.72	2.00	0.00	0.56	0.00
26.41	37.98	2.00	0.00	0.55	0.00	26.57	30.73	2.00	0.00	0.55	0.00
26.74	27.99	2.00	0.00	0.55	0.00	26.90	19.11	2.00	0.00	0.54	0.00
27.07	16.15	2.00	0.00	0.54	0.00	27.23	15.47	2.00	0.00	0.54	0.00
27.39	17.20	2.00	0.00	0.54	0.00	27.56	18.37	2.00	0.00	0.53	0.00
27.72	19.43	2.00	0.00	0.53	0.00	27.89	57.43	0.21	2.87	0.53	0.06
28.05	63.36	0.23	2.61	0.52	0.05	28.21	78.51	0.28	2.13	0.52	0.04
28.38	63.23	0.23	2.59	0.52	0.05	28.54	73.64	0.26	2.24	0.52	0.04
28.71	75.72	0.27	2.17	0.51	0.04	28.87	73.70	0.26	2.21	0.51	0.04
29.04	28.73	2.00	0.00	0.51	0.00	29.20	25.17	2.00	0.00	0.51	0.00
29.36	23.65	2.00	0.00	0.50	0.00	29.53	25.85	2.00	0.00	0.50	0.00
29.69	33.78	2.00	0.00	0.50	0.00	29.86	34.89	2.00	0.00	0.49	0.00
30.02	31.10	2.00	0.00	0.49	0.00	30.18	30.85	2.00	0.00	0.49	0.00
30.35	26.72	2.00	0.00	0.49	0.00	30.51	25.59	2.00	0.00	0.48	0.00
30.68	26.31	2.00	0.00	0.48	0.00	30.84	28.10	2.00	0.00	0.48	0.00
31.00	30.60	2.00	0.00	0.47	0.00	31.17	82.87	0.29	1.83	0.47	0.04
31.33	97.29	0.34	1.55	0.47	0.03	31.50	84.85	0.30	1.77	0.47	0.03
31.66	81.49	0.28	1.82	0.46	0.04	31.82	94.67	0.33	1.56	0.46	0.03
31.99	121.24	0.45	1.20	0.46	0.02	32.15	176.22	1.18	0.24	0.46	0.00
32.32	198.30	2.00	0.00	0.45	0.00	32.48	206.66	2.00	0.00	0.45	0.00
32.64	206.14	2.00	0.00	0.45	0.00	32.81	212.05	2.00	0.00	0.44	0.00
32.97	210.87	2.00	0.00	0.44	0.00	33.14	191.64	1.96	0.01	0.44	0.00
33.30	178.14	1.24	0.20	0.44	0.00	33.47	165.60	0.90	0.43	0.43	0.01
33.63	168.42	0.96	0.37	0.43	0.01	33.79	169.81	0.99	0.34	0.43	0.01
33.96	166.26	0.91	0.41	0.42	0.01	34.12	161.70	0.83	0.51	0.42	0.01
34.28	157.96	0.77	0.61	0.42	0.01	34.45	145.99	0.62	0.89	0.42	0.02
34.61	141.65	0.58	0.92	0.41	0.02	34.78	139.70	0.57	0.92	0.41	0.02
34.94	141.33	0.58	0.91	0.41	0.02	35.10	143.85	0.60	0.88	0.41	0.02
35.27	155.85	0.73	0.65	0.40	0.01	35.43	146.25	0.62	0.85	0.40	0.02
35.60	131.25	0.50	0.96	0.40	0.02	35.76	148.60	0.65	0.83	0.39	0.02
35.92	208.94	2.00	0.00	0.39	0.00	36.09	269.61	2.00	0.00	0.39	0.00
36.25	324.71	2.00	0.00	0.39	0.00	36.42	342.90	2.00	0.00	0.38	0.00
36.58	325.18	2.00	0.00	0.38	0.00	36.74	305.36	2.00	0.00	0.38	0.00
36.91	302.02	2.00	0.00	0.37	0.00	37.07	299.07	2.00	0.00	0.37	0.00
37.24	302.50	2.00	0.00	0.37	0.00	37.40	308.17	2.00	0.00	0.37	0.00
37.57	317.75	2.00	0.00	0.36	0.00	37.73	285.66	2.00	0.00	0.36	0.00
37.89	306.65	2.00	0.00	0.36	0.00	38.06	312.52	2.00	0.00	0.35	0.00
38.22	330.58	2.00	0.00	0.35	0.00	38.39	344.29	2.00	0.00	0.35	0.00
38.55	360.20	2.00	0.00	0.35	0.00	38.71	374.28	2.00	0.00	0.34	0.00
38.88	377.66	2.00	0.00	0.34	0.00	39.04	374.63	2.00	0.00	0.34	0.00
39.21	350.93	2.00	0.00	0.34	0.00	39.37	330.79	2.00	0.00	0.33	0.00
39.53	342.33	2.00	0.00	0.33	0.00	39.70	359.78	2.00	0.00	0.33	0.00
39.86	368.73	2.00	0.00	0.32	0.00	40.03	366.68	2.00	0.00	0.32	0.00
40.19	318.05	2.00	0.00	0.32	0.00	40.35	196.57	2.00	0.00	0.32	0.00

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

Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)	Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)
40.52	102.66	0.36	0.98	0.31	0.02	40.68	103.19	0.37	0.97	0.31	0.02
40.85	78.33	0.27	1.26	0.31	0.02	41.01	27.61	2.00	0.00	0.30	0.00
41.17	24.43	2.00	0.00	0.30	0.00	41.34	23.63	2.00	0.00	0.30	0.00
41.50	27.48	2.00	0.00	0.30	0.00	41.67	24.56	2.00	0.00	0.29	0.00
41.83	23.55	2.00	0.00	0.29	0.00	41.99	20.38	2.00	0.00	0.29	0.00
42.16	18.59	2.00	0.00	0.29	0.00	42.32	17.69	2.00	0.00	0.28	0.00
42.49	16.21	2.00	0.00	0.28	0.00	42.65	15.13	2.00	0.00	0.28	0.00
42.81	12.53	2.00	0.00	0.27	0.00	42.98	12.26	2.00	0.00	0.27	0.00
43.14	13.13	2.00	0.00	0.27	0.00	43.31	13.90	2.00	0.00	0.27	0.00
43.47	13.63	2.00	0.00	0.26	0.00	43.63	11.71	2.00	0.00	0.26	0.00
43.80	10.32	2.00	0.00	0.26	0.00	43.96	9.74	2.00	0.00	0.25	0.00
44.13	9.71	2.00	0.00	0.25	0.00	44.29	11.31	2.00	0.00	0.25	0.00
44.45	12.56	2.00	0.00	0.25	0.00	44.62	12.73	2.00	0.00	0.24	0.00
44.78	12.25	2.00	0.00	0.24	0.00	44.95	12.29	2.00	0.00	0.24	0.00
45.11	13.42	2.00	0.00	0.24	0.00	45.28	16.50	2.00	0.00	0.23	0.00
45.44	13.36	2.00	0.00	0.23	0.00	45.60	11.57	2.00	0.00	0.23	0.00
45.77	10.48	2.00	0.00	0.22	0.00	45.93	8.66	2.00	0.00	0.22	0.00
46.10	9.09	2.00	0.00	0.22	0.00	46.26	8.15	2.00	0.00	0.22	0.00
46.42	7.85	2.00	0.00	0.21	0.00	46.59	8.92	2.00	0.00	0.21	0.00
46.75	12.89	2.00	0.00	0.21	0.00	46.92	16.66	2.00	0.00	0.20	0.00
47.08	19.70	2.00	0.00	0.20	0.00	47.24	20.83	2.00	0.00	0.20	0.00
47.41	20.20	2.00	0.00	0.20	0.00	47.57	22.34	2.00	0.00	0.19	0.00
47.74	62.49	0.23	0.96	0.19	0.02	47.90	65.00	0.23	0.92	0.19	0.02
48.06	25.67	2.00	0.00	0.19	0.00	48.23	24.61	2.00	0.00	0.18	0.00
48.39	22.95	2.00	0.00	0.18	0.00	48.56	21.70	2.00	0.00	0.18	0.00
48.72	22.18	2.00	0.00	0.17	0.00	48.88	22.87	2.00	0.00	0.17	0.00
49.05	25.41	2.00	0.00	0.17	0.00	49.21	31.49	2.00	0.00	0.17	0.00
49.38	74.91	0.27	0.70	0.16	0.01	49.54	80.65	0.28	0.64	0.16	0.01
49.70	87.17	0.31	0.58	0.16	0.01	49.87	110.20	0.40	0.45	0.15	0.01
50.03	96.40	0.34	0.51	0.15	0.01	50.20	79.29	0.28	0.60	0.15	0.01

Total estimated settlement: 5.39

Abbreviations

- Q_{tn,cs}: Equivalent dean 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

:: Strength loss calculation Idriss & Boulanger (2008) ::

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
1.31	18.47	29.56	2.31	68.19	2.39	0.06	0.68
1.48	16.96	27.12	2.76	74.96	2.47	0.06	0.67
1.64	14.72	23.50	3.88	91.11	2.61	0.06	0.62
1.80	13.33	21.26	4.65	98.94	2.69	0.06	0.62
1.97	12.18	19.40	5.05	98.04	2.73	0.06	0.62
2.13	11.49	18.28	4.60	84.01	2.69	0.06	0.62
2.30	11.18	17.76	4.14	73.53	2.64	0.06	0.62
2.46	11.05	17.54	3.69	64.81	2.59	0.06	0.64
2.63	11.41	18.10	3.25	58.87	2.54	0.05	0.64
2.79	11.90	18.89	2.83	53.37	2.48	0.05	0.64
2.95	12.79	20.30	2.47	50.21	2.42	0.05	0.64
3.12	14.05	22.32	2.12	47.40	2.35	0.05	0.65
3.28	15.73	25.00	1.84	46.00	2.28	0.05	0.65
3.44	17.43	27.72	1.00	27.72	2.21	0.04	0.62
3.61	18.63	29.63	1.00	29.63	2.18	0.04	0.62
3.77	19.69	31.33	1.00	31.33	2.17	0.04	0.62
3.94	19.98	31.78	1.58	50.27	2.19	0.05	0.67
4.10	20.31	32.29	1.61	52.04	2.20	0.05	0.67
4.26	19.91	31.63	1.69	53.37	2.23	0.06	0.67
4.43	19.84	31.50	1.74	54.68	2.24	0.06	0.67
4.59	19.56	31.04	1.78	55.34	2.26	0.06	0.67
4.76	19.72	31.29	1.76	55.09	2.25	0.06	0.67
4.92	20.35	32.29	1.70	54.88	2.23	0.06	0.67
5.08	21.69	34.42	1.60	55.00	2.19	0.06	0.68
5.25	23.37	37.11	1.51	56.08	2.15	0.06	0.68
5.41	24.88	39.53	1.45	57.13	2.12	0.06	0.68
5.58	26.37	41.90	1.39	58.41	2.08	0.06	0.68
5.74	28.42	45.19	1.34	60.73	2.04	0.06	0.68
5.91	31.51	50.14	1.00	50.14	1.98	0.06	0.63
6.07	35.15	55.97	1.00	55.97	1.91	0.07	0.65
6.23	38.56	61.43	1.00	61.43	1.86	0.08	0.66
6.40	41.16	65.60	1.00	65.60	1.82	0.08	0.67
6.56	42.78	68.18	1.00	68.18	1.81	0.08	0.68
6.73	43.16	68.77	1.00	68.77	1.83	0.09	0.68
6.89	41.96	66.85	1.00	66.85	1.87	0.08	0.68
7.05	39.31	62.56	1.26	78.70	1.93	0.08	0.71
7.22	36.04	57.30	1.32	75.47	2.01	0.08	0.71
7.38	33.75	53.60	1.39	74.41	2.08	0.07	0.71
7.55	33.49	53.18	1.42	75.50	2.10	0.07	0.71
7.71	34.75	55.19	1.40	77.22	2.09	0.08	0.72
7.87	36.40	57.82	1.36	78.62	2.05	0.08	0.72
8.04	38.58	61.32	1.31	80.44	2.01	0.08	0.71
8.20	41.46	65.91	1.27	83.42	1.94	0.08	0.71
8.37	43.50	68.71	1.24	85.06	1.90	0.09	0.71
8.53	43.39	67.70	1.24	83.72	1.90	0.09	0.70
8.69	41.04	63.77	1.25	79.91	1.92	0.08	0.70
8.86	38.24	59.42	1.28	76.03	1.96	0.08	0.70
9.02	35.58	55.28	1.31	72.50	2.01	0.07	0.69

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
9.19	33.57	52.16	1.35	70.53	2.05	0.07	0.69
9.35	32.63	50.26	1.36	68.58	2.06	0.07	0.69
9.51	32.89	50.02	1.36	67.97	2.05	0.07	0.69
9.68	34.32	51.31	1.33	68.44	2.03	0.07	0.69
9.84	36.11	53.13	1.32	70.02	2.01	0.07	0.69
10.01	37.22	54.05	1.31	70.75	2.00	0.07	0.70
10.17	37.38	53.71	1.31	70.34	2.00	0.07	0.69
10.34	36.69	52.32	1.32	69.01	2.01	0.07	0.69
10.50	33.96	48.34	1.36	65.64	2.05	0.07	0.69
10.66	33.90	47.74	1.36	64.79	2.05	0.06	0.67
10.83	34.12	47.55	1.36	64.48	2.05	0.07	0.69
10.99	37.18	50.93	1.32	67.14	2.01	0.07	0.69
11.15	39.11	53.09	1.30	68.93	1.99	0.07	0.69
11.32	43.22	57.84	1.00	57.84	1.94	0.07	0.65
11.48	47.91	63.24	1.00	63.24	1.89	0.08	0.67
11.65	51.77	67.78	1.00	67.78	1.86	0.08	0.68
11.81	53.18	69.66	1.23	85.39	1.88	0.09	0.71
11.97	52.99	69.39	1.24	85.91	1.90	0.09	0.71
12.14	52.11	67.91	1.24	83.95	1.90	0.09	0.70
12.30	52.01	67.11	1.00	67.11	1.87	0.08	0.68
12.47	51.56	66.23	1.00	66.23	1.87	0.08	0.68
12.63	50.45	64.79	1.00	64.79	1.89	0.08	0.67
12.79	49.06	63.00	1.00	63.00	1.91	0.08	0.66
12.96	49.09	62.81	1.00	62.81	1.91	0.08	0.66
13.12	50.56	64.41	1.24	79.74	1.90	0.08	0.70
13.29	51.89	65.75	1.23	80.98	1.89	0.08	0.70
13.45	52.88	66.55	1.00	66.55	1.88	0.08	0.68
13.62	54.37	67.86	1.00	67.86	1.85	0.08	0.68
13.78	56.49	69.91	1.00	69.91	1.82	0.09	0.69
13.94	58.54	71.83	1.00	71.83	1.79	0.09	0.69
14.11	57.93	70.81	1.00	70.81	1.79	0.09	0.69
14.27	57.50	70.13	1.00	70.13	1.79	0.08	0.68
14.44	57.53	70.08	1.00	70.08	1.81	0.09	0.69
14.60	58.65	71.27	1.00	71.27	1.81	0.09	0.69
14.76	52.39	63.93	1.00	63.93	1.86	0.09	0.69
14.93	39.14	48.62	1.32	64.18	2.01	0.07	0.68
15.09	24.64	31.45	1.81	56.85	2.27	0.05	0.65
15.26	15.44	20.19	3.37	68.06	2.55	0.05	0.64
15.42	13.10	17.17	4.32	74.10	2.66	0.05	0.62
15.58	15.15	19.68	3.59	70.59	2.58	0.05	0.63
15.75	19.03	24.32	2.59	63.02	2.44	0.06	0.66
15.91	22.17	28.09	2.26	63.37	2.38	0.06	0.67
16.08	22.50	28.53	2.40	68.56	2.41	0.06	0.67
16.24	21.86	27.85	2.82	78.44	2.48	0.06	0.67
16.40	21.42	27.36	3.18	87.12	2.53	0.06	0.66
16.57	21.79	27.89	3.53	98.43	2.57	0.06	0.66
16.73	25.03	31.95	3.38	107.92	2.55	0.07	0.67
16.90	30.12	38.17	2.98	113.70	2.50	0.07	0.70

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q _t (tsf)	Q _{tn}	K _c	Q _{tn,cs}	I _c	S _{u(liq)'/σ'_v}	S _{u(peak)'/σ'_v}
17.06	36.90	46.26	2.51	115.95	2.42	0.08	0.71
17.22	55.27	67.41	1.64	110.80	2.21	0.07	0.72
17.39	83.19	98.39	1.30	127.44	1.99	0.13	0.78
17.55	109.57	126.76	1.19	150.72	1.84	0.22	0.81
17.72	114.88	132.18	1.18	155.48	1.82	0.22	0.82
17.88	100.73	116.92	1.25	146.69	1.93	0.16	0.80
18.05	79.96	94.67	1.47	139.17	2.13	0.12	0.79
18.21	72.59	86.91	1.81	156.90	2.27	0.10	0.77
18.37	84.33	100.52	1.78	179.14	2.26	0.13	0.81
18.54	113.88	133.13	1.45	192.79	2.12	0.20	0.85
18.70	129.48	149.80	1.37	205.50	2.06	0.39	0.89
18.86	114.36	132.57	1.47	194.82	2.13	0.25	0.87
19.03	76.52	90.15	2.16	194.80	2.36	0.12	0.79
19.19	42.83	51.59	4.74	244.46	2.70	0.09	0.62
19.36	29.03	35.14	7.78	273.41	2.94	0.08	0.62
19.52	27.23	32.66	8.65	282.46	2.99	0.09	0.62
19.68	28.50	34.00	8.17	277.94	2.96	0.09	0.62
19.85	29.18	34.61	7.73	267.48	2.93	0.09	0.62
20.01	27.48	32.31	7.52	243.04	2.92	0.09	0.62
20.18	27.39	31.76	6.40	203.35	2.84	0.08	0.62
20.34	28.39	32.47	5.17	167.92	2.74	0.08	0.62
20.50	30.88	34.94	4.19	146.51	2.65	0.08	0.62
20.67	34.18	38.35	3.55	136.18	2.58	0.08	0.70
20.83	38.12	42.45	3.03	128.73	2.51	0.08	0.72
21.00	38.83	43.02	2.99	128.79	2.50	0.08	0.73
21.16	34.22	37.88	3.76	142.26	2.60	0.08	0.62
21.32	25.97	28.74	5.80	166.65	2.80	0.08	0.62
21.49	19.86	21.72	8.61	187.03	2.99	0.08	0.62
21.65	21.21	23.15	7.95	184.15	2.95	0.07	0.62
21.82	30.69	33.47	5.06	169.24	2.73	0.08	0.62
21.98	36.29	39.44	4.42	174.24	2.67	0.10	0.62
22.15	33.86	36.68	5.10	186.90	2.74	0.08	0.62
22.31	25.23	27.14	7.25	196.67	2.90	0.08	0.62
22.47	23.15	24.60	6.93	170.46	2.88	0.07	0.62
22.64	25.01	26.39	5.67	149.53	2.78	0.08	0.62
22.80	35.49	37.28	3.38	125.90	2.55	0.07	0.68
22.97	51.25	53.46	2.04	108.89	2.33	0.09	0.74
23.13	65.18	67.40	1.52	102.63	2.16	0.11	0.78
23.29	63.11	64.97	1.52	98.77	2.16	0.10	0.77
23.46	48.03	49.44	2.12	104.76	2.35	0.08	0.73
23.62	31.40	32.30	4.68	151.23	2.70	0.08	0.62
23.79	21.98	22.29	9.47	211.12	3.04	0.08	1.59
23.95	19.15	19.13	13.73	262.52	3.24	0.08	1.37
24.11	22.36	22.44	13.16	295.27	3.22	0.08	1.60
24.28	30.51	30.94	9.69	299.83	3.05	0.09	2.21
24.44	36.82	37.38	6.90	257.83	2.88	0.10	0.62
24.61	40.05	40.27	4.71	189.81	2.70	0.09	0.62
24.77	41.73	41.50	2.99	123.97	2.50	0.08	0.71

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
24.93	46.02	45.51	2.26	102.97	2.38	0.08	0.73
25.10	50.57	49.90	2.11	105.37	2.35	0.08	0.74
25.26	51.86	51.03	2.21	112.91	2.37	0.09	0.74
25.43	50.72	49.70	2.31	114.77	2.39	0.09	0.74
25.59	47.63	46.48	2.67	124.19	2.45	0.09	0.73
25.75	42.82	41.51	2.98	123.80	2.50	0.08	0.72
25.92	38.12	36.71	3.49	128.17	2.57	0.08	0.70
26.08	35.62	34.08	3.82	130.17	2.61	0.08	0.62
26.25	36.45	34.77	4.12	143.14	2.64	0.08	0.62
26.41	35.40	33.61	4.76	160.02	2.71	0.09	0.62
26.57	33.16	31.28	5.47	170.96	2.77	0.08	0.62
26.74	26.72	24.84	7.24	179.86	2.90	0.08	0.62
26.90	21.75	19.84	9.09	180.27	3.02	0.08	1.42
27.07	17.49	15.58	11.17	174.04	3.13	0.08	1.11
27.23	16.89	14.92	10.81	161.36	3.11	0.07	1.07
27.39	17.74	15.67	9.06	141.99	3.02	0.07	1.12
27.56	19.19	16.99	6.97	118.45	2.88	0.07	0.62
27.72	20.57	18.23	5.07	92.38	2.73	0.06	0.62
27.89	24.83	22.21	3.21	71.28	2.53	0.06	0.65
28.05	37.01	33.68	1.72	57.96	2.24	0.05	0.67
28.21	52.16	47.93	1.34	64.15	2.03	0.07	0.70
28.38	59.71	54.93	1.00	54.93	1.95	0.08	0.67
28.54	55.33	50.66	1.32	66.75	2.01	0.07	0.69
28.71	44.81	40.60	1.65	66.88	2.21	0.06	0.70
28.87	36.89	33.01	2.83	93.43	2.48	0.07	0.69
29.04	31.36	27.67	5.27	145.89	2.75	0.08	0.62
29.20	27.91	24.32	8.15	198.17	2.96	0.08	0.62
29.36	26.98	23.34	10.01	233.58	3.07	0.08	1.67
29.53	30.16	26.13	9.22	240.81	3.02	0.08	1.87
29.69	34.28	29.75	7.62	226.69	2.93	0.09	0.62
29.86	36.27	31.43	6.40	201.17	2.84	0.09	0.62
30.02	35.33	30.45	5.89	179.35	2.80	0.08	0.62
30.18	32.51	27.76	5.89	163.54	2.80	0.08	0.62
30.35	30.62	25.94	6.00	155.68	2.81	0.08	0.62
30.51	29.09	24.43	6.43	157.03	2.84	0.08	0.62
30.68	29.70	24.87	6.49	161.30	2.85	0.08	0.62
30.84	31.68	26.52	6.24	165.39	2.83	0.08	0.62
31.00	36.66	30.86	5.10	157.25	2.74	0.08	0.62
31.17	45.07	38.29	3.63	139.02	2.59	0.08	0.71
31.33	49.32	42.01	2.89	121.57	2.49	0.09	0.74
31.50	49.61	42.15	2.67	112.72	2.45	0.08	0.72
31.66	50.64	42.94	2.50	107.50	2.42	0.07	0.71
31.82	66.54	56.99	1.87	106.75	2.29	0.08	0.74
31.99	105.26	91.40	1.40	128.39	2.09	0.12	0.78
32.15	152.62	133.45	1.28	170.45	1.96	0.30	0.86
32.32	193.84	170.13	1.20	204.65	1.85	0.76	0.89
32.48	213.18	187.12	1.15	215.93	1.80	0.92	0.89
32.64	218.38	191.24	1.14	218.83	1.79	0.92	0.89

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
32.81	212.89	185.37	1.20	222.35	1.85	0.92	0.90
32.97	201.32	174.04	1.25	218.18	1.93	0.78	0.90
33.14	189.26	163.05	1.25	203.83	1.92	0.47	0.88
33.30	182.98	157.55	1.21	190.99	1.86	0.42	0.86
33.47	184.02	159.17	1.04	166.17	1.73	0.41	0.85
33.63	186.81	161.72	1.00	161.72	1.67	0.44	0.85
33.79	187.43	161.91	1.00	161.91	1.66	0.46	0.85
33.96	183.42	157.51	1.03	162.66	1.72	0.41	0.85
34.12	175.90	149.99	1.14	171.22	1.79	0.34	0.84
34.28	165.98	140.70	1.19	166.90	1.83	0.29	0.84
34.45	158.47	133.92	1.18	158.46	1.83	0.24	0.82
34.61	154.51	130.35	1.17	151.86	1.81	0.23	0.82
34.78	155.87	131.52	1.12	146.85	1.77	0.23	0.81
34.94	159.33	134.48	1.06	142.16	1.73	0.24	0.81
35.10	166.53	140.74	1.00	140.74	1.69	0.26	0.82
35.27	167.54	141.16	1.00	141.16	1.70	0.33	0.83
35.43	159.67	133.36	1.13	150.78	1.78	0.25	0.82
35.60	156.70	129.94	1.19	155.18	1.84	0.18	0.80
35.76	181.13	151.11	1.08	163.71	1.75	0.27	0.83
35.92	234.84	198.53	1.00	198.53	1.58	0.93	0.90
36.09	299.91	256.57	1.00	256.57	1.42	0.97	0.95
36.25	349.29	299.74	1.00	299.74	1.37	0.99	1.00
36.42	370.40	317.08	1.00	317.08	1.38	1.00	1.01
36.58	363.58	308.97	1.00	308.97	1.45	1.00	1.00
36.74	348.73	295.12	1.00	295.12	1.47	0.99	0.98
36.91	339.35	287.19	1.00	287.19	1.44	0.99	0.98
37.07	338.65	287.62	1.00	287.62	1.38	0.99	0.98
37.24	341.33	289.17	1.00	289.17	1.38	0.99	0.98
37.40	348.75	294.12	1.00	294.12	1.41	0.99	0.98
37.57	342.84	287.08	1.00	287.08	1.47	0.99	0.99
37.73	342.66	285.66	1.00	285.66	1.49	0.99	0.97
37.89	341.09	283.63	1.00	283.63	1.50	0.99	0.98
38.06	358.39	299.39	1.00	299.39	1.43	0.99	0.99
38.22	372.99	315.08	1.00	315.08	1.30	1.00	1.00
38.39	391.40	333.68	1.00	333.68	1.20	1.01	1.01
38.55	408.33	348.70	1.00	348.70	1.17	1.02	1.02
38.71	421.40	357.98	1.00	357.98	1.21	1.02	1.03
38.88	427.31	362.07	1.00	362.07	1.22	1.03	1.03
39.04	418.90	354.08	1.00	354.08	1.22	1.02	1.03
39.21	401.54	337.52	1.00	337.52	1.26	1.01	1.02
39.37	389.68	325.97	1.00	325.97	1.29	1.01	1.00
39.53	393.48	329.08	1.00	329.08	1.27	1.01	1.01
39.70	408.36	341.92	1.00	341.92	1.25	1.02	1.02
39.86	418.10	349.96	1.00	349.96	1.24	1.02	1.03
40.03	402.57	335.48	1.00	335.48	1.26	1.01	1.03
40.19	338.71	278.32	1.00	278.32	1.36	0.98	0.99
40.35	235.90	188.35	1.00	188.35	1.57	0.92	0.88
40.52	139.85	106.64	1.22	130.26	1.88	0.12	0.75

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q _t (tsf)	Q _{tn}	K _c	Q _{tn,cs}	I _c	S _{u(liq)'/σ'_v}	S _{u(peak)'/σ'_v}
40.68	78.81	56.77	1.67	94.52	2.22	0.09	0.75
40.85	53.51	36.90	2.56	94.33	2.43	0.07	0.70
41.01	38.50	25.34	4.11	104.11	2.64	0.07	0.62
41.17	32.89	21.04	5.25	110.50	2.75	0.07	0.62
41.34	32.73	20.71	5.98	123.82	2.81	0.07	0.62
41.50	32.94	20.71	6.30	130.53	2.84	0.08	0.62
41.67	33.03	20.70	6.59	136.33	2.86	0.08	0.62
41.83	30.19	18.71	7.13	133.31	2.89	0.08	0.62
41.99	27.66	16.94	7.46	126.30	2.92	0.07	0.62
42.16	25.19	15.23	7.75	118.05	2.94	0.07	0.62
42.32	23.43	14.00	7.75	108.46	2.94	0.07	0.62
42.49	21.95	12.97	8.08	104.79	2.96	0.07	0.62
42.65	19.74	11.46	9.17	105.06	3.02	0.07	0.82
42.81	18.07	10.31	10.90	112.38	3.11	0.07	0.74
42.98	17.26	9.74	12.17	118.51	3.17	0.07	0.70
43.14	17.90	10.13	11.76	119.11	3.16	0.07	0.72
43.31	18.53	10.51	11.12	116.83	3.13	0.07	0.75
43.47	17.92	10.07	11.35	114.26	3.14	0.07	0.72
43.63	16.35	9.01	12.47	112.33	3.19	0.07	0.64
43.80	14.65	7.87	13.92	109.52	3.25	0.07	0.56
43.96	13.79	7.29	14.67	106.89	3.28	0.07	0.52
44.13	14.30	7.59	13.72	104.11	3.24	0.07	0.54
44.29	15.62	8.41	12.15	102.22	3.17	0.07	0.60
44.45	17.01	9.28	10.79	100.22	3.11	0.07	0.66
44.62	17.46	9.54	10.24	97.71	3.08	0.07	0.68
44.78	17.37	9.45	9.96	94.19	3.07	0.07	0.68
44.95	17.72	9.64	9.25	89.23	3.03	0.07	0.69
45.11	19.60	10.81	7.80	84.34	2.94	0.07	0.62
45.28	20.08	11.08	7.63	84.54	2.93	0.07	0.62
45.44	19.26	10.53	8.45	88.95	2.98	0.07	0.62
45.60	16.65	8.84	10.82	95.70	3.11	0.07	0.63
45.77	14.60	7.53	14.42	108.50	3.27	0.07	0.54
45.93	13.54	6.83	17.38	118.65	3.38	0.07	0.49
46.10	12.55	6.18	20.72	128.15	3.48	0.08	0.44
46.26	12.25	5.97	21.64	129.22	3.51	0.07	0.43
46.42	12.16	5.90	21.74	128.17	3.51	0.07	0.42
46.59	14.36	7.24	16.71	120.95	3.36	0.07	0.52
46.75	18.41	9.73	11.31	110.02	3.13	0.07	0.70
46.92	23.48	12.83	7.43	95.34	2.92	0.07	0.62
47.08	27.23	15.19	5.65	85.88	2.78	0.07	0.62
47.24	29.00	16.44	4.79	78.74	2.71	0.06	0.62
47.41	30.22	17.30	4.27	73.89	2.66	0.06	0.62
47.57	32.02	18.55	3.78	70.04	2.60	0.06	0.62
47.74	34.99	20.52	3.43	70.38	2.56	0.06	0.66
47.90	36.82	21.59	3.51	75.84	2.57	0.06	0.67
48.06	37.03	21.40	4.13	88.40	2.64	0.07	0.62
48.23	35.55	20.09	5.11	102.77	2.74	0.07	0.62
48.39	33.76	18.69	6.13	114.53	2.82	0.07	0.62

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

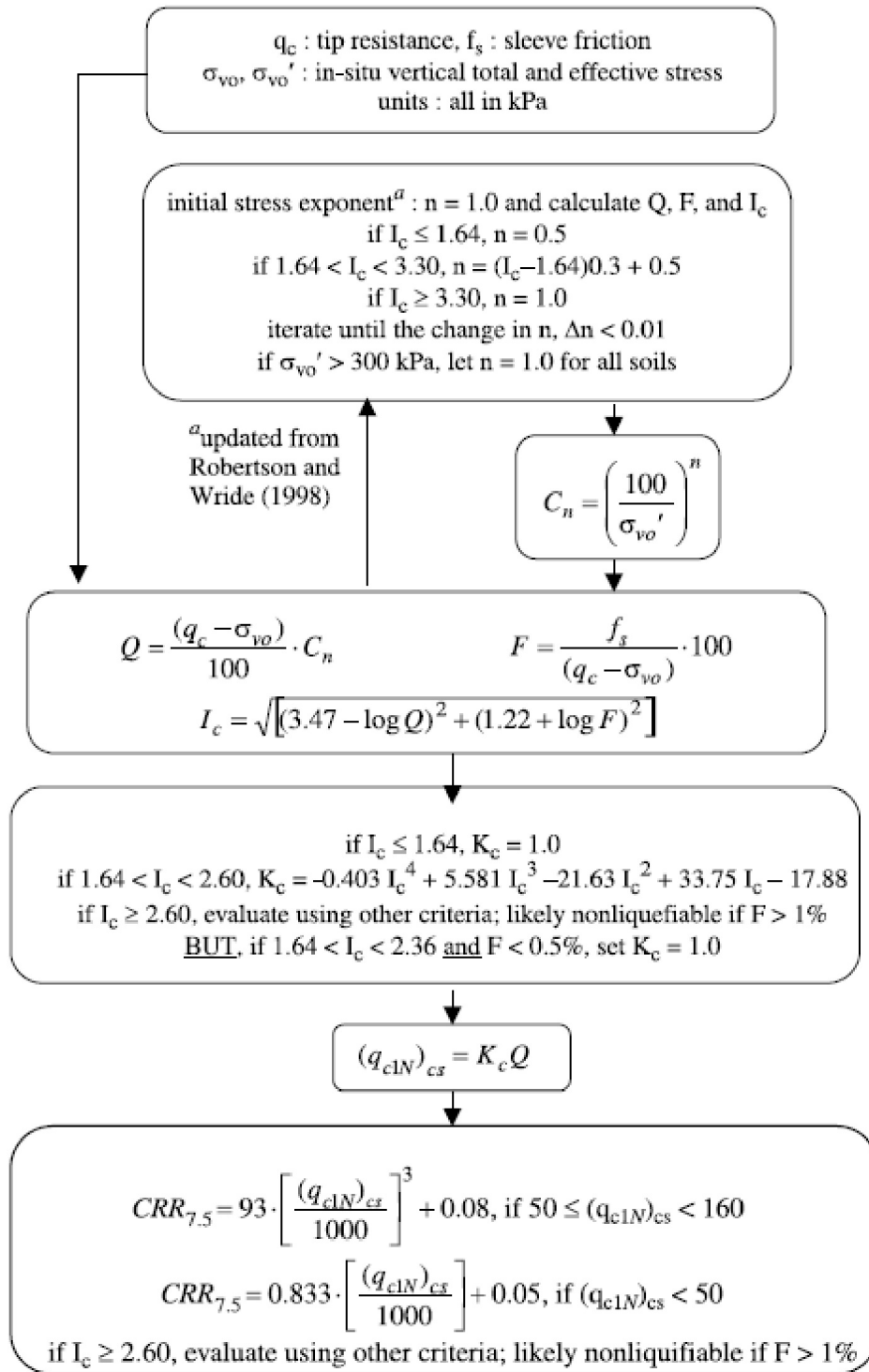
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
48.56	32.72	18.01	6.47	116.42	2.85	0.07	0.62
48.72	32.75	17.97	6.31	113.31	2.84	0.07	0.62
48.88	34.52	19.04	5.70	108.62	2.79	0.07	0.62
49.05	38.76	21.82	4.82	105.14	2.71	0.07	0.62
49.21	43.87	25.21	4.01	101.20	2.63	0.07	0.62
49.38	50.18	29.49	3.23	95.36	2.54	0.07	0.70
49.54	57.58	34.63	2.56	88.50	2.43	0.07	0.71
49.70	71.83	44.83	1.82	81.59	2.27	0.08	0.72
49.87	78.47	49.68	1.61	79.84	2.20	0.10	0.77
50.03	74.13	46.43	1.70	78.83	2.23	0.09	0.74
50.20	61.76	37.40	2.16	80.89	2.36	0.07	0.71

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)

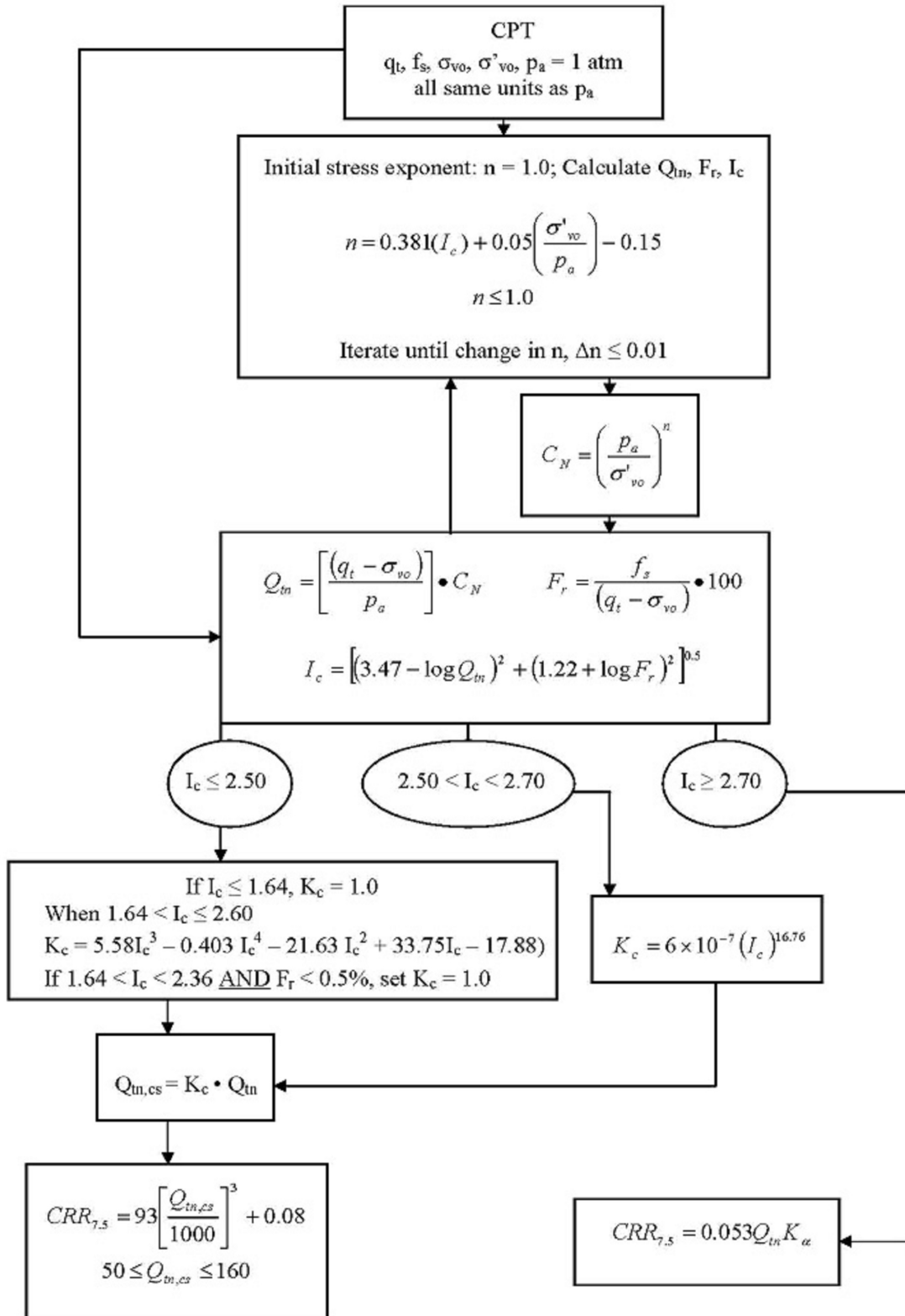
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of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

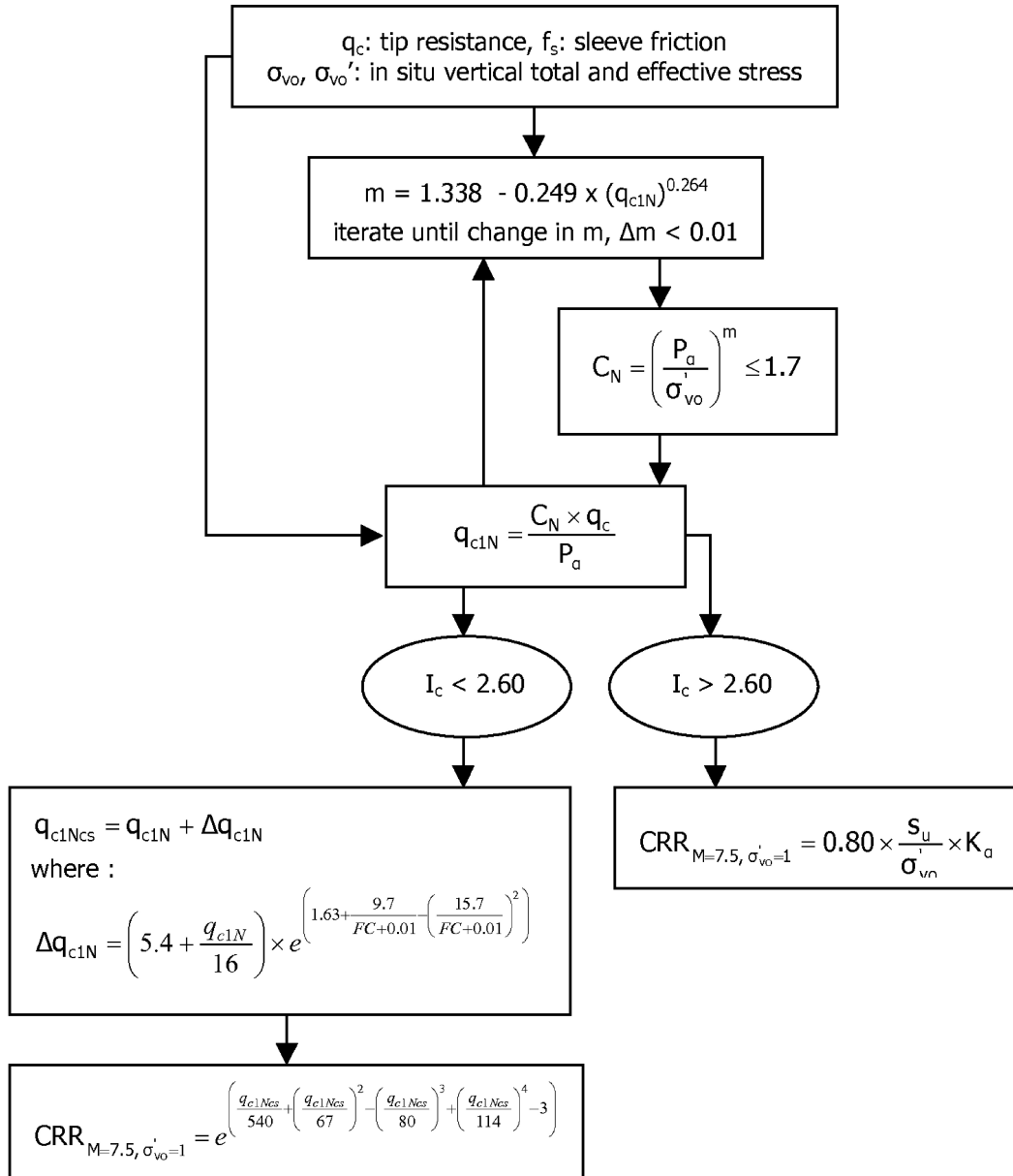
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

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:

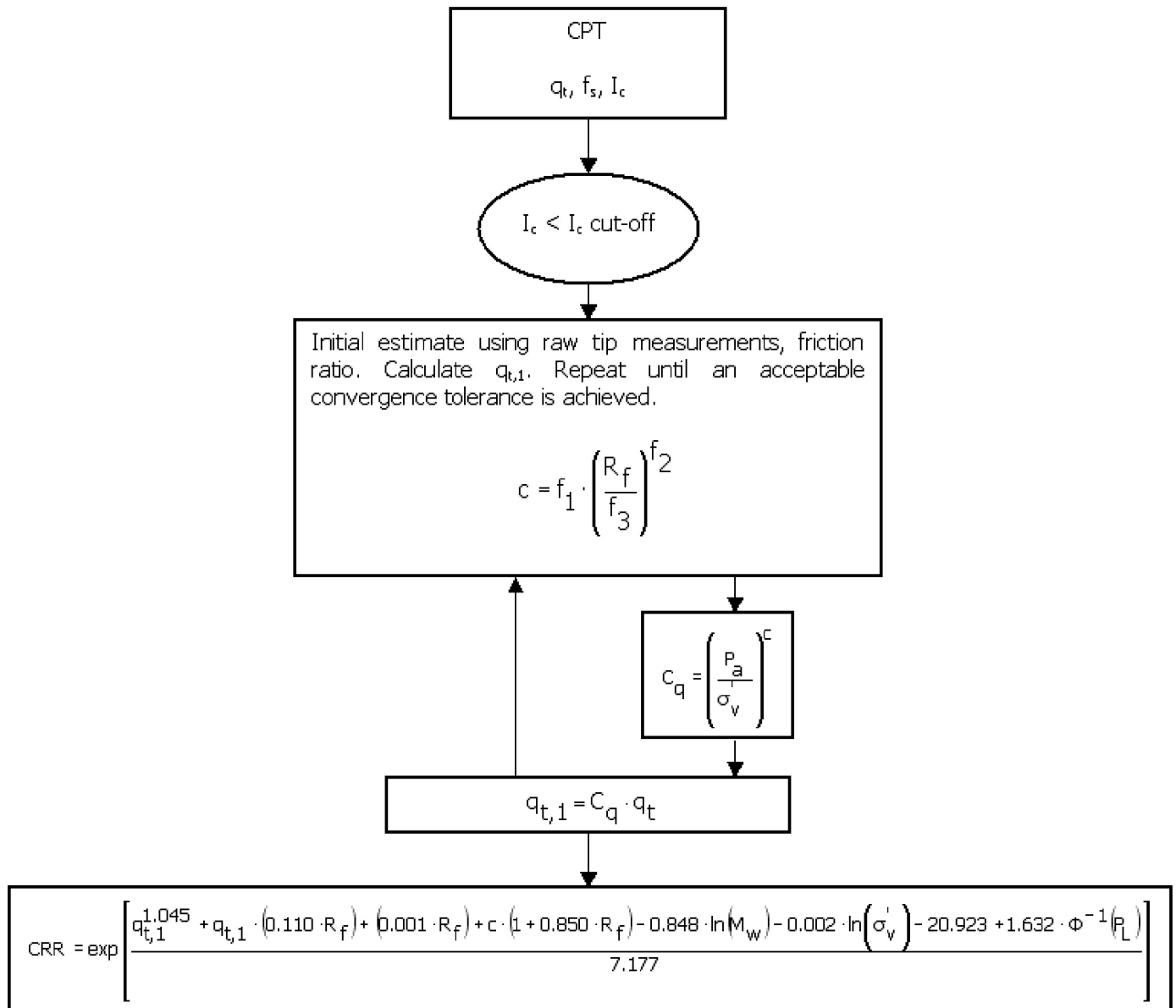


¹ P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

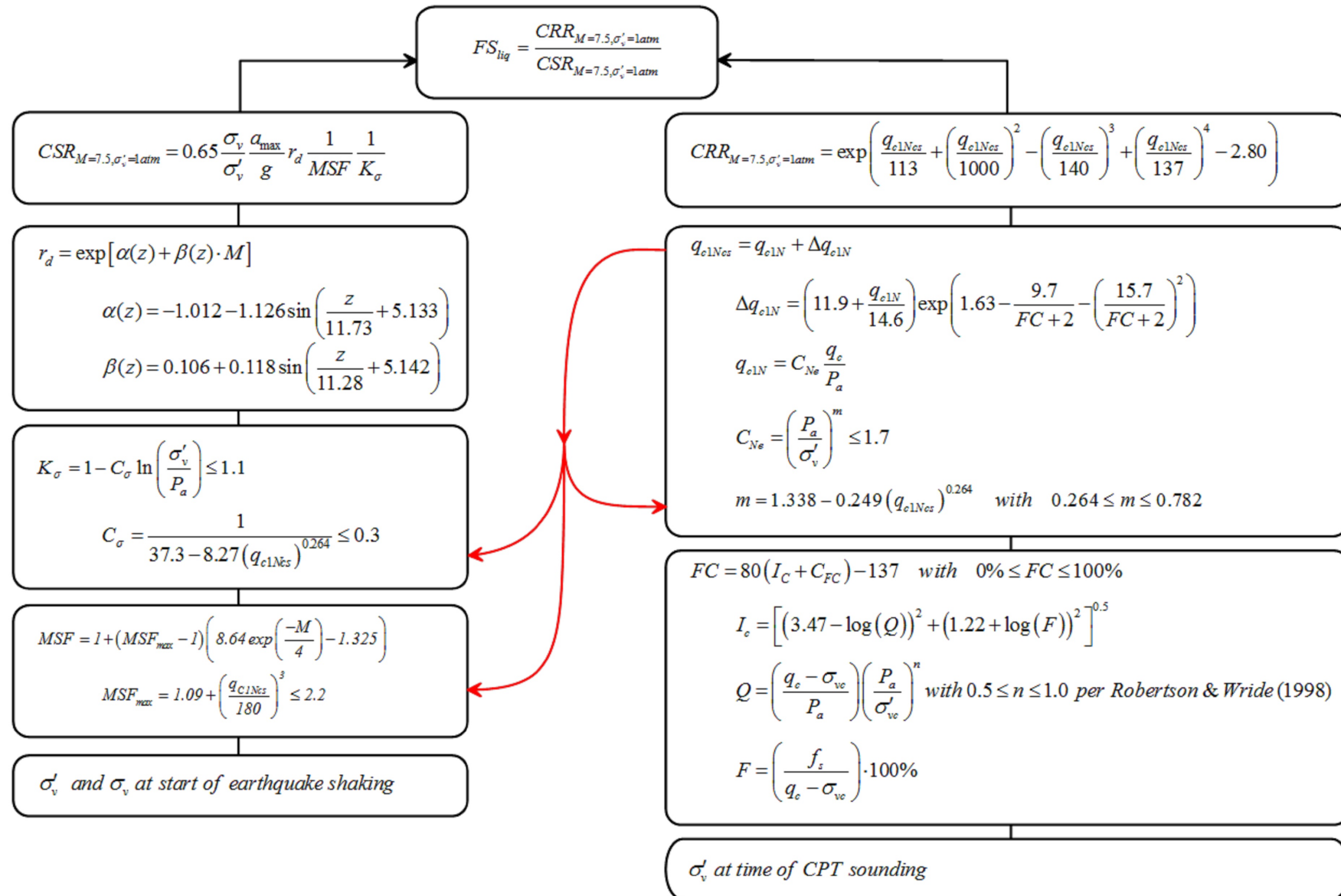
Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



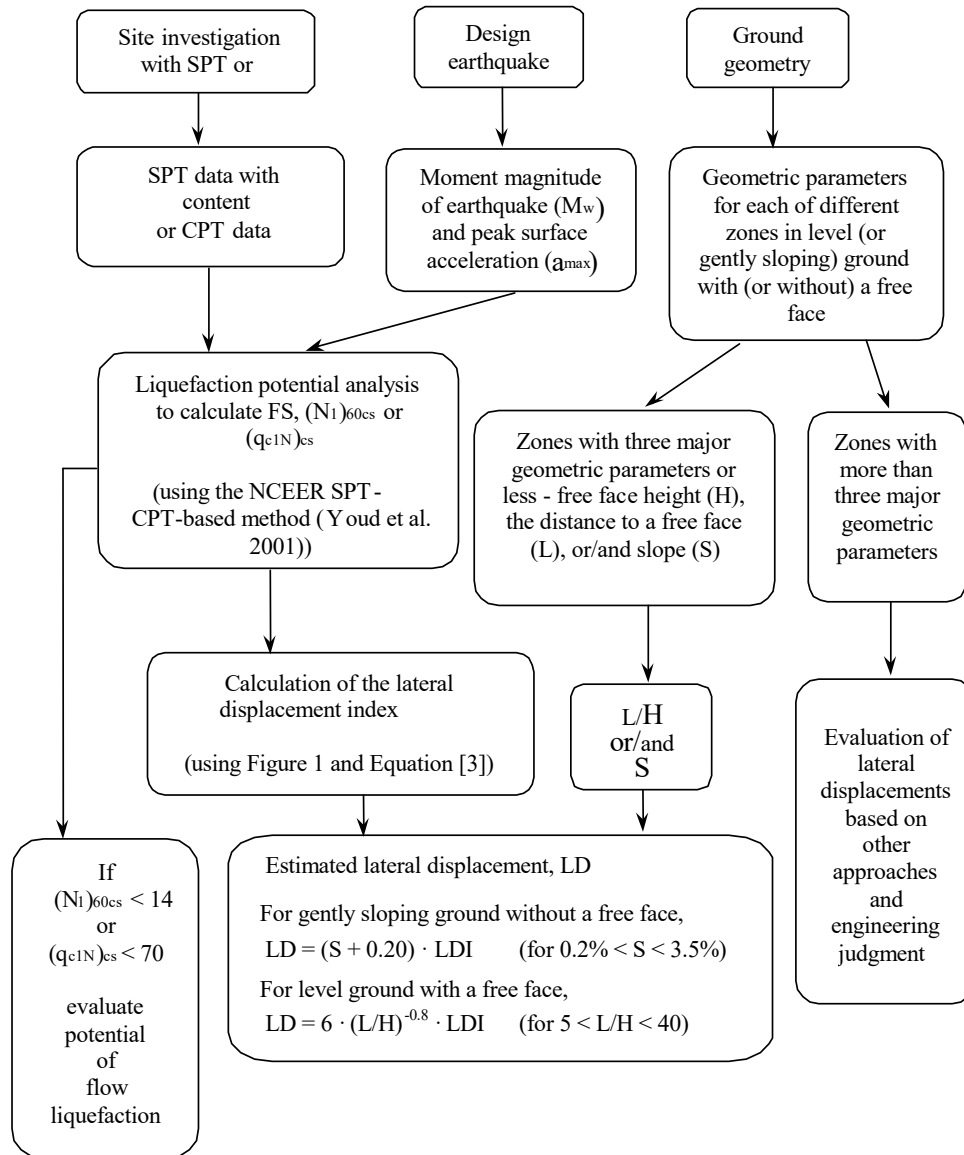
Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



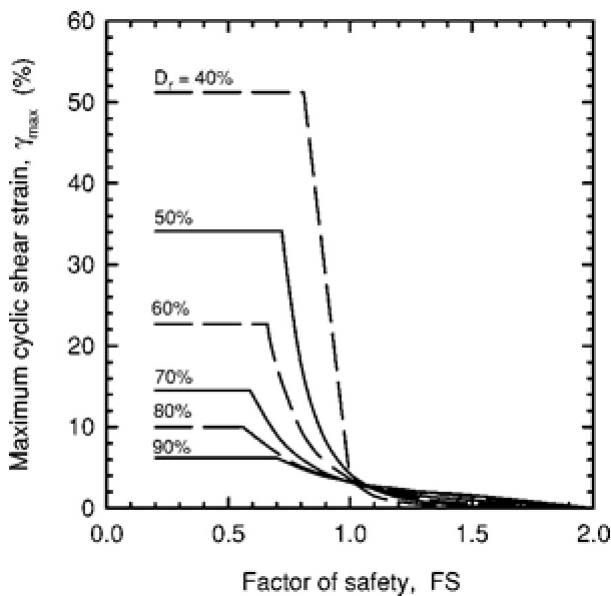
Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)



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



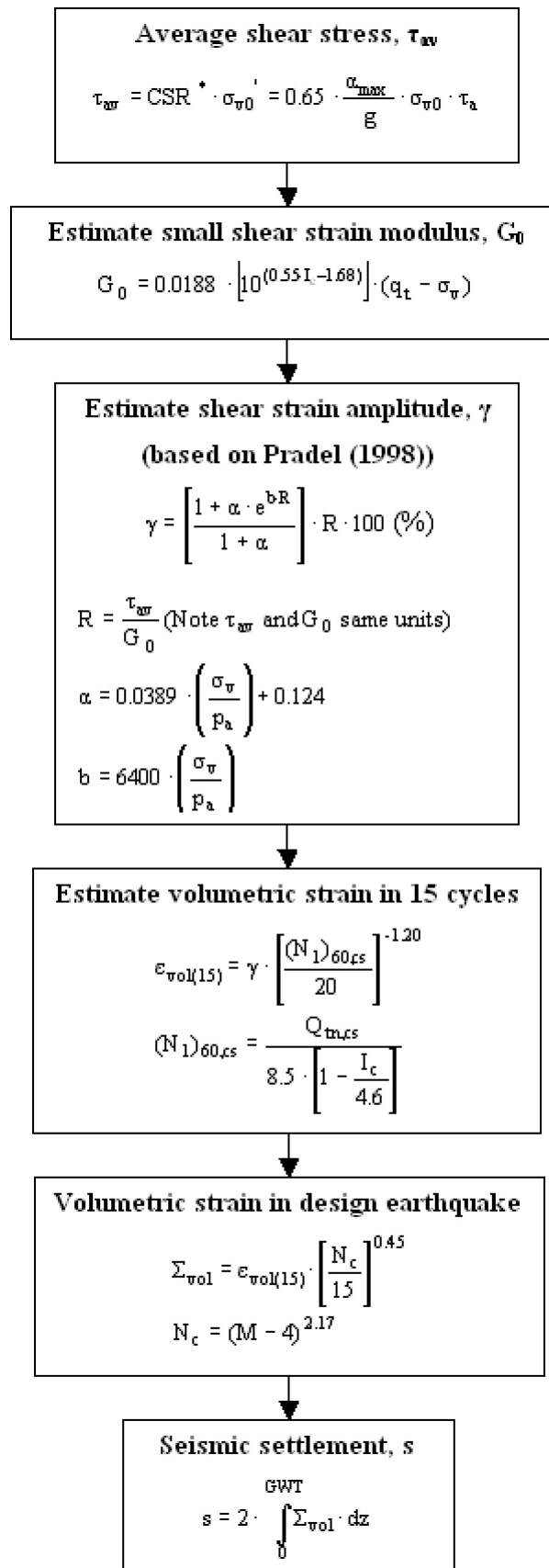
¹ Figure 1

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

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:

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

where:

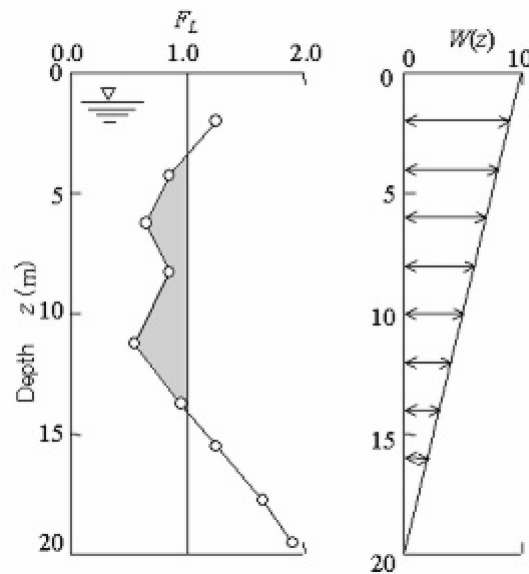
$F_L = 1 - F.S.$ when F.S. less than 1

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

z depth of 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

Shear-Induced Building Settlement (Ds) calculation procedure

The shear-induced building settlement (Ds) due to liquefaction below the building can be estimated using the relationship developed by Bray and Macedo (2017):

$$\begin{aligned} \ln(Ds) = & c1 + c2 * LBS + 0.58 * \ln\left(\tanh\left(\frac{HL}{6}\right)\right) + \\ & 4.59 * \ln(Q) - 0.42 * \ln(Q)^2 - 0.02 * B + \\ & 0.84 * \ln(CAVdp) + 0.41 * \ln(Sa1) + \varepsilon \end{aligned}$$

where Ds is in the units of mm, c1= -8.35 and c2= 0.072 for LBS ≤ 16, and c1= -7.48 and c2= 0.014 otherwise. Q is the building contact pressure in units of kPa, HL is the cumulative thickness of the liquefiable layers in the units of m, B is the building width in the units of m, CAVdp is a standardized version of the cumulative absolute velocity in the units of g-s, Sa1 is 5%-damped pseudo-acceleration response spectral value at a period of 1 s in the units of g, and ε is a normal random variable with zero mean and 0.50 standard deviation in Ln units. The liquefaction-induced building settlement index (LBS) is:

$$LBS = \sum W * \frac{\varepsilon_{shear}}{z} dz$$

where z (m) is the depth measured from the ground surface > 0, w is a foundation-weighting factor wherein W = 0.0 for z less than Df, which is the embedment depth of the foundation, and W = 1.0 otherwise. The shear strain parameter (ε_{shear}) is the liquefaction-induced free-field shear strain (in %) estimated using Zhang et al. (2004). It is calculated based on the estimated Dr of the liquefied soil layer and the calculated safety factor against liquefaction triggering (FSL).

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LIQUEFACTION ANALYSIS REPORT

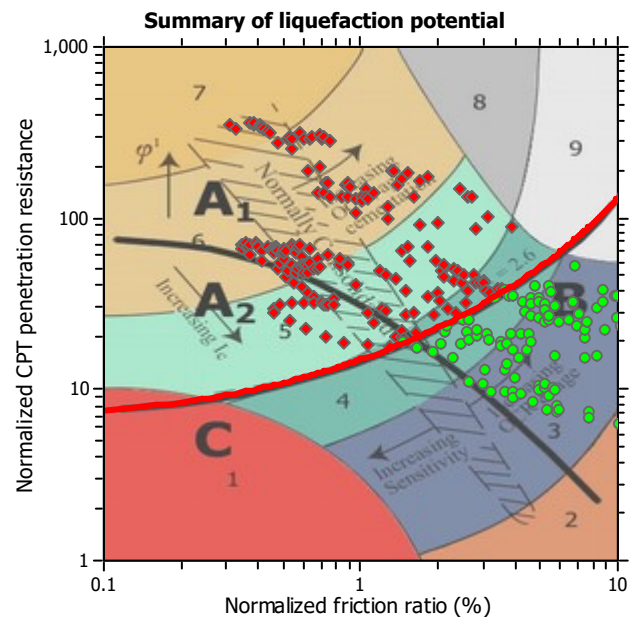
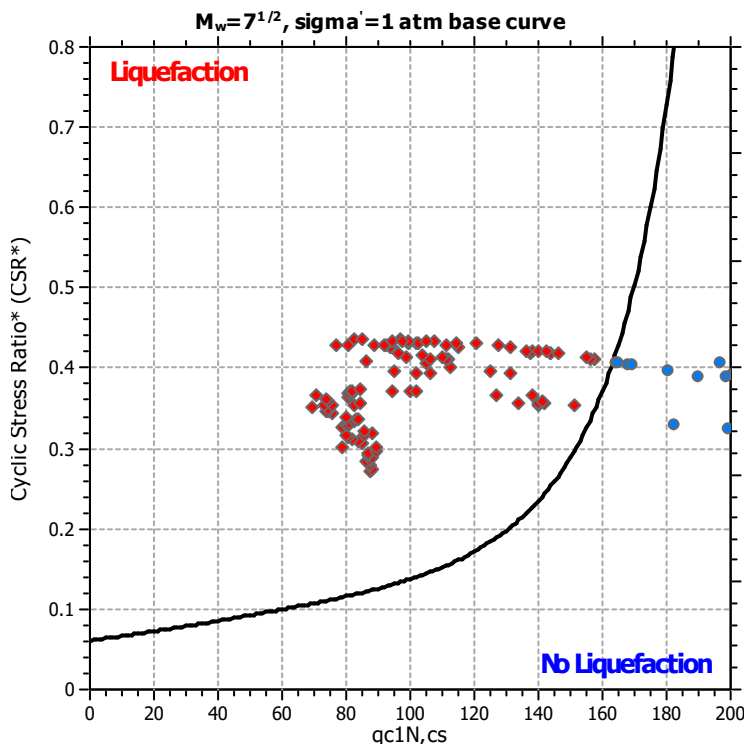
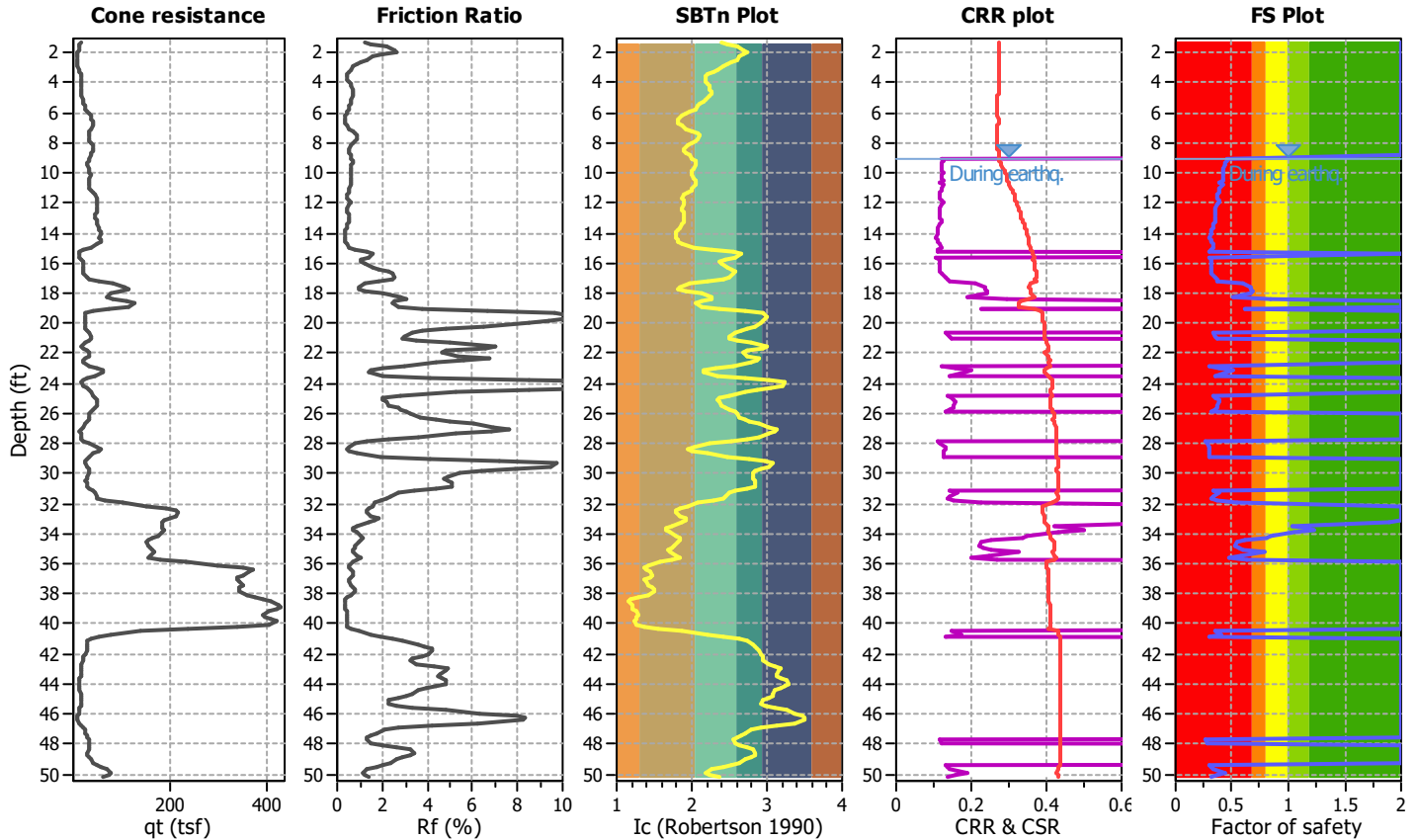
Project title : Manteca WWTP

Location : Manteca, CA

CPT file : CPT 1

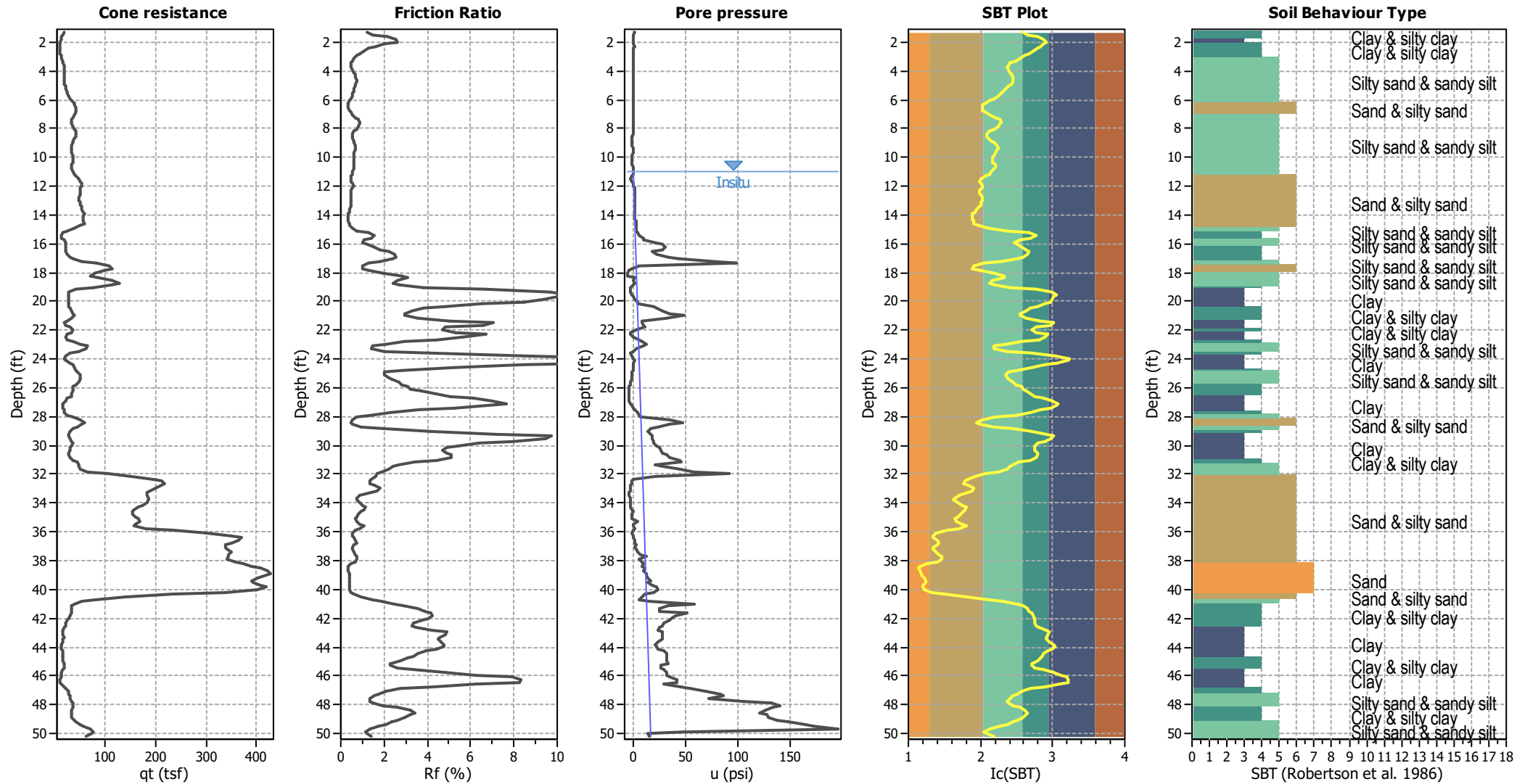
Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	11.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	9.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w :	7.13	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.43	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
 Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
 Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



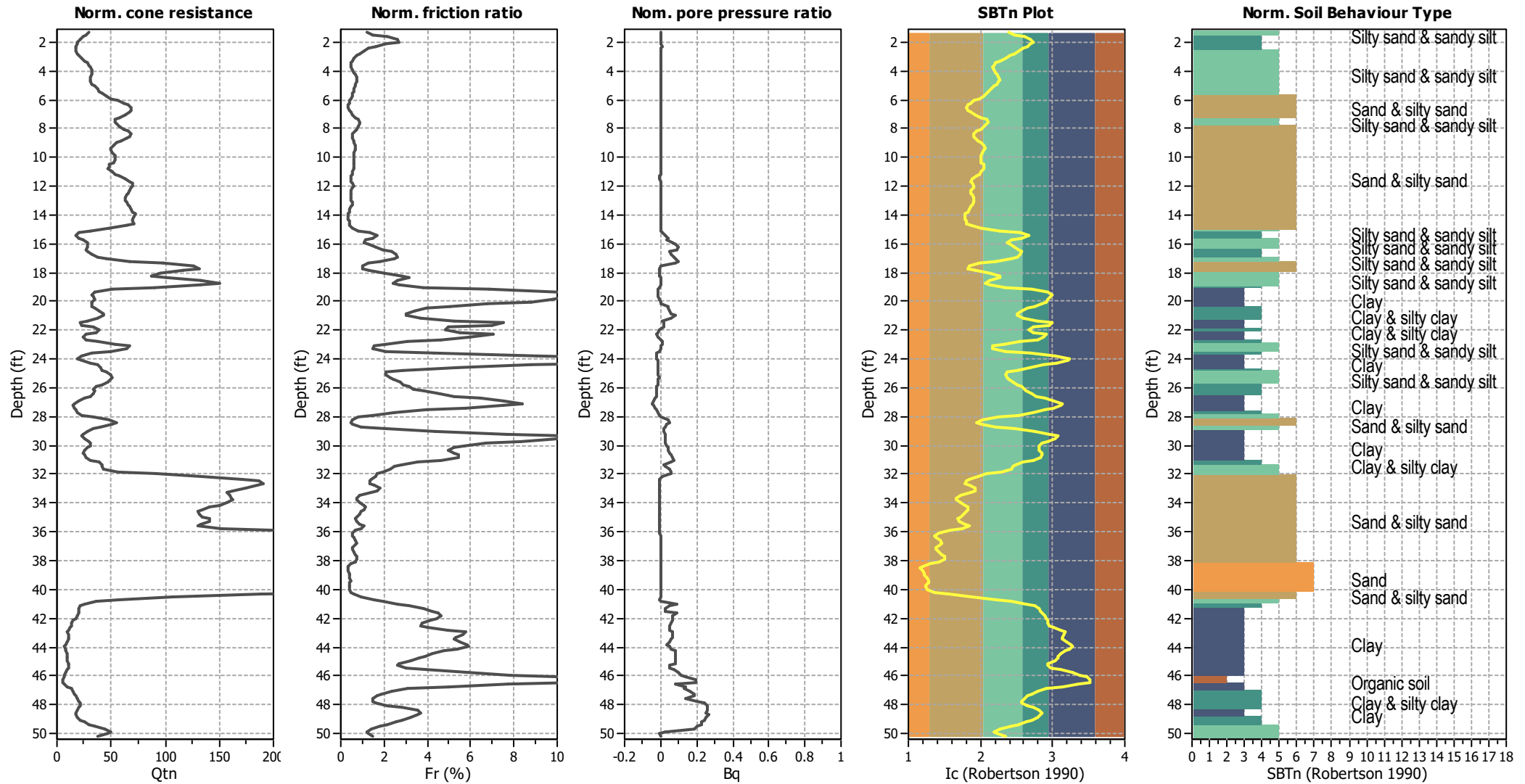
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



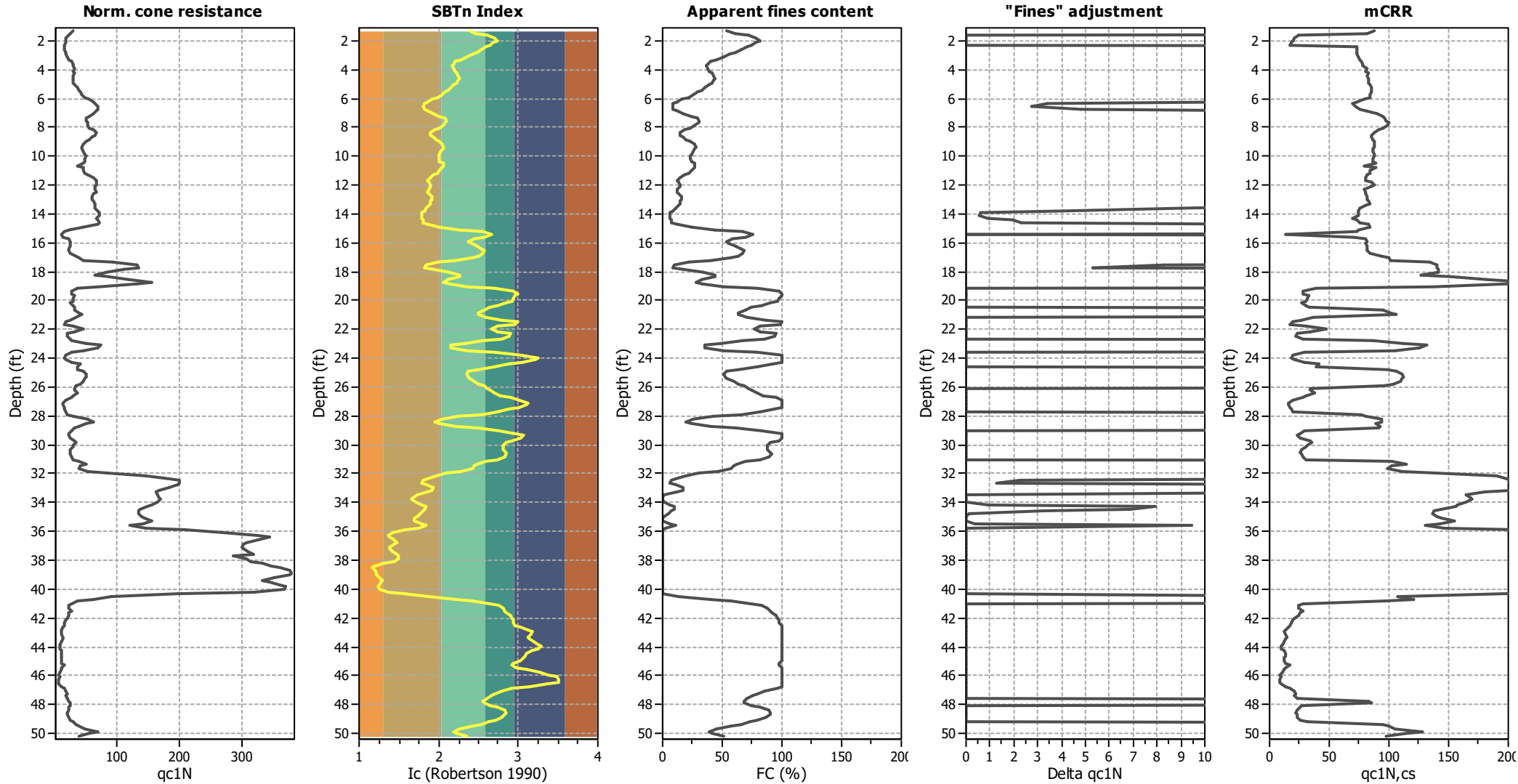
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _s applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

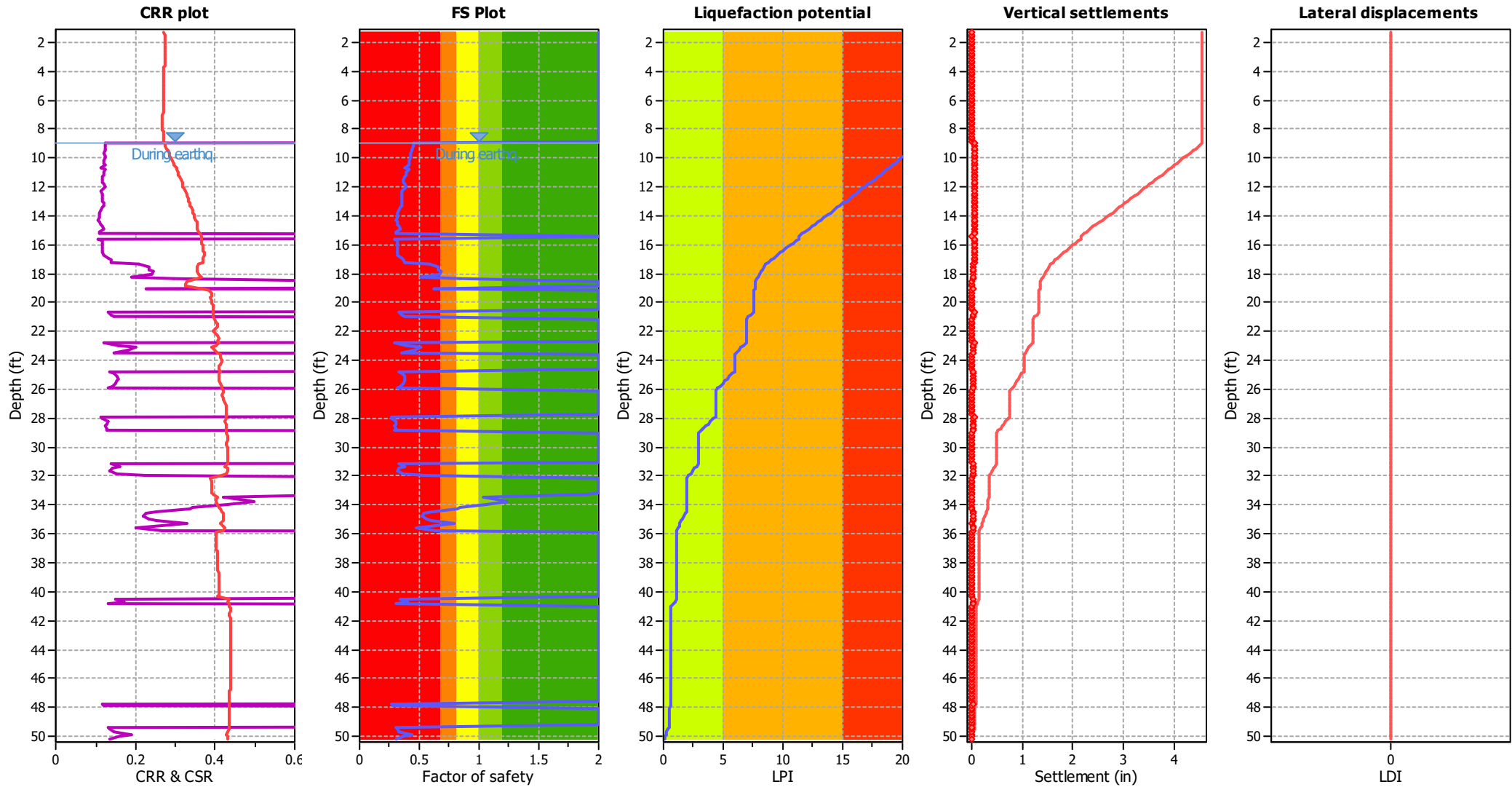
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (earthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _o applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

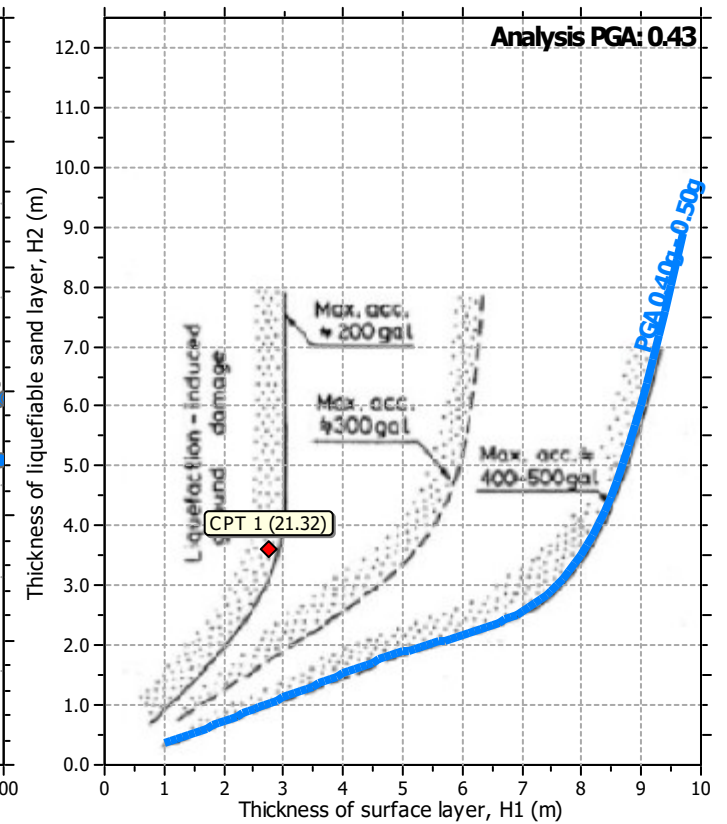
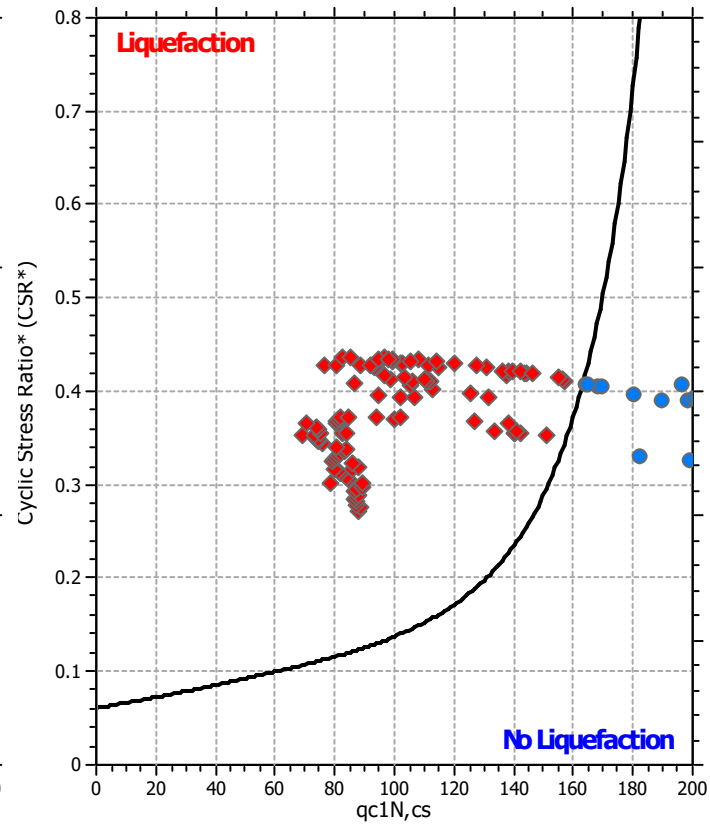
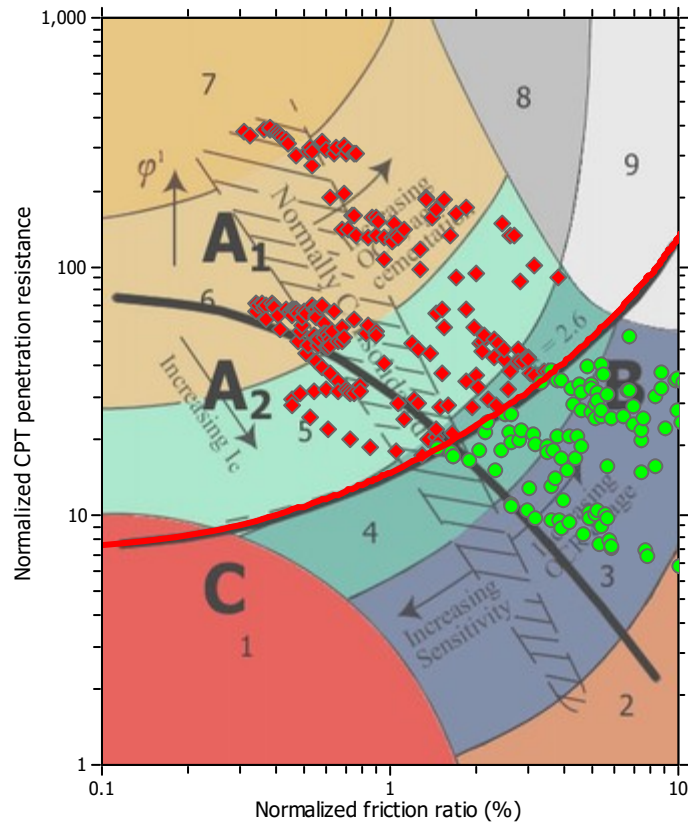
F.S. color scheme

Very high risk	Almost certain it will liquefy
High risk	Very likely to liquefy
Low risk	Liquefaction and no liq. are equally likely
	Unlike to liquefy
	Almost certain it will not liquefy

LPI color scheme

Very high risk
High risk
Low risk

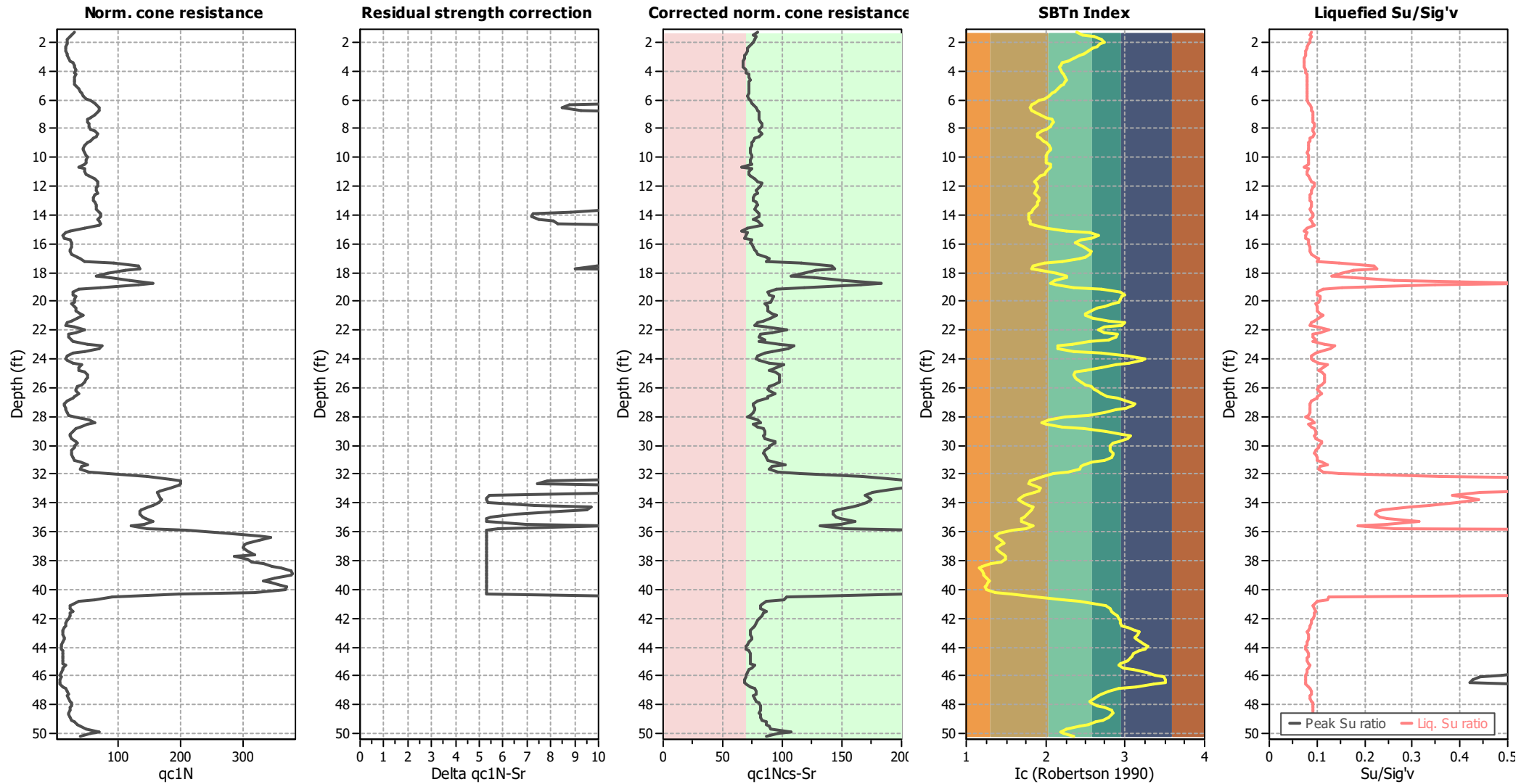
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Idriss & Boulanger (2008))



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	9.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_o applied:	Yes
Earthquake magnitude M_w :	7.13	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.43	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.00 ft	Fill height:	N/A	Limit depth:	N/A

:: Field input data ::						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
1	1.31	19.66	0.22	0.99	25.89	106.41
2	1.48	16.04	0.23	0.58	29.25	107.07
3	1.64	15.14	0.30	0.42	36.05	108.47
4	1.80	12.95	0.42	0.39	40.18	108.78
5	1.97	11.89	0.31	0.25	42.19	108.04
6	2.13	11.69	0.23	0.19	39.89	105.63
7	2.30	10.87	0.17	1.01	37.49	103.64
8	2.46	10.95	0.14	0.57	35.03	101.79
9	2.63	11.30	0.11	0.38	32.41	100.64
10	2.79	11.95	0.10	0.32	29.67	99.47
11	2.95	12.45	0.09	0.32	27.17	99.04
12	3.12	13.96	0.09	0.32	24.36	98.69
13	3.28	15.74	0.08	0.37	21.66	98.71
14	3.44	17.48	0.08	0.56	5.00	98.71
15	3.61	19.05	0.08	0.51	5.00	99.27
16	3.77	19.33	0.09	0.50	5.00	100.26
17	3.94	20.68	0.11	0.38	18.55	101.23
18	4.10	19.92	0.12	0.35	18.96	102.09
19	4.26	20.32	0.13	0.28	19.94	102.65
20	4.43	19.47	0.14	0.25	20.51	103.15
21	4.59	19.71	0.15	0.27	21.05	103.33
22	4.76	19.48	0.14	0.24	20.79	103.27
23	4.92	19.97	0.14	0.21	20.09	103.29
24	5.08	21.59	0.14	0.20	18.77	103.41
25	5.25	23.49	0.14	0.23	17.48	103.76
26	5.41	25.02	0.15	0.21	16.33	103.92
27	5.58	26.13	0.14	0.07	15.29	104.04
28	5.74	27.94	0.14	0.11	14.05	104.28
29	5.91	31.19	0.15	0.13	5.00	104.74
30	6.07	35.40	0.16	0.20	5.00	104.76
31	6.23	38.85	0.13	0.19	5.00	104.89
32	6.40	41.42	0.14	0.18	5.00	104.97
33	6.56	43.21	0.15	0.17	5.00	105.74
34	6.73	43.70	0.17	0.15	5.00	106.48
35	6.89	42.55	0.19	0.11	5.00	107.24
36	7.05	39.64	0.21	0.05	11.18	108.03
37	7.22	35.73	0.24	-0.03	13.27	108.72
38	7.38	32.75	0.28	-0.07	15.15	109.38
39	7.55	32.77	0.30	-0.08	15.83	109.91
40	7.71	34.96	0.31	-0.06	15.40	110.24
41	7.87	36.53	0.30	-0.10	14.46	110.24
42	8.04	37.71	0.29	-0.14	13.10	109.97
43	8.20	41.52	0.26	-0.20	11.47	109.56
44	8.37	45.15	0.24	-0.65	10.43	109.17
45	8.53	43.86	0.23	-1.23	10.38	108.89
46	8.69	41.20	0.23	-1.37	10.99	108.42
47	8.86	38.12	0.21	-0.94	11.99	108.16
48	9.02	35.46	0.23	-1.09	13.09	107.92

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
49	9.19	33.19	0.23	-0.96	14.27	108.03
50	9.35	32.09	0.23	-0.72	14.59	107.66
51	9.51	32.64	0.20	-0.64	14.44	107.51
52	9.68	33.97	0.21	-0.73	13.77	107.45
53	9.84	36.39	0.22	-0.80	13.29	107.81
54	10.01	38.00	0.22	-0.99	13.01	107.97
55	10.17	37.31	0.22	-1.08	13.02	107.95
56	10.34	36.86	0.21	-0.95	13.33	107.81
57	10.50	35.95	0.21	-0.87	14.42	107.35
58	10.66	29.10	0.20	0.58	14.40	107.15
59	10.83	36.65	0.20	-0.28	14.37	107.12
60	10.99	36.61	0.21	-0.20	13.30	107.55
61	11.15	38.29	0.22	-0.09	12.66	107.77
62	11.32	42.47	0.21	-1.73	5.00	108.11
63	11.48	48.98	0.21	-2.77	5.00	108.55
64	11.65	52.37	0.23	-1.52	5.00	109.41
65	11.81	54.03	0.27	-0.05	10.01	110.70
66	11.97	53.15	0.34	0.58	10.43	111.20
67	12.14	51.76	0.30	0.99	10.37	110.68
68	12.30	51.37	0.21	1.05	5.00	109.49
69	12.47	52.86	0.22	1.07	5.00	109.15
70	12.63	50.39	0.26	1.16	5.00	109.29
71	12.79	48.04	0.23	1.53	5.00	109.35
72	12.96	48.69	0.23	1.59	5.00	109.34
73	13.12	50.48	0.26	1.30	10.43	109.79
74	13.29	52.46	0.27	0.92	10.20	109.99
75	13.45	52.68	0.24	0.88	5.00	109.74
76	13.62	53.44	0.23	1.53	5.00	109.32
77	13.78	56.94	0.22	1.60	5.00	109.04
78	13.94	59.02	0.21	1.76	5.00	108.64
79	14.11	59.59	0.19	1.90	5.00	108.26
80	14.27	55.09	0.19	1.84	5.00	108.31
81	14.44	57.73	0.21	2.11	5.00	108.73
82	14.60	59.67	0.23	2.35	5.00	109.31
83	14.76	58.46	0.24	2.46	5.00	108.59
84	14.93	38.93	0.17	2.47	13.35	107.45
85	15.09	19.92	0.19	2.69	21.32	105.87
86	15.26	14.94	0.20	4.04	33.14	105.15
87	15.42	11.29	0.21	5.74	38.43	104.98
88	15.58	12.78	0.21	9.81	34.41	105.49
89	15.75	21.02	0.21	9.78	28.04	105.79
90	15.91	22.72	0.19	20.60	25.47	107.03
91	16.08	21.92	0.29	27.98	26.64	108.26
92	16.24	21.72	0.34	29.76	29.61	109.81
93	16.40	20.71	0.39	27.06	31.99	110.95
94	16.57	20.75	0.46	17.34	34.07	112.54
95	16.73	22.94	0.62	22.27	33.17	114.66
96	16.90	30.35	0.79	33.35	30.69	116.62

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
97	17.06	35.65	0.89	42.45	27.42	118.31
98	17.22	42.48	1.02	78.12	19.39	120.02
99	17.39	84.52	1.07	98.63	12.55	121.42
100	17.55	119.95	1.06	5.99	8.91	122.43
101	17.72	122.76	1.17	-1.71	8.61	122.89
102	17.88	101.92	1.22	-4.48	11.05	123.22
103	18.05	77.68	1.39	-5.61	16.79	124.30
104	18.21	60.49	2.13	-5.28	21.29	125.88
105	18.37	79.73	2.55	1.96	21.04	128.13
106	18.54	112.82	3.18	0.06	16.39	129.73
107	18.70	149.04	3.11	0.97	14.76	130.51
108	18.86	126.57	3.14	0.07	16.78	130.02
109	19.03	67.48	2.93	-2.31	24.68	128.65
110	19.19	35.59	2.64	-2.84	40.62	127.10
111	19.36	25.55	2.98	-3.11	54.42	126.02
112	19.52	26.05	2.78	-1.93	57.94	126.11
113	19.68	30.18	2.93	-0.33	56.03	126.18
114	19.85	29.27	2.93	1.69	54.20	125.89
115	20.01	28.01	2.39	3.77	53.34	124.54
116	20.18	25.02	1.67	4.67	48.49	122.57
117	20.34	28.73	1.29	19.52	42.76	120.72
118	20.50	30.76	1.14	22.11	37.78	119.83
119	20.67	32.17	1.10	27.08	34.20	119.79
120	20.83	38.41	1.15	34.75	31.03	119.98
121	21.00	42.18	1.11	48.90	30.78	120.13
122	21.16	34.22	1.15	32.11	35.37	120.29
123	21.32	24.96	1.37	8.55	45.74	120.17
124	21.49	18.04	1.39	8.24	57.79	120.02
125	21.65	16.19	1.43	9.52	55.13	120.19
126	21.82	28.97	1.38	11.38	42.20	121.46
127	21.98	46.58	1.61	2.03	38.97	122.89
128	22.15	33.17	2.10	-2.69	42.40	123.19
129	22.31	21.88	1.71	-2.38	52.18	122.00
130	22.47	20.72	1.27	0.13	50.81	119.87
131	22.64	26.79	0.92	5.95	45.13	118.84
132	22.80	27.32	1.11	8.43	33.17	119.37
133	22.97	51.96	1.13	12.89	23.58	120.27
134	23.13	74.04	0.93	9.37	17.66	120.27
135	23.29	69.17	0.87	3.21	17.63	119.60
136	23.46	45.94	0.90	-0.52	24.32	119.46
137	23.62	28.98	1.12	-2.61	40.33	120.55
138	23.79	19.36	1.85	-1.73	61.17	122.37
139	23.95	17.66	2.62	-0.30	76.34	124.60
140	24.11	20.46	3.48	0.63	74.45	126.70
141	24.28	28.96	3.95	0.59	62.01	128.16
142	24.44	42.09	3.64	0.43	50.67	127.40
143	24.61	39.40	1.78	-0.34	40.49	124.67
144	24.77	38.66	0.86	-0.68	30.74	120.50

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
145	24.93	47.15	0.86	-0.92	25.53	119.10
146	25.10	52.30	1.07	-2.12	24.26	119.99
147	25.26	52.33	1.13	-1.32	25.11	120.98
148	25.43	51.04	1.28	-1.97	25.91	121.04
149	25.59	48.86	1.13	-2.54	28.61	121.51
150	25.75	43.10	1.44	-2.94	30.71	120.73
151	25.92	36.62	1.02	-3.54	33.85	120.28
152	26.08	34.80	1.05	-3.76	35.73	119.98
153	26.25	35.61	1.37	-3.77	37.37	121.18
154	26.41	39.09	1.60	-3.89	40.73	122.21
155	26.57	31.67	1.70	-4.12	44.18	122.53
156	26.74	28.91	1.69	-4.46	52.15	121.84
157	26.90	19.77	1.50	-4.27	59.68	120.82
158	27.07	16.74	1.36	-3.27	67.51	119.39
159	27.23	16.08	1.16	-1.52	66.21	118.24
160	27.39	17.93	0.95	-0.10	59.58	116.78
161	27.56	19.21	0.69	1.44	50.99	114.83
162	27.72	20.36	0.45	3.40	42.26	112.06
163	27.89	22.01	0.26	5.13	32.15	110.12
164	28.05	31.91	0.29	7.00	20.34	109.70
165	28.21	56.43	0.27	34.60	13.90	110.68
166	28.38	66.87	0.28	46.91	5.00	110.95
167	28.54	54.16	0.29	34.47	13.28	111.23
168	28.71	43.44	0.33	24.11	19.43	113.01
169	28.87	35.76	0.61	16.63	29.70	116.62
170	29.04	30.68	1.20	14.22	43.26	120.57
171	29.20	26.96	2.07	16.12	55.93	123.50
172	29.36	25.41	2.76	17.28	63.22	125.37
173	29.53	27.84	3.04	18.11	60.18	126.27
174	29.69	36.44	2.78	19.84	53.74	126.21
175	29.86	37.73	2.34	19.87	48.48	125.18
176	30.02	33.74	1.84	22.60	46.16	123.76
177	30.18	33.56	1.60	24.54	46.17	122.22
178	30.35	29.16	1.37	26.18	46.68	121.30
179	30.51	28.01	1.36	27.41	48.60	121.10
180	30.68	28.86	1.56	31.77	48.87	121.56
181	30.84	30.89	1.62	34.29	47.75	122.25
182	31.00	33.70	1.70	44.58	42.39	122.60
183	31.17	43.59	1.55	45.66	34.66	122.66
184	31.33	56.31	1.33	20.85	30.13	121.86
185	31.50	46.70	1.10	27.32	28.63	121.07
186	31.66	44.47	1.14	44.83	27.40	120.69
187	31.82	58.86	1.13	58.47	22.01	122.25
188	31.99	93.50	1.54	90.90	15.52	125.69
189	32.15	160.96	2.55	21.11	11.90	129.02
190	32.32	201.79	3.18	-0.54	9.29	130.54
191	32.48	218.49	2.54	-2.05	8.14	130.93
192	32.64	219.33	2.73	-1.82	7.96	131.12

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
193	32.81	217.42	3.33	-2.57	9.19	131.92
194	32.97	202.02	3.62	-2.95	11.01	132.67
195	33.14	184.65	3.98	-3.19	10.88	131.54
196	33.30	181.25	1.96	-3.54	9.56	129.73
197	33.47	183.18	1.61	-3.69	6.64	126.58
198	33.63	187.79	1.33	-3.51	5.54	125.37
199	33.79	189.62	1.19	-3.05	5.45	125.29
200	33.96	185.00	1.57	-2.77	6.53	126.32
201	34.12	175.77	1.98	-2.42	7.92	127.22
202	34.28	167.03	1.89	-2.24	8.84	127.20
203	34.45	155.25	1.66	-1.95	8.77	126.28
204	34.61	153.18	1.40	0.28	8.36	125.35
205	34.78	155.13	1.33	-1.01	7.52	124.48
206	34.94	159.33	1.15	-1.47	6.78	123.92
207	35.10	163.58	1.09	-1.85	5.92	123.57
208	35.27	176.66	1.11	4.12	6.15	123.98
209	35.43	162.35	1.34	-0.69	7.73	125.10
210	35.60	139.95	1.74	-0.40	9.05	126.24
211	35.76	167.80	1.85	1.27	7.07	126.55
212	35.92	235.63	1.32	-0.40	4.01	127.02
213	36.09	301.09	1.64	-0.90	1.80	127.59
214	36.25	363.02	1.82	-0.04	1.18	129.04
215	36.42	383.79	2.07	-0.36	1.31	130.28
216	36.58	364.37	2.53	1.65	2.09	131.39
217	36.74	342.55	2.93	1.61	2.38	131.17
218	36.91	339.18	1.95	2.45	2.03	130.09
219	37.07	336.23	1.58	1.61	1.25	128.55
220	37.24	340.45	1.70	2.40	1.34	128.86
221	37.40	347.21	2.16	3.52	1.71	129.93
222	37.57	358.40	2.40	7.28	2.41	130.87
223	37.73	322.56	2.60	13.08	2.76	131.41
224	37.89	346.65	2.71	5.36	2.82	131.42
225	38.06	353.67	2.41	8.71	1.93	130.75
226	38.22	374.50	1.81	9.47	0.43	128.37
227	38.39	390.42	0.72	8.30	0.00	126.56
228	38.55	408.87	1.27	10.76	0.00	126.59
229	38.71	425.29	1.77	10.15	0.00	128.16
230	38.88	429.58	1.57	11.73	0.00	128.66
231	39.04	426.57	1.57	12.87	0.00	128.46
232	39.21	399.99	1.67	14.40	0.00	128.54
233	39.37	377.42	1.69	16.80	0.27	128.66
234	39.53	390.98	1.71	14.44	0.14	128.51
235	39.70	411.33	1.55	17.39	0.00	128.60
236	39.86	421.99	1.70	21.63	0.00	128.77
237	40.03	420.07	1.78	23.68	0.04	128.62
238	40.19	364.72	1.51	19.05	1.06	127.87
239	40.35	230.57	1.48	11.23	3.81	126.28
240	40.52	111.86	1.34	7.80	9.86	124.35

:: Field input data :: (continued)

Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
241	40.68	76.79	1.14	4.81	19.66	122.12
242	40.85	47.38	1.05	15.60	27.78	120.06
243	41.01	35.23	0.84	57.86	37.33	118.84
244	41.17	31.35	0.98	33.23	43.15	118.49
245	41.34	30.41	1.06	25.30	46.58	119.90
246	41.50	35.25	1.46	24.35	48.05	120.62
247	41.67	31.69	1.33	51.71	49.31	121.18
248	41.83	30.49	1.37	39.84	51.66	120.38
249	41.99	26.56	1.14	36.44	53.06	119.19
250	42.16	24.34	0.85	34.26	54.30	117.77
251	42.32	23.24	0.87	29.40	54.28	116.21
252	42.49	21.38	0.64	28.09	55.66	115.36
253	42.65	20.03	0.64	25.28	60.00	114.84
254	42.81	16.70	0.79	23.93	66.53	115.42
255	42.98	16.38	0.88	27.06	71.06	116.02
256	43.14	17.55	0.88	27.96	69.61	116.27
257	43.31	18.58	0.84	28.26	67.32	116.15
258	43.47	18.27	0.81	27.02	68.14	115.68
259	43.63	15.78	0.75	23.87	72.09	115.05
260	43.80	13.98	0.71	20.22	76.97	114.24
261	43.96	13.23	0.65	22.09	79.41	113.64
262	44.13	13.22	0.62	23.70	76.31	113.38
263	44.29	15.37	0.62	28.94	70.98	113.46
264	44.45	17.05	0.61	31.20	66.14	113.55
265	44.62	17.30	0.59	31.32	64.08	113.30
266	44.78	16.69	0.54	31.39	63.05	112.72
267	44.95	16.77	0.48	31.50	60.32	112.00
268	45.11	18.31	0.43	33.41	54.50	111.71
269	45.28	22.41	0.44	26.43	53.78	111.90
270	45.44	18.28	0.51	25.77	57.14	112.43
271	45.60	15.93	0.56	29.18	66.23	112.82
272	45.77	14.49	0.60	31.62	78.61	114.27
273	45.93	12.05	0.96	32.32	87.78	115.43
274	46.10	12.66	0.98	33.93	97.23	116.42
275	46.26	11.40	1.05	41.01	100.00	116.50
276	46.42	11.01	1.02	40.81	100.00	116.37
277	46.59	12.49	0.94	28.44	85.78	116.00
278	46.75	17.92	0.74	45.02	68.00	115.52
279	46.92	23.00	0.65	53.94	52.95	114.70
280	47.08	27.09	0.53	69.67	45.07	114.19
281	47.24	28.63	0.53	82.45	40.88	113.42
282	47.41	27.84	0.44	86.14	38.19	112.85
283	47.57	30.73	0.40	72.40	35.49	112.56
284	47.74	33.68	0.45	105.29	33.49	113.34
285	47.90	36.10	0.55	131.68	33.98	114.75
286	48.06	35.25	0.67	139.76	37.44	116.79
287	48.23	33.90	0.98	133.42	42.49	118.44
288	48.39	31.76	1.14	126.26	47.25	119.52

:: Field input data :: (continued)						
Point ID	Depth (ft)	q _c (tsf)	f _s (tsf)	u (tsf)	Fines content (%)	Unit weight (pcf)
289	48.56	30.15	1.16	121.12	48.77	119.54
290	48.72	30.85	1.03	127.89	48.06	119.20
291	48.88	31.81	0.99	128.32	45.30	119.00
292	49.05	35.24	1.02	136.68	41.01	119.36
293	49.21	43.29	1.06	147.76	36.82	119.77
294	49.38	46.61	1.04	165.00	32.30	120.04
295	49.54	53.66	1.00	171.75	27.78	120.13
296	49.70	64.80	0.96	195.26	21.45	120.33
297	49.87	91.08	0.90	46.36	18.90	120.15
298	50.03	75.84	0.85	13.75	20.06	119.88
299	50.20	54.40	0.91	14.88	24.70	119.46

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	1.31	0.07	0.00	0.07	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
2	1.48	0.08	0.00	0.08	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
3	1.64	0.09	0.00	0.09	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
4	1.80	0.10	0.00	0.10	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
5	1.97	0.11	0.00	0.11	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
6	2.13	0.11	0.00	0.11	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
7	2.30	0.12	0.00	0.12	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
8	2.46	0.13	0.00	0.13	1.00	0.280	1.10	0.253	1.10	1.10	2.000	No
9	2.63	0.14	0.00	0.14	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
10	2.79	0.15	0.00	0.15	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
11	2.95	0.16	0.00	0.16	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
12	3.12	0.16	0.00	0.16	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
13	3.28	0.17	0.00	0.17	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
14	3.44	0.18	0.00	0.18	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
15	3.61	0.19	0.00	0.19	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
16	3.77	0.20	0.00	0.20	1.00	0.279	1.10	0.253	1.10	1.10	2.000	No
17	3.94	0.20	0.00	0.20	1.00	0.278	1.10	0.252	1.10	1.10	2.000	No
18	4.10	0.21	0.00	0.21	1.00	0.278	1.10	0.252	1.10	1.10	2.000	No
19	4.26	0.22	0.00	0.22	0.99	0.278	1.10	0.252	1.10	1.10	2.000	No
20	4.43	0.23	0.00	0.23	0.99	0.278	1.10	0.252	1.10	1.10	2.000	No
21	4.59	0.24	0.00	0.24	0.99	0.278	1.10	0.252	1.10	1.10	2.000	No
22	4.76	0.25	0.00	0.25	0.99	0.278	1.10	0.252	1.10	1.10	2.000	No
23	4.92	0.25	0.00	0.25	0.99	0.278	1.10	0.252	1.10	1.10	2.000	No
24	5.08	0.26	0.00	0.26	0.99	0.277	1.10	0.252	1.10	1.10	2.000	No
25	5.25	0.27	0.00	0.27	0.99	0.277	1.10	0.251	1.10	1.10	2.000	No
26	5.41	0.28	0.00	0.28	0.99	0.277	1.10	0.251	1.10	1.10	2.000	No
27	5.58	0.29	0.00	0.29	0.99	0.277	1.10	0.251	1.10	1.10	2.000	No
28	5.74	0.30	0.00	0.30	0.99	0.277	1.10	0.251	1.10	1.10	2.000	No
29	5.91	0.31	0.00	0.31	0.99	0.277	1.10	0.251	1.10	1.10	2.000	No
30	6.07	0.31	0.00	0.31	0.99	0.277	1.10	0.251	1.10	1.10	2.000	No
31	6.23	0.32	0.00	0.32	0.99	0.276	1.10	0.251	1.10	1.10	2.000	No
32	6.40	0.33	0.00	0.33	0.99	0.276	1.10	0.250	1.10	1.10	2.000	No
33	6.56	0.34	0.00	0.34	0.99	0.276	1.10	0.250	1.10	1.10	2.000	No
34	6.73	0.35	0.00	0.35	0.99	0.276	1.10	0.250	1.10	1.10	2.000	No
35	6.89	0.36	0.00	0.36	0.99	0.276	1.10	0.250	1.10	1.10	2.000	No
36	7.05	0.37	0.00	0.37	0.99	0.276	1.10	0.250	1.10	1.10	2.000	No
37	7.22	0.38	0.00	0.38	0.99	0.275	1.10	0.250	1.10	1.10	2.000	No
38	7.38	0.38	0.00	0.38	0.98	0.275	1.10	0.250	1.10	1.10	2.000	No
39	7.55	0.39	0.00	0.39	0.98	0.275	1.10	0.250	1.10	1.10	2.000	No
40	7.71	0.40	0.00	0.40	0.98	0.275	1.10	0.249	1.10	1.10	2.000	No
41	7.87	0.41	0.00	0.41	0.98	0.275	1.10	0.249	1.10	1.10	2.000	No
42	8.04	0.42	0.00	0.42	0.98	0.275	1.10	0.249	1.09	1.10	2.000	No
43	8.20	0.43	0.00	0.43	0.98	0.275	1.10	0.249	1.09	1.10	2.000	No
44	8.37	0.44	0.00	0.44	0.98	0.274	1.10	0.249	1.09	1.10	2.000	No
45	8.53	0.45	0.00	0.45	0.98	0.274	1.10	0.249	1.08	1.10	2.000	No
46	8.69	0.46	0.00	0.46	0.98	0.274	1.10	0.249	1.08	1.10	2.000	No
47	8.86	0.47	0.00	0.47	0.98	0.274	1.10	0.248	1.08	1.10	2.000	No
48	9.02	0.47	0.00	0.47	0.98	0.274	1.10	0.249	1.08	1.10	0.273	No

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

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR _{eq}	K_σ	User FS	CSR*	Belongs to transition
49	9.19	0.48	0.01	0.48	0.98	0.277	1.10	0.251	1.08	1.10	0.275	No
50	9.35	0.49	0.01	0.48	0.98	0.280	1.10	0.254	1.08	1.10	0.279	No
51	9.51	0.50	0.02	0.48	0.98	0.282	1.10	0.256	1.07	1.10	0.281	No
52	9.68	0.51	0.02	0.49	0.98	0.285	1.10	0.258	1.07	1.10	0.285	No
53	9.84	0.52	0.03	0.49	0.98	0.287	1.10	0.261	1.07	1.10	0.287	No
54	10.01	0.53	0.03	0.50	0.98	0.290	1.10	0.263	1.07	1.10	0.289	No
55	10.17	0.54	0.04	0.50	0.98	0.292	1.10	0.265	1.07	1.10	0.293	No
56	10.34	0.55	0.04	0.50	0.97	0.295	1.10	0.267	1.07	1.10	0.295	No
57	10.50	0.55	0.05	0.51	0.97	0.297	1.10	0.270	1.07	1.10	0.297	No
58	10.66	0.56	0.05	0.51	0.97	0.300	1.10	0.272	1.07	1.10	0.303	No
59	10.83	0.57	0.06	0.51	0.97	0.302	1.10	0.274	1.07	1.10	0.302	No
60	10.99	0.58	0.06	0.52	0.97	0.304	1.10	0.276	1.07	1.10	0.306	No
61	11.15	0.59	0.07	0.52	0.97	0.306	1.10	0.278	1.07	1.10	0.309	No
62	11.32	0.60	0.07	0.53	0.97	0.309	1.10	0.280	1.06	1.10	0.312	No
63	11.48	0.61	0.08	0.53	0.97	0.311	1.10	0.282	1.06	1.10	0.314	No
64	11.65	0.62	0.08	0.53	0.97	0.313	1.10	0.284	1.06	1.10	0.317	No
65	11.81	0.63	0.09	0.54	0.97	0.315	1.10	0.286	1.06	1.10	0.317	No
66	11.97	0.63	0.09	0.54	0.97	0.317	1.10	0.288	1.06	1.10	0.319	No
67	12.14	0.64	0.10	0.55	0.97	0.319	1.10	0.289	1.06	1.10	0.322	No
68	12.30	0.65	0.10	0.55	0.97	0.321	1.10	0.291	1.06	1.10	0.326	No
69	12.47	0.66	0.11	0.55	0.97	0.323	1.10	0.293	1.06	1.10	0.328	No
70	12.63	0.67	0.11	0.56	0.97	0.325	1.10	0.295	1.06	1.10	0.330	No
71	12.79	0.68	0.12	0.56	0.97	0.327	1.10	0.296	1.06	1.10	0.332	No
72	12.96	0.69	0.12	0.56	0.96	0.329	1.10	0.298	1.06	1.10	0.334	No
73	13.12	0.70	0.13	0.57	0.96	0.330	1.10	0.300	1.06	1.10	0.335	No
74	13.29	0.71	0.13	0.57	0.96	0.332	1.10	0.301	1.06	1.10	0.337	No
75	13.45	0.72	0.14	0.58	0.96	0.334	1.10	0.303	1.06	1.10	0.340	No
76	13.62	0.72	0.14	0.58	0.96	0.336	1.10	0.304	1.05	1.10	0.343	No
77	13.78	0.73	0.15	0.58	0.96	0.337	1.10	0.306	1.05	1.10	0.346	No
78	13.94	0.74	0.15	0.59	0.96	0.339	1.10	0.307	1.05	1.10	0.348	No
79	14.11	0.75	0.16	0.59	0.96	0.341	1.10	0.309	1.05	1.10	0.349	No
80	14.27	0.76	0.16	0.60	0.96	0.342	1.10	0.310	1.05	1.10	0.352	No
81	14.44	0.77	0.17	0.60	0.96	0.344	1.10	0.312	1.05	1.10	0.353	No
82	14.60	0.78	0.17	0.60	0.96	0.345	1.10	0.313	1.05	1.10	0.355	No
83	14.76	0.79	0.18	0.61	0.96	0.347	1.10	0.314	1.05	1.10	0.354	No
84	14.93	0.80	0.18	0.61	0.96	0.348	1.10	0.316	1.05	1.10	0.356	No
85	15.09	0.80	0.19	0.61	0.96	0.350	1.10	0.317	1.05	1.10	0.360	No
86	15.26	0.81	0.20	0.62	0.96	0.351	1.10	0.319	1.05	1.10	0.362	No
87	15.42	0.82	0.20	0.62	0.95	0.353	1.10	0.320	1.04	1.10	0.365	No
88	15.58	0.83	0.21	0.62	0.95	0.354	1.10	0.321	1.04	1.10	0.366	No
89	15.75	0.84	0.21	0.63	0.95	0.356	1.10	0.323	1.05	1.10	0.365	No
90	15.91	0.85	0.22	0.63	0.95	0.357	1.10	0.324	1.05	1.10	0.366	No
91	16.08	0.86	0.22	0.64	0.95	0.358	1.10	0.325	1.05	1.10	0.368	No
92	16.24	0.87	0.23	0.64	0.95	0.360	1.10	0.326	1.05	1.10	0.369	No
93	16.40	0.87	0.23	0.64	0.95	0.361	1.10	0.327	1.05	1.10	0.371	No
94	16.57	0.88	0.24	0.65	0.95	0.362	1.10	0.328	1.05	1.10	0.372	No
95	16.73	0.89	0.24	0.65	0.95	0.363	1.10	0.329	1.05	1.10	0.373	No
96	16.90	0.90	0.25	0.66	0.95	0.364	1.10	0.331	1.05	1.10	0.371	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)												
Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR _{eq}	K_σ	User FS	CSR*	Belongs to transition
97	17.06	0.91	0.25	0.66	0.95	0.366	1.10	0.332	1.05	1.10	0.371	No
98	17.22	0.92	0.26	0.67	0.95	0.367	1.10	0.332	1.05	1.10	0.371	No
99	17.39	0.93	0.26	0.67	0.95	0.368	1.10	0.333	1.06	1.10	0.357	No
100	17.55	0.94	0.27	0.68	0.95	0.369	1.10	0.334	1.07	1.10	0.355	No
101	17.72	0.95	0.27	0.68	0.94	0.370	1.10	0.335	1.06	1.10	0.356	No
102	17.88	0.96	0.28	0.69	0.94	0.370	1.10	0.336	1.06	1.10	0.356	No
103	18.05	0.97	0.28	0.69	0.94	0.371	1.10	0.337	1.06	1.10	0.358	No
104	18.21	0.98	0.29	0.70	0.94	0.372	1.10	0.338	1.06	1.10	0.367	No
105	18.37	0.99	0.29	0.70	0.94	0.373	1.10	0.338	1.07	1.10	0.354	No
106	18.54	1.00	0.30	0.71	0.94	0.374	1.10	0.339	1.09	1.10	0.330	No
107	18.70	1.01	0.30	0.71	0.94	0.374	1.10	0.340	1.10	1.10	0.324	No
108	18.86	1.03	0.31	0.72	0.94	0.375	1.10	0.340	1.10	1.10	0.325	No
109	19.03	1.04	0.31	0.72	0.94	0.376	1.10	0.341	1.06	1.10	0.366	No
110	19.19	1.05	0.32	0.73	0.94	0.377	1.10	0.342	1.04	1.10	0.385	No
111	19.36	1.06	0.32	0.73	0.94	0.377	1.10	0.342	1.04	1.10	0.390	No
112	19.52	1.07	0.33	0.74	0.94	0.378	1.10	0.343	1.04	1.10	0.390	No
113	19.68	1.08	0.33	0.74	0.94	0.379	1.10	0.343	1.04	1.10	0.390	No
114	19.85	1.09	0.34	0.75	0.93	0.379	1.10	0.344	1.04	1.10	0.391	No
115	20.01	1.10	0.34	0.75	0.93	0.380	1.10	0.345	1.03	1.10	0.393	No
116	20.18	1.11	0.35	0.76	0.93	0.381	1.10	0.345	1.03	1.10	0.395	No
117	20.34	1.12	0.35	0.76	0.93	0.381	1.10	0.346	1.03	1.10	0.395	No
118	20.50	1.13	0.36	0.77	0.93	0.382	1.10	0.347	1.03	1.10	0.395	No
119	20.67	1.14	0.36	0.77	0.93	0.383	1.10	0.347	1.03	1.10	0.396	No
120	20.83	1.15	0.37	0.78	0.93	0.383	1.10	0.348	1.03	1.10	0.395	No
121	21.00	1.16	0.37	0.78	0.93	0.384	1.10	0.348	1.03	1.10	0.394	No
122	21.16	1.17	0.38	0.79	0.93	0.385	1.10	0.349	1.03	1.10	0.398	No
123	21.32	1.18	0.38	0.79	0.93	0.385	1.10	0.349	1.03	1.10	0.402	No
124	21.49	1.19	0.39	0.80	0.93	0.386	1.10	0.350	1.03	1.10	0.405	No
125	21.65	1.20	0.39	0.80	0.93	0.387	1.10	0.351	1.02	1.10	0.406	No
126	21.82	1.21	0.40	0.81	0.93	0.387	1.10	0.351	1.03	1.10	0.403	No
127	21.98	1.22	0.41	0.81	0.93	0.388	1.10	0.352	1.03	1.10	0.396	No
128	22.15	1.23	0.41	0.82	0.92	0.388	1.10	0.352	1.03	1.10	0.403	No
129	22.31	1.24	0.42	0.82	0.92	0.389	1.10	0.352	1.02	1.10	0.408	No
130	22.47	1.25	0.42	0.83	0.92	0.389	1.10	0.353	1.02	1.10	0.409	No
131	22.64	1.26	0.43	0.83	0.92	0.390	1.10	0.353	1.02	1.10	0.408	No
132	22.80	1.27	0.43	0.84	0.92	0.390	1.10	0.354	1.02	1.10	0.409	No
133	22.97	1.28	0.44	0.84	0.92	0.391	1.10	0.354	1.03	1.10	0.401	No
134	23.13	1.29	0.44	0.85	0.92	0.391	1.10	0.355	1.03	1.10	0.393	No
135	23.29	1.30	0.45	0.85	0.92	0.392	1.10	0.355	1.03	1.10	0.397	No
136	23.46	1.31	0.45	0.85	0.92	0.392	1.10	0.356	1.02	1.10	0.406	No
137	23.62	1.32	0.46	0.86	0.92	0.393	1.10	0.356	1.02	1.10	0.412	No
138	23.79	1.33	0.46	0.86	0.92	0.393	1.10	0.356	1.02	1.10	0.415	No
139	23.95	1.34	0.47	0.87	0.92	0.393	1.10	0.357	1.02	1.10	0.416	No
140	24.11	1.35	0.47	0.87	0.91	0.394	1.10	0.357	1.02	1.10	0.416	No
141	24.28	1.36	0.48	0.88	0.91	0.394	1.10	0.357	1.02	1.10	0.414	No
142	24.44	1.37	0.48	0.89	0.91	0.394	1.10	0.358	1.02	1.10	0.409	No
143	24.61	1.38	0.49	0.89	0.91	0.395	1.10	0.358	1.02	1.10	0.411	No
144	24.77	1.39	0.49	0.90	0.91	0.395	1.10	0.358	1.02	1.10	0.413	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	24.93	1.40	0.50	0.90	0.91	0.395	1.10	0.358	1.02	1.10	0.411	No
146	25.10	1.41	0.50	0.90	0.91	0.396	1.10	0.359	1.02	1.10	0.410	No
147	25.26	1.42	0.51	0.91	0.91	0.396	1.10	0.359	1.02	1.10	0.411	No
148	25.43	1.43	0.51	0.91	0.91	0.396	1.10	0.359	1.02	1.10	0.412	No
149	25.59	1.44	0.52	0.92	0.91	0.397	1.10	0.360	1.02	1.10	0.413	No
150	25.75	1.45	0.52	0.92	0.91	0.397	1.10	0.360	1.01	1.10	0.415	No
151	25.92	1.46	0.53	0.93	0.91	0.397	1.10	0.360	1.01	1.10	0.418	No
152	26.08	1.47	0.53	0.93	0.91	0.398	1.10	0.361	1.01	1.10	0.419	No
153	26.25	1.48	0.54	0.94	0.90	0.398	1.10	0.361	1.01	1.10	0.419	No
154	26.41	1.49	0.54	0.94	0.90	0.398	1.10	0.361	1.01	1.10	0.418	No
155	26.57	1.50	0.55	0.95	0.90	0.398	1.10	0.361	1.01	1.10	0.421	No
156	26.74	1.51	0.55	0.95	0.90	0.399	1.10	0.361	1.01	1.10	0.422	No
157	26.90	1.52	0.56	0.96	0.90	0.399	1.10	0.362	1.01	1.10	0.425	No
158	27.07	1.53	0.56	0.96	0.90	0.399	1.10	0.362	1.01	1.10	0.427	No
159	27.23	1.54	0.57	0.97	0.90	0.399	1.10	0.362	1.01	1.10	0.427	No
160	27.39	1.55	0.57	0.97	0.90	0.400	1.10	0.362	1.01	1.10	0.427	No
161	27.56	1.55	0.58	0.98	0.90	0.400	1.10	0.363	1.01	1.10	0.428	No
162	27.72	1.56	0.58	0.98	0.90	0.400	1.10	0.363	1.01	1.10	0.428	No
163	27.89	1.57	0.59	0.98	0.90	0.401	1.10	0.363	1.01	1.10	0.429	No
164	28.05	1.58	0.59	0.99	0.90	0.401	1.10	0.364	1.01	1.10	0.428	No
165	28.21	1.59	0.60	0.99	0.89	0.401	1.10	0.364	1.01	1.10	0.426	No
166	28.38	1.60	0.60	1.00	0.89	0.402	1.10	0.364	1.01	1.10	0.426	No
167	28.54	1.61	0.61	1.00	0.89	0.402	1.10	0.364	1.01	1.10	0.428	No
168	28.71	1.62	0.61	1.00	0.89	0.402	1.10	0.365	1.01	1.10	0.428	No
169	28.87	1.63	0.62	1.01	0.89	0.402	1.10	0.365	1.00	1.10	0.428	No
170	29.04	1.64	0.63	1.01	0.89	0.403	1.10	0.365	1.00	1.10	0.429	No
171	29.20	1.65	0.63	1.02	0.89	0.403	1.10	0.365	1.00	1.10	0.430	No
172	29.36	1.66	0.64	1.02	0.89	0.403	1.10	0.365	1.00	1.10	0.431	No
173	29.53	1.67	0.64	1.03	0.89	0.403	1.10	0.365	1.00	1.10	0.430	No
174	29.69	1.68	0.65	1.03	0.89	0.403	1.10	0.365	1.00	1.10	0.428	No
175	29.86	1.69	0.65	1.04	0.89	0.403	1.10	0.365	1.00	1.10	0.428	No
176	30.02	1.70	0.66	1.04	0.89	0.403	1.10	0.366	1.00	1.10	0.430	No
177	30.18	1.71	0.66	1.05	0.88	0.403	1.10	0.366	1.00	1.10	0.430	No
178	30.35	1.72	0.67	1.05	0.88	0.403	1.10	0.366	1.00	1.10	0.432	No
179	30.51	1.73	0.67	1.06	0.88	0.403	1.10	0.366	1.00	1.10	0.433	No
180	30.68	1.74	0.68	1.06	0.88	0.403	1.10	0.366	1.00	1.10	0.433	No
181	30.84	1.75	0.68	1.07	0.88	0.404	1.10	0.366	1.00	1.10	0.432	No
182	31.00	1.76	0.69	1.07	0.88	0.404	1.10	0.366	1.00	1.10	0.432	No
183	31.17	1.77	0.69	1.08	0.88	0.404	1.10	0.366	1.00	1.10	0.430	No
184	31.33	1.78	0.70	1.08	0.88	0.404	1.10	0.366	1.00	1.10	0.426	No
185	31.50	1.79	0.70	1.09	0.88	0.404	1.10	0.366	1.00	1.10	0.430	No
186	31.66	1.80	0.71	1.09	0.88	0.404	1.10	0.366	1.00	1.10	0.431	No
187	31.82	1.81	0.71	1.10	0.88	0.404	1.10	0.366	1.00	1.10	0.428	No
188	31.99	1.82	0.72	1.10	0.88	0.404	1.10	0.366	0.99	1.10	0.418	No
189	32.15	1.83	0.72	1.11	0.87	0.404	1.10	0.366	0.99	1.10	0.389	No
190	32.32	1.84	0.73	1.11	0.87	0.404	1.10	0.366	0.99	1.10	0.390	No
191	32.48	1.85	0.73	1.12	0.87	0.404	1.10	0.366	0.99	1.10	0.391	No
192	32.64	1.86	0.74	1.12	0.87	0.404	1.10	0.366	0.98	1.10	0.391	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	32.81	1.87	0.74	1.13	0.87	0.404	1.10	0.366	0.98	1.10	0.392	No
194	32.97	1.88	0.75	1.14	0.87	0.403	1.10	0.366	0.98	1.10	0.393	No
195	33.14	1.89	0.75	1.14	0.87	0.403	1.10	0.366	0.98	1.10	0.392	No
196	33.30	1.91	0.76	1.15	0.87	0.403	1.10	0.366	0.98	1.10	0.395	No
197	33.47	1.92	0.76	1.15	0.87	0.403	1.10	0.366	0.98	1.10	0.406	No
198	33.63	1.93	0.77	1.16	0.87	0.403	1.10	0.366	0.98	1.10	0.404	No
199	33.79	1.94	0.77	1.16	0.87	0.403	1.10	0.366	0.98	1.10	0.403	No
200	33.96	1.95	0.78	1.17	0.87	0.403	1.10	0.365	0.98	1.10	0.407	No
201	34.12	1.96	0.78	1.17	0.86	0.403	1.10	0.365	0.98	1.10	0.411	No
202	34.28	1.97	0.79	1.18	0.86	0.403	1.10	0.365	0.98	1.10	0.412	No
203	34.45	1.98	0.79	1.18	0.86	0.403	1.10	0.365	0.98	1.10	0.418	No
204	34.61	1.99	0.80	1.19	0.86	0.403	1.10	0.365	0.98	1.10	0.421	No
205	34.78	2.00	0.80	1.19	0.86	0.403	1.10	0.365	0.98	1.10	0.422	No
206	34.94	2.01	0.81	1.20	0.86	0.403	1.10	0.365	0.98	1.10	0.421	No
207	35.10	2.02	0.81	1.20	0.86	0.403	1.10	0.365	0.98	1.10	0.419	No
208	35.27	2.03	0.82	1.21	0.86	0.402	1.10	0.365	0.98	1.10	0.414	No
209	35.43	2.04	0.82	1.21	0.86	0.402	1.10	0.365	0.98	1.10	0.420	No
210	35.60	2.05	0.83	1.22	0.86	0.402	1.10	0.365	0.98	1.10	0.425	No
211	35.76	2.06	0.83	1.22	0.86	0.402	1.10	0.365	0.98	1.10	0.419	No
212	35.92	2.07	0.84	1.23	0.85	0.402	1.10	0.365	0.96	1.10	0.401	No
213	36.09	2.08	0.85	1.24	0.85	0.402	1.10	0.365	0.95	1.10	0.402	No
214	36.25	2.09	0.85	1.24	0.85	0.402	1.10	0.364	0.95	1.10	0.402	No
215	36.42	2.10	0.86	1.25	0.85	0.402	1.10	0.364	0.95	1.10	0.403	No
216	36.58	2.11	0.86	1.25	0.85	0.401	1.10	0.364	0.95	1.10	0.403	No
217	36.74	2.12	0.87	1.26	0.85	0.401	1.10	0.364	0.95	1.10	0.403	No
218	36.91	2.13	0.87	1.26	0.85	0.401	1.10	0.364	0.95	1.10	0.404	No
219	37.07	2.14	0.88	1.27	0.85	0.401	1.10	0.364	0.95	1.10	0.404	No
220	37.24	2.16	0.88	1.27	0.85	0.401	1.10	0.363	0.94	1.10	0.405	No
221	37.40	2.17	0.89	1.28	0.85	0.401	1.10	0.363	0.94	1.10	0.405	No
222	37.57	2.18	0.89	1.29	0.85	0.400	1.10	0.363	0.94	1.10	0.405	No
223	37.73	2.19	0.90	1.29	0.85	0.400	1.10	0.363	0.94	1.10	0.406	No
224	37.89	2.20	0.90	1.30	0.84	0.400	1.10	0.363	0.94	1.10	0.406	No
225	38.06	2.21	0.91	1.30	0.84	0.400	1.10	0.363	0.94	1.10	0.406	No
226	38.22	2.22	0.91	1.31	0.84	0.400	1.10	0.362	0.94	1.10	0.407	No
227	38.39	2.23	0.92	1.31	0.84	0.400	1.10	0.362	0.94	1.10	0.407	No
228	38.55	2.24	0.92	1.32	0.84	0.399	1.10	0.362	0.93	1.10	0.408	No
229	38.71	2.25	0.93	1.32	0.84	0.399	1.10	0.362	0.93	1.10	0.408	No
230	38.88	2.26	0.93	1.33	0.84	0.399	1.10	0.362	0.93	1.10	0.408	No
231	39.04	2.27	0.94	1.33	0.84	0.399	1.10	0.362	0.93	1.10	0.409	No
232	39.21	2.28	0.94	1.34	0.84	0.399	1.10	0.362	0.93	1.10	0.409	No
233	39.37	2.29	0.95	1.35	0.84	0.398	1.10	0.361	0.93	1.10	0.409	No
234	39.53	2.30	0.95	1.35	0.84	0.398	1.10	0.361	0.93	1.10	0.410	No
235	39.70	2.31	0.96	1.36	0.83	0.398	1.10	0.361	0.93	1.10	0.410	No
236	39.86	2.32	0.96	1.36	0.83	0.398	1.10	0.361	0.92	1.10	0.410	No
237	40.03	2.34	0.97	1.37	0.83	0.398	1.10	0.361	0.92	1.10	0.411	No
238	40.19	2.35	0.97	1.37	0.83	0.398	1.10	0.360	0.92	1.10	0.411	No
239	40.35	2.36	0.98	1.38	0.83	0.397	1.10	0.360	0.93	1.10	0.406	No
240	40.52	2.37	0.98	1.38	0.83	0.397	1.10	0.360	0.97	1.10	0.434	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	40.68	2.38	0.99	1.39	0.83	0.397	1.10	0.360	0.97	1.10	0.431	No
242	40.85	2.39	0.99	1.39	0.83	0.397	1.10	0.360	0.97	1.10	0.436	No
243	41.01	2.40	1.00	1.40	0.83	0.397	1.10	0.360	0.97	1.10	0.437	No
244	41.17	2.41	1.00	1.40	0.83	0.397	1.10	0.360	0.97	1.10	0.437	No
245	41.34	2.42	1.01	1.41	0.83	0.397	1.10	0.360	0.97	1.10	0.437	No
246	41.50	2.43	1.01	1.41	0.83	0.396	1.10	0.359	0.97	1.10	0.437	No
247	41.67	2.44	1.02	1.42	0.82	0.396	1.10	0.359	0.97	1.10	0.437	No
248	41.83	2.45	1.02	1.42	0.82	0.396	1.10	0.359	0.97	1.10	0.437	No
249	41.99	2.45	1.03	1.43	0.82	0.396	1.10	0.359	0.97	1.10	0.438	No
250	42.16	2.46	1.03	1.43	0.82	0.396	1.10	0.359	0.97	1.10	0.438	No
251	42.32	2.47	1.04	1.43	0.82	0.396	1.10	0.359	0.97	1.10	0.438	No
252	42.49	2.48	1.04	1.44	0.82	0.396	1.10	0.359	0.97	1.10	0.438	No
253	42.65	2.49	1.05	1.44	0.82	0.396	1.10	0.359	0.97	1.10	0.438	No
254	42.81	2.50	1.06	1.45	0.82	0.395	1.10	0.359	0.97	1.10	0.438	No
255	42.98	2.51	1.06	1.45	0.82	0.395	1.10	0.358	0.97	1.10	0.438	No
256	43.14	2.52	1.07	1.46	0.82	0.395	1.10	0.358	0.97	1.10	0.438	No
257	43.31	2.53	1.07	1.46	0.82	0.395	1.10	0.358	0.97	1.10	0.438	No
258	43.47	2.54	1.08	1.47	0.81	0.395	1.10	0.358	0.97	1.10	0.438	No
259	43.63	2.55	1.08	1.47	0.81	0.395	1.10	0.358	0.97	1.10	0.438	No
260	43.80	2.56	1.09	1.47	0.81	0.395	1.10	0.358	0.97	1.10	0.438	No
261	43.96	2.57	1.09	1.48	0.81	0.395	1.10	0.358	0.97	1.10	0.438	No
262	44.13	2.58	1.10	1.48	0.81	0.394	1.10	0.358	0.97	1.10	0.438	No
263	44.29	2.59	1.10	1.49	0.81	0.394	1.10	0.358	0.97	1.10	0.438	No
264	44.45	2.60	1.11	1.49	0.81	0.394	1.10	0.357	0.97	1.10	0.438	No
265	44.62	2.61	1.11	1.49	0.81	0.394	1.10	0.357	0.97	1.10	0.438	No
266	44.78	2.62	1.12	1.50	0.81	0.394	1.10	0.357	0.97	1.10	0.438	No
267	44.95	2.62	1.12	1.50	0.81	0.394	1.10	0.357	0.97	1.10	0.438	No
268	45.11	2.63	1.13	1.51	0.81	0.394	1.10	0.357	0.97	1.10	0.438	No
269	45.28	2.64	1.13	1.51	0.81	0.394	1.10	0.357	0.97	1.10	0.438	No
270	45.44	2.65	1.14	1.51	0.80	0.394	1.10	0.357	0.97	1.10	0.438	No
271	45.60	2.66	1.14	1.52	0.80	0.393	1.10	0.357	0.97	1.10	0.438	No
272	45.77	2.67	1.15	1.52	0.80	0.393	1.10	0.357	0.97	1.10	0.438	No
273	45.93	2.68	1.15	1.53	0.80	0.393	1.10	0.356	0.97	1.10	0.438	No
274	46.10	2.69	1.16	1.53	0.80	0.393	1.10	0.356	0.97	1.10	0.438	No
275	46.26	2.70	1.16	1.54	0.80	0.393	1.10	0.356	0.97	1.10	0.438	No
276	46.42	2.71	1.17	1.54	0.80	0.393	1.10	0.356	0.97	1.10	0.438	No
277	46.59	2.72	1.17	1.55	0.80	0.392	1.10	0.356	0.97	1.10	0.438	No
278	46.75	2.73	1.18	1.55	0.80	0.392	1.10	0.356	0.97	1.10	0.437	No
279	46.92	2.74	1.18	1.55	0.80	0.392	1.10	0.356	0.97	1.10	0.437	No
280	47.08	2.75	1.19	1.56	0.80	0.392	1.10	0.355	0.97	1.10	0.437	No
281	47.24	2.76	1.19	1.56	0.79	0.392	1.10	0.355	0.96	1.10	0.437	No
282	47.41	2.76	1.20	1.57	0.79	0.392	1.10	0.355	0.96	1.10	0.437	No
283	47.57	2.77	1.20	1.57	0.79	0.391	1.10	0.355	0.96	1.10	0.437	No
284	47.74	2.78	1.21	1.57	0.79	0.391	1.10	0.355	0.96	1.10	0.436	No
285	47.90	2.79	1.21	1.58	0.79	0.391	1.10	0.355	0.96	1.10	0.436	No
286	48.06	2.80	1.22	1.58	0.79	0.391	1.10	0.355	0.96	1.10	0.436	No
287	48.23	2.81	1.22	1.59	0.79	0.391	1.10	0.354	0.96	1.10	0.436	No
288	48.39	2.82	1.23	1.59	0.79	0.391	1.10	0.354	0.96	1.10	0.436	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	48.56	2.83	1.23	1.60	0.79	0.390	1.10	0.354	0.96	1.10	0.436	No
290	48.72	2.84	1.24	1.60	0.79	0.390	1.10	0.354	0.96	1.10	0.436	No
291	48.88	2.85	1.24	1.61	0.79	0.390	1.10	0.354	0.96	1.10	0.436	No
292	49.05	2.86	1.25	1.61	0.79	0.390	1.10	0.353	0.96	1.10	0.435	No
293	49.21	2.87	1.25	1.62	0.78	0.389	1.10	0.353	0.96	1.10	0.435	No
294	49.38	2.88	1.26	1.62	0.78	0.389	1.10	0.353	0.96	1.10	0.434	No
295	49.54	2.89	1.26	1.63	0.78	0.389	1.10	0.353	0.95	1.10	0.434	No
296	49.70	2.90	1.27	1.63	0.78	0.389	1.10	0.353	0.95	1.10	0.433	No
297	49.87	2.91	1.28	1.64	0.78	0.388	1.10	0.352	0.94	1.10	0.429	No
298	50.03	2.92	1.28	1.64	0.78	0.388	1.10	0.352	0.95	1.10	0.431	No
299	50.20	2.93	1.29	1.64	0.78	0.388	1.10	0.352	0.95	1.10	0.433	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_c (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
1	1.31	18.47	53.97	2.39	0.53	1.70	31.59	55.79	87.37	4.000	No	No	2.00
2	1.48	16.96	60.40	2.47	0.54	1.70	25.77	56.04	81.81	4.000	No	No	2.00
3	1.64	14.72	72.13	2.61	0.54	1.70	24.32	0.00	24.32	4.000	No	Yes	2.00
4	1.80	13.33	78.59	2.69	0.55	1.70	20.81	0.00	20.81	4.000	No	Yes	2.00
5	1.97	12.18	81.57	2.73	0.55	1.70	19.10	0.00	19.10	4.000	No	Yes	2.00
6	2.13	11.49	78.15	2.69	0.56	1.70	18.78	0.00	18.78	4.000	No	Yes	2.00
7	2.30	11.18	74.44	2.64	0.56	1.70	17.46	0.00	17.46	4.000	No	Yes	2.00
8	2.46	11.05	70.46	2.59	0.56	1.70	17.59	55.82	73.41	4.000	No	No	2.00
9	2.63	11.41	66.04	2.54	0.56	1.70	18.16	55.15	73.31	4.000	No	No	2.00
10	2.79	11.90	61.16	2.48	0.56	1.70	19.20	54.38	73.58	4.000	No	No	2.00
11	2.95	12.79	56.48	2.42	0.56	1.70	20.00	53.39	73.39	4.000	No	No	2.00
12	3.12	14.05	50.88	2.35	0.56	1.70	22.43	52.27	74.69	4.000	No	No	2.00
13	3.28	15.73	45.12	2.28	0.56	1.70	25.29	50.68	75.97	4.000	No	No	2.00
14	3.44	17.43	39.90	2.21	0.55	1.70	28.08	48.64	76.72	4.000	No	No	2.00
15	3.61	18.63	37.61	2.18	0.55	1.70	30.61	47.79	78.39	4.000	No	No	2.00
16	3.77	19.69	36.70	2.17	0.55	1.70	31.06	47.27	78.32	4.000	No	No	2.00
17	3.94	19.98	37.93	2.19	0.54	1.70	33.23	48.62	81.85	4.000	No	No	2.00
18	4.10	20.31	38.92	2.20	0.54	1.70	32.00	48.98	80.98	4.000	No	No	2.00
19	4.26	19.91	41.22	2.23	0.54	1.70	32.65	50.52	83.17	4.000	No	No	2.00
20	4.43	19.84	42.54	2.24	0.54	1.70	31.28	50.91	82.19	4.000	No	No	2.00
21	4.59	19.56	43.76	2.26	0.54	1.70	31.67	51.64	83.30	4.000	No	No	2.00
22	4.76	19.72	43.18	2.25	0.54	1.70	31.30	51.25	82.55	4.000	No	No	2.00
23	4.92	20.35	41.57	2.23	0.54	1.70	32.08	50.58	82.66	4.000	No	No	2.00
24	5.08	21.69	38.47	2.19	0.54	1.70	34.69	49.32	84.01	4.000	No	No	2.00
25	5.25	23.37	35.31	2.15	0.53	1.70	37.74	47.75	85.49	4.000	No	No	2.00
26	5.41	24.88	32.37	2.12	0.53	1.70	40.20	45.77	85.97	4.000	No	No	2.00
27	5.58	26.37	29.60	2.08	0.53	1.70	41.98	43.35	85.33	4.000	No	No	2.00
28	5.74	28.42	26.18	2.04	0.53	1.70	44.89	39.71	84.60	4.000	No	No	2.00
29	5.91	31.51	21.78	1.98	0.54	1.70	50.11	33.65	83.76	4.000	No	No	2.00
30	6.07	35.15	16.13	1.91	0.55	1.70	56.88	22.29	79.17	4.000	No	No	2.00
31	6.23	38.56	11.61	1.86	0.56	1.70	62.42	10.70	73.12	4.000	No	No	2.00
32	6.40	41.16	8.43	1.82	0.57	1.70	66.55	3.44	69.99	4.000	No	No	2.00
33	6.56	42.78	8.01	1.81	0.57	1.70	69.42	2.75	72.17	4.000	No	No	2.00
34	6.73	43.16	9.10	1.83	0.56	1.70	70.21	4.80	75.02	4.000	No	No	2.00
35	6.89	41.96	12.24	1.87	0.54	1.70	68.36	12.69	81.06	4.000	No	No	2.00
36	7.05	39.31	17.55	1.93	0.52	1.70	63.69	26.52	90.21	4.000	No	No	2.00
37	7.22	36.04	23.93	2.01	0.51	1.69	57.20	38.49	95.69	4.000	No	No	2.00
38	7.38	33.75	29.22	2.08	0.51	1.67	51.68	44.86	96.53	4.000	No	No	2.00
39	7.55	33.49	31.05	2.10	0.50	1.65	50.95	46.74	97.69	4.000	No	No	2.00
40	7.71	34.75	29.89	2.09	0.50	1.62	53.50	45.99	99.49	4.000	No	No	2.00
41	7.87	36.40	27.35	2.05	0.50	1.60	55.40	43.23	98.63	4.000	No	No	2.00
42	8.04	38.58	23.44	2.01	0.51	1.60	57.02	37.65	94.67	4.000	No	No	2.00
43	8.20	41.46	18.48	1.94	0.52	1.59	62.56	28.59	91.15	4.000	No	No	2.00
44	8.37	43.50	15.12	1.90	0.52	1.59	67.69	20.66	88.35	4.000	No	No	2.00
45	8.53	43.39	14.97	1.90	0.53	1.58	65.45	20.05	85.50	4.000	No	No	2.00
46	8.69	41.04	16.95	1.92	0.53	1.56	60.84	24.74	85.58	4.000	No	No	2.00
47	8.86	38.24	20.09	1.96	0.53	1.54	55.59	31.19	86.78	4.000	No	No	2.00
48	9.02	35.58	23.42	2.01	0.53	1.53	51.11	36.64	87.75	0.123	No	No	0.45

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

Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
49	9.19	33.57	26.80	2.05	0.52	1.51	47.32	40.99	88.32	0.124	No	No	0.45
50	9.35	32.63	27.69	2.06	0.53	1.50	45.42	41.78	87.20	0.123	No	No	0.44
51	9.51	32.89	27.29	2.05	0.53	1.48	45.77	41.35	87.12	0.123	No	No	0.44
52	9.68	34.32	25.38	2.03	0.53	1.47	47.27	39.03	86.30	0.122	No	No	0.43
53	9.84	36.11	24.01	2.01	0.53	1.46	50.07	37.43	87.51	0.123	No	No	0.43
54	10.01	37.22	23.17	2.00	0.53	1.44	51.77	36.34	88.11	0.124	No	No	0.43
55	10.17	37.38	23.22	2.00	0.53	1.43	50.50	36.22	86.73	0.122	No	No	0.42
56	10.34	36.69	24.10	2.01	0.53	1.42	49.45	37.48	86.93	0.123	No	No	0.42
57	10.50	33.96	27.22	2.05	0.52	1.40	47.65	41.61	89.25	0.125	No	No	0.42
58	10.66	33.90	27.17	2.05	0.55	1.41	38.89	39.90	78.80	0.115	No	No	0.38
59	10.83	34.12	27.08	2.05	0.52	1.38	47.79	41.45	89.24	0.125	No	No	0.41
60	10.99	37.18	24.04	2.01	0.53	1.38	47.67	37.08	84.75	0.120	No	No	0.39
61	11.15	39.11	22.14	1.99	0.54	1.37	49.73	34.24	83.97	0.120	No	No	0.39
62	11.32	43.22	18.06	1.94	0.54	1.37	55.14	26.73	81.88	0.118	No	No	0.38
63	11.48	47.91	14.06	1.89	0.54	1.37	63.47	17.42	80.89	0.117	No	No	0.37
64	11.65	51.77	12.14	1.86	0.55	1.37	67.70	12.38	80.08	0.116	No	No	0.37
65	11.81	53.18	13.70	1.88	0.53	1.35	69.02	16.84	85.86	0.121	No	No	0.38
66	11.97	52.99	15.14	1.90	0.53	1.34	67.45	20.68	88.13	0.124	No	No	0.39
67	12.14	52.11	14.92	1.90	0.53	1.34	65.68	19.93	85.62	0.121	No	No	0.38
68	12.30	52.01	12.55	1.87	0.55	1.35	65.57	13.40	78.97	0.115	No	No	0.35
69	12.47	51.56	12.37	1.87	0.55	1.34	67.13	13.00	80.13	0.116	No	No	0.35
70	12.63	50.45	13.85	1.89	0.54	1.34	63.74	16.87	80.61	0.116	No	No	0.35
71	12.79	49.06	15.46	1.91	0.54	1.33	60.50	20.93	81.43	0.117	No	No	0.35
72	12.96	49.09	15.53	1.91	0.54	1.33	61.05	21.15	82.20	0.118	No	No	0.35
73	13.12	50.56	15.13	1.90	0.54	1.32	62.99	20.29	83.28	0.119	No	No	0.35
74	13.29	51.89	14.37	1.89	0.54	1.32	65.22	18.41	83.63	0.119	No	No	0.35
75	13.45	52.88	13.00	1.88	0.55	1.32	65.56	14.66	80.22	0.116	No	No	0.34
76	13.62	54.37	10.87	1.85	0.56	1.32	66.69	8.93	75.63	0.112	No	No	0.33
77	13.78	56.49	8.53	1.82	0.56	1.32	70.92	3.69	74.61	0.111	No	No	0.32
78	13.94	58.54	6.12	1.79	0.56	1.31	73.33	0.62	73.95	0.111	No	No	0.32
79	14.11	57.93	6.00	1.79	0.56	1.31	73.77	0.55	74.31	0.111	No	No	0.32
80	14.27	57.50	6.54	1.79	0.57	1.31	68.43	0.93	69.36	0.107	No	No	0.30
81	14.44	57.53	7.44	1.81	0.56	1.30	71.12	1.93	73.05	0.110	No	No	0.31
82	14.60	58.65	7.72	1.81	0.56	1.30	73.05	2.34	75.40	0.112	No	No	0.32
83	14.76	52.39	11.93	1.86	0.54	1.28	70.73	11.97	82.70	0.118	No	No	0.33
84	14.93	39.14	24.19	2.01	0.54	1.27	46.89	37.17	84.06	0.120	No	No	0.34
85	15.09	24.64	44.36	2.27	0.56	1.29	24.20	50.05	74.26	0.111	No	No	0.31
86	15.26	15.44	67.29	2.55	0.56	1.28	18.12	55.39	73.51	0.110	No	No	0.30
87	15.42	13.10	75.91	2.66	0.58	1.29	13.72	0.00	13.72	4.000	No	Yes	2.00
88	15.58	15.15	69.44	2.58	0.57	1.28	15.47	55.02	70.49	0.108	No	No	0.29
89	15.75	19.03	58.14	2.44	0.55	1.26	25.07	55.25	80.32	0.116	No	No	0.32
90	15.91	22.17	53.14	2.38	0.54	1.26	26.99	54.27	81.26	0.117	No	No	0.32
91	16.08	22.50	55.45	2.41	0.54	1.25	25.98	54.73	80.71	0.117	No	No	0.32
92	16.24	21.86	61.05	2.48	0.54	1.25	25.64	56.17	81.81	0.118	No	No	0.32
93	16.40	21.42	65.31	2.53	0.54	1.25	24.39	56.79	81.18	0.117	No	No	0.32
94	16.57	21.79	68.87	2.57	0.54	1.24	24.34	57.49	81.84	0.118	No	No	0.32
95	16.73	25.03	67.35	2.55	0.53	1.23	26.75	57.89	84.64	0.120	No	No	0.32
96	16.90	30.12	63.00	2.50	0.51	1.22	34.96	59.28	94.24	0.130	No	No	0.35

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

Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
97	17.06	36.90	56.95	2.42	0.50	1.21	40.73	59.24	99.97	0.137	No	No	0.37
98	17.22	55.27	39.93	2.21	0.49	1.20	48.29	53.53	101.82	0.140	No	No	0.38
99	17.39	83.19	21.81	1.99	0.43	1.17	93.60	40.25	133.85	0.210	No	No	0.59
100	17.55	109.57	9.90	1.84	0.42	1.16	131.93	8.29	140.21	0.236	No	No	0.66
101	17.72	114.88	8.79	1.82	0.42	1.16	134.66	5.28	139.94	0.234	No	No	0.66
102	17.88	100.73	17.15	1.93	0.42	1.16	111.34	30.67	142.01	0.244	No	No	0.68
103	18.05	79.96	33.54	2.13	0.42	1.15	84.65	56.57	141.22	0.240	No	No	0.67
104	18.21	72.59	44.30	2.27	0.44	1.16	66.29	60.66	126.95	0.189	No	No	0.51
105	18.37	84.33	43.73	2.26	0.40	1.14	85.91	65.26	151.17	0.297	No	No	0.84
106	18.54	113.88	32.51	2.12	0.35	1.12	119.38	62.90	182.28	0.798	No	No	2.00
107	18.70	129.48	28.18	2.06	0.31	1.10	154.95	63.56	218.51	4.000	No	No	2.00
108	18.86	114.36	33.52	2.13	0.33	1.11	132.30	66.97	199.27	1.816	No	No	2.00
109	19.03	76.52	51.53	2.36	0.42	1.13	72.35	65.86	138.21	0.227	No	No	0.62
110	19.19	42.83	79.24	2.70	0.49	1.15	38.83	0.00	38.83	4.000	No	Yes	2.00
111	19.36	29.03	98.06	2.94	0.52	1.16	28.00	0.00	28.00	4.000	No	Yes	2.00
112	19.52	27.23	100.00	2.99	0.52	1.16	28.44	0.00	28.44	4.000	No	Yes	2.00
113	19.68	28.50	100.00	2.96	0.51	1.15	32.72	0.00	32.72	4.000	No	Yes	2.00
114	19.85	29.18	97.78	2.93	0.51	1.14	31.66	0.00	31.66	4.000	No	Yes	2.00
115	20.01	27.48	96.71	2.92	0.51	1.14	30.24	0.00	30.24	4.000	No	Yes	2.00
116	20.18	27.39	90.41	2.84	0.53	1.14	27.01	0.00	27.01	4.000	No	Yes	2.00
117	20.34	28.39	82.41	2.74	0.52	1.14	30.84	0.00	30.84	4.000	No	Yes	2.00
118	20.50	30.88	74.89	2.65	0.51	1.13	32.90	0.00	32.90	4.000	No	Yes	2.00
119	20.67	34.18	69.08	2.58	0.51	1.13	34.29	60.43	94.72	0.131	No	No	0.33
120	20.83	38.12	63.62	2.51	0.49	1.12	40.67	61.06	101.73	0.140	No	No	0.35
121	21.00	38.83	63.17	2.50	0.48	1.11	44.44	62.02	106.46	0.147	No	No	0.37
122	21.16	34.22	71.03	2.60	0.50	1.12	36.11	0.00	36.11	4.000	No	Yes	2.00
123	21.32	25.97	86.65	2.80	0.53	1.12	26.40	0.00	26.40	4.000	No	Yes	2.00
124	21.49	19.86	100.00	2.99	0.55	1.12	19.11	0.00	19.11	4.000	No	Yes	2.00
125	21.65	21.21	98.94	2.95	0.56	1.12	17.12	0.00	17.12	4.000	No	Yes	2.00
126	21.82	30.69	81.59	2.73	0.52	1.11	30.31	0.00	30.31	4.000	No	Yes	2.00
127	21.98	36.29	76.74	2.67	0.47	1.09	48.15	0.00	48.15	4.000	No	Yes	2.00
128	22.15	33.86	81.88	2.74	0.50	1.10	34.43	0.00	34.43	4.000	No	Yes	2.00
129	22.31	25.23	95.23	2.90	0.54	1.10	22.78	0.00	22.78	4.000	No	Yes	2.00
130	22.47	23.15	93.46	2.88	0.54	1.10	21.53	0.00	21.53	4.000	No	Yes	2.00
131	22.64	25.01	85.79	2.78	0.52	1.09	27.67	0.00	27.67	4.000	No	Yes	2.00
132	22.80	35.49	67.34	2.55	0.53	1.09	28.17	58.30	86.47	0.122	No	No	0.30
133	22.97	51.25	49.26	2.33	0.47	1.08	52.93	59.71	112.63	0.157	No	No	0.39
134	23.13	65.18	35.76	2.16	0.44	1.07	74.82	56.53	131.35	0.202	No	No	0.51
135	23.29	63.11	35.67	2.16	0.45	1.07	69.86	55.33	125.18	0.184	No	No	0.46
136	23.46	48.03	50.79	2.35	0.49	1.07	46.56	58.66	105.22	0.145	No	No	0.36
137	23.62	31.40	78.82	2.70	0.52	1.07	29.43	0.00	29.43	4.000	No	Yes	2.00
138	23.79	21.98	100.00	3.04	0.55	1.08	19.68	0.00	19.68	4.000	No	Yes	2.00
139	23.95	19.15	100.00	3.24	0.55	1.07	17.91	0.00	17.91	4.000	No	Yes	2.00
140	24.11	22.36	100.00	3.22	0.54	1.07	20.66	0.00	20.66	4.000	No	Yes	2.00
141	24.28	30.51	100.00	3.05	0.52	1.06	29.06	0.00	29.06	4.000	No	Yes	2.00
142	24.44	36.82	93.29	2.88	0.48	1.05	41.94	0.00	41.94	4.000	No	Yes	2.00
143	24.61	40.05	79.05	2.70	0.49	1.05	39.21	0.00	39.21	4.000	No	Yes	2.00
144	24.77	41.73	63.10	2.50	0.50	1.05	38.41	60.29	98.70	0.136	No	No	0.33

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

Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
145	24.93	46.02	53.25	2.38	0.48	1.05	46.66	59.63	106.29	0.146	No	No	0.36
146	25.10	50.57	50.66	2.35	0.47	1.04	51.59	59.95	111.53	0.155	No	No	0.38
147	25.26	51.86	52.42	2.37	0.47	1.04	51.49	60.62	112.11	0.156	No	No	0.38
148	25.43	50.72	54.00	2.39	0.47	1.04	50.11	60.83	110.95	0.154	No	No	0.37
149	25.59	47.63	59.21	2.45	0.48	1.04	47.87	61.91	109.78	0.152	No	No	0.37
150	25.75	42.82	63.04	2.50	0.49	1.04	42.17	61.34	103.51	0.142	No	No	0.34
151	25.92	38.12	68.50	2.57	0.51	1.03	35.78	60.74	96.52	0.133	No	No	0.32
152	26.08	35.62	71.62	2.61	0.51	1.03	33.93	0.00	33.93	4.000	No	Yes	2.00
153	26.25	36.45	74.25	2.64	0.51	1.03	34.63	0.00	34.63	4.000	No	Yes	2.00
154	26.41	35.40	79.41	2.71	0.50	1.03	37.89	0.00	37.89	4.000	No	Yes	2.00
155	26.57	33.16	84.45	2.77	0.52	1.02	30.65	0.00	30.65	4.000	No	Yes	2.00
156	26.74	26.72	95.19	2.90	0.52	1.02	27.92	0.00	27.92	4.000	No	Yes	2.00
157	26.90	21.75	100.00	3.02	0.55	1.02	19.07	0.00	19.07	4.000	No	Yes	2.00
158	27.07	17.49	100.00	3.13	0.56	1.02	16.11	0.00	16.11	4.000	No	Yes	2.00
159	27.23	16.89	100.00	3.11	0.56	1.02	15.44	0.00	15.44	4.000	No	Yes	2.00
160	27.39	17.74	100.00	3.02	0.56	1.01	17.17	0.00	17.17	4.000	No	Yes	2.00
161	27.56	19.19	93.70	2.88	0.55	1.01	18.35	0.00	18.35	4.000	No	Yes	2.00
162	27.72	20.57	81.68	2.73	0.55	1.01	19.41	0.00	19.41	4.000	No	Yes	2.00
163	27.89	24.83	65.59	2.53	0.55	1.01	20.94	55.86	76.80	0.113	No	No	0.26
164	28.05	37.01	42.14	2.24	0.54	1.00	30.29	50.45	80.74	0.117	No	No	0.27
165	28.21	52.16	25.75	2.03	0.51	1.00	53.45	40.66	94.10	0.130	No	No	0.31
166	28.38	59.71	19.17	1.95	0.51	1.00	63.21	30.23	93.44	0.129	No	No	0.30
167	28.54	55.33	23.98	2.01	0.52	1.00	51.10	37.56	88.65	0.124	No	No	0.29
168	28.71	44.81	40.04	2.21	0.51	1.00	40.90	51.82	92.72	0.129	No	No	0.30
169	28.87	36.89	61.23	2.48	0.52	0.99	33.60	58.46	92.05	0.128	No	No	0.30
170	29.04	31.36	83.13	2.75	0.52	0.99	28.76	0.00	28.76	4.000	No	Yes	2.00
171	29.20	27.91	99.93	2.96	0.53	0.99	25.20	0.00	25.20	4.000	No	Yes	2.00
172	29.36	26.98	100.00	3.07	0.53	0.99	23.69	0.00	23.69	4.000	No	Yes	2.00
173	29.53	30.16	100.00	3.02	0.53	0.98	25.90	0.00	25.90	4.000	No	Yes	2.00
174	29.69	34.28	97.21	2.93	0.50	0.98	33.84	0.00	33.84	4.000	No	Yes	2.00
175	29.86	36.27	90.40	2.84	0.50	0.98	34.96	0.00	34.96	4.000	No	Yes	2.00
176	30.02	35.33	87.24	2.80	0.51	0.98	31.17	0.00	31.17	4.000	No	Yes	2.00
177	30.18	32.51	87.24	2.80	0.51	0.98	30.93	0.00	30.93	4.000	No	Yes	2.00
178	30.35	30.62	87.95	2.81	0.53	0.97	26.80	0.00	26.80	4.000	No	Yes	2.00
179	30.51	29.09	90.55	2.84	0.53	0.97	25.68	0.00	25.68	4.000	No	Yes	2.00
180	30.68	29.70	90.91	2.85	0.53	0.97	26.40	0.00	26.40	4.000	No	Yes	2.00
181	30.84	31.68	89.41	2.83	0.52	0.97	28.21	0.00	28.21	4.000	No	Yes	2.00
182	31.00	36.66	81.87	2.74	0.52	0.96	30.71	0.00	30.71	4.000	No	Yes	2.00
183	31.17	45.07	69.85	2.59	0.49	0.96	39.70	62.15	101.86	0.140	No	No	0.33
184	31.33	49.32	62.00	2.49	0.47	0.96	51.29	63.66	114.95	0.161	No	No	0.38
185	31.50	49.61	59.25	2.45	0.49	0.96	42.37	60.38	102.75	0.141	No	No	0.33
186	31.66	50.64	56.91	2.42	0.50	0.96	40.24	59.10	99.33	0.137	No	No	0.32
187	31.82	66.54	45.88	2.29	0.47	0.96	53.27	58.20	111.47	0.155	No	No	0.36
188	31.99	105.26	30.22	2.09	0.42	0.96	84.84	52.76	137.60	0.224	No	No	0.54
189	32.15	152.62	19.84	1.96	0.34	0.97	146.95	42.88	189.83	1.117	No	No	2.00
190	32.32	193.84	11.23	1.85	0.33	0.97	184.17	14.69	198.86	1.775	No	No	2.00
191	32.48	213.18	7.08	1.80	0.33	0.96	199.17	2.25	201.42	2.051	No	No	2.00
192	32.64	218.38	6.40	1.79	0.33	0.96	199.61	1.25	200.86	1.986	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)													
Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
193	32.81	212.89	10.89	1.85	0.31	0.96	197.89	13.87	211.76	3.925	No	No	2.00
194	32.97	201.32	17.03	1.93	0.30	0.96	183.89	38.01	221.89	4.000	No	No	2.00
195	33.14	189.26	16.60	1.92	0.33	0.96	167.29	34.71	202.00	2.122	No	No	2.00
196	33.30	182.98	12.19	1.86	0.36	0.95	163.32	17.50	180.82	0.751	No	No	1.90
197	33.47	184.02	1.19	1.73	0.38	0.95	164.25	0.00	164.25	0.420	No	No	1.03
198	33.63	186.81	0.00	1.67	0.37	0.95	168.26	0.00	168.26	0.476	No	No	1.18
199	33.79	187.43	0.00	1.66	0.37	0.95	169.68	0.00	169.68	0.499	No	No	1.24
200	33.96	183.42	0.73	1.72	0.38	0.94	165.11	0.00	165.11	0.431	No	No	1.06
201	34.12	175.90	6.22	1.79	0.39	0.94	156.32	0.93	157.25	0.345	No	No	0.84
202	34.28	165.98	9.65	1.83	0.39	0.94	148.26	7.95	156.21	0.336	No	No	0.82
203	34.45	158.47	9.38	1.83	0.41	0.93	137.12	6.92	144.04	0.254	No	No	0.61
204	34.61	154.51	7.90	1.81	0.42	0.93	134.83	3.27	138.10	0.226	No	No	0.54
205	34.78	155.87	4.69	1.77	0.43	0.93	136.24	0.10	136.34	0.219	No	No	0.52
206	34.94	159.33	1.74	1.73	0.42	0.93	139.84	0.00	139.84	0.234	No	No	0.56
207	35.10	166.53	0.00	1.69	0.41	0.93	143.49	0.00	143.49	0.251	No	No	0.60
208	35.27	167.54	0.00	1.70	0.39	0.93	155.26	0.00	155.26	0.328	No	No	0.79
209	35.43	159.67	5.53	1.78	0.42	0.92	141.89	0.39	142.28	0.245	No	No	0.58
210	35.60	156.70	10.38	1.84	0.44	0.92	121.64	9.45	131.09	0.201	No	No	0.47
211	35.76	181.13	2.94	1.75	0.41	0.92	146.35	0.00	146.35	0.266	No	No	0.64
212	35.92	234.84	0.00	1.58	0.32	0.94	208.94	0.00	208.94	3.254	No	No	2.00
213	36.09	299.91	0.00	1.42	0.26	0.95	269.61	0.00	269.61	4.000	No	No	2.00
214	36.25	349.29	0.00	1.37	0.26	0.95	324.71	0.00	324.71	4.000	No	No	2.00
215	36.42	370.40	0.00	1.38	0.26	0.95	342.90	0.00	342.90	4.000	No	No	2.00
216	36.58	363.58	0.00	1.45	0.26	0.94	325.18	0.00	325.18	4.000	No	No	2.00
217	36.74	348.73	0.00	1.47	0.26	0.94	305.36	0.00	305.36	4.000	No	No	2.00
218	36.91	339.35	0.00	1.44	0.26	0.94	302.02	0.00	302.02	4.000	No	No	2.00
219	37.07	338.65	0.00	1.38	0.26	0.94	299.07	0.00	299.07	4.000	No	No	2.00
220	37.24	341.33	0.00	1.38	0.26	0.94	302.50	0.00	302.50	4.000	No	No	2.00
221	37.40	348.75	0.00	1.41	0.26	0.94	308.17	0.00	308.17	4.000	No	No	2.00
222	37.57	342.84	0.00	1.47	0.26	0.94	317.75	0.00	317.75	4.000	No	No	2.00
223	37.73	342.66	0.00	1.49	0.26	0.94	285.66	0.00	285.66	4.000	No	No	2.00
224	37.89	341.09	0.00	1.50	0.26	0.94	306.65	0.00	306.65	4.000	No	No	2.00
225	38.06	358.39	0.00	1.43	0.26	0.94	312.52	0.00	312.52	4.000	No	No	2.00
226	38.22	372.99	0.00	1.30	0.26	0.93	330.58	0.00	330.58	4.000	No	No	2.00
227	38.39	391.40	0.00	1.20	0.26	0.93	344.29	0.00	344.29	4.000	No	No	2.00
228	38.55	408.33	0.00	1.17	0.26	0.93	360.20	0.00	360.20	4.000	No	No	2.00
229	38.71	421.40	0.00	1.21	0.26	0.93	374.28	0.00	374.28	4.000	No	No	2.00
230	38.88	427.31	0.00	1.22	0.26	0.93	377.66	0.00	377.66	4.000	No	No	2.00
231	39.04	418.90	0.00	1.22	0.26	0.93	374.63	0.00	374.63	4.000	No	No	2.00
232	39.21	401.54	0.00	1.26	0.26	0.93	350.93	0.00	350.93	4.000	No	No	2.00
233	39.37	389.68	0.00	1.29	0.26	0.93	330.79	0.00	330.79	4.000	No	No	2.00
234	39.53	393.48	0.00	1.27	0.26	0.93	342.33	0.00	342.33	4.000	No	No	2.00
235	39.70	408.36	0.00	1.25	0.26	0.93	359.78	0.00	359.78	4.000	No	No	2.00
236	39.86	418.10	0.00	1.24	0.26	0.92	368.73	0.00	368.73	4.000	No	No	2.00
237	40.03	402.57	0.00	1.26	0.26	0.92	366.68	0.00	366.68	4.000	No	No	2.00
238	40.19	338.71	0.00	1.36	0.26	0.92	318.05	0.00	318.05	4.000	No	No	2.00
239	40.35	235.90	0.00	1.57	0.33	0.90	196.57	0.00	196.57	1.568	No	No	2.00
240	40.52	139.85	13.20	1.88	0.48	0.86	90.98	16.82	107.80	0.149	No	No	0.34

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)													
Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
241	40.68	78.81	40.57	2.22	0.46	0.87	62.85	57.48	120.33	0.172	No	No	0.40
242	40.85	53.51	57.65	2.43	0.51	0.85	38.13	58.74	96.86	0.134	No	No	0.31
243	41.01	38.50	74.17	2.64	0.53	0.84	28.10	0.00	28.10	4.000	No	Yes	2.00
244	41.17	32.89	82.97	2.75	0.53	0.84	24.91	0.00	24.91	4.000	No	Yes	2.00
245	41.34	32.73	87.81	2.81	0.54	0.84	24.11	0.00	24.11	4.000	No	Yes	2.00
246	41.50	32.94	89.81	2.84	0.52	0.84	28.02	0.00	28.02	4.000	No	Yes	2.00
247	41.67	33.03	91.50	2.86	0.53	0.84	25.08	0.00	25.08	4.000	No	Yes	2.00
248	41.83	30.19	94.56	2.89	0.53	0.84	24.06	0.00	24.06	4.000	No	Yes	2.00
249	41.99	27.66	96.35	2.92	0.54	0.83	20.85	0.00	20.85	4.000	No	Yes	2.00
250	42.16	25.19	97.91	2.94	0.55	0.83	19.04	0.00	19.04	4.000	No	Yes	2.00
251	42.32	23.43	97.89	2.94	0.55	0.83	18.13	0.00	18.13	4.000	No	Yes	2.00
252	42.49	21.95	99.59	2.96	0.56	0.82	16.63	0.00	16.63	4.000	No	Yes	2.00
253	42.65	19.74	100.00	3.02	0.56	0.82	15.53	0.00	15.53	4.000	No	Yes	2.00
254	42.81	18.07	100.00	3.11	0.57	0.82	12.88	0.00	12.88	4.000	No	Yes	2.00
255	42.98	17.26	100.00	3.17	0.57	0.81	12.61	0.00	12.61	4.000	No	Yes	2.00
256	43.14	17.90	100.00	3.16	0.57	0.81	13.50	0.00	13.50	4.000	No	Yes	2.00
257	43.31	18.53	100.00	3.13	0.57	0.81	14.29	0.00	14.29	4.000	No	Yes	2.00
258	43.47	17.92	100.00	3.14	0.57	0.81	14.02	0.00	14.02	4.000	No	Yes	2.00
259	43.63	16.35	100.00	3.19	0.57	0.81	12.06	0.00	12.06	4.000	No	Yes	2.00
260	43.80	14.65	100.00	3.25	0.58	0.81	10.64	0.00	10.64	4.000	No	Yes	2.00
261	43.96	13.79	100.00	3.28	0.58	0.80	10.05	0.00	10.05	4.000	No	Yes	2.00
262	44.13	14.30	100.00	3.24	0.58	0.80	10.03	0.00	10.03	4.000	No	Yes	2.00
263	44.29	15.62	100.00	3.17	0.58	0.80	11.67	0.00	11.67	4.000	No	Yes	2.00
264	44.45	17.01	100.00	3.11	0.57	0.80	12.94	0.00	12.94	4.000	No	Yes	2.00
265	44.62	17.46	100.00	3.08	0.57	0.80	13.12	0.00	13.12	4.000	No	Yes	2.00
266	44.78	17.37	100.00	3.07	0.57	0.80	12.63	0.00	12.63	4.000	No	Yes	2.00
267	44.95	17.72	100.00	3.03	0.57	0.80	12.67	0.00	12.67	4.000	No	Yes	2.00
268	45.11	19.60	98.16	2.94	0.57	0.80	13.83	0.00	13.83	4.000	No	Yes	2.00
269	45.28	20.08	97.26	2.93	0.56	0.80	16.98	0.00	16.98	4.000	No	Yes	2.00
270	45.44	19.26	100.00	2.98	0.57	0.80	13.77	0.00	13.77	4.000	No	Yes	2.00
271	45.60	16.65	100.00	3.11	0.57	0.79	11.95	0.00	11.95	4.000	No	Yes	2.00
272	45.77	14.60	100.00	3.27	0.58	0.79	10.83	0.00	10.83	4.000	No	Yes	2.00
273	45.93	13.54	100.00	3.38	0.59	0.79	8.97	0.00	8.97	4.000	No	Yes	2.00
274	46.10	12.55	100.00	3.48	0.58	0.79	9.41	0.00	9.41	4.000	No	Yes	2.00
275	46.26	12.25	100.00	3.51	0.59	0.78	8.45	0.00	8.45	4.000	No	Yes	2.00
276	46.42	12.16	100.00	3.51	0.59	0.78	8.14	0.00	8.14	4.000	No	Yes	2.00
277	46.59	14.36	100.00	3.36	0.59	0.78	9.24	0.00	9.24	4.000	No	Yes	2.00
278	46.75	18.41	100.00	3.13	0.57	0.79	13.32	0.00	13.32	4.000	No	Yes	2.00
279	46.92	23.48	96.21	2.92	0.56	0.79	17.17	0.00	17.17	4.000	No	Yes	2.00
280	47.08	27.23	85.71	2.78	0.55	0.79	20.26	0.00	20.26	4.000	No	Yes	2.00
281	47.24	29.00	79.63	2.71	0.55	0.79	21.40	0.00	21.40	4.000	No	Yes	2.00
282	47.41	30.22	75.53	2.66	0.55	0.79	20.75	0.00	20.75	4.000	No	Yes	2.00
283	47.57	32.02	71.22	2.60	0.55	0.79	22.92	0.00	22.92	4.000	No	Yes	2.00
284	47.74	34.99	67.89	2.56	0.54	0.79	25.15	57.54	82.70	0.118	No	No	0.27
285	47.90	36.82	68.71	2.57	0.53	0.79	27.00	58.24	85.24	0.121	No	No	0.28
286	48.06	37.03	74.36	2.64	0.53	0.79	26.33	0.00	26.33	4.000	No	Yes	2.00
287	48.23	35.55	82.01	2.74	0.53	0.79	25.28	0.00	25.28	4.000	No	Yes	2.00
288	48.39	33.76	88.73	2.82	0.54	0.79	23.61	0.00	23.61	4.000	No	Yes	2.00

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

Point ID	Depth (ft)	q_t (tsf)	FC (%)	I_c	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	CRR _{7.5}	Belongs to trans. layer	Clay-like behaviour	FS
289	48.56	32.72	90.78	2.85	0.54	0.78	22.34	0.00	22.34	4.000	No	Yes	2.00
290	48.72	32.75	89.83	2.84	0.54	0.78	22.84	0.00	22.84	4.000	No	Yes	2.00
291	48.88	34.52	86.03	2.79	0.54	0.78	23.53	0.00	23.53	4.000	No	Yes	2.00
292	49.05	38.76	79.84	2.71	0.53	0.78	26.10	0.00	26.10	4.000	No	Yes	2.00
293	49.21	43.87	73.36	2.63	0.51	0.79	32.27	0.00	32.27	4.000	No	Yes	2.00
294	49.38	50.18	65.85	2.54	0.51	0.79	34.77	59.89	94.65	0.131	No	No	0.30
295	49.54	57.58	57.64	2.43	0.50	0.79	40.16	59.30	99.46	0.137	No	No	0.32
296	49.70	71.83	44.65	2.27	0.49	0.80	48.71	56.40	105.11	0.145	No	No	0.33
297	49.87	78.47	38.78	2.20	0.44	0.81	69.83	57.87	127.70	0.191	No	No	0.44
298	50.03	74.13	41.51	2.23	0.47	0.80	57.36	56.75	114.11	0.159	No	No	0.37
299	50.20	61.76	51.57	2.36	0.50	0.79	40.42	57.32	97.74	0.135	No	No	0.31

Abbreviations

Depth:	Depth from free surface, at which CPT was performed (ft)
q_t :	Total cone resistance
FC:	Fines content (%)
I_c :	Soil behavior type index
m:	Stress exponent
C_N :	Overburden correction factor
q_{c1N} :	Normalized and adjusted cone resistance
Δq_{c1N} :	Cone resistance correction factor due to fines
$q_{c1N,cs}$:	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	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}	Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}
1.31	2.00	0.00	0.00	0.16	0.00	1.48	2.00	0.00	0.00	0.16	0.00
1.64	2.00	0.00	0.00	0.16	0.00	1.80	2.00	0.00	0.00	0.16	0.00
1.97	2.00	0.00	0.00	0.17	0.00	2.13	2.00	0.00	0.00	0.16	0.00
2.30	2.00	0.00	0.00	0.16	0.00	2.46	2.00	0.00	0.00	0.16	0.00
2.63	2.00	0.00	0.00	0.16	0.00	2.79	2.00	0.00	0.00	0.16	0.00
2.95	2.00	0.00	0.00	0.16	0.00	3.12	2.00	0.00	0.00	0.16	0.00
3.28	2.00	0.00	0.00	0.16	0.00	3.44	2.00	0.00	0.00	0.16	0.00
3.61	2.00	0.00	0.00	0.16	0.00	3.77	2.00	0.00	0.00	0.16	0.00
3.94	2.00	0.00	0.00	0.16	0.00	4.10	2.00	0.00	0.00	0.16	0.00
4.26	2.00	0.00	0.00	0.16	0.00	4.43	2.00	0.00	0.00	0.16	0.00
4.59	2.00	0.00	0.00	0.16	0.00	4.76	2.00	0.00	0.00	0.16	0.00
4.92	2.00	0.00	0.00	0.16	0.00	5.08	2.00	0.00	0.00	0.16	0.00
5.25	2.00	0.00	0.00	0.16	0.00	5.41	2.00	0.00	0.00	0.16	0.00
5.58	2.00	0.00	0.00	0.16	0.00	5.74	2.00	0.00	0.00	0.16	0.00
5.91	2.00	0.00	0.00	0.17	0.00	6.07	2.00	0.00	0.00	0.16	0.00
6.23	2.00	0.00	0.00	0.16	0.00	6.40	2.00	0.00	0.00	0.16	0.00
6.56	2.00	0.00	0.00	0.16	0.00	6.73	2.00	0.00	0.00	0.16	0.00
6.89	2.00	0.00	0.00	0.16	0.00	7.05	2.00	0.00	0.00	0.16	0.00
7.22	2.00	0.00	0.00	0.16	0.00	7.38	2.00	0.00	0.00	0.16	0.00
7.55	2.00	0.00	0.00	0.16	0.00	7.71	2.00	0.00	0.00	0.16	0.00
7.87	2.00	0.00	0.00	0.16	0.00	8.04	2.00	0.00	0.00	0.16	0.00
8.20	2.00	0.00	0.00	0.16	0.00	8.37	2.00	0.00	0.00	0.16	0.00
8.53	2.00	0.00	0.00	0.16	0.00	8.69	2.00	0.00	0.00	0.16	0.00
8.86	2.00	0.00	0.00	0.16	0.00	9.02	0.45	0.55	0.43	0.16	0.24
9.19	0.45	0.55	0.43	0.16	0.24	9.35	0.44	0.56	0.42	0.16	0.24
9.51	0.44	0.56	0.41	0.16	0.24	9.68	0.43	0.57	0.41	0.16	0.24
9.84	0.43	0.57	0.41	0.16	0.24	10.01	0.43	0.57	0.41	0.16	0.24
10.17	0.42	0.58	0.40	0.16	0.25	10.34	0.42	0.58	0.40	0.16	0.25
10.50	0.42	0.58	0.40	0.16	0.24	10.66	0.38	0.62	0.37	0.16	0.26
10.83	0.41	0.59	0.40	0.16	0.24	10.99	0.39	0.61	0.38	0.16	0.25
11.15	0.39	0.61	0.38	0.16	0.25	11.32	0.38	0.62	0.37	0.16	0.26
11.48	0.37	0.63	0.37	0.16	0.26	11.65	0.37	0.63	0.36	0.16	0.26
11.81	0.38	0.62	0.37	0.16	0.25	11.97	0.39	0.61	0.38	0.16	0.25
12.14	0.38	0.62	0.37	0.16	0.25	12.30	0.35	0.65	0.35	0.16	0.26
12.47	0.35	0.65	0.35	0.16	0.26	12.63	0.35	0.65	0.35	0.16	0.26
12.79	0.35	0.65	0.35	0.16	0.26	12.96	0.35	0.65	0.35	0.16	0.26
13.12	0.35	0.65	0.35	0.16	0.26	13.29	0.35	0.65	0.35	0.16	0.26
13.45	0.34	0.66	0.35	0.16	0.26	13.62	0.33	0.67	0.34	0.16	0.27
13.78	0.32	0.68	0.33	0.16	0.27	13.94	0.32	0.68	0.33	0.16	0.27
14.11	0.32	0.68	0.33	0.16	0.27	14.27	0.30	0.70	0.32	0.16	0.27
14.44	0.31	0.69	0.33	0.16	0.27	14.60	0.32	0.68	0.33	0.16	0.27
14.76	0.33	0.67	0.34	0.16	0.26	14.93	0.34	0.66	0.34	0.16	0.26
15.09	0.31	0.69	0.33	0.16	0.27	15.26	0.30	0.70	0.32	0.16	0.27
15.42	2.00	0.00	0.00	0.16	0.00	15.58	0.29	0.71	0.32	0.16	0.27
15.75	0.32	0.68	0.33	0.16	0.26	15.91	0.32	0.68	0.33	0.16	0.26
16.08	0.32	0.68	0.33	0.16	0.26	16.24	0.32	0.68	0.33	0.16	0.26
16.40	0.32	0.68	0.33	0.16	0.26	16.57	0.32	0.68	0.33	0.16	0.26
16.73	0.32	0.68	0.33	0.16	0.25	16.90	0.35	0.65	0.35	0.16	0.24

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}	Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}
17.06	0.37	0.63	0.36	0.16	0.23	17.22	0.38	0.62	0.37	0.16	0.23
17.39	0.59	0.41	0.61	0.16	0.15	17.55	0.66	0.34	0.79	0.16	0.12
17.72	0.66	0.34	0.77	0.16	0.13	17.88	0.68	0.32	0.86	0.16	0.11
18.05	0.67	0.33	0.81	0.16	0.12	18.21	0.51	0.49	0.50	0.16	0.18
18.37	0.84	0.00	0.00	0.16	0.06	18.54	2.00	0.00	0.00	0.16	0.00
18.70	2.00	0.00	0.00	0.16	0.00	18.86	2.00	0.00	0.00	0.16	0.00
19.03	0.62	0.38	0.67	0.16	0.14	19.19	2.00	0.00	0.00	0.16	0.00
19.36	2.00	0.00	0.00	0.16	0.00	19.52	2.00	0.00	0.00	0.16	0.00
19.68	2.00	0.00	0.00	0.16	0.00	19.85	2.00	0.00	0.00	0.16	0.00
20.01	2.00	0.00	0.00	0.16	0.00	20.18	2.00	0.00	0.00	0.16	0.00
20.34	2.00	0.00	0.00	0.16	0.00	20.50	2.00	0.00	0.00	0.16	0.00
20.67	0.33	0.67	0.34	0.16	0.23	20.83	0.35	0.65	0.35	0.16	0.22
21.00	0.37	0.63	0.37	0.16	0.21	21.16	2.00	0.00	0.00	0.16	0.00
21.32	2.00	0.00	0.00	0.16	0.00	21.49	2.00	0.00	0.00	0.16	0.00
21.65	2.00	0.00	0.00	0.16	0.00	21.82	2.00	0.00	0.00	0.16	0.00
21.98	2.00	0.00	0.00	0.16	0.00	22.15	2.00	0.00	0.00	0.16	0.00
22.31	2.00	0.00	0.00	0.16	0.00	22.47	2.00	0.00	0.00	0.16	0.00
22.64	2.00	0.00	0.00	0.16	0.00	22.80	0.30	0.70	0.32	0.16	0.23
22.97	0.39	0.61	0.38	0.16	0.20	23.13	0.51	0.49	0.49	0.16	0.16
23.29	0.46	0.54	0.44	0.16	0.17	23.46	0.36	0.64	0.36	0.16	0.21
23.62	2.00	0.00	0.00	0.16	0.00	23.79	2.00	0.00	0.00	0.16	0.00
23.95	2.00	0.00	0.00	0.16	0.00	24.11	2.00	0.00	0.00	0.16	0.00
24.28	2.00	0.00	0.00	0.16	0.00	24.44	2.00	0.00	0.00	0.16	0.00
24.61	2.00	0.00	0.00	0.16	0.00	24.77	0.33	0.67	0.34	0.16	0.21
24.93	0.36	0.64	0.35	0.16	0.20	25.10	0.38	0.62	0.37	0.16	0.19
25.26	0.38	0.62	0.37	0.16	0.19	25.43	0.37	0.63	0.37	0.16	0.19
25.59	0.37	0.63	0.36	0.16	0.19	25.75	0.34	0.66	0.35	0.16	0.20
25.92	0.32	0.68	0.33	0.16	0.21	26.08	2.00	0.00	0.00	0.16	0.00
26.25	2.00	0.00	0.00	0.16	0.00	26.41	2.00	0.00	0.00	0.16	0.00
26.57	2.00	0.00	0.00	0.16	0.00	26.74	2.00	0.00	0.00	0.16	0.00
26.90	2.00	0.00	0.00	0.16	0.00	27.07	2.00	0.00	0.00	0.16	0.00
27.23	2.00	0.00	0.00	0.16	0.00	27.39	2.00	0.00	0.00	0.16	0.00
27.56	2.00	0.00	0.00	0.16	0.00	27.72	2.00	0.00	0.00	0.16	0.00
27.89	0.26	0.74	0.30	0.16	0.21	28.05	0.27	0.73	0.31	0.16	0.21
28.21	0.31	0.69	0.33	0.16	0.20	28.38	0.30	0.70	0.32	0.16	0.20
28.54	0.29	0.71	0.32	0.16	0.20	28.71	0.30	0.70	0.32	0.16	0.20
28.87	0.30	0.70	0.32	0.16	0.20	29.04	2.00	0.00	0.00	0.16	0.00
29.20	2.00	0.00	0.00	0.16	0.00	29.36	2.00	0.00	0.00	0.16	0.00
29.53	2.00	0.00	0.00	0.16	0.00	29.69	2.00	0.00	0.00	0.16	0.00
29.86	2.00	0.00	0.00	0.16	0.00	30.02	2.00	0.00	0.00	0.16	0.00
30.18	2.00	0.00	0.00	0.16	0.00	30.35	2.00	0.00	0.00	0.16	0.00
30.51	2.00	0.00	0.00	0.16	0.00	30.68	2.00	0.00	0.00	0.16	0.00
30.84	2.00	0.00	0.00	0.16	0.00	31.00	2.00	0.00	0.00	0.16	0.00
31.17	0.33	0.67	0.34	0.16	0.18	31.33	0.38	0.62	0.37	0.16	0.16
31.50	0.33	0.67	0.34	0.16	0.17	31.66	0.32	0.68	0.33	0.16	0.18
31.82	0.36	0.64	0.36	0.16	0.16	31.99	0.54	0.46	0.53	0.16	0.12
32.15	2.00	0.00	0.00	0.16	0.00	32.32	2.00	0.00	0.00	0.16	0.00
32.48	2.00	0.00	0.00	0.16	0.00	32.64	2.00	0.00	0.00	0.16	0.00

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}	Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}
32.81	2.00	0.00	0.00	0.16	0.00	32.97	2.00	0.00	0.00	0.16	0.00
33.14	2.00	0.00	0.00	0.16	0.00	33.30	1.90	0.00	0.00	0.16	0.00
33.47	1.03	0.00	0.00	0.16	0.00	33.63	1.18	0.00	0.00	0.16	0.00
33.79	1.24	0.00	0.00	0.16	0.00	33.96	1.06	0.00	0.00	0.16	0.00
34.12	0.84	0.00	0.00	0.16	0.04	34.28	0.82	0.00	0.00	0.16	0.04
34.45	0.61	0.39	0.64	0.16	0.09	34.61	0.54	0.46	0.53	0.16	0.11
34.78	0.52	0.48	0.50	0.16	0.11	34.94	0.56	0.44	0.55	0.16	0.10
35.10	0.60	0.40	0.63	0.16	0.09	35.27	0.79	0.00	0.00	0.16	0.05
35.43	0.58	0.42	0.60	0.16	0.10	35.60	0.47	0.53	0.45	0.16	0.12
35.76	0.64	0.36	0.71	0.16	0.08	35.92	2.00	0.00	0.00	0.16	0.00
36.09	2.00	0.00	0.00	0.16	0.00	36.25	2.00	0.00	0.00	0.16	0.00
36.42	2.00	0.00	0.00	0.16	0.00	36.58	2.00	0.00	0.00	0.16	0.00
36.74	2.00	0.00	0.00	0.16	0.00	36.91	2.00	0.00	0.00	0.16	0.00
37.07	2.00	0.00	0.00	0.16	0.00	37.24	2.00	0.00	0.00	0.16	0.00
37.40	2.00	0.00	0.00	0.16	0.00	37.57	2.00	0.00	0.00	0.16	0.00
37.73	2.00	0.00	0.00	0.16	0.00	37.89	2.00	0.00	0.00	0.16	0.00
38.06	2.00	0.00	0.00	0.16	0.00	38.22	2.00	0.00	0.00	0.16	0.00
38.39	2.00	0.00	0.00	0.16	0.00	38.55	2.00	0.00	0.00	0.16	0.00
38.71	2.00	0.00	0.00	0.16	0.00	38.88	2.00	0.00	0.00	0.16	0.00
39.04	2.00	0.00	0.00	0.16	0.00	39.21	2.00	0.00	0.00	0.16	0.00
39.37	2.00	0.00	0.00	0.16	0.00	39.53	2.00	0.00	0.00	0.16	0.00
39.70	2.00	0.00	0.00	0.16	0.00	39.86	2.00	0.00	0.00	0.16	0.00
40.03	2.00	0.00	0.00	0.16	0.00	40.19	2.00	0.00	0.00	0.16	0.00
40.35	2.00	0.00	0.00	0.16	0.00	40.52	0.34	0.66	0.35	0.16	0.13
40.68	0.40	0.60	0.39	0.16	0.11	40.85	0.31	0.69	0.33	0.16	0.13
41.01	2.00	0.00	0.00	0.17	0.00	41.17	2.00	0.00	0.00	0.16	0.00
41.34	2.00	0.00	0.00	0.16	0.00	41.50	2.00	0.00	0.00	0.16	0.00
41.67	2.00	0.00	0.00	0.16	0.00	41.83	2.00	0.00	0.00	0.16	0.00
41.99	2.00	0.00	0.00	0.16	0.00	42.16	2.00	0.00	0.00	0.16	0.00
42.32	2.00	0.00	0.00	0.16	0.00	42.49	2.00	0.00	0.00	0.16	0.00
42.65	2.00	0.00	0.00	0.16	0.00	42.81	2.00	0.00	0.00	0.16	0.00
42.98	2.00	0.00	0.00	0.16	0.00	43.14	2.00	0.00	0.00	0.16	0.00
43.31	2.00	0.00	0.00	0.16	0.00	43.47	2.00	0.00	0.00	0.16	0.00
43.63	2.00	0.00	0.00	0.16	0.00	43.80	2.00	0.00	0.00	0.16	0.00
43.96	2.00	0.00	0.00	0.16	0.00	44.13	2.00	0.00	0.00	0.16	0.00
44.29	2.00	0.00	0.00	0.16	0.00	44.45	2.00	0.00	0.00	0.16	0.00
44.62	2.00	0.00	0.00	0.16	0.00	44.78	2.00	0.00	0.00	0.16	0.00
44.95	2.00	0.00	0.00	0.16	0.00	45.11	2.00	0.00	0.00	0.16	0.00
45.28	2.00	0.00	0.00	0.16	0.00	45.44	2.00	0.00	0.00	0.16	0.00
45.60	2.00	0.00	0.00	0.16	0.00	45.77	2.00	0.00	0.00	0.16	0.00
45.93	2.00	0.00	0.00	0.16	0.00	46.10	2.00	0.00	0.00	0.16	0.00
46.26	2.00	0.00	0.00	0.16	0.00	46.42	2.00	0.00	0.00	0.16	0.00
46.59	2.00	0.00	0.00	0.16	0.00	46.75	2.00	0.00	0.00	0.16	0.00
46.92	2.00	0.00	0.00	0.16	0.00	47.08	2.00	0.00	0.00	0.16	0.00
47.24	2.00	0.00	0.00	0.16	0.00	47.41	2.00	0.00	0.00	0.16	0.00
47.57	2.00	0.00	0.00	0.16	0.00	47.74	0.27	0.73	0.31	0.16	0.10
47.90	0.28	0.72	0.31	0.16	0.10	48.06	2.00	0.00	0.00	0.16	0.00
48.23	2.00	0.00	0.00	0.16	0.00	48.39	2.00	0.00	0.00	0.16	0.00

:: Liquefaction Potential Index calculation data ::												
Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}		Depth (ft)	FS	m(FS)	H ₁ *m(FS)	d _z	LPI _{ISH}
48.56	2.00	0.00	0.00	0.16	0.00		48.72	2.00	0.00	0.00	0.16	0.00
48.88	2.00	0.00	0.00	0.16	0.00		49.05	2.00	0.00	0.00	0.16	0.00
49.21	2.00	0.00	0.00	0.16	0.00		49.38	0.30	0.70	0.32	0.16	0.09
49.54	0.32	0.68	0.33	0.16	0.08		49.70	0.33	0.67	0.34	0.16	0.08
49.87	0.44	0.56	0.42	0.16	0.07		50.03	0.37	0.63	0.36	0.16	0.07
50.20	0.31	0.69	0.33	0.16	0.08							

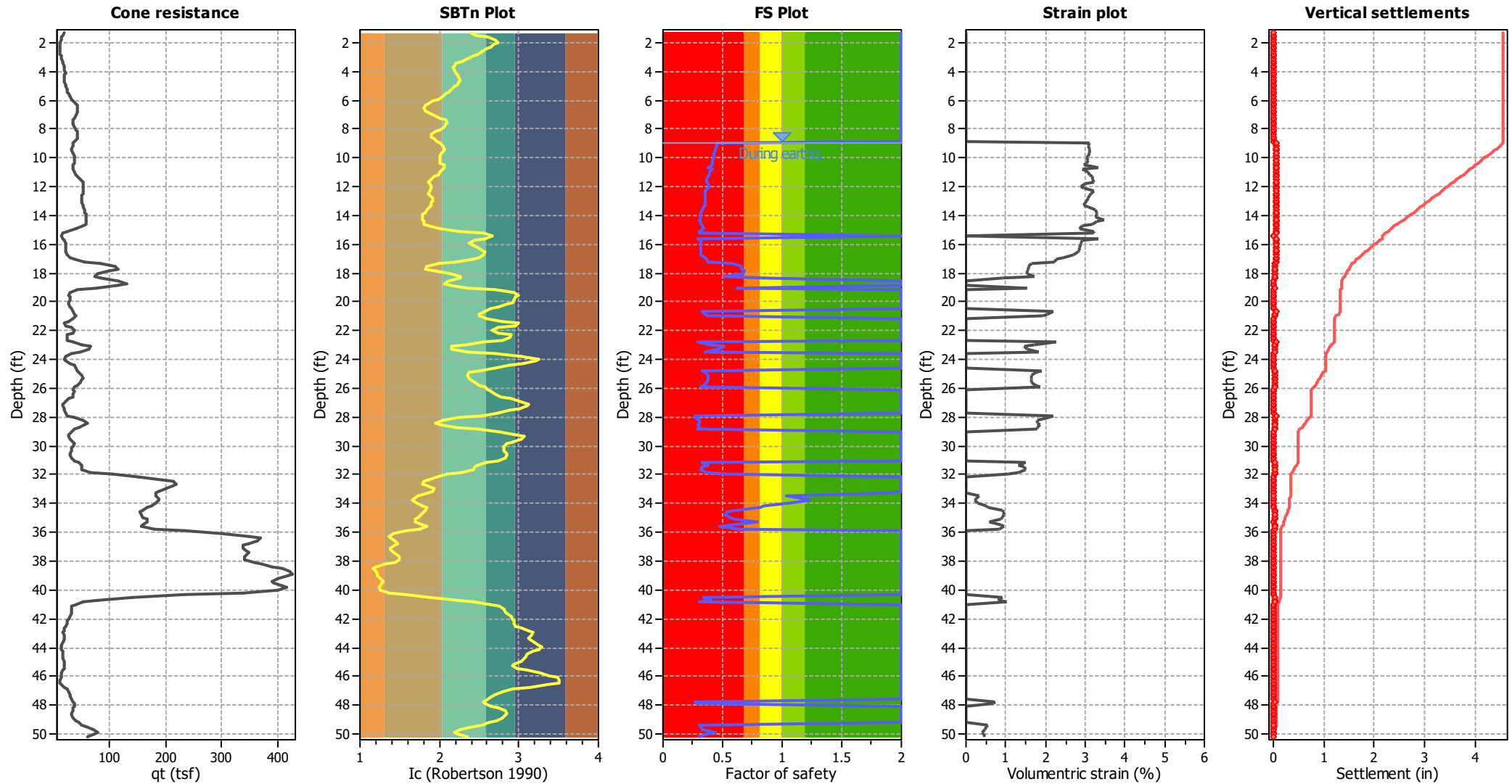
Overall liquefaction potential: 21.32

LPI_{ISH} > 5.0 - Liquefaction manifestation is expected

Abbreviations

- FS: Calculated factor of safety for test point
- 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 due to soil liquefaction ::

Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)	Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)
9.02	87.75	0.45	3.10	0.85	0.06	9.19	88.32	0.45	3.07	0.84	0.06
9.35	87.20	0.44	3.10	0.84	0.06	9.51	87.12	0.44	3.09	0.84	0.06
9.68	86.30	0.43	3.11	0.84	0.06	9.84	87.51	0.43	3.06	0.83	0.06
10.01	88.11	0.43	3.03	0.83	0.06	10.17	86.73	0.42	3.07	0.83	0.06
10.34	86.93	0.42	3.05	0.82	0.06	10.50	89.25	0.42	2.96	0.82	0.06
10.66	78.80	0.38	3.33	0.82	0.07	10.83	89.24	0.41	2.94	0.82	0.06
10.99	84.75	0.39	3.08	0.81	0.06	11.15	83.97	0.39	3.10	0.81	0.06
11.32	81.88	0.38	3.17	0.81	0.06	11.48	80.89	0.37	3.19	0.81	0.06
11.65	80.08	0.37	3.21	0.80	0.06	11.81	85.86	0.38	2.99	0.80	0.06
11.97	88.13	0.39	2.91	0.80	0.06	12.14	85.62	0.38	2.98	0.79	0.06
12.30	78.97	0.35	3.21	0.79	0.06	12.47	80.13	0.35	3.16	0.79	0.06
12.63	80.61	0.35	3.13	0.79	0.06	12.79	81.43	0.35	3.09	0.78	0.06
12.96	82.20	0.35	3.05	0.78	0.06	13.12	83.28	0.35	3.00	0.78	0.06
13.29	83.63	0.35	2.98	0.77	0.06	13.45	80.22	0.34	3.09	0.77	0.06
13.62	75.63	0.33	3.25	0.77	0.06	13.78	74.61	0.32	3.28	0.77	0.07
13.94	73.95	0.32	3.30	0.76	0.06	14.11	74.31	0.32	3.27	0.76	0.06
14.27	69.36	0.30	3.48	0.76	0.07	14.44	73.05	0.31	3.30	0.76	0.06
14.60	75.40	0.32	3.19	0.75	0.06	14.76	82.70	0.33	2.91	0.75	0.06
14.93	84.06	0.34	2.85	0.75	0.06	15.09	74.26	0.31	3.20	0.74	0.06
15.26	73.51	0.30	3.22	0.74	0.06	15.42	13.72	2.00	0.00	0.74	0.00
15.58	70.49	0.29	3.33	0.74	0.07	15.75	80.32	0.32	2.93	0.73	0.06
15.91	81.26	0.32	2.88	0.73	0.06	16.08	80.71	0.32	2.89	0.73	0.06
16.24	81.81	0.32	2.84	0.72	0.06	16.40	81.18	0.32	2.85	0.72	0.06
16.57	81.84	0.32	2.82	0.72	0.06	16.73	84.64	0.32	2.72	0.72	0.05
16.90	94.24	0.35	2.44	0.71	0.05	17.06	99.97	0.37	2.28	0.71	0.04
17.22	101.82	0.38	2.23	0.71	0.04	17.39	133.85	0.59	1.66	0.71	0.03
17.55	140.21	0.66	1.57	0.70	0.03	17.72	139.94	0.66	1.57	0.70	0.03
17.88	142.01	0.68	1.54	0.70	0.03	18.05	141.22	0.67	1.54	0.69	0.03
18.21	126.95	0.51	1.73	0.69	0.03	18.37	151.17	0.84	0.91	0.69	0.02
18.54	182.28	2.00	0.00	0.69	0.00	18.70	218.51	2.00	0.00	0.68	0.00
18.86	199.27	2.00	0.00	0.68	0.00	19.03	138.21	0.62	1.54	0.68	0.03
19.19	38.83	2.00	0.00	0.67	0.00	19.36	28.00	2.00	0.00	0.67	0.00
19.52	28.44	2.00	0.00	0.67	0.00	19.68	32.72	2.00	0.00	0.67	0.00
19.85	31.66	2.00	0.00	0.66	0.00	20.01	30.24	2.00	0.00	0.66	0.00
20.18	27.01	2.00	0.00	0.66	0.00	20.34	30.84	2.00	0.00	0.66	0.00
20.50	32.90	2.00	0.00	0.65	0.00	20.67	94.72	0.33	2.21	0.65	0.04
20.83	101.73	0.35	2.04	0.65	0.04	21.00	106.46	0.37	1.94	0.64	0.04
21.16	36.11	2.00	0.00	0.64	0.00	21.32	26.40	2.00	0.00	0.64	0.00
21.49	19.11	2.00	0.00	0.64	0.00	21.65	17.12	2.00	0.00	0.63	0.00
21.82	30.31	2.00	0.00	0.63	0.00	21.98	48.15	2.00	0.00	0.63	0.00
22.15	34.43	2.00	0.00	0.62	0.00	22.31	22.78	2.00	0.00	0.62	0.00
22.47	21.53	2.00	0.00	0.62	0.00	22.64	27.67	2.00	0.00	0.62	0.00
22.80	86.47	0.30	2.28	0.61	0.04	22.97	112.63	0.39	1.73	0.61	0.03
23.13	131.35	0.51	1.46	0.61	0.03	23.29	125.18	0.46	1.54	0.61	0.03
23.46	105.22	0.36	1.84	0.60	0.04	23.62	29.43	2.00	0.00	0.60	0.00
23.79	19.68	2.00	0.00	0.60	0.00	23.95	17.91	2.00	0.00	0.59	0.00
24.11	20.66	2.00	0.00	0.59	0.00	24.28	29.06	2.00	0.00	0.59	0.00
24.44	41.94	2.00	0.00	0.59	0.00	24.61	39.21	2.00	0.00	0.58	0.00

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

Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)	Depth (ft)	q _{c1N,cs}	FS	e _v (%)	DF	Settlement (in)
24.77	98.70	0.33	1.89	0.58	0.04	24.93	106.29	0.36	1.74	0.58	0.03
25.10	111.53	0.38	1.65	0.57	0.03	25.26	112.11	0.38	1.63	0.57	0.03
25.43	110.95	0.37	1.64	0.57	0.03	25.59	109.78	0.37	1.65	0.57	0.03
25.75	103.51	0.34	1.75	0.56	0.03	25.92	96.52	0.32	1.87	0.56	0.04
26.08	33.93	2.00	0.00	0.56	0.00	26.25	34.63	2.00	0.00	0.56	0.00
26.41	37.89	2.00	0.00	0.55	0.00	26.57	30.65	2.00	0.00	0.55	0.00
26.74	27.92	2.00	0.00	0.55	0.00	26.90	19.07	2.00	0.00	0.54	0.00
27.07	16.11	2.00	0.00	0.54	0.00	27.23	15.44	2.00	0.00	0.54	0.00
27.39	17.17	2.00	0.00	0.54	0.00	27.56	18.35	2.00	0.00	0.53	0.00
27.72	19.41	2.00	0.00	0.53	0.00	27.89	76.80	0.26	2.20	0.53	0.04
28.05	80.74	0.27	2.08	0.52	0.04	28.21	94.10	0.31	1.78	0.52	0.04
28.38	93.44	0.30	1.79	0.52	0.04	28.54	88.65	0.29	1.87	0.52	0.04
28.71	92.72	0.30	1.78	0.51	0.04	28.87	92.05	0.30	1.78	0.51	0.04
29.04	28.76	2.00	0.00	0.51	0.00	29.20	25.20	2.00	0.00	0.51	0.00
29.36	23.69	2.00	0.00	0.50	0.00	29.53	25.90	2.00	0.00	0.50	0.00
29.69	33.84	2.00	0.00	0.50	0.00	29.86	34.96	2.00	0.00	0.49	0.00
30.02	31.17	2.00	0.00	0.49	0.00	30.18	30.93	2.00	0.00	0.49	0.00
30.35	26.80	2.00	0.00	0.49	0.00	30.51	25.68	2.00	0.00	0.48	0.00
30.68	26.40	2.00	0.00	0.48	0.00	30.84	28.21	2.00	0.00	0.48	0.00
31.00	30.71	2.00	0.00	0.47	0.00	31.17	101.86	0.33	1.49	0.47	0.03
31.33	114.95	0.38	1.30	0.47	0.03	31.50	102.75	0.33	1.46	0.47	0.03
31.66	99.33	0.32	1.50	0.46	0.03	31.82	111.47	0.36	1.32	0.46	0.03
31.99	137.60	0.54	1.05	0.46	0.02	32.15	189.83	2.00	0.00	0.46	0.00
32.32	198.86	2.00	0.00	0.45	0.00	32.48	201.42	2.00	0.00	0.45	0.00
32.64	200.86	2.00	0.00	0.45	0.00	32.81	211.76	2.00	0.00	0.44	0.00
32.97	221.89	2.00	0.00	0.44	0.00	33.14	202.00	2.00	0.00	0.44	0.00
33.30	180.82	1.90	0.02	0.44	0.00	33.47	164.25	1.03	0.33	0.43	0.01
33.63	168.26	1.18	0.24	0.43	0.00	33.79	169.68	1.24	0.21	0.43	0.00
33.96	165.11	1.06	0.30	0.42	0.01	34.12	157.25	0.84	0.52	0.42	0.01
34.28	156.21	0.82	0.55	0.42	0.01	34.45	144.04	0.61	0.90	0.42	0.02
34.61	138.10	0.54	0.94	0.41	0.02	34.78	136.34	0.52	0.95	0.41	0.02
34.94	139.84	0.56	0.92	0.41	0.02	35.10	143.49	0.60	0.88	0.41	0.02
35.27	155.26	0.79	0.57	0.40	0.01	35.43	142.28	0.58	0.88	0.40	0.02
35.60	131.09	0.47	0.96	0.40	0.02	35.76	146.35	0.64	0.84	0.39	0.02
35.92	208.94	2.00	0.00	0.39	0.00	36.09	269.61	2.00	0.00	0.39	0.00
36.25	324.71	2.00	0.00	0.39	0.00	36.42	342.90	2.00	0.00	0.38	0.00
36.58	325.18	2.00	0.00	0.38	0.00	36.74	305.36	2.00	0.00	0.38	0.00
36.91	302.02	2.00	0.00	0.37	0.00	37.07	299.07	2.00	0.00	0.37	0.00
37.24	302.50	2.00	0.00	0.37	0.00	37.40	308.17	2.00	0.00	0.37	0.00
37.57	317.75	2.00	0.00	0.36	0.00	37.73	285.66	2.00	0.00	0.36	0.00
37.89	306.65	2.00	0.00	0.36	0.00	38.06	312.52	2.00	0.00	0.35	0.00
38.22	330.58	2.00	0.00	0.35	0.00	38.39	344.29	2.00	0.00	0.35	0.00
38.55	360.20	2.00	0.00	0.35	0.00	38.71	374.28	2.00	0.00	0.34	0.00
38.88	377.66	2.00	0.00	0.34	0.00	39.04	374.63	2.00	0.00	0.34	0.00
39.21	350.93	2.00	0.00	0.34	0.00	39.37	330.79	2.00	0.00	0.33	0.00
39.53	342.33	2.00	0.00	0.33	0.00	39.70	359.78	2.00	0.00	0.33	0.00
39.86	368.73	2.00	0.00	0.32	0.00	40.03	366.68	2.00	0.00	0.32	0.00
40.19	318.05	2.00	0.00	0.32	0.00	40.35	196.57	2.00	0.00	0.32	0.00

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

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
40.52	107.80	0.34	0.93	0.31	0.02	40.68	120.33	0.40	0.82	0.31	0.02
40.85	96.86	0.31	1.02	0.31	0.02	41.01	28.10	2.00	0.00	0.30	0.00
41.17	24.91	2.00	0.00	0.30	0.00	41.34	24.11	2.00	0.00	0.30	0.00
41.50	28.02	2.00	0.00	0.30	0.00	41.67	25.08	2.00	0.00	0.29	0.00
41.83	24.06	2.00	0.00	0.29	0.00	41.99	20.85	2.00	0.00	0.29	0.00
42.16	19.04	2.00	0.00	0.29	0.00	42.32	18.13	2.00	0.00	0.28	0.00
42.49	16.63	2.00	0.00	0.28	0.00	42.65	15.53	2.00	0.00	0.28	0.00
42.81	12.88	2.00	0.00	0.27	0.00	42.98	12.61	2.00	0.00	0.27	0.00
43.14	13.50	2.00	0.00	0.27	0.00	43.31	14.29	2.00	0.00	0.27	0.00
43.47	14.02	2.00	0.00	0.26	0.00	43.63	12.06	2.00	0.00	0.26	0.00
43.80	10.64	2.00	0.00	0.26	0.00	43.96	10.05	2.00	0.00	0.25	0.00
44.13	10.03	2.00	0.00	0.25	0.00	44.29	11.67	2.00	0.00	0.25	0.00
44.45	12.94	2.00	0.00	0.25	0.00	44.62	13.12	2.00	0.00	0.24	0.00
44.78	12.63	2.00	0.00	0.24	0.00	44.95	12.67	2.00	0.00	0.24	0.00
45.11	13.83	2.00	0.00	0.24	0.00	45.28	16.98	2.00	0.00	0.23	0.00
45.44	13.77	2.00	0.00	0.23	0.00	45.60	11.95	2.00	0.00	0.23	0.00
45.77	10.83	2.00	0.00	0.22	0.00	45.93	8.97	2.00	0.00	0.22	0.00
46.10	9.41	2.00	0.00	0.22	0.00	46.26	8.45	2.00	0.00	0.22	0.00
46.42	8.14	2.00	0.00	0.21	0.00	46.59	9.24	2.00	0.00	0.21	0.00
46.75	13.32	2.00	0.00	0.21	0.00	46.92	17.17	2.00	0.00	0.20	0.00
47.08	20.26	2.00	0.00	0.20	0.00	47.24	21.40	2.00	0.00	0.20	0.00
47.41	20.75	2.00	0.00	0.20	0.00	47.57	22.92	2.00	0.00	0.19	0.00
47.74	82.70	0.27	0.74	0.19	0.01	47.90	85.24	0.28	0.71	0.19	0.01
48.06	26.33	2.00	0.00	0.19	0.00	48.23	25.28	2.00	0.00	0.18	0.00
48.39	23.61	2.00	0.00	0.18	0.00	48.56	22.34	2.00	0.00	0.18	0.00
48.72	22.84	2.00	0.00	0.17	0.00	48.88	23.53	2.00	0.00	0.17	0.00
49.05	26.10	2.00	0.00	0.17	0.00	49.21	32.27	2.00	0.00	0.17	0.00
49.38	94.65	0.30	0.55	0.16	0.01	49.54	99.46	0.32	0.52	0.16	0.01
49.70	105.11	0.33	0.48	0.16	0.01	49.87	127.70	0.44	0.38	0.15	0.01
50.03	114.11	0.37	0.43	0.15	0.01	50.20	97.74	0.31	0.49	0.15	0.01

Total estimated settlement: 4.55**Abbreviations**

$Q_{tn,cs}$:	Equivalent dean 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

:: Strength loss calculation Idriss & Boulanger (2008) ::

Depth (ft)	q _t (tsf)	Q _{tn}	K _c	Q _{tn,cs}	I _c	S _{u(liq)} /σ' _v	S _{u(peak)} /σ' _v
1.31	18.47	29.56	2.31	68.19	2.39	0.09	0.72
1.48	16.96	27.12	2.76	74.96	2.47	0.08	0.71
1.64	14.72	23.50	3.88	91.11	2.61	0.09	0.62
1.80	13.33	21.26	4.65	98.94	2.69	0.09	0.62
1.97	12.18	19.40	5.05	98.04	2.73	0.08	0.62
2.13	11.49	18.28	4.60	84.01	2.69	0.08	0.62
2.30	11.18	17.76	4.14	73.53	2.64	0.08	0.62
2.46	11.05	17.54	3.69	64.81	2.59	0.08	0.69
2.63	11.41	18.10	3.25	58.87	2.54	0.08	0.69
2.79	11.90	18.89	2.83	53.37	2.48	0.08	0.69
2.95	12.79	20.30	2.47	50.21	2.42	0.08	0.69
3.12	14.05	22.32	2.12	47.40	2.35	0.07	0.69
3.28	15.73	25.00	1.84	46.00	2.28	0.07	0.70
3.44	17.43	27.72	1.00	27.72	2.21	0.07	0.70
3.61	18.63	29.63	1.00	29.63	2.18	0.07	0.70
3.77	19.69	31.33	1.00	31.33	2.17	0.07	0.70
3.94	19.98	31.78	1.58	50.27	2.19	0.08	0.71
4.10	20.31	32.29	1.61	52.04	2.20	0.08	0.71
4.26	19.91	31.63	1.69	53.37	2.23	0.08	0.71
4.43	19.84	31.50	1.74	54.68	2.24	0.08	0.71
4.59	19.56	31.04	1.78	55.34	2.26	0.08	0.71
4.76	19.72	31.29	1.76	55.09	2.25	0.08	0.71
4.92	20.35	32.29	1.70	54.88	2.23	0.08	0.71
5.08	21.69	34.42	1.60	55.00	2.19	0.08	0.72
5.25	23.37	37.11	1.51	56.08	2.15	0.08	0.72
5.41	24.88	39.53	1.45	57.13	2.12	0.08	0.72
5.58	26.37	41.90	1.39	58.41	2.08	0.08	0.72
5.74	28.42	45.19	1.34	60.73	2.04	0.08	0.72
5.91	31.51	50.14	1.00	50.14	1.98	0.08	0.72
6.07	35.15	55.97	1.00	55.97	1.91	0.08	0.71
6.23	38.56	61.43	1.00	61.43	1.86	0.08	0.69
6.40	41.16	65.60	1.00	65.60	1.82	0.08	0.68
6.56	42.78	68.18	1.00	68.18	1.81	0.09	0.69
6.73	43.16	68.77	1.00	68.77	1.83	0.09	0.70
6.89	41.96	66.85	1.00	66.85	1.87	0.09	0.71
7.05	39.31	62.56	1.26	78.70	1.93	0.09	0.73
7.22	36.04	57.30	1.32	75.47	2.01	0.09	0.74
7.38	33.75	53.60	1.39	74.41	2.08	0.09	0.74
7.55	33.49	53.18	1.42	75.50	2.10	0.09	0.74
7.71	34.75	55.19	1.40	77.22	2.09	0.09	0.75
7.87	36.40	57.82	1.36	78.62	2.05	0.09	0.75
8.04	38.58	61.32	1.31	80.44	2.01	0.09	0.74
8.20	41.46	65.91	1.27	83.42	1.94	0.09	0.73
8.37	43.50	68.71	1.24	85.06	1.90	0.09	0.73
8.53	43.39	67.70	1.24	83.72	1.90	0.09	0.72
8.69	41.04	63.77	1.25	79.91	1.92	0.09	0.72
8.86	38.24	59.42	1.28	76.03	1.96	0.08	0.72
9.02	35.58	55.28	1.31	72.50	2.01	0.08	0.72

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
9.19	33.57	52.16	1.35	70.53	2.05	0.08	0.73
9.35	32.63	50.26	1.36	68.58	2.06	0.08	0.72
9.51	32.89	50.02	1.36	67.97	2.05	0.08	0.72
9.68	34.32	51.31	1.33	68.44	2.03	0.08	0.72
9.84	36.11	53.13	1.32	70.02	2.01	0.08	0.72
10.01	37.22	54.05	1.31	70.75	2.00	0.08	0.72
10.17	37.38	53.71	1.31	70.34	2.00	0.08	0.72
10.34	36.69	52.32	1.32	69.01	2.01	0.08	0.72
10.50	33.96	48.34	1.36	65.64	2.05	0.08	0.73
10.66	33.90	47.74	1.36	64.79	2.05	0.07	0.70
10.83	34.12	47.55	1.36	64.48	2.05	0.08	0.73
10.99	37.18	50.93	1.32	67.14	2.01	0.08	0.72
11.15	39.11	53.09	1.30	68.93	1.99	0.08	0.72
11.32	43.22	57.84	1.00	57.84	1.94	0.08	0.71
11.48	47.91	63.24	1.00	63.24	1.89	0.09	0.71
11.65	51.77	67.78	1.00	67.78	1.86	0.09	0.71
11.81	53.18	69.66	1.23	85.39	1.88	0.09	0.72
11.97	52.99	69.39	1.24	85.91	1.90	0.09	0.72
12.14	52.11	67.91	1.24	83.95	1.90	0.09	0.72
12.30	52.01	67.11	1.00	67.11	1.87	0.09	0.70
12.47	51.56	66.23	1.00	66.23	1.87	0.09	0.71
12.63	50.45	64.79	1.00	64.79	1.89	0.09	0.71
12.79	49.06	63.00	1.00	63.00	1.91	0.08	0.71
12.96	49.09	62.81	1.00	62.81	1.91	0.09	0.71
13.12	50.56	64.41	1.24	79.74	1.90	0.09	0.71
13.29	51.89	65.75	1.23	80.98	1.89	0.09	0.72
13.45	52.88	66.55	1.00	66.55	1.88	0.09	0.71
13.62	54.37	67.86	1.00	67.86	1.85	0.09	0.70
13.78	56.49	69.91	1.00	69.91	1.82	0.09	0.69
13.94	58.54	71.83	1.00	71.83	1.79	0.09	0.69
14.11	57.93	70.81	1.00	70.81	1.79	0.09	0.69
14.27	57.50	70.13	1.00	70.13	1.79	0.08	0.68
14.44	57.53	70.08	1.00	70.08	1.81	0.09	0.69
14.60	58.65	71.27	1.00	71.27	1.81	0.09	0.70
14.76	52.39	63.93	1.00	63.93	1.86	0.09	0.71
14.93	39.14	48.62	1.32	64.18	2.01	0.08	0.72
15.09	24.64	31.45	1.81	56.85	2.27	0.07	0.69
15.26	15.44	20.19	3.37	68.06	2.55	0.08	0.69
15.42	13.10	17.17	4.32	74.10	2.66	0.08	0.62
15.58	15.15	19.68	3.59	70.59	2.58	0.08	0.68
15.75	19.03	24.32	2.59	63.02	2.44	0.08	0.71
15.91	22.17	28.09	2.26	63.37	2.38	0.08	0.71
16.08	22.50	28.53	2.40	68.56	2.41	0.08	0.71
16.24	21.86	27.85	2.82	78.44	2.48	0.08	0.71
16.40	21.42	27.36	3.18	87.12	2.53	0.09	0.71
16.57	21.79	27.89	3.53	98.43	2.57	0.09	0.71
16.73	25.03	31.95	3.38	107.92	2.55	0.09	0.72
16.90	30.12	38.17	2.98	113.70	2.50	0.10	0.74

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q _t (tsf)	Q _{tn}	K _c	Q _{tn,cs}	I _c	S _{u(liq)} /σ' _v	S _{u(peak)} /σ' _v
17.06	36.90	46.26	2.51	115.95	2.42	0.10	0.75
17.22	55.27	67.41	1.64	110.80	2.21	0.10	0.75
17.39	83.19	98.39	1.30	127.44	1.99	0.15	0.80
17.55	109.57	126.76	1.19	150.72	1.84	0.22	0.81
17.72	114.88	132.18	1.18	155.48	1.82	0.23	0.81
17.88	100.73	116.92	1.25	146.69	1.93	0.18	0.82
18.05	79.96	94.67	1.47	139.17	2.13	0.15	0.81
18.21	72.59	86.91	1.81	156.90	2.27	0.13	0.79
18.37	84.33	100.52	1.78	179.14	2.26	0.17	0.83
18.54	113.88	133.13	1.45	192.79	2.12	0.26	0.87
18.70	129.48	149.80	1.37	205.50	2.06	0.55	0.91
18.86	114.36	132.57	1.47	194.82	2.13	0.35	0.89
19.03	76.52	90.15	2.16	194.80	2.36	0.15	0.81
19.19	42.83	51.59	4.74	244.46	2.70	0.11	0.62
19.36	29.03	35.14	7.78	273.41	2.94	0.10	0.62
19.52	27.23	32.66	8.65	282.46	2.99	0.10	0.62
19.68	28.50	34.00	8.17	277.94	2.96	0.11	0.62
19.85	29.18	34.61	7.73	267.48	2.93	0.11	0.62
20.01	27.48	32.31	7.52	243.04	2.92	0.10	0.62
20.18	27.39	31.76	6.40	203.35	2.84	0.10	0.62
20.34	28.39	32.47	5.17	167.92	2.74	0.10	0.62
20.50	30.88	34.94	4.19	146.51	2.65	0.10	0.62
20.67	34.18	38.35	3.55	136.18	2.58	0.10	0.74
20.83	38.12	42.45	3.03	128.73	2.51	0.11	0.75
21.00	38.83	43.02	2.99	128.79	2.50	0.11	0.76
21.16	34.22	37.88	3.76	142.26	2.60	0.10	0.62
21.32	25.97	28.74	5.80	166.65	2.80	0.10	0.62
21.49	19.86	21.72	8.61	187.03	2.99	0.09	0.62
21.65	21.21	23.15	7.95	184.15	2.95	0.09	0.62
21.82	30.69	33.47	5.06	169.24	2.73	0.10	0.62
21.98	36.29	39.44	4.42	174.24	2.67	0.13	0.62
22.15	33.86	36.68	5.10	186.90	2.74	0.11	0.62
22.31	25.23	27.14	7.25	196.67	2.90	0.09	0.62
22.47	23.15	24.60	6.93	170.46	2.88	0.09	0.62
22.64	25.01	26.39	5.67	149.53	2.78	0.10	0.62
22.80	35.49	37.28	3.38	125.90	2.55	0.09	0.72
22.97	51.25	53.46	2.04	108.89	2.33	0.12	0.77
23.13	65.18	67.40	1.52	102.63	2.16	0.14	0.80
23.29	63.11	64.97	1.52	98.77	2.16	0.13	0.79
23.46	48.03	49.44	2.12	104.76	2.35	0.11	0.76
23.62	31.40	32.30	4.68	151.23	2.70	0.10	0.62
23.79	21.98	22.29	9.47	211.12	3.04	0.09	1.59
23.95	19.15	19.13	13.73	262.52	3.24	0.09	1.37
24.11	22.36	22.44	13.16	295.27	3.22	0.09	1.60
24.28	30.51	30.94	9.69	299.83	3.05	0.10	2.21
24.44	36.82	37.38	6.90	257.83	2.88	0.12	0.62
24.61	40.05	40.27	4.71	189.81	2.70	0.11	0.62
24.77	41.73	41.50	2.99	123.97	2.50	0.10	0.75

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
24.93	46.02	45.51	2.26	102.97	2.38	0.11	0.76
25.10	50.57	49.90	2.11	105.37	2.35	0.11	0.77
25.26	51.86	51.03	2.21	112.91	2.37	0.12	0.77
25.43	50.72	49.70	2.31	114.77	2.39	0.11	0.77
25.59	47.63	46.48	2.67	124.19	2.45	0.12	0.77
25.75	42.82	41.51	2.98	123.80	2.50	0.11	0.75
25.92	38.12	36.71	3.49	128.17	2.57	0.10	0.74
26.08	35.62	34.08	3.82	130.17	2.61	0.10	0.62
26.25	36.45	34.77	4.12	143.14	2.64	0.10	0.62
26.41	35.40	33.61	4.76	160.02	2.71	0.11	0.62
26.57	33.16	31.28	5.47	170.96	2.77	0.10	0.62
26.74	26.72	24.84	7.24	179.86	2.90	0.10	0.62
26.90	21.75	19.84	9.09	180.27	3.02	0.09	1.42
27.07	17.49	15.58	11.17	174.04	3.13	0.09	1.11
27.23	16.89	14.92	10.81	161.36	3.11	0.08	1.07
27.39	17.74	15.67	9.06	141.99	3.02	0.09	1.12
27.56	19.19	16.99	6.97	118.45	2.88	0.09	0.62
27.72	20.57	18.23	5.07	92.38	2.73	0.08	0.62
27.89	24.83	22.21	3.21	71.28	2.53	0.08	0.70
28.05	37.01	33.68	1.72	57.96	2.24	0.08	0.71
28.21	52.16	47.93	1.34	64.15	2.03	0.09	0.74
28.38	59.71	54.93	1.00	54.93	1.95	0.09	0.74
28.54	55.33	50.66	1.32	66.75	2.01	0.08	0.73
28.71	44.81	40.60	1.65	66.88	2.21	0.09	0.73
28.87	36.89	33.01	2.83	93.43	2.48	0.10	0.73
29.04	31.36	27.67	5.27	145.89	2.75	0.10	0.62
29.20	27.91	24.32	8.15	198.17	2.96	0.10	0.62
29.36	26.98	23.34	10.01	233.58	3.07	0.10	1.67
29.53	30.16	26.13	9.22	240.81	3.02	0.10	1.87
29.69	34.28	29.75	7.62	226.69	2.93	0.11	0.62
29.86	36.27	31.43	6.40	201.17	2.84	0.11	0.62
30.02	35.33	30.45	5.89	179.35	2.80	0.10	0.62
30.18	32.51	27.76	5.89	163.54	2.80	0.10	0.62
30.35	30.62	25.94	6.00	155.68	2.81	0.10	0.62
30.51	29.09	24.43	6.43	157.03	2.84	0.10	0.62
30.68	29.70	24.87	6.49	161.30	2.85	0.10	0.62
30.84	31.68	26.52	6.24	165.39	2.83	0.10	0.62
31.00	36.66	30.86	5.10	157.25	2.74	0.10	0.62
31.17	45.07	38.29	3.63	139.02	2.59	0.11	0.75
31.33	49.32	42.01	2.89	121.57	2.49	0.12	0.77
31.50	49.61	42.15	2.67	112.72	2.45	0.11	0.75
31.66	50.64	42.94	2.50	107.50	2.42	0.10	0.75
31.82	66.54	56.99	1.87	106.75	2.29	0.11	0.77
31.99	105.26	91.40	1.40	128.39	2.09	0.15	0.81
32.15	152.62	133.45	1.28	170.45	1.96	0.36	0.88
32.32	193.84	170.13	1.20	204.65	1.85	0.81	0.89
32.48	213.18	187.12	1.15	215.93	1.80	0.92	0.89
32.64	218.38	191.24	1.14	218.83	1.79	0.92	0.89

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
32.81	212.89	185.37	1.20	222.35	1.85	0.92	0.90
32.97	201.32	174.04	1.25	218.18	1.93	0.91	0.91
33.14	189.26	163.05	1.25	203.83	1.92	0.56	0.89
33.30	182.98	157.55	1.21	190.99	1.86	0.44	0.87
33.47	184.02	159.17	1.04	166.17	1.73	0.38	0.85
33.63	186.81	161.72	1.00	161.72	1.67	0.42	0.85
33.79	187.43	161.91	1.00	161.91	1.66	0.44	0.85
33.96	183.42	157.51	1.03	162.66	1.72	0.39	0.85
34.12	175.90	149.99	1.14	171.22	1.79	0.33	0.84
34.28	165.98	140.70	1.19	166.90	1.83	0.30	0.84
34.45	158.47	133.92	1.18	158.46	1.83	0.24	0.82
34.61	154.51	130.35	1.17	151.86	1.81	0.22	0.81
34.78	155.87	131.52	1.12	146.85	1.77	0.22	0.81
34.94	159.33	134.48	1.06	142.16	1.73	0.23	0.81
35.10	166.53	140.74	1.00	140.74	1.69	0.25	0.82
35.27	167.54	141.16	1.00	141.16	1.70	0.31	0.83
35.43	159.67	133.36	1.13	150.78	1.78	0.25	0.82
35.60	156.70	129.94	1.19	155.18	1.84	0.19	0.80
35.76	181.13	151.11	1.08	163.71	1.75	0.26	0.82
35.92	234.84	198.53	1.00	198.53	1.58	0.93	0.90
36.09	299.91	256.57	1.00	256.57	1.42	0.97	0.95
36.25	349.29	299.74	1.00	299.74	1.37	0.99	1.00
36.42	370.40	317.08	1.00	317.08	1.38	1.00	1.01
36.58	363.58	308.97	1.00	308.97	1.45	1.00	1.00
36.74	348.73	295.12	1.00	295.12	1.47	0.99	0.98
36.91	339.35	287.19	1.00	287.19	1.44	0.99	0.98
37.07	338.65	287.62	1.00	287.62	1.38	0.99	0.98
37.24	341.33	289.17	1.00	289.17	1.38	0.99	0.98
37.40	348.75	294.12	1.00	294.12	1.41	0.99	0.98
37.57	342.84	287.08	1.00	287.08	1.47	0.99	0.99
37.73	342.66	285.66	1.00	285.66	1.49	0.99	0.97
37.89	341.09	283.63	1.00	283.63	1.50	0.99	0.98
38.06	358.39	299.39	1.00	299.39	1.43	0.99	0.99
38.22	372.99	315.08	1.00	315.08	1.30	1.00	1.00
38.39	391.40	333.68	1.00	333.68	1.20	1.01	1.01
38.55	408.33	348.70	1.00	348.70	1.17	1.02	1.02
38.71	421.40	357.98	1.00	357.98	1.21	1.02	1.03
38.88	427.31	362.07	1.00	362.07	1.22	1.03	1.03
39.04	418.90	354.08	1.00	354.08	1.22	1.02	1.03
39.21	401.54	337.52	1.00	337.52	1.26	1.01	1.02
39.37	389.68	325.97	1.00	325.97	1.29	1.01	1.00
39.53	393.48	329.08	1.00	329.08	1.27	1.01	1.01
39.70	408.36	341.92	1.00	341.92	1.25	1.02	1.02
39.86	418.10	349.96	1.00	349.96	1.24	1.02	1.03
40.03	402.57	335.48	1.00	335.48	1.26	1.01	1.03
40.19	338.71	278.32	1.00	278.32	1.36	0.98	0.99
40.35	235.90	188.35	1.00	188.35	1.57	0.92	0.88
40.52	139.85	106.64	1.22	130.26	1.88	0.13	0.76

:: Strength loss calculation (Idriss & Boulanger (2008)) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
40.68	78.81	56.77	1.67	94.52	2.22	0.12	0.78
40.85	53.51	36.90	2.56	94.33	2.43	0.10	0.74
41.01	38.50	25.34	4.11	104.11	2.64	0.09	0.62
41.17	32.89	21.04	5.25	110.50	2.75	0.09	0.62
41.34	32.73	20.71	5.98	123.82	2.81	0.09	0.62
41.50	32.94	20.71	6.30	130.53	2.84	0.10	0.62
41.67	33.03	20.70	6.59	136.33	2.86	0.10	0.62
41.83	30.19	18.71	7.13	133.31	2.89	0.09	0.62
41.99	27.66	16.94	7.46	126.30	2.92	0.09	0.62
42.16	25.19	15.23	7.75	118.05	2.94	0.09	0.62
42.32	23.43	14.00	7.75	108.46	2.94	0.09	0.62
42.49	21.95	12.97	8.08	104.79	2.96	0.09	0.62
42.65	19.74	11.46	9.17	105.06	3.02	0.08	0.82
42.81	18.07	10.31	10.90	112.38	3.11	0.08	0.74
42.98	17.26	9.74	12.17	118.51	3.17	0.08	0.70
43.14	17.90	10.13	11.76	119.11	3.16	0.08	0.72
43.31	18.53	10.51	11.12	116.83	3.13	0.08	0.75
43.47	17.92	10.07	11.35	114.26	3.14	0.08	0.72
43.63	16.35	9.01	12.47	112.33	3.19	0.08	0.64
43.80	14.65	7.87	13.92	109.52	3.25	0.08	0.56
43.96	13.79	7.29	14.67	106.89	3.28	0.08	0.52
44.13	14.30	7.59	13.72	104.11	3.24	0.08	0.54
44.29	15.62	8.41	12.15	102.22	3.17	0.08	0.60
44.45	17.01	9.28	10.79	100.22	3.11	0.08	0.66
44.62	17.46	9.54	10.24	97.71	3.08	0.08	0.68
44.78	17.37	9.45	9.96	94.19	3.07	0.08	0.68
44.95	17.72	9.64	9.25	89.23	3.03	0.08	0.69
45.11	19.60	10.81	7.80	84.34	2.94	0.08	0.62
45.28	20.08	11.08	7.63	84.54	2.93	0.09	0.62
45.44	19.26	10.53	8.45	88.95	2.98	0.08	0.62
45.60	16.65	8.84	10.82	95.70	3.11	0.08	0.63
45.77	14.60	7.53	14.42	108.50	3.27	0.08	0.54
45.93	13.54	6.83	17.38	118.65	3.38	0.08	0.49
46.10	12.55	6.18	20.72	128.15	3.48	0.08	0.44
46.26	12.25	5.97	21.64	129.22	3.51	0.08	0.43
46.42	12.16	5.90	21.74	128.17	3.51	0.07	0.42
46.59	14.36	7.24	16.71	120.95	3.36	0.08	0.52
46.75	18.41	9.73	11.31	110.02	3.13	0.08	0.70
46.92	23.48	12.83	7.43	95.34	2.92	0.09	0.62
47.08	27.23	15.19	5.65	85.88	2.78	0.09	0.62
47.24	29.00	16.44	4.79	78.74	2.71	0.09	0.62
47.41	30.22	17.30	4.27	73.89	2.66	0.08	0.62
47.57	32.02	18.55	3.78	70.04	2.60	0.09	0.62
47.74	34.99	20.52	3.43	70.38	2.56	0.09	0.71
47.90	36.82	21.59	3.51	75.84	2.57	0.09	0.72
48.06	37.03	21.40	4.13	88.40	2.64	0.09	0.62
48.23	35.55	20.09	5.11	102.77	2.74	0.09	0.62
48.39	33.76	18.69	6.13	114.53	2.82	0.09	0.62

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

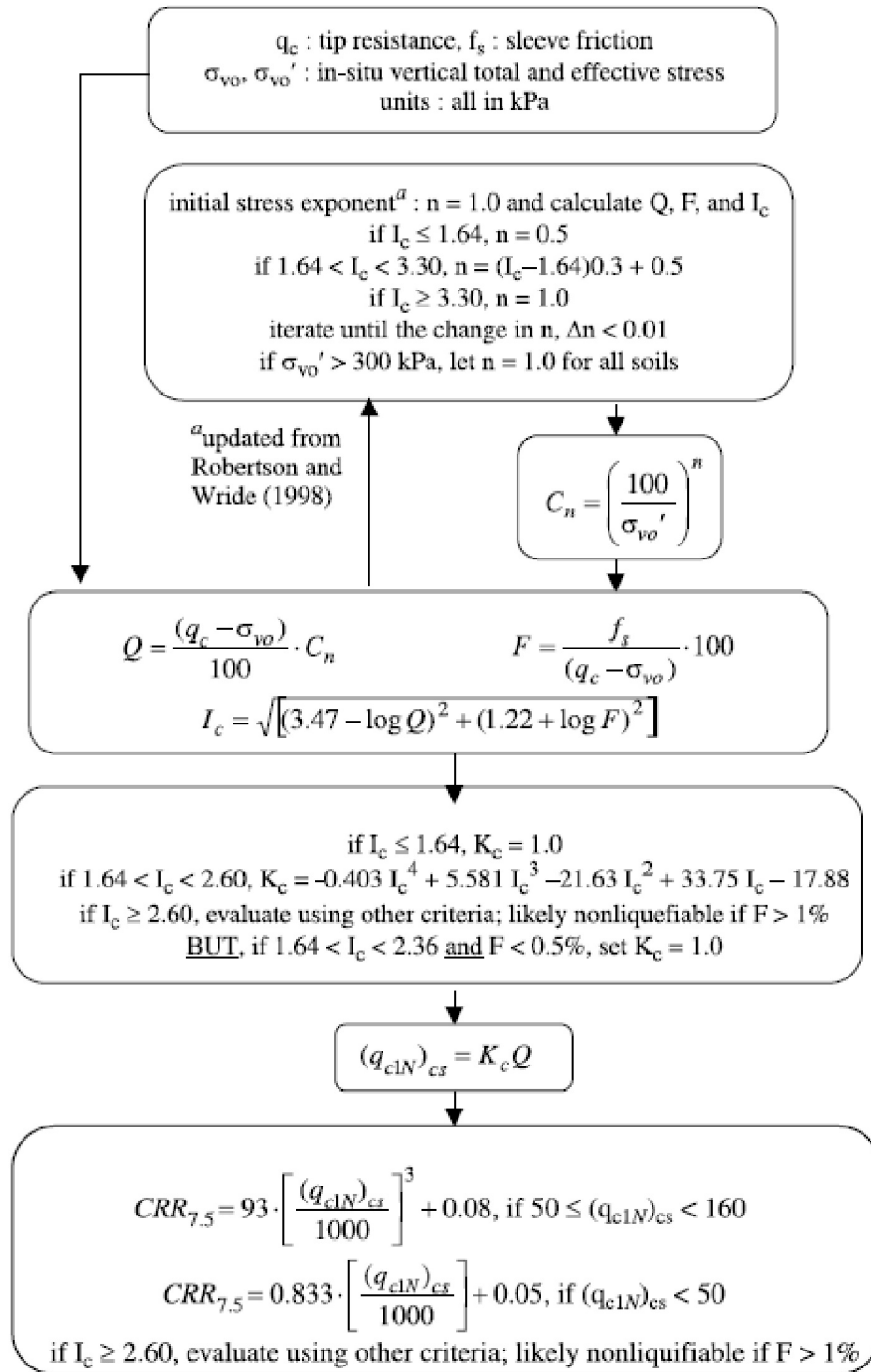
Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
48.56	32.72	18.01	6.47	116.42	2.85	0.09	0.62
48.72	32.75	17.97	6.31	113.31	2.84	0.09	0.62
48.88	34.52	19.04	5.70	108.62	2.79	0.09	0.62
49.05	38.76	21.82	4.82	105.14	2.71	0.09	0.62
49.21	43.87	25.21	4.01	101.20	2.63	0.10	0.62
49.38	50.18	29.49	3.23	95.36	2.54	0.10	0.74
49.54	57.58	34.63	2.56	88.50	2.43	0.10	0.75
49.70	71.83	44.83	1.82	81.59	2.27	0.10	0.76
49.87	78.47	49.68	1.61	79.84	2.20	0.13	0.79
50.03	74.13	46.43	1.70	78.83	2.23	0.11	0.77
50.20	61.76	37.40	2.16	80.89	2.36	0.10	0.74

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)

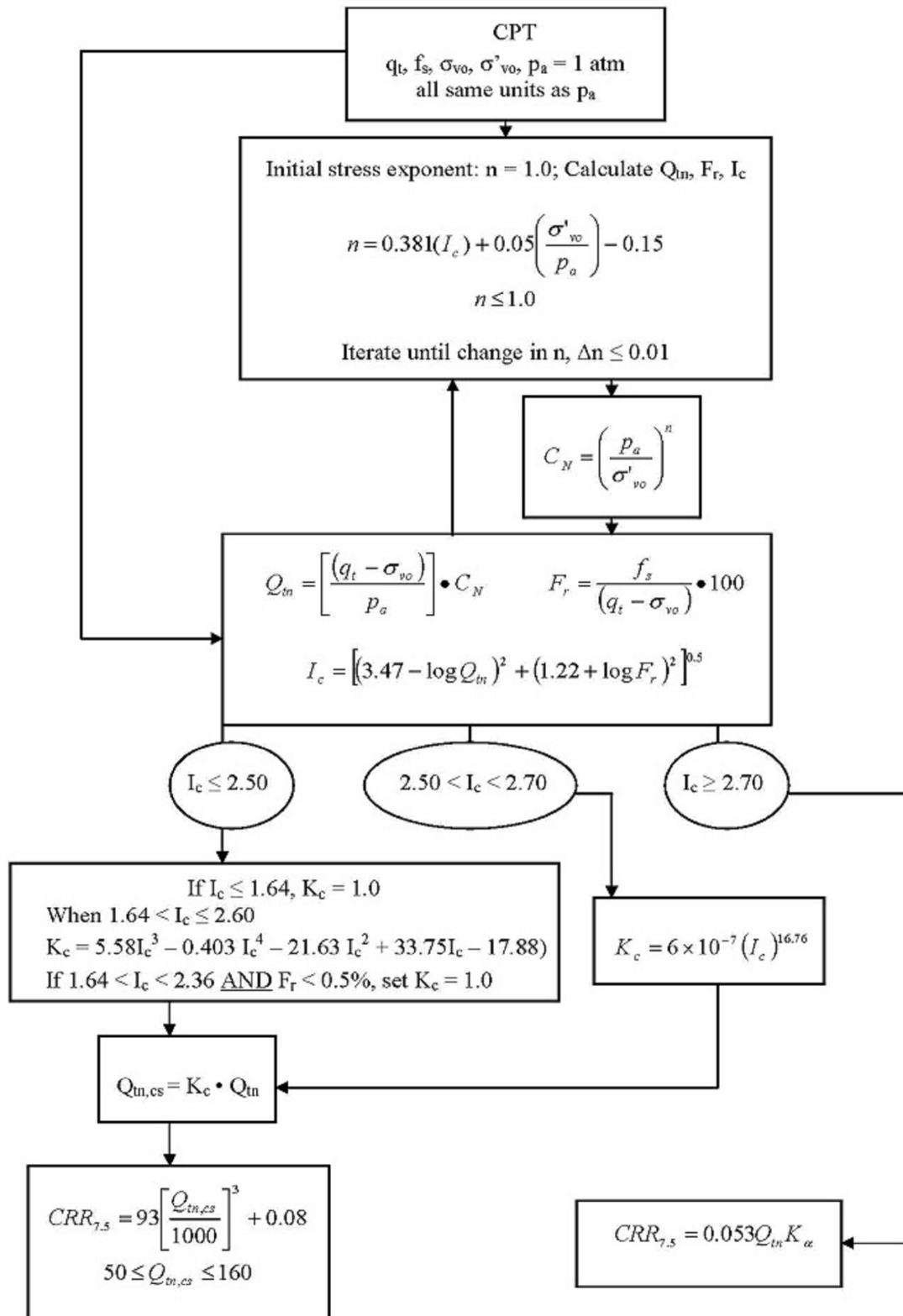
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of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

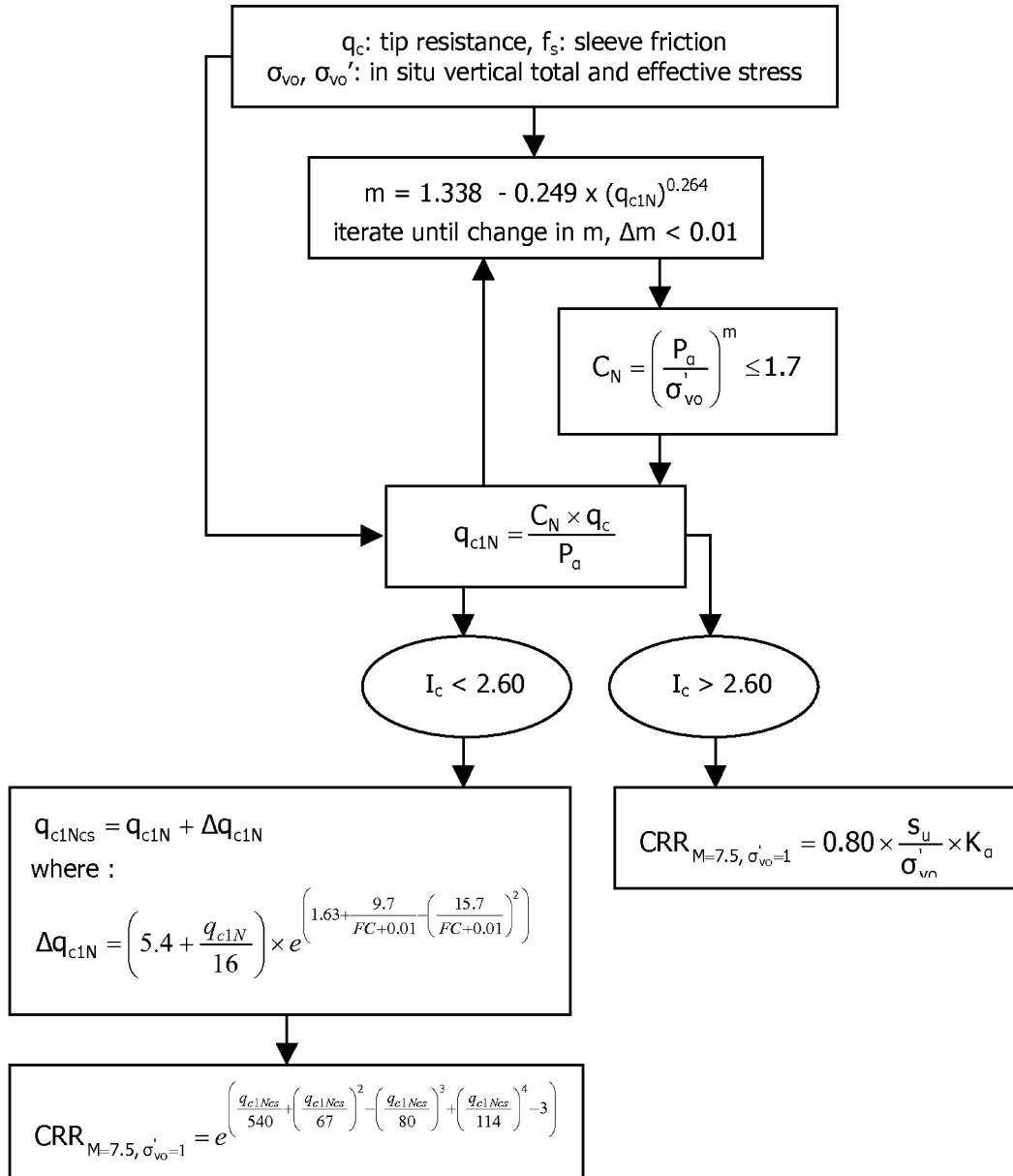
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

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:

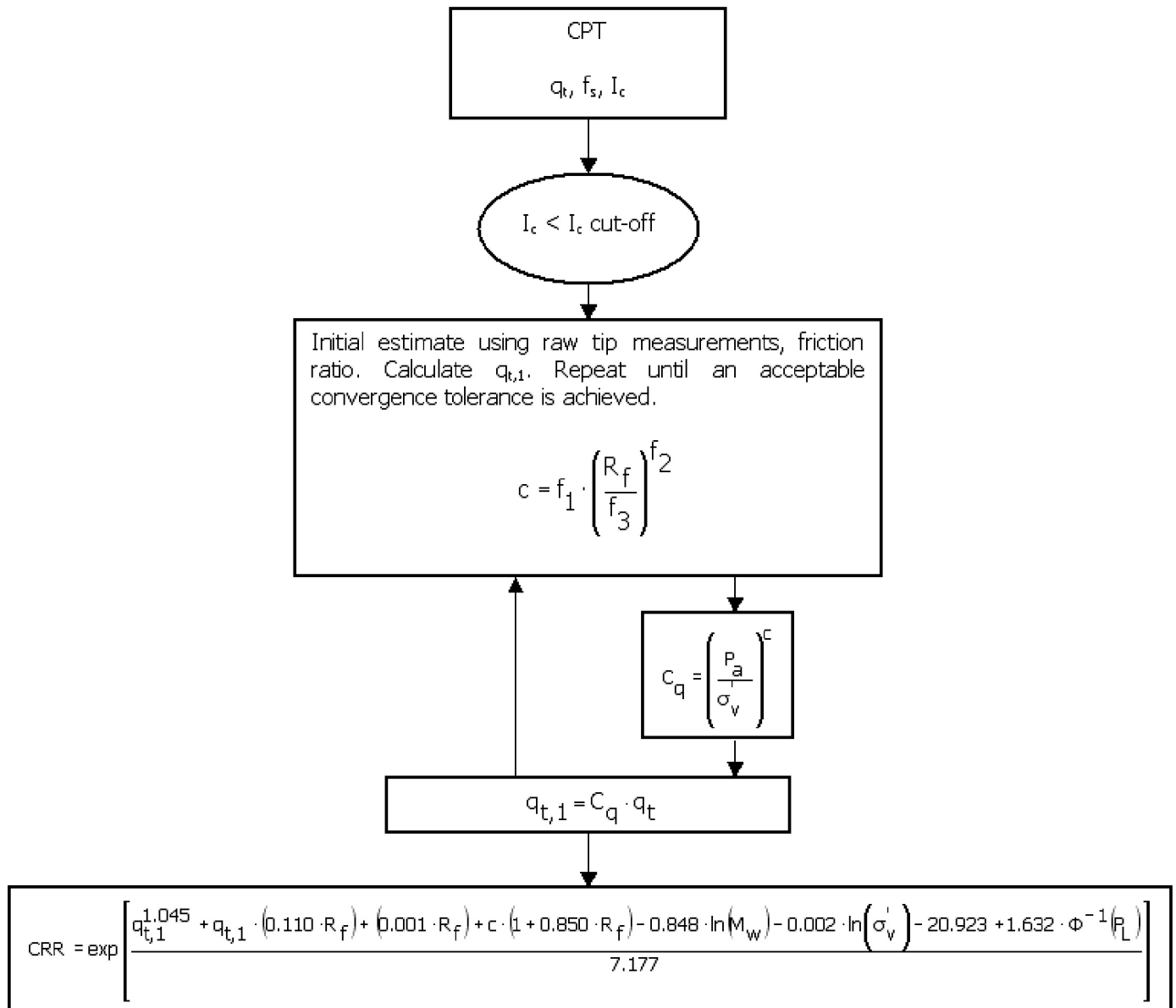


¹ P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

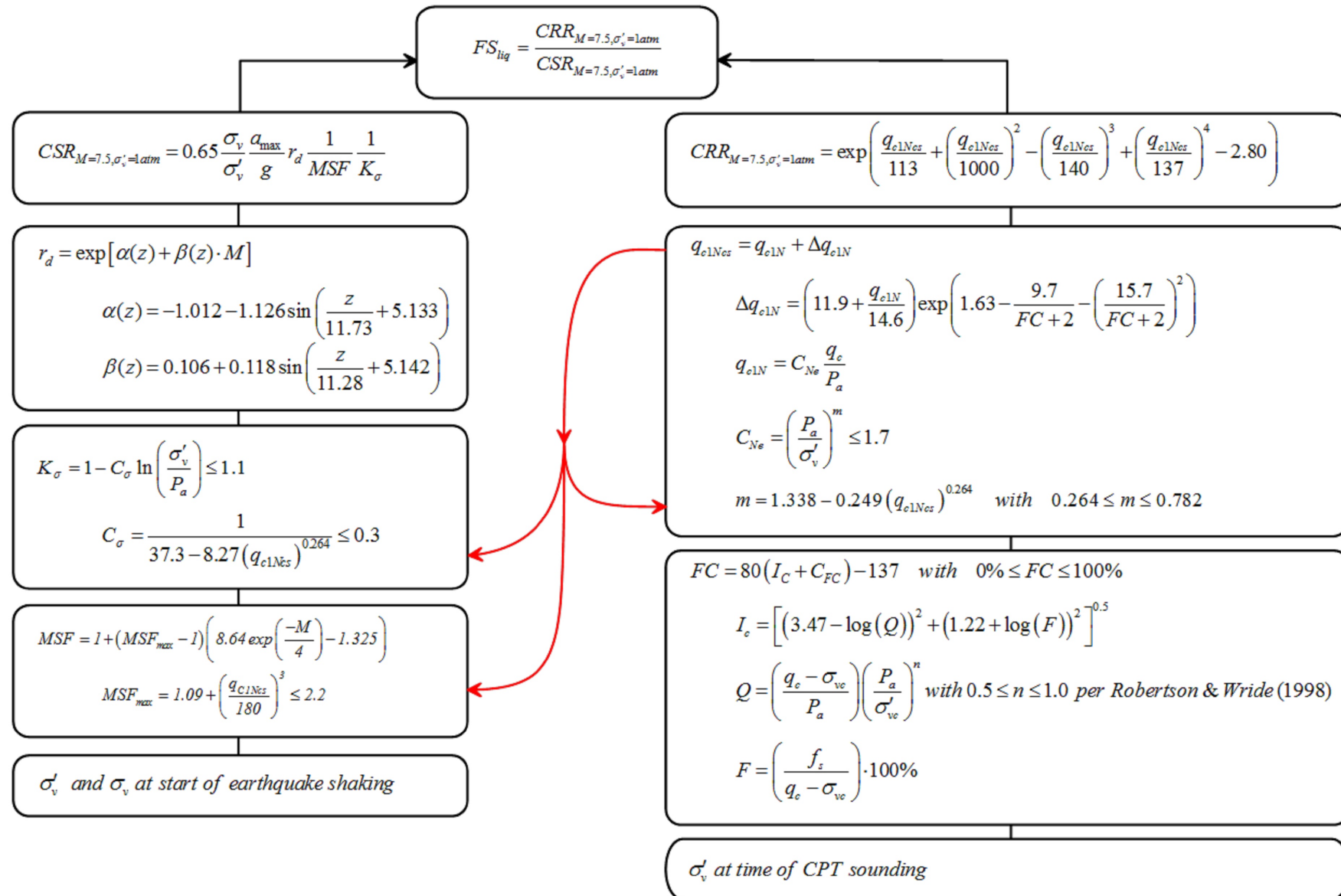
Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



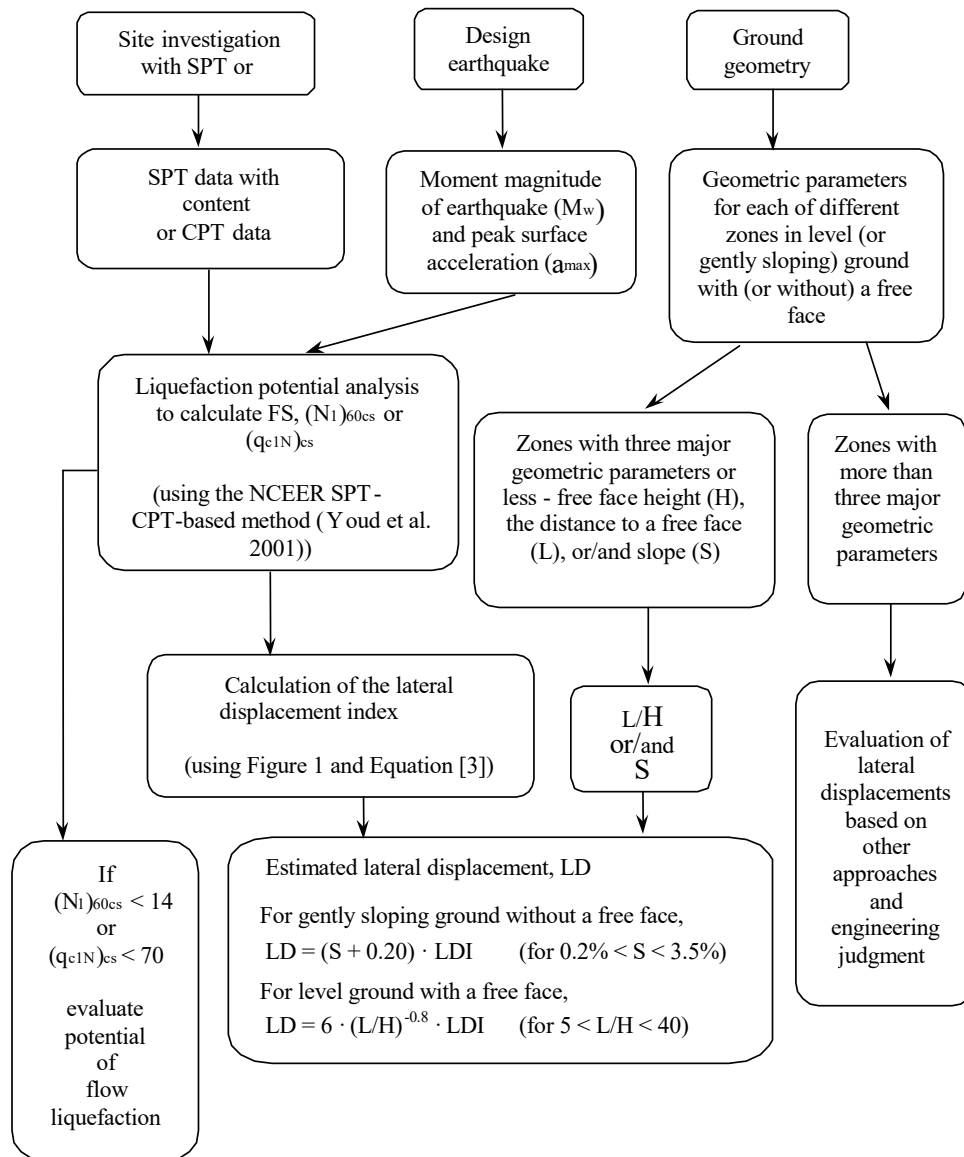
Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



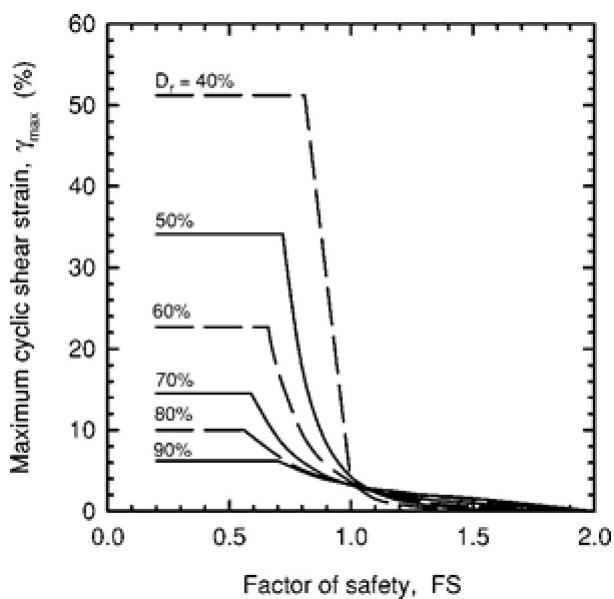
Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)



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



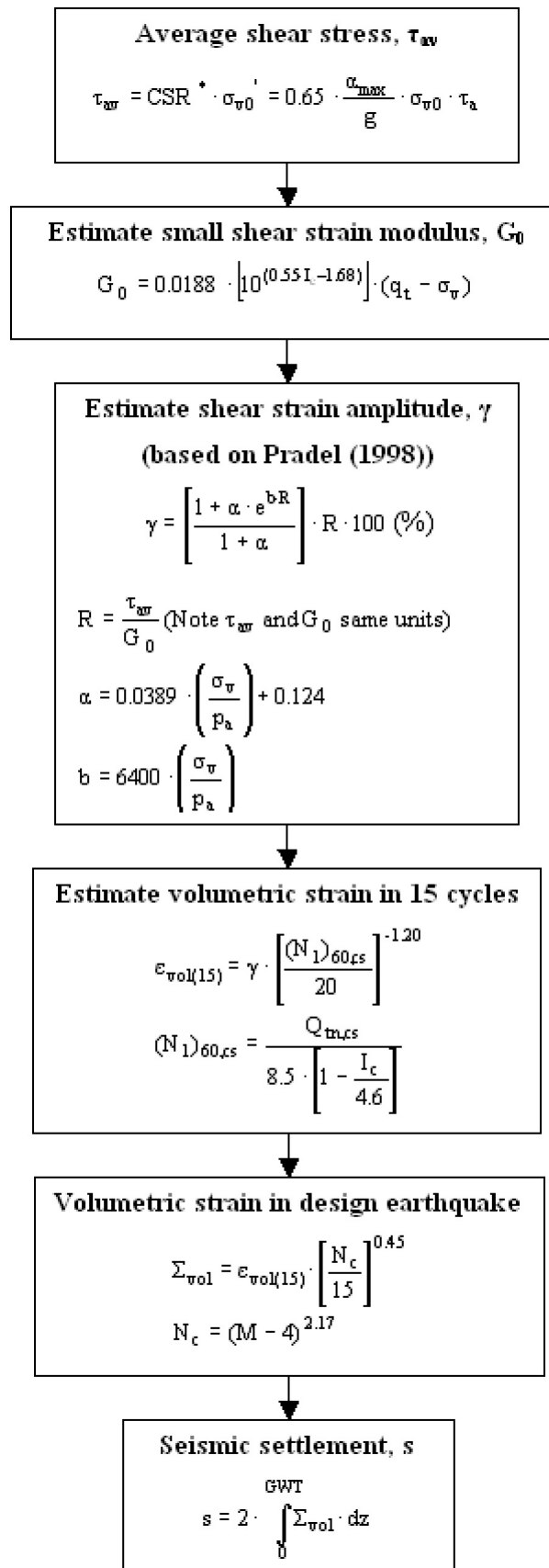
¹ Figure 1

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

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:

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

where:

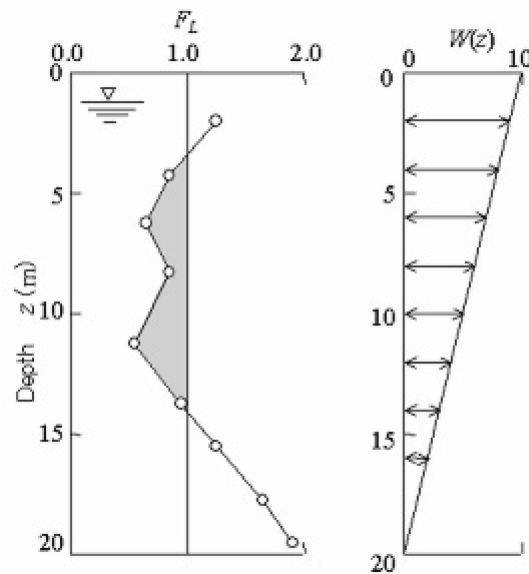
$F_L = 1 - F.S.$ when F.S. less than 1

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

z depth of 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

Shear-Induced Building Settlement (Ds) calculation procedure

The shear-induced building settlement (Ds) due to liquefaction below the building can be estimated using the relationship developed by Bray and Macedo (2017):

$$\begin{aligned} \ln(Ds) = & c1 + c2 * LBS + 0.58 * \ln\left(\tanh\left(\frac{HL}{6}\right)\right) + \\ & 4.59 * \ln(Q) - 0.42 * \ln(Q)^2 - 0.02 * B + \\ & 0.84 * \ln(CAVdp) + 0.41 * \ln(Sa1) + \varepsilon \end{aligned}$$

where Ds is in the units of mm, c1= -8.35 and c2= 0.072 for LBS ≤ 16, and c1= -7.48 and c2= 0.014 otherwise. Q is the building contact pressure in units of kPa, HL is the cumulative thickness of the liquefiable layers in the units of m, B is the building width in the units of m, CAVdp is a standardized version of the cumulative absolute velocity in the units of g-s, Sa1 is 5%-damped pseudo-acceleration response spectral value at a period of 1 s in the units of g, and ε is a normal random variable with zero mean and 0.50 standard deviation in Ln units. The liquefaction-induced building settlement index (LBS) is:

$$LBS = \sum W * \frac{\varepsilon_{shear}}{z} dz$$

where z (m) is the depth measured from the ground surface > 0, w is a foundation-weighting factor wherein W = 0.0 for z less than Df, which is the embedment depth of the foundation, and W = 1.0 otherwise. The shear strain parameter (ε_{shear}) is the liquefaction-induced free-field shear strain (in %) estimated using Zhang et al. (2004). It is calculated based on the estimated Dr of the liquefied soil layer and the calculated safety factor against liquefaction triggering (FSL).

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APPENDIX D
GBA REPORT INSERT

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, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them 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 herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences 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.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

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

- for a different client;
- for a different project or purpose;
- 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, the reliability of a geotechnical-engineering report can be 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 you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site 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.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual site-wide 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 through project completion to obtain 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 judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed 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 continuing 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 available 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-phase observations.

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 information 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. 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. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. 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 provide 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 obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

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, the engineer’s services were not designed, conducted, or intended to prevent 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.*



**GEOPROFESSIONAL
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Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

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ATTACHMENT B **DRAFT SCOPE OF PDB SERVICES**

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DRAFT SCOPE OF PDB SERVICES

I. PRECONSTRUCTION PHASE SERVICES

Generally, the Preconstruction Phase Services consist of those tasks necessary for the PDB Team to develop the Project design to approximately 60 percent completion and develop a Guaranteed Maximum Price (GMP) and associated Baseline Construction Phase Project Schedule. These services also include project management activities and specific tasks for the development of certain Management Plans necessary to advance the Project through the Preconstruction and Construction Phases.

Management Activities:

1. Participate in one Project kick-off meeting for the Preconstruction Phase Services at City location.
2. Participate in monthly progress meetings on-site or at the office location provided by the City.
3. Participate in up to 12 additional meetings or workshops with the City and/or others as needed.
4. Establish and maintain monthly Project Schedule for the Preconstruction Phase Services.
5. Develop and maintain a work management and file management system compatible with the City systems.
6. Prepare and submit monthly progress reports with descriptions of the work completed in the last monthly period in a format acceptable to the City. At a minimum, monthly progress reports shall include:
 - a. Cost of the work during the Preconstruction Phase including hourly labor charges and direct costs incurred during the period, by task, by staff person.
 - b. A summary of accomplishments, progress on deliverables, meetings, etc., by task.
 - c. A summary of anticipated activities for the following monthly period by task.
 - d. Identification of any current or anticipated challenges regarding the execution of the Preconstruction Phase work.
 - e. Any additional information as required by City funding agencies (as applicable).
7. Participate in project partnering workshops (if applicable).

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Design Development:

1. In general, develop the design of the Project, including all design drawings, specifications, and all other necessary design-related work products from the Basis of Design level of completion up to and including 60 percent completion of the final design, plans and specifications to facilitate the development of the GMP.
2. Consult with, advise, and provide recommendations to the City on planning, design, and proposed construction of the Project. During design progression, provide ongoing constructability review and input, as well as information on material availability, recommendations on equipment and/or packaging to advance construction, and independent quantity calculations to verify quantities specified by Design Engineer. Services under this task shall be provided beginning with the development of the Basis of Design Report (BODR) and up to and including 60 percent completion of the final design, plans and specifications.
3. Participate in biweekly update meetings with the City, third-party construction management firm, and/or others as needed.
4. At the 30 percent and 60 percent design completion milestones, attend up to three (3) design review workshops for each design completion milestone (30 percent and 60 percent) with attendees including the Project Manager, Lead Estimator, Lead Scheduler, Superintendent, and any other necessary personnel to address key design and constructability issues, e.g., interface issues, temporary construction activities, packaging, site conditions, construction impact reduction strategies, cost, schedule, stating, etc.
5. Provide draft and final versions of written value engineering recommendations at the 30 percent and 60 percent design completion milestones.
6. Support and attend up to four (4) value engineering focused workshops at the 30 percent and 60 percent design completion milestones.
7. At the 60 percent design completion milestone, prepare and provide a list of additional details that would be needed to complete the Project in the allotted time or to accelerate aspects of the Construction Phase work.
8. Identify, evaluate, and recommend elements of the Project that may require less than 100 percent design completion.
9. Provide review of site investigation studies and work products (prepared by others) and provide any written comments as necessary to City regarding potential constructability impacts. In addition, identify additional investigation studies required.
10. Provide support and input to City regarding operations and maintenance (O&M) and repair and replacement (R&R) preliminary plan development.

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Project Schedules:

1. Based on the Baseline Preconstruction Phase Schedule provided under Section (V) (A) (4) of this RFP, prepare the Preconstruction Phase Project Schedule.
2. Develop and provide a draft structure/format for City review that will serve as the basis of the Baseline Construction Phase Project Schedule.
3. Develop a preliminary draft of a work Breakdown Structure (WBS) for City review that will be used to inform the ongoing development of the Baseline Construction Phase Project Schedule as well as the GMP Cost Model. The WBS shall provide a clear description of each work package and deliverable included in the Construction Phase work. Revise the WBS to address comments received from City and resubmit for City approval.
4. Develop the Baseline Construction Phase Project Schedule at the 30 percent final design completion milestone for the Construction Phase work.
5. Develop the Baseline Construction Phase Project Schedule in coordination with the GMP proposal for City review and consideration.

Procurement and GMP Development:

1. Identify the portions of the Construction Phase work that PDB Team intends to self-perform and the portions that it intends to award to Subcontractors and explain the rationale for the proposed approach. Identify which work PDB Team intends to procure through value-based competitive selections, in lieu of low-bid selection, and explain the rationale. Revise the proposed approach to address comments received from City and resubmit for City approval.
2. Provide recommendations to the City regarding the division of the Construction Phase work to facilitate bids and proposals for the major elements of the Construction Phase work.
3. Support the City in the pre-selection of certain Project equipment.
4. Identify long-lead equipment procurement needs with respect to equipment availability considerations and mitigation strategies to address supply chain issues as applicable.
5. Develop and provide a draft Subcontractor Procurement Plans for Construction Phase work for City approval in accordance with the Agreement, outlining the process to be implemented for value-based and/or low-bid selection of Subcontractors, equipment, and materials and including the PDB Team's DBE Participation Plan. Provide recommendations and commitments regarding DBE goals for the Construction Phase.
6. Conduct a meeting to discuss City review comments on draft Subcontractor Procurement Plan.

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7. Revise draft Subcontractor Procurement Plan in response to City review comments and submit for City approval.
8. Prepare and provide a draft GMP Cost Model for City review and approval that will be used to manage the Open Book Basis GMP development process. The draft GMP Cost Model may be furnished in the PDB Team's preferred structure, however it must include, at a minimum, the following elements and/or functionality:
 - a. A complete representation of all Construction Phase work, broken down into a manageable hierarchy of organization:
 - i. The ability to provide reporting from a number of perspectives, (e.g., construction package, project type, funding source, contracts, vendors, etc.).
 - ii. Inclusion of linkages to all documentation utilized during the PDB Team's implementation of the procurement process, (e.g., subcontractor and supplier procurement documents, quotes/bids/proposals received, etc.).
 - iii. Identification of all contingency assumptions.
 - iv. Identification of all GMP Cost Model assumptions.
9. Conduct a workshop to present and discuss draft GMP Cost Model with City.
10. Revise draft GMP Cost Model based on City review and provide final GMP Cost Model for City approval.
11. Utilizing the GMP Cost Model, prepare and submit detailed, updated cost estimates on an Open Book Basis as the design is advanced to the 30 percent and 60 percent levels of design completion. The 30 percent and 60 percent GMP Cost Model updates shall be accompanied by a summary level log of changes from the prior submission, and a narrative describing the nature and rationale for the cost changes.
12. PDB Team shall conduct a workshop at the 30 percent and 60 percent levels of design completion to discuss the GMP Cost Model updates with City.
13. Revised 30 percent and 60 percent GMP Cost Models based on City reviews and workshop outcomes and provide final 30 percent and 60 percent GMP Cost Models for City approval.
14. Maintain, update, and provide a summary version of the GMP Cost Model on a monthly basis.
15. At the 60 percent level of design completion (or at such other time as agreed to with the City), prepare and provide a draft version to the City of a complete, detailed, written GMP Proposal which includes the following elements:
 - a. Construction Phase Submittal List that identifies all services and products related to the Construction Phase work and included in the GMP.

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- b. GMP Cost Model.
 - c. Baseline Construction Phase Project Schedule.
 - d. Projected cash flow schedule.
 - e. Links, references, or inclusion of 60 percent design drawings and specifications prepared by Design Engineer.
 - f. Descriptions, justifications, and calculations for all stand-alone or embedded cost contingencies included in the GMP, whether controlled by PDB Team or City.
 - g. Identification of any assumptions, limitations, or conditions associated with the draft version of the GMP Proposal.
16. Conduct a workshop to discuss City comments on draft GMP Proposal.
17. Revise GMP Proposal in accordance with City review and submit final GMP Proposal for City consideration.

Management Plans:

1. Prepare and provide for City review a draft version of a Construction Management Plan for the Construction Phase work that, at a minimum, addresses the following items:
 - a. Project organization and communication;
 - b. Health, safety, and emergency response procedures;
 - c. Risk Management;
 - d. QA/QC management;
 - e. Site management;
 - f. Construction Phase work communication, scheduling, and sequencing approach;
 - g. Construction noise management;
 - h. Storm water pollution prevention; and
 - i. Cost control.
2. Based on City review comments, prepare and provide a final version of the Construction Management Plan.
3. Prepare, implement, and maintain a Risk Management Plan for the Construction Phase work in coordination and alignment with City's risk management structure. The Risk Management Plan shall include:
 - a. A risk registry identifying specific Construction Phase risks (as applicable), their estimated probability of occurrence, the estimated magnitude of impact on cost and schedule, and the party responsible for the management of that risk; and

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- b. A discussion of the potential mitigation measures for each risk identified in the risk registry.
4. Participate in quarterly program-wide risk management workshops to present updates to Construction Phase risk management approach for incorporation into the program-wide risk management methodology.
5. Prepare a draft Project Commissioning Plan that describes in detail the process that will be implemented and the deliverables that will be provided in order to commission, test, and start up the Project. At a minimum, the draft Project Commissioning Plan shall include:
 - a. A description of the overall plan to commission, test, and start up the Project, including identification of roles and responsibilities of the PDB Team, City, and others.
 - b. A description and outline of the testing process the Project Company will implement to demonstrate performance of individual components of the Project.
 - c. A description and outline of the Project acceptance testing process and plan.
6. Conduct a workshop with the City to discuss draft Project Commissioning Plan.
7. Provide support to the City as required to incorporate comments based on City review of draft Project Commissioning Plan to facilitate submittal of final version for City approval.

II. CONSTRUCTION PHASE WORK

Note to Proposers: The Scope of Services for the Construction Phase Work will be developed during the Preconstruction Phase for inclusion in the Construction Phase Work amendment to the Agreement. The services described below are for illustrative purposes only.

1. Management Activities:
 - a. Participate in Project kick-off meeting(s) for the Construction Phase work.
 - b. Participate in weekly construction meetings.
 - c. Conduct meetings with all the contractors and subcontractors performing major elements of the Construction Phase work prior to the start of their activities.
 - d. Attend monthly meetings with the Design Engineer and City staff and provide written monthly progress report and updated schedule.
 - e. Coordinate and manage the Construction Phase work that includes all required appurtenances, necessary site improvements, and all other work required to make a complete and operable system within the GMP and the allowable contract time.

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- f. Maintain and update the Construction Phase Project Schedule on a monthly basis, and prepare three-week look ahead work schedules consistent with overall schedule.
 - g. In coordination with City's risk management approach and provide updates to the Construction Phase work risk registry on a monthly basis, and participate in quarterly risk management meetings.
 - h. Coordinate with Governmental Entities, as necessary and in compliance with the approved Permitting Plan.
 - i. Monitor and maintain quality controls over Shop Drawings, equipment and materials, implementation, and Construction Phase work.
 - j. Provide and maintain the Construction Phase Bonds.
 - k. Comply with the City's insurance program during Construction Phase as required by the Contract Documents.
 - l. Implement the construction site safety and emergency response plans to provide a safe working site for the Project.
 - m. Establish and implement procedures to track, expedite and process all Submittals, Change Orders, and requests for information.
 - n. Review and process all pay applications from Subcontractors.
 - o. Implement and maintain accounting, reporting, and payment systems to comply with City and funding agency requirements (as required and necessary).
 - p. Conduct monthly progress meetings with the on-site trade forepersons or superintendents.
 - q. Maintain current hard copies of Project as-built drawings, including all subcontracted work, and submit monthly in hard copy, PDF, and electronic format.
2. Procurement Activities:
- a. Prepare the bids/proposals packages for the elements of the Construction Phase work incorporating applicable requirements of the Contract Documents in accordance with the approved Subcontract Procurement Plan.
 - b. Develop and submit recommendations for City consideration and approval concerning the awarding of subcontracts with respect to Changes in the work.
 - c. Manage all procurement of materials and equipment.
 - d. Manage all procurement and construction-related Subcontracts while meeting the City's requirements for procurement of Subcontractor and Supplier bids or proposals. This effort includes inspecting the Construction Phase work performed

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by subcontractors to ensure conformance with the Contract Documents and Good Faith Efforts.

3. Operations and Maintenance Support Activities:
 - a. In general, consult with, advise, and provide recommendations to the City regarding the development of the operations and maintenance approach for the Project, including repair and replacement methodology.

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ATTACHMENT C **DRAFT PDB AGREEMENT**

**AGREEMENT FOR SERVICES
PROGRESSIVE DESIGN-BUILD
FOR WQCF AMMONIA SIDESTREAM TREATMENT CIP 25005 & ULTRA-VIOLET
DISINFECTION SYSTEM REHABILITATION CIP 25004 PROJECT**

THIS AGREEMENT ("AGREEMENT") is made and entered into this _____ day of _____, _____, by and between the CITY OF MANTECA, a municipal corporation of the State of California (hereinafter referred to as "CITY"), and

Design Build Firm

MAILING ADDRESS

CITY

STATE

ZIP

a _____ (State of inception) _____ (business structure)

STATE LICENSE CLASSIFICATION & NUMBER (if required)
hereinafter referred to as "DB Firm".

WITNESSETH:

A. WHEREAS, CITY desires to enter into this AGREEMENT for services for the Progressive Design Build delivery of the Ammonia Sidestream Treatment (CIP 25005) and Ultra-Violet (UV) Disinfection System Rehabilitation (CIP 25004) Project (collectively "Project").

B. WHEREAS, CITY desires to retain DB Firm to provide these services by reason of its qualifications, applicable license(s), and experience for performing such services, and DB Firm has offered to provide the required services on the terms and in the manner set forth herein.

C. WHEREAS, in March 2022, the CITY completed a capacity assessment study for the Manteca Wastewater Quality Control Facility (WQCF) (the "Site" or "Job Site"), which identified 10 interim improvement projects needed to improve the WQCF treatment process, and among them was the Ammonia Sidestream Treatment; and

D. WHEREAS, in March 2024, the CITY adopted the 2024 Wastewater Master Plan which identified additional interim improvement projects to improve the WQCF treatment process and among them is the Ultra-Violet Disinfection System Rehabilitation; and

E. WHEREAS, on August 6, 2024, the CITY entered into an Agreement ("C2024-120") for Professional Services with Carollo Engineers, Inc. ("Carollo") for the preparation of a predesign report (PDR) as a basis of design for the Ammonia Sidestream Treatment (CIP 25005) and Ultra-Violet (UV) Disinfection System Rehabilitation (CIP 25004) Project to ensure continued permit and regulatory compliance; and

Agreement for Services

- F. WHEREAS, the completed PDR recommended the following:
- Sidestream treatment facilities for treatment of centrate by the Anita Mox De-Ammonification process
 - New UV disinfection structure with Trojan UVSigna 2-Row system
 - New electrical building for UV system
 - Yard piping, paving and grading, and other site civil improvements as needed; and

G. WHEREAS, staff explored a variety of alternative delivery methods beyond the standard Design-Bid-Build to try and accelerate the project delivery schedule to continue to meet current treatment requirements, staff concluded that the Progressive Design-Build (PDB) delivery method allows for the best balance for control of scope, fee, and schedule; and

H. WHEREAS, Chapter 4.7 Section 22185 of the Public Contract Code allows local agencies to utilize design-build contracting for up to 10 public works projects in excess of \$5,000,000 for each project; and

I. WHEREAS, the Progressive Design-Build delivery method will allow these critical plant capacity projects to be completed most expeditiously and allow for the ordering of long lead items and starting phases of construction as early as Summer 2025; and

J. WHEREAS, on April 15, 2025, the Manteca CITY Council adopted a resolution approving Amendment No. 1 to the Agreement ("C2024-120-A1") for Professional Services with Carollo to serve as the CITY'S Agent in moving forward with delivering the projects via a PDB method; and

K. WHEREAS, CITY anticipates that the Project will be completed no later than earlier the better; and

L. WHEREAS, CITY determined that its goals for the Project would be best-served by using a process whereby CITY and DB Firm will collaboratively implement the Project through Progressive Design-Build project delivery method, during which DB Firm will deliver the Project in two phases; and

M. WHEREAS, in phase 1 ("Pre-Construction Phase"), the DB Firm shall prepare approximately 75% Plans Specifications and Estimates ("PS&E") in sufficient detail to obtain subcontractor bids via a competitive bidding process to ultimately negotiate a Guaranteed Maximum Price ("GMP") for the phase 2 ("Construction Phase") with the CITY; and

N. WHEREAS, if CITY and DB Firm cannot agree to a GMP, the DB Firm shall prepare a PS&E bid set for a Design-Bid-Build Project delivery; and

NOW, THEREFORE, in consideration of their mutual covenants, the parties hereto agree as follows:

AGREEMENT

1. SCOPE OF SERVICES:

A. DB Firm shall do all work, attend all meetings, produce all reports and carry out all activities necessary to complete the services for the Project attached here to as **EXHIBIT "A"**

and incorporated by reference as if fully set forth herein. This AGREEMENT and its exhibits shall be known as the "AGREEMENT DOCUMENTS". Terms set forth in any AGREEMENT DOCUMENT shall be deemed to be incorporated in all AGREEMENT DOCUMENTS as if set forth in full herein. In the event of conflict between terms contained in these AGREEMENT DOCUMENTS, the more specific term shall govern. If any portion of the AGREEMENT DOCUMENTS is in conflict with any other portion or provisions contained in the AGREEMENT, the AGREEMENT shall govern over the conflicting provisions contained in the exhibits to the AGREEMENT. To eliminate doubt, in the case of conflict between DB Firm's proposal or DB Firm's attachments and the CITY'S AGREEMENT and attachments, the CITY'S AGREEMENT and attachments shall take precedence over DB Firm's proposal and attachments.

B. DB Firm enters into this AGREEMENT as an independent contractor and not as an employee of the CITY. The DB Firm shall have no power or authority by this AGREEMENT to bind the CITY in any respect. Nothing in this AGREEMENT shall be construed to be inconsistent with this relationship or status. All employees, agents, contractors or subcontractors hired or retained by the DB Firm are employees, agents, contractors or subcontractors of the DB Firm and not of the CITY. The CITY shall not be obligated in any way to pay any wage claims or other claims made against DB Firm by any such employees, agents, contractors or subcontractors, or any other person resulting from performance of this AGREEMENT.

C. The DB Firm agrees it has satisfied itself by its own investigation and research regarding the conditions affecting the work to be done, labor and materials needed, and that its decision to execute this AGREEMENT is based on such independent investigation and research.

D. Pre-Construction Phase:

DB Firm shall perform the services of design, pricing, and other services for the Project based on the Pre-Construction Phase Scope of Services as set forth in **EXHIBIT A**, attached hereto and incorporated herein (the "Pre-Construction Phase Scope of Services"). DB Firm shall perform such services to the level of completion required for DB Firm and CITY to establish the GMP for the Construction Phase, as set forth below. The Pre-Construction Phase Services shall commence within ten (10) working days of DB Firm's receipt of CITY'S Notice to Proceed unless the parties mutually agree otherwise in writing. DB Firm shall schedule workshops with the CITY at completion of 50% and 75% design, corresponding decision logs, and release of purchase for long lead items.

Upon completion of the Pre-Construction Phase Services, the DB Firm shall submit a proposal to CITY for the completion of the Construction Phase of the Project. Construction Phase services shall consist of the completion of design services for the Project, the procurement of all materials and equipment for the Project, the performance of construction services for the Project, and the start-up, testing, and commissioning of the Project. The DB Firm's Construction Phase Services and Pre-Construction Phase Services shall collectively be referred to herein as the **"WORK"**. The GMP shall be developed during the Pre-Construction Phase on an open-book bid basis. All cost estimates for GMP development shall be disclosed to the CITY during the Pre-Construction Phase for negotiation.

The GMP Proposal shall include the following unless the parties mutually agree otherwise:

- The cost for development of PS&E bid-set.
- The proposed GMP.

- A list of the assumptions and clarifications made by DB Firm in the preparation of the Proposal, which list is intended to supplement the information contained in the drawings and specifications.
- All mark-ups including but not limited to all overhead, profit, labor, materials, equipment, supplies, all taxes sales, consumer, use, employment-related and other taxes mandated by applicable Laws and Regulations or that result from the performance of the WORK.
- The Scheduled Substantial Completion Date upon which the GMP is based, and a schedule upon which the Substantial Completion Date is based and a Project Schedule for the WORK.
- If applicable, a list of Allowance Items, Allowance Values, and a statement of their basis.
- If applicable, a schedule of alternate prices.
- If applicable, a schedule of unit prices.
- If applicable, a statement of Additional Services which may be performed but which are not included in the proposed GMP, and which, if performed, shall be the basis for a change in compensation and/or schedule.
- The time limit for acceptance of the proposed GMP, which shall not be less than one hundred twenty (60) days from the date of delivery of the proposed GMP.
- A permit list detailing any permits and/or regulatory approvals and the party responsible for acquiring such permit, if any.

After submission of the GMP Proposal, DB Firm and CITY shall meet to discuss and review the proposal. CITY, shall give written notice to DB Firm of any comments, inconsistencies, or inaccuracies in the information presented. If appropriate, DB Firm shall, upon receipt of CITY'S notice, make appropriate adjustments to the GMP.

Upon mutual written AGREEMENT, the GMP Proposal shall establish the basis for an amendment to this AGREEMENT, for the Construction Phase. Under no circumstances shall the DB Firm proceed with any Construction Phase WORK unless the GMP Proposal has been accepted in writing by the CITY.

If CITY rejects the GMP Proposal, or fails to notify DB Firm in writing on or before the date specified, the proposal shall be deemed withdrawn. In such event, either party may terminate this AGREEMENT subject to section 4.

E. Construction Phase:

DB Firm shall commence with the Construction Phase upon receipt of the Notice to Proceed and will perform the WORK in accordance with the GENERAL CONDITIONS (**EXHIBIT "D"**) and AGREEMENT DOCUMENTS.

DB Firm shall substantially complete the WORK no later than the date set forth in the GMP Proposal ("Scheduled Substantial Completion Date"), subject to adjustment in accordance with the GENERAL CONDITIONS (**EXHIBIT "D"**).

DB Firm shall achieve Final Completion no later than ninety (90) days from Substantial Completion ("Scheduled Final Completion Date"), subject to adjustment in accordance with the GENERAL CONDITIONS (**EXHIBIT "D"**).

It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage that CITY will sustain in the event of and by reason of DB Firm's delay; therefore, DB Firm agrees that it shall pay to CITY the sum of **TEN THOUSAND DOLLARS (\$10,000) per day** as liquidated damages for the period of time that any portion of the WORK remains unfinished after the time fixed for an interim milestone and/or Substantial Completion.

It is hereby understood and agreed that this amount is not a penalty, but is a reasonable estimate of the damages that CITY will incur. In the event any portion of the liquidated damages is not paid to CITY, CITY may deduct that amount from any money due or that may become due the DB Firm under this AGREEMENT, CITY may seek recovery of Liquidated Damages from the DB Firm's Performance Bond Surety and/or CITY may seek recovery of Liquidated Damages from the DB Firm or the Performance Bond Surety without having exhausted remedies against the other.

2. TERM OF AGREEMENT

A. The services of DB Firm are to commence upon execution of this AGREEMENT and shall be completed and this AGREEMENT terminated on _____, unless otherwise extended in writing by the mutual AGREEMENT of both parties.

B. The CITY Manager, or their designee may, by written instrument signed by the Parties, extend the duration of this AGREEMENT in the manner provided in Section 5, provided that the extension does not require the payment of compensation in excess of the maximum compensation set forth in Section 3, Compensation.

3. COMPENSATION:

A. The DB Firm shall be paid in accordance with the attached Fee Schedule in **EXHIBIT "B"**. DB Firm charges separately for certain costs incurred in the representation, as well as for any disbursements to third parties made on CITY'S behalf. Such costs and disbursements include, for example, the following: mileage (at the IRS rate in effect at the time the travel occurs), overnight delivery and messenger services. DB Firm shall be reimbursed for expenses related to travel, for example (flights, hotels, meals). However, DB Firm shall not make travel arrangements or incur costs on behalf of CITY without prior written authorization to incur said expenses and in no event shall total compensation under this AGREEMENT exceed _____ (\$_____) without CITY'S prior written approval.

B. Said amount shall be paid upon submittal of monthly billings showing completion of the tasks that month. DB Firm shall furnish CITY with invoices for all expenses as well as for

all materials authorized by this AGREEMENT. The invoices shall be submitted with the monthly billings.

C. If the WORK is temporarily suspended at the request of the CITY, compensation shall be based upon the portion of WORK completed as of the date of the suspension, subject to Section 4.

D. Compensation for Construction Phase Services.

CITY shall pay DB Firm, in accordance with the GENERAL CONDITIONS (**EXHIBIT "D"**), a GMP for the WORK. The GMP shall be established by the GMP Proposal and is subject to adjustments made in accordance with Article 10, 11, and 12 of the GENERAL CONDITIONS (**EXHIBIT "D"**).

For WORK performed after the Effective Date of the Construction Phase, CITY shall make progress payments after CITY'S receipt of each properly submitted and accurate Application for Payment submitted in accordance with Section 14.02 of the GENERAL CONDITIONS (**EXHIBIT "D"**). All such payments will be measured by the Progress Payment Schedule, pursuant to Paragraph 14.01 of the GENERAL CONDITIONS (**EXHIBIT "D"**), and shall reflect the total of payments previously made and amounts properly withheld as retainage, as set forth below, and under the Article 14 of the GENERAL CONDITIONS (**EXHIBIT "D"**). WORK completed as estimated shall be an estimate only and no inaccuracy or error in said estimate shall release DB Firm or any Surety from such WORK or from enforcing each and every provision of the AGREEMENT DOCUMENTS.

Progress payments will be in an amount equal to ninety five percent (95%) of WORK completed. The remaining five percent (5%) of such amounts shall be held as the Retention.

Each Progress Payment shall be conditioned upon DB Firm providing to CITY with the corresponding Application for Payment a conditional waiver and release of claims for payment upon payment from the DB Firm and each of its subcontractors and materials suppliers that have contracts with DB Firm that exceed \$250,000 in the form required by Civil Code Section 8132, covering all sums requested in such Application for Payment, and an unconditional waiver and release of claims for payment from each party, in the form required by Civil Code Section 8132, covering sums disbursed pursuant to the most recently preceding Application for Payment. Failure to provide either a condition waiver and release, or unconditional waiver and release shall result in the subject sums being in dispute, and thus withheld from payment.

After DB Firm has, in the opinion of CITY, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the AGREEMENT DOCUMENTS, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked up record documents, and other documents, DB Firm may make application for final payment following the procedure for progress payments and in accordance with Section 14.07 of the GENERAL CONDITIONS (**EXHIBIT "D"**).

It is the policy of the CITY that payment for all goods and services shall be made in a timely manner. The time at which payment shall be due from CITY shall be thirty (30) days from receipt of a proper invoice (i.e., Application for Payment) and acceptance of services.

4. TERMINATION:

A. This AGREEMENT may be terminated by either party, provided that the other party is given not less than thirty (30) calendar days' written notice (delivered by registered mail) of intent to terminate.

B. The CITY may temporarily suspend this AGREEMENT, at no additional cost to CITY, provided that the DB Firm is given written notice (delivered by certified mail, return receipt requested) of temporary suspension. If CITY gives such notice of temporary suspension, DB Firm shall immediately suspend its activities under this AGREEMENT.

C. Notwithstanding any provisions of this AGREEMENT, DB Firm shall not be relieved of liability to the CITY for damages sustained by the CITY by virtue of any breach of this AGREEMENT by DB Firm, and the CITY may withhold any payments due to DB Firm until such time as the exact amount of damages, if any, due the CITY from DB Firm is determined.

D. In the event of termination, the DB Firm shall be compensated as provided for in this AGREEMENT, except as provided in Section 4C. Upon termination, the CITY shall be entitled to all final WORK and draft WORK, including but not limited to, appraisals, inventories, studies, analyses, drawings and data estimates performed to that date in accordance with Section 7 herein.

5. AMENDMENTS, CHANGES OR MODIFICATIONS:

Amendments, changes or modifications in the terms of this AGREEMENT may be made at any time by mutual written AGREEMENT between the parties hereto and shall be signed by the persons authorized to bind the parties hereto.

The AGREEMENT DOCUMENTS may only be amended, modified, or supplemented as provided in Article 10, 11, and 12 of the GENERAL CONDITIONS (**EXHIBIT "D"**).

6. EXTENSIONS OF TIME:

DB Firm may, for good cause, request extensions of time to perform the services required herein. Such extensions shall be authorized in advance by the CITY in writing and shall be incorporated in written amendments to this AGREEMENT in the manner provided in Section 5.

7. PROPERTY OF CITY:

A. It is mutually agreed that all draft and final materials prepared by the DB Firm under this AGREEMENT shall become the property of the CITY, and the DB Firm shall have no property right therein whatsoever. Immediately upon termination, the CITY shall be entitled to, and the DB Firm shall deliver to the CITY, all data, drawings, specifications, reports, estimates, summaries and other such materials as may have been prepared or accumulated to date by the DB Firm in performing this AGREEMENT which is not DB Firm's privileged information, as defined by law, or DB Firm's personnel information, along with all other property belonging exclusively to the CITY which is in the DB Firm's possession.

B. Additionally, it is agreed that the parties intend this to be an AGREEMENT for WORK, as defined herein, each considers the services, products, and results of the WORK rendered by DB Firm herein to be a WORK made for hire. DB Firm acknowledges and agrees

that the WORK (and all rights therein, including, without limitation, copyright) belongs to and shall be the sole and exclusive property of the CITY.

8. COMPLIANCE WITH ALL LAWS:

C. DB Firm shall comply with all applicable laws, ordinances, and codes of federal, state and local governments, and shall commit no trespass on any public or private property in performing any of the WORK authorized by this AGREEMENT. It shall be CITY'S responsibility to obtain all rights of way and easements to enable DB Firm to perform its services herein. DB Firm shall assist CITY in providing the same.

D. DB Firm warrants to the CITY that it is licensed by all applicable governmental bodies to perform this AGREEMENT and will remain so licensed throughout the progress of the WORK, and that it has, and will have, throughout the progress of the WORK, the necessary experience, skill and financial resources to enable it to perform this AGREEMENT.

9. WARRANTIES AND RESPONSIBILITIES - DB FIRM:

A. DB Firm agrees and represents that it is qualified to properly provide the services set forth in **EXHIBIT "A"** in a manner which is consistent with the generally accepted standards of DB Firm's profession.

B. DB Firm agrees and represents that the WORK performed under this AGREEMENT shall be in accordance with applicable federal, State and local law in accordance with Section 17A hereof.

C. DB Firm shall designate a project manager who at all times shall represent the DB Firm before the CITY on all matters relating to this AGREEMENT. The project manager shall continue in such capacity unless and until he or she is removed at the request of the CITY, is no longer employed by DB Firm, or is replaced with the written approval of the CITY, which approval shall not be unreasonably withheld.

D. DB Firm shall provide corrective services without charge to the CITY for services which fail to meet the above professional and legal standards and which are reported to DB Firm in writing within sixty (60) days of discovery. Should DB Firm fail or refuse to perform promptly its obligations, the CITY may render or undertake performance thereof and the DB Firm shall be liable for any expenses thereby incurred.

10. SUBCONTRACTING:

None of the services covered by this AGREEMENT shall be subcontracted without the prior written consent of the CITY, which will not be unreasonably withheld. DB Firm shall be fully responsible to the CITY for the negligent acts and omissions of its contractors and subcontractors, and of persons either directly or indirectly employed by them, as it is for the negligent acts and omissions of persons directly employed by DB Firm.

11. ASSIGNABILITY:

DB Firm shall not assign or transfer any interest in this AGREEMENT whether by assignment or novation, without the prior written consent of the CITY. However, claims for money due or to become due to DB Firm from the CITY under this AGREEMENT may be assigned to a

financial institution, or to a trustee in bankruptcy, without such approval. Notice of any assignment or transfer whether voluntary or involuntary shall be furnished promptly to the CITY.

12. INTEREST IN AGREEMENT:

DB Firm covenants that neither it, nor any of its employees, agents, contractors, subcontractors has any interest, nor shall they acquire any interest, direct or indirect, in the subject of the AGREEMENT, nor any other interest which would conflict in any manner or degree with the performance of its services hereunder. DB Firm shall make all disclosures required by the CITY'S conflict of interest code in accordance with the category designated by the CITY, unless the CITY Manager determines in writing that DB Firm's duties are more limited in scope than is warranted by the category designated by the CITY code and that a narrower disclosure category should apply. DB Firm also agrees to make disclosure in compliance with the CITY conflict of interest code if, at any time after the execution of this AGREEMENT, CITY determines and notifies DB Firm in writing that DB Firm's duties under this AGREEMENT warrant greater disclosure by DB Firm than was originally contemplated. DB Firm shall make disclosures in the time, place and manner set forth in the conflict of interest code and as directed by the CITY.

13. MATERIALS CONFIDENTIAL:

All of the materials prepared or assembled by DB Firm pursuant to performance of this AGREEMENT are confidential and DB Firm agrees that they shall not be made available to any individual or organization without the prior written approval of the CITY, except by court order.

14. LIABILITY OF DB FIRM-NEGLIGENCE:

DB Firm shall be responsible for performing the WORK under this AGREEMENT in a manner which is consistent with the generally-accepted standards of the DB Firm's profession and shall be liable for its own negligence and the negligent acts of its employees, agents, contractors and subcontractors. The CITY shall have no right of control over the manner in which the WORK is to be done but only as to its outcome, and shall not be charged with the responsibility of preventing risk to DB Firm or its employees, agents, contractors or subcontractors.

15. INDEMNITY AND LITIGATION COSTS:

To the fullest extent permitted by law, DB Firm shall indemnify, defend, and hold harmless the CITY, its officers, officials, agents, and employees against all claims, damages, demands, liability, costs, losses and expenses, including without limitation court costs and reasonable attorneys' fees, arising from DB Firm's negligent acts or negligent failure to act, errors, omissions or willful misconduct incident to the performance of this AGREEMENT except such loss or damage caused solely by the active negligence, sole negligence, or willful misconduct of the CITY. The provisions of this paragraph shall survive termination or suspension of this AGREEMENT.

16. DB FIRM TO PROVIDE INSURANCE:

A. DB Firm shall not commence any WORK before obtaining, and shall maintain in full force at all times during the duration and performance of this AGREEMENT, the policies of insurance specified in this Section. Such insurance must have the approval of the CITY as to limit, form, and amount, and shall be placed with insurers with a current A.M. Best's rating of no

less than “A” in Class VII (an NR rating is acceptable for Worker’s Compensation insurance written with the State Compensation Insurance Fund of California).

B. Prior to execution of this AGREEMENT and prior to commencement of any WORK, the DB Firm shall furnish the CITY with certificates of insurance and copies of endorsements providing evidence of coverage for all policies required by the AGREEMENT. The DB Firm and its contractors and subcontractors shall, at their expense, maintain in effect at all times during the performance of WORK under the AGREEMENT not less than the following coverage and limits of insurance, which shall be maintained with insurers and under forms of policy satisfactory to the CITY. The maintenance by DB Firm and its contractors and subcontractors of the following coverage and limits of insurance is a material element of this AGREEMENT. The failure of DB Firm or of any of its contractors or subcontractors to maintain or renew coverage or to provide evidence of renewal may be treated by the CITY as a material breach of this AGREEMENT. Approval of the insurance by the CITY shall not relieve or decrease any liability of DB Firm.

1. Commercial General Liability Insurance.

a. DB Firm shall maintain commercial general liability insurance with coverage at least as broad as Insurance Services Office form CG 00 01 (or equivalent), in an amount not less than twenty million dollars (\$20,000,000) per occurrence and forty million dollars (\$40,000,000) minimum limit for general aggregate for bodily injury, personal injury, and property damage, including without limitation, blanket contractual liability. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit. DB Firm’s general liability policies shall be primary and shall not seek contribution from the CITY’S coverage, and be endorsed using Insurance Services Office form CG 20 10 (or equivalent) to provide that CITY and its officers, officials, employees, and agents shall be additional insureds under such policies. For construction projects, an endorsement providing completed operations coverage for the additional insured, ISO form CG 20 37 (or equivalent), is also required.

b. Any failure to comply with reporting provisions of the policies by DB Firm shall not affect coverage provided the CITY.

c. Coverage shall state that DB Firm insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer’s liability.

d. Coverage shall contain a waiver of subrogation in favor of the CITY.

2. *Automobile Liability.* If vehicles are brought onto CITY facilities, DB Firm shall maintain automobile liability with limits no less than one million dollars (\$1,000,000) minimum limit per accident for bodily injury and property damage.

3. *Workers’ Compensation and Employers’ Liability.* DB Firm shall maintain Workers’ Compensation Insurance and Employer’s Liability Insurance with limits of at least one million dollars (\$1,000,000). DB Firm shall submit to CITY, along with the certificate of insurance, a waiver of subrogation endorsement in favor of CITY, its officers, agents, employees, and volunteers. DB Firm shall sign the Certificate of Compliance with Labor Code 3700 (**EXHIBIT “C”**).

4. *Professional Liability.* DB Firm shall maintain professional liability insurance that insures against professional errors and omissions that may be made in performing the Services to be rendered in connection with this AGREEMENT, in the minimum amount of twenty million dollars (\$20,000,000) per claim and in the aggregate. Any policy inception date, continuity date, or retroactive date must be before the effective date of this AGREEMENT, and DB Firm agrees to maintain continuous coverage through a period no less than three years after completion of the services required by this AGREEMENT.

5. All Coverages.

a. Each insurance policy required by this AGREEMENT shall be endorsed to state that coverage shall not be suspended, voided, cancelled, or reduced in limits except after thirty (30) days' prior written notice has been given to the CITY.

b. All self-insurance, self-insured retentions, and deductibles must be declared and approved by the CITY.

c. Evidence of Insurance - Prior to commencement of WORK, the DB Firm shall furnish to the CITY certificates, additional insured endorsements, and waivers of subrogation evidencing compliance with the insurance requirements above. The DB Firm must agree to provide complete, certified copies of all required insurance policies when requested by the CITY.

d. Acceptability of Insurers - Insurance shall be placed with insurers admitted in the State of California and with an A.M. Best rating of "A" Class VII or higher.

e. Subcontractors and DB Firms - A category of risk and the applicable insurance requirements will be determined on a "per subcontractor" or "per DB Firm" basis, considering the particular WORK to be done by the subcontractor or DB Firm and the interrelationship of that WORK to other WORK being conducted by the DB Firm.

6. No other provision of this AGREEMENT or any attachment thereto shall reduce the insurance or indemnity obligations imposed under this Section.

C. In addition to any other remedy the CITY may have, if DB Firm fails to maintain the insurance coverage as required in this Section, the CITY may obtain such insurance coverage that is not being maintained, in the form and amount substantially the same as is required herein, and the CITY may deduct the cost of such insurance from any amounts due or which may become due to DB Firm under this AGREEMENT.

D. No policy required by this AGREEMENT shall be suspended, cancelled, terminated by either party, or reduced in coverage or in limits unless written approval is obtained by DB Firm from the CITY.

E. Any deductibles or self-insured retentions in excess of \$10,000 must be declared to, and approved by, the CITY.

F. The requirement as to types, limits, and the CITY'S approval of insurance coverage to be maintained by DB Firm are not intended to, and shall not in any manner, limit or qualify the liabilities and obligations assumed by DB Firm under the AGREEMENT.

17. MISCELLANEOUS PROVISIONS:

A. Compliance with Laws. DB Firm shall keep itself fully informed of, shall observe and comply with, and shall cause any and all persons, firms or corporations employed by it or under its control to observe and comply with, applicable federal, state, county and municipal laws, ordinances, regulations, orders and decrees which in any manner affect those engaged or employed on the WORK described by this AGREEMENT or the materials used or which in any way affect the conduct of the WORK.

B. Unlawful Acts. DB Firm shall not engage in unlawful employment discrimination. Such unlawful employment discrimination includes, but is not limited to, employment discrimination based upon a person's race, religious creed, color, national origin, ancestry, physical handicap, medical condition, marital status, gender, citizenship, or sexual orientation.

C. Record Retention. DB Firm shall maintain and make available for inspection by the CITY and its auditors accurate records of all of its costs, disbursements and receipts with respect to any WORK under this AGREEMENT. Such inspections may be made during regular office hours at any time until six (6) months after the final payments under this AGREEMENT are made to the DB Firm.

D. Notice. All notices that are required to be given by one party to the other under this AGREEMENT shall be in writing and shall be deemed to have been given if delivered personally or enclosed in a properly addressed envelope and deposited in a United States Post Office for delivery by registered or certified mail addressed to the parties at the following addresses:

CITY:

Somporn Boonsalat
Deputy Director of Engineering
City of Manteca
1001 W. Center St.
Manteca, CA 95337

DB Firm:

Other Party Contact Name
Other Party Contact Title
Other Party Vendor Name
Other Party Address
Other Party Phone Number
Other Party Email

E. Governing Law and Venue. This AGREEMENT shall be interpreted and governed by the laws of the State of California, and any legal action relating to this AGREEMENT shall take place in the Superior Court, County of San Joaquin or the Eastern District of California for any federal litigation.

F. Waiver. Waiver of any breach or default under this AGREEMENT shall not constitute a continuing waiver of a subsequent breach or default of the same or any other provision under this AGREEMENT.

G. Severability. If any provision of this AGREEMENT is held to be invalid, illegal or otherwise unenforceable by a court of competent jurisdiction, the remaining provisions of this AGREEMENT shall continue in full force and effect.

H. Mediation. In the event of any controversy or claim arising out of or relating to this AGREEMENT or the Services provided by DB Firm (each referred to as a "Dispute" and all

collectively referred to as the “Disputes”), the parties shall try to resolve all Disputes through good faith, direct discussions involving the representatives of each party who possess the necessary authority to resolve such Dispute. If direct discussions are unsuccessful in resolving a Dispute, the Parties shall endeavor to resolve the matter by mediation through and administered by JAMS or its successor in interest. JAMS shall provide the parties with the name of five (5) qualified mediators. Each party shall have the option to strike two of the five mediators selected by JAMS, and thereafter the mediator remaining shall hear the Dispute. If the Dispute remains unresolved after mediation, either party may commence litigation.

I. Costs and Attorney' Fees. If either party commences any legal action against the other party arising out of this AGREEMENT or the performance thereof, the prevailing party in such action may recover its reasonable litigation expenses, including court costs, expert witness fees, discovery expenses, and attorneys' fees.

J. Entire AGREEMENT. This AGREEMENT constitutes the entire AGREEMENT between the parties relative to the services specified herein and no modification hereof shall be effective unless and until such modification is evidenced by a writing signed by both parties to this AGREEMENT. There are no understandings, agreements, conditions, representations, warranties or promises, with respect to this AGREEMENT, except those contained in or referred to in writing.

K. Execution. This AGREEMENT may be executed in several counterparts, each of which shall constitute one and the same instrument and shall become binding upon the parties when at least one copy has been signed by both parties.

L. Authority to Enter AGREEMENT DB Firm warrants that it has all requisite power and authority to conduct its business and to execute, deliver, and perform this AGREEMENT. Each party warrants to the other that the signature to this AGREEMENT have the legal power, right, and authority to enter into this AGREEMENT and to bind each party.

M. California Prevailing Wage Requirement Pursuant to California Labor Code sections 1720 through 1861, the DB Firm, its Contractor and all subcontractors shall ensure that all workers who perform WORK under this AGREEMENT are paid not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations (DIR), if applicable. This includes WORK performed during the design, site assessment, feasibility study, and other preconstruction phases of construction, including but not limited to inspection and land surveying WORK, regardless of whether any further construction WORK is conducted, and WORK performed during the post-construction phases of construction, including but not limited to all cleanup WORK at the jobsite. The most current prevailing wage determination can be found at <https://www.dir.ca.gov/OPRL/DPreWageDetermination.htm>.

N. CITY'S Expectations. The following is a list of the CITY'S expectations shall be incorporated into the DB Firm's contract:

1. Understand the WORK as designed or know where to research the documents for information.
2. Respond to all of the CITY'S questions no matter how small they may seem.
3. Talk with the CITY about the planned design and what goals are going to be achieved. Follow up on any outstanding issues, inquiries from the CITY, etc.

4. Think ahead of possible utility conflicts.
5. Observe the field conditions and discuss with CITY any discrepancies.
6. Maintain a professional appearance during all meetings including in-person meetings and virtual meetings. This includes an understanding of virtual meeting software, in addition to, the use of a professional background, use of adequate equipment including camera, laptop, lighting, microphone, etc.
7. When issues arise, work with all parties to come-up with a solution and take a position that provides the greatest benefit to the CITY.
8. Review initial draft of the progress billing request prior to submittal to CITY'S project manager.
9. Return all phone calls from CITY project management staff on the same business day.
10. Provide CITY with all known scheduled time off during the Project duration. Review time off impacts to project and project coverage with CITY at least one weeks in advance, or as soon as practicable.
11. No proprietary software shall be used in conjunction with this Project.

O. DB Firm's Representations. DB Firm shall be deemed to have made the following representations with its submission of the GMP Proposal:

1. DB Firm has examined, carefully studied, and thoroughly understands the AGREEMENT DOCUMENTS and the Reference Documents associated with the WORK.
2. DB Firm has visited the Site and is familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the WORK.
3. DB Firm is familiar with and is satisfied as to all laws and regulations that may affect cost, progress, and performance of the WORK.
4. DB Firm is aware of the general nature of WORK to be performed by CITY and others at the Site that relates to the WORK as indicated in the AGREEMENT DOCUMENTS.
5. DB Firm has correlated the AGREEMENT DOCUMENTS with the information known to DB Firm, information and observations obtained from visits to the Site, reports and drawings identified in the AGREEMENT DOCUMENTS, and all additional examinations, investigations, explorations, tests, studies and data.
6. DB Firm has given CITY written notice of all conflicts, errors, ambiguities or discrepancies that DB Firm has discovered in the AGREEMENT DOCUMENTS before submitting a GMP Proposal and the written resolution thereof by CITY is acceptable to DB Firm.

7. The AGREEMENT DOCUMENTS are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the WORK.

8. DB Firm shall be bound by and shall perform its obligations in full compliance with the AGREEMENT DOCUMENTS.

9. DB Firm shall be liable for its actions, including its negligence or gross negligence, and shall be liable for the acts, omissions, or errors of its agents or employees.

10. DB Firm shall perform its obligations under this AGREEMENT using its best professional skill and judgment, acting with due care and in accordance with the standard of care applicable to the WORK and Services to be provided by DB Firm, the covenants, terms and conditions of this AGREEMENT, and all applicable laws, codes, rules and regulations of the State of California and all other federal, state, and local jurisdictions having authority. DB Firm represents and warrants that it is fully experienced in projects of the nature and scope of WORK, and that it is properly qualified, licensed and equipped to supply and perform the WORK. The WORK completed herein must meet the approval of CITY and shall be subject to CITY's general right of inspection and supervision to secure the satisfactory completion thereof.

11. DB Firm agrees that all technologies, formulae, procedures, processes, methods, writings, ideas, dialogue, compositions, recordings, teleplays and video productions prepared for, written for, or submitted to CITY and/or used in connection with this AGREEMENT, shall either be the property of DB Firm, or DB Firm shall have all necessary rights to use such formulae, procedures, processes, methods, writings, ideas, dialogue, compositions, recordings, teleplays and video productions and to provide the same and derivative works thereof to CITY in connection with this AGREEMENT, and shall not otherwise be copied in whole or in part from any other source.

12. Except with respect to design pre-check documents and associated works and other third party intellectual property used by DB Firm on an authorized basis, all drawings, specifications, calculations, data, notes and other materials and documents, including electronic data (other than system performance data provided during operation, which shall not be deemed "WORK PRODUCT") furnished by DB Firm to CITY under this AGREEMENT ("WORK PRODUCT") shall be and remain the property of CITY. DB Firm, or the author of such works, if other than DB Firm, will retain all common law, statutory and other reserved rights, including copyrights in the WORK PRODUCT. Upon Final Completion, DB Firm will grant CITY, and its successors and assigns, a perpetual, non-transferable royalty-free license to use the WORK PRODUCT (excluding commercially provided hardware and software) for the purposes of repair, maintenance, renovation, modernization, and all other purposes related to the Project, including, without limitation, additions, alignments, or other development on the Site. CITY's use of such WORK PRODUCT without the involvement of the DB Firm shall be at CITY's sole risk and without liability or legal exposure to the DB Firm or anyone working by or through DB Firm. CITY understands that the use of commercially provided hardware and software may require the CITY to pay annual fees for such

use. If the DB Firm purchases a license for any commercial provided hardware or software as part of the WORK, DB Firm shall transfer such license to the CITY upon final completion.

P. Defined Terms. Terms used in this AGREEMENT and not defined herein shall have the meanings indicated in the GENERAL CONDITIONS (**EXHIBIT “D”**).

Q. Exhibits. The following exhibits (“Exhibits”) are specifically made part of, and incorporated by reference into, this AGREEMENT:

Exhibit “A”	DB Firm Proposal/Scope of Work Pre-construction Phase Services
Exhibit “B”	Fee Schedule
Exhibit “C”	Certificate of Compliance with Labor Code § 3700
Exhibit “D”	General Conditions
Exhibit “E”	Supplementary General Conditions
Exhibit “F”	CA Government Code Section 14310 Questionnaire
Exhibit “G”	Equal Employment Opportunity Certification
Exhibit “H”	Public Contract Code Section 10285.1 Certification
Exhibit “I”	Public Contract Code Section 10232 Certification
Exhibit “J”	Debarment and Suspension Certification
Exhibit “K”	Local Business Enterprise
Exhibit “L”	Non Lobbying Certification
Exhibit “M”	Site Visit Affidavit
Exhibit “N”	Acknowledgement of Insurance Requirements
Exhibit “O”	Non-Collusion Affidavit
Exhibit “P”	DIR Compliance Affidavit
Exhibit “Q”	Statement Acknowledging Penal and Civil Penalties Concerning The Contractors’ Licensing Laws
Exhibit “R”	Faithful Performance Bond
Exhibit “S”	Payment Bond
Exhibit “T”	Warranty Bond

- Exhibit "U" Workers' Compensation Insurance
- Exhibit "V" Insurance and Indemnification Documents
- Exhibit "W" Project Preliminary Design Report

R. Order of Precedence of the AGREEMENT DOCUMENTS. Notwithstanding anything in Paragraph 1(A) of this AGREEMENT, the following order of precedence shall apply in the case of direct, irresolvable conflicts between or among AGREEMENT DOCUMENTS:

1. Work Change Directives, Change Orders, and Field Orders with those of a later date taking precedence;
2. Written amendments signed by the Parties with those of a later date taking precedence;
3. This AGREEMENT, including all Exhibits;
4. The Final Drawings and Specifications;
5. Procurement Solicitation Documents (Notice Inviting Bids, Information to Bidders, Request for Qualifications, Request for Proposals, etc.)
6. Any provisions required by law or applicable regulations, whether inserted or not
7. Appendices (photographs, data contained in reports, and other information)

The singular includes the plural; the masculine, feminine, and neuter genders shall each be deemed to include the others; "shall," "will," or "agrees" are mandatory; "may" is permissive; "or" is not exclusive; "include," "includes" and "including" are not limiting and shall be construed as if followed by the words "without limitation," and "days" means calendar days unless specifically provided otherwise if there is more than one signer of this AGREEMENT, the signer obligations are joint and several. The failure to capitalize a defined term shall not automatically revert that term to its commonly accepted definition outside of this AGREEMENT (i.e., dictionary definition).

S. AGREEMENT Interpretation. Additionally, the following interpretation principles shall apply to this AGREEMENT:

1. Written numbers over figures, unless obviously incorrect.
2. Figured dimensions over scaled dimensions.
3. Large-scale drawings over small-scale drawings.
4. Any conflict between a bill or list of materials shown in the AGREEMENT DOCUMENTS and the actual quantities required to complete the WORK required by AGREEMENT DOCUMENTS, will be resolved in favor of the actual quantities, date (i.e., the most recent

Agreement for Services

document), and if the dates are the same or not determinable, then in favor of Specifications.

THIS SPACE INTENTIONALLY LEFT BLANK

TO EFFECTUATE THIS AGREEMENT, each of the parties has caused this AGREEMENT to be executed by its duly authorized representative as of the date set forth in the introductory paragraph on page 1 above.

CITY OF MANTECA:

DB FIRM:

Toni Lundgren
City Manager

(Type name of Consultant/form of organization)*

ATTEST:

By: _____
(Signature)

Cassandra Candini-Tilton,
Director of Legislative Services

(Type name and title)

COUNTERSIGNED:

By: _____
(Signature)

Matthew Boring
Interim Director of Finance

(Type name and title)

COUNTERSIGNED:

Address: _____

Stephanie Van Steyn,
Director of Human Resources

Telephone: _____

APPROVED AS TO FORM:

Riana Daniel, Deputy City Attorney

EXHIBIT "A"

DB Firm Proposal/Scope of Work
Pre-construction Phase Services

EXHIBIT “B”

Fee Schedule

EXHIBIT “C”

**CERTIFICATE OF COMPLIANCE WITH LABOR CODE § 3700
[Labor Code § 1861]**

I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this AGREEMENT.

DB FIRMS

By: _____
[Title]

EXHIBIT “D”

General Conditions

EXHIBIT “E”

Supplementary General Conditions

EXHIBIT “F”

CA Government Code Section 14310 Questionnaire

EXHIBIT "G"

Equal Employment Opportunity Certification

EXHIBIT "H"

Public Contract Code Section 10285.1 Certification

EXHIBIT "I"

Public Contract Code Section 10232 Certification

EXHIBIT “J”

Debarment and Suspension Certification

EXHIBIT “K”

Local Business Enterprise

EXHIBIT “L”

Non-Lobbying Certification

EXHIBIT “M”

Site Visit Affidavit

EXHIBIT “N”

Acknowledgement of Insurance Requirements

EXHIBIT “O”

Non-Collusion Affidavit

EXHIBIT “P”

DIR Compliance Affidavit

EXHIBIT “Q”

Statement Acknowledging Penal and Civil Penalties Concerning The Contractors’ Licensing
Laws

EXHIBIT “R”

Faithful Performance Bond

EXHIBIT “S”

Payment Bond

EXHIBIT “T”

Warranty Bond

EXHIBIT “U”

Workers' Compensation Insurance

EXHIBIT “V”

Insurance and Indemnification Documents

EXHIBIT “W”
Project Preliminary Design Report

Request For Proposals
Progressive Design-Build Services - Sidestream Treatment and UV Rehabilitation

ATTACHMENT D **FEE PROPOSAL FORM**

Request For Proposals
Progressive Design-Build Services - Sidestream Treatment and UV Rehabilitation

FEE PROPOSAL FORM

Note: *Proposers should review Section V (A) (5) of this RFP for information regarding the completion and City use of this form.*

1. Preconstruction Phase Services Fee

The Preconstruction Phase Services Fee shall be provided as a not-to-exceed amount (in number and words).

\$ _____

2. Construction Phase Work Fee Percentage

The Construction Phase Work Fee Percentage shall apply to Construction Phase work and shall be provided as a percentage of the cost of the Construction Phase Work (expressed in numbers and words).

_____ % _____ percent

3. Construction Phase Work Subcontractor Mark-up

The Construction Phase Work Subcontractor Mark-up shall apply to Construction Phase work and shall be provided as a percentage of the cost of the Construction Phase Work provided by subcontractors to the PDB Team (expressed in numbers and words).

_____ % _____ percent

4. Construction Phase Work Major Equipment Mark-up

The Construction Phase Work Major Equipment Mark-up shall apply to Construction Phase work and shall be provided as a percentage of the cost of the Major Equipment portion of the Construction Phase Work (expressed in numbers and words).

_____ % _____ percent

5. Preconstruction Phase Personnel Rates and Prices

To be provided by Proposer. See Section V (A) (5).

6. Preconstruction Phase Other Direct Costs

To be provided by Proposer. See Section V (A) (5).