ADDENDUM TO REQUEST FOR PROPOSALS – Maple St Correctional Center Photovoltaic System

	ADDENDUM No. 02
	San Mateo County 555 Government Center, Fifth Floor Redwood City, CA 94063
	RFP: Maple St Correctional Center Photovoltaic System
	Date: February 02, 2023

INTENT:

This Addendum is issued by the County of San Mateo to add a modification to the Request for Proposals (RFP) for Maple St Correctional Center Photovoltaic System. Proposers shall ascertain prior to submitting its Proposal that is has received all addenda issued. Please clearly note the addendum date and number on your proposal.

In the event of a conflict between the terms and provisions of this Addendum and the terms and provisions of the Maple St Correctional Center Photovoltaic System, the terms and provisions of this Addendum shall control. In all other respects, the RFP for Maple St Correctional Center Photovoltaic System shall remain unchanged and in full force and effect.

1. **Remove – 01 32 13 from the Contents Table under Contents, Technical, Division 01 00 00 General Requirements**
2. **Replace - Document 00 11 09 Bidding Calendar with attached updated document revising the bid schedule to extend bid timeline.**
3. **Add – Section 01**
4. **Add – 32 01 12.62 Fog Seal**
5. **Add – Geotechnical Report and Supplemental Letter**

Initial and Date: SY 02/02/2023

DOCUMENT 00 11 09

BIDDING CALENDAR

NOTICE - THIS SUMMARY OF DATES IS FOR INFORMATIONAL PURPOSES ONLY.

The dates and times listed may not be relied upon or enforced. This summary does not form a part of the Contract Documents and does not establish contractual obligations.

NOTICE – THIS IS A SUMMARY ONLY AND DOES NOT LIST ALL DATES, TIMES OR TIME PERIODS CONTAINED IN THE BIDDING AND CONTRACT DOCUMENTS.

All bidders and contractors must refer to the actual documents for all applicable dates, times, and time periods.

Maple Street Correctional Center Photovoltaic System, Project No PB010		
Event	**Date/Time**	**Location**
Contract Documents Issued for Bid (Released &Available):	Monday 9th of January 2023	https://publicworks.smcgov.org/projects-out-bid
Mandatory Pre-Bid Conference and Project Site Visit/Job Walk	Thursday 26th of January 2023	1300, Maple St, Redwood City, CA 94063
Deadline for Questions –Last Day for prospective Bidders to submit questions, in writing, by email to Authorized Contact Person: bdelgado@smcgov.org	Wednesday 8th of February 2023	N/A
Response to Questions	Wednesday 15th of February 2023	https://publicworks.smcgov.org/projects-out-bid
Bids Due:	Wednesday February 22nd 2023	See Notice to Contractors Document 00 11 16
Bid Opening Date:	Monday February 27th 2023	See Notice to Contractors Document 00 11 16
Bid Evaluation Period:	Friday March 3rd 2023	N/A
Issue Notice of Intent to Award:	Monday March 6th 2023	N/A
Protest Period:	Friday March 10th 2023	See Instructions to Bidders Document 11 21 13
Submission to County Board for Approval:	April 5th 2023	N/A
Anticipated Contract Award Date:	April 13th, 2023	N/A

END OF DOCUMENT

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SECTION 01 10 00

PROJECT SUMMARY

General

1.01 Summary

A. This Section includes the following:

1. Project Information.
2. Work covered by the Contract Documents.
3. Work phases.
4. Work under separate contracts.
5. Use of premises.
6. Owner's occupancy requirements.
7. Specification formats and conventions.

1.02 Work covered by contract documents

A. Project Identification:
County of San Mateo: Maple Street Correctional Facility

B. Project Location
1300 Maple Street
Redwood City California, 94063

C. Owner
County of San Mateo

D. Owner’s Representative:
Suna Yatagama, Energy Program Manager
County of San Mateo, Department of Public Works
555 County Center
Redwood City, CA 94603

E. Architect:
Bartos Architecture, Inc.
Mark Bartos, Architect
300 8th Avenue, Suite 202
San Mateo, CA 94401

F. The Work consists of the following:

1. Construction of a solar shade structure at the San Mateo County Correctional Facility located at 300 maple Street in Redwood city. This is a site built – shade structure over an existing parking lot. The work includes Steel Structure, Foundations, Solar Racking system, Solar panels, Inverters, and connection to existing power system. Paving and striping is also included. Refer to title sheet and all drawings and project manual for additional scope.

1.03 Work under other contracts

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.04 Use of premises

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. General: Contractor shall have limited use of premises for construction operations as indicated on the Contract Drawings.

C. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to boundaries as indicated on site plan, within the property line.
2. Sidewalks, Driveways and Entrances: Keep sidewalks, driveways and entrances serving premises and public use areas available to the General Public, Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

   (a) Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
   (b) Coordinate all project related access with County Representative who will provide interface with Correctional Center site staff. Contractor shall follow all site security protocol required by the Sheriff's office- via the County's Representative.

1.05 Owner's occupancy requirements

A. Owner Occupancy: Owner will vacate the premises prior to Notice to Proceed to the start of construction and during the entire construction period.

B. Site is a working Correctional Facility and Contractor shall follow any and all requirements necessary for the secure functioning of the facility.

1.06 Work restrictions

A. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (7.6 m) of entrances, operable windows, or outdoor air intakes.

B. Smoking, including vaping, is not permitted in any areas of the work zone.

1.07 Specification formats and conventions

A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "Master Format" numbering system.

1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    (a) The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

END OF SECTION 01 00 00

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SECTION 01 25 13

SUBSTITUTIONS

Part 1. General

1.01 Related documents

A. Drawings and general provisions of Contract, including General Conditions and Supplemental General Conditions and other Division 01 General Requirements, apply to this Section.

1.02 Summary

A. This Section specifies administrative and procedural requirements for handling requests for Substitutions.

B. Pre-bid substitutions will not be considered. No Substitution request will be accepted or considered by County prior to bid.

C. Procedural requirements governing the Contractor's selection of products and product options are included under General Requirements - Product Requirements.

1.03 Definitions

A. Definitions used in this Section are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents are considered requests for "substitutions." Where phrases such as "or equal" or "or equal as approved by the Architect" occurs in the Contract Documents, do not assume that materials or equipment will be approved as equal unless the item has been specifically approved for this work by the Architect prior to Bid Opening Date, or as otherwise allowed in these Contract Documents.

C. If the Contractor desires to use material or equipment other than that specified, they shall submit a request for approval of such substitution, in writing, to the Architect.

1.04 Submittals

A. If the Contractor desires to use material or equipment other than that specified, they shall submit a request for approval of such substitution, in writing, to the Architect. Product Substitutions for all Specification Sections must be requested within the time period specified in the general conditions. Substitution Request Form: Use CSI Form 13.1A.

B. Submit Substitution Request packages using the form provided and, in a quantity, to be returned to the Contractor plus four (4) copies of each request for substitution for review by the Architect.

C. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

1. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
2. Samples where applicable or requested.
3. A detailed, side-by-side comparison of the significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include but is not necessarily limited to elements such as size, weight, durability, performance and visual effect.
4. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors will become necessary to accommodate the proposed substitution.
5. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
6. Cost information, including a proposal of the net change, if any, in the Contract Sum.
7. Certification by the contractor that the substitution proposed is equal-to or better in every significant respect to that required by the contract documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
8. The Contractor warrants that they have investigated the proposed product and determined that it is equal to or superior in all respects to that indicated or specified.
9. The Contractor waives claim for additional costs and time associated with the proposed product, which may subsequently become apparent.
10. The Contractor shall provide a signed statement that the proposed product is in full compliance with the Contract Documents, and applicable regulatory requirements, requires no changes to specified controls and monitoring systems that may be specified in other Sections, and Certify that the Contractor will be responsible for coordination at no additional expense to the Owner
11. The Contractor shall provide information on availability of maintenance service, and source of replacement materials, and provide a sample of Manufacturer's standard form of guarantee or warranty for proposed product.

1.05 Architect's action

A. Within ten (10) days of receipt of the request, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution. The Architect at their sole discretion will determine the acceptability of proposed products and their determination shall be final. If a decision on use of a proposed substitution cannot be made or obtained within the time allocated, use the product specified by name in the Contract Documents.

B. No consideration will be given to a substitute product unless, in the Architect's judgment, it complies with the following conditions.

1. Substitution Request is complete.
2. It is equal in quality, performance and serviceability.
3. Its use does not entail changes in details or related construction.
4. It is acceptable in regards to design and aesthetic effect.
5. There is a cost and/or time advantage to the Owner.

C. Acceptance of a product shall not relieve the Contractor from responsibility for the proper execution of the Work and any other requirements of the Contract Documents.

D. If a proposed product is not accepted, use the product originally specified or indicated in the Contract Documents.

E. No products other than those indicated or specified in the Contract Documents shall be purchased or incorporated in the Work without the Architect’s prior written acceptance.

Part 2. Products

2.01 Substitutions

A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one (1) or more of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents.
3. The request is timely, fully documented and properly submitted.
4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
5. The Specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or Separate Contractors, and similar considerations.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

B. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents, does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

Part 3. Execution (Not Used)

END OF SECTION 01 25 13

Advancement of Construction Technology

Part 4. **Substitution**

REQUEST

(After the Bidding Phase)

Project: Insert project name ____________

Substitution Request Number: For the Architect to fill in.

From: Insert your name and company name

To: Insert name of Architect, Engineer or GC

Date: Insert the current date

A/E Project Number: Fill in if you know the number

.

Contract For: Insert your contract scope (in general)

Re: Substitution request

Specification Title: Insert spec title from specification book

Description: Copy section title from specification

Section: Copy from spec book

Page: insert page Article/Paragraph: insert para

Proposed Substitution: __________

__________ Manufacturer:

__________ Address: __________ Phone: insert plant phone number

Trade Name: __________ Model No.:)

Installer: insert subs company Address: insert subs address Phone: insert subs phone number

History: ☐ New product ☐ 2-5 years old X☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: __________

X☐ Point-by-point comparative data attached - REQUIRED BY A/E.

Reason for not providing specified item: __________

Similar Installation:

Project: List a completed project Architect: Insert name of Architect on completed project

Address: Insert project address Owner: Insert name of Owner on completed project

Date Installed: __________

Proposed substitution affects other parts of Work: X ☐ No ☐ Yes; explain __________

Savings to Owner for accepting substitution: __________ ($__________).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] __________ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ ____________

Part 5. **SUBSTITUTION**

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: Insert submitters name, normally project manager for sub

Signed by: Submitter to sign

Firm: Insert Submitters company name

Address: Insert

Telephone: Insert company phone number

Attachments: List name of attachments

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - General

1.01 Summary

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.02 Schedule of Values

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including; Application for Payment forms with Continuation Sheets, Submittals Schedule and Contractor's Construction Schedule.
2. Submit the Schedule of Values to the Architect at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
3. Sub schedules: Where the Work is separated into phases requiring separately phased payments, provide sub schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one-line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

   (a) Project name and location.
   (b) Name of Architect.
   (c) Architect's project number.
   (d) Contractor's name and address.
   (e) Date of submittal.

2. Submit draft of AIA Document G703 Continuation Sheets. or approved equivalent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. (Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.)

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    (a) Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.03 Applications for Payment

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Progress payments shall be submitted to County Project Manager by the 25th of the month. Provide a “draft copy” of proposed % complete values for review by the Architect and Owner. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Payment Application Forms: Use forms provided by Owner as form for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

F. Transmittal: Upon approval of the “draft copy” by the Architect and Owner, submit a signed and notarized original copy of each Application for Payment to the County Project Manager by a method ensuring receipt (within 24 hours). Submittal shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
2. Contractor shall submit a Construction Schedule Update (hard copy and electronic copy) in accordance with Section 01 32 16 (Construction Progress Documentation) along with the final copies of each months Application for Payment.
3. Contractor shall submit copies of the current months Photographic Documentation (electronic copy) in accordance with Section 01 32 33 (Photographic Documentation) along with the final copies of each months Application for Payment.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary, if not final).
4. Schedule of unit prices.
5. Submittals Schedule (preliminary, if not final).

6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent (100%) completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
   5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
   6. AIA Document G707-1994, "Consent of Surety to Final Payment."
   7. Evidence that claims have been settled.
   8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   9. Final, liquidated damages settlement statement.

PART 2 - Products (Not Used)

PART 3 - Execution (Not Used)

END OF SECTION 01 29 00

SECTION 01 32 16

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - General

1.01 Related Documents and Provisions

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions;

C. Summary of Work; and

D. Submittals.

1.02 Section Includes

A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.

1. Development of Project Schedule (including Initial, Baseline, and Progress Schedule). Contractor shall employ computerized Critical Path Method (“CPM”) scheduling (“CPM Schedule”).
2. Work Plan Cash Flow of the schedule shall be:
   - (a) Related to the Project Schedule of Values as approved by the Owner.
   - (b) Represent the intended work plan cash-flow.
   - (c) The basis of Earned Value assessment.
3. Submit schedules and reports as specified in the General Conditions.
4. Scheduling best practices identifying technical issues and project float.

B. Time Impacts including directed scope additions, unexpected critical impacts, inclement weather, and defined liability assignments.

C. Earned Value Management including schedule health assessment, forecast completion estimation, and schedule efficiency performance indicators.

D. Monthly Schedule Reporting.

1.03 Qualifications

A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of Primavera P6 Professional or approved equivalent software. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.

B. Project Scheduler qualifications shall be submitted in writing at the Notice of Intent to Award.

1. The written statement shall identify the individual who will perform CPM scheduling and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.
2. Required level of experience shall include at least two (2) projects of similar nature and scope, with a minimum of five (5) years of verifiable experience. The written statement shall provide contact persons for referenced projects with current telephone and address information.
3. Project Scheduler with capability of producing schedule reports and diagrams within 24 hours of Owner's request.

C. County reserves the right to approve or reject Contractor's scheduler or consultant at any time. County reserves the right to refuse replacing of Contractor's scheduler or consultant, if County believes replacement will negatively affect the scheduling of Work under this Contract.

1.04 General

A. Project Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents.

B. Overall time of completion and time of completion for each milestone shown on Project Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by County. Any such agreement shall be formalized by a Change Order.

1. County is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.
2. Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.
3. A schedule showing the work completed in less than the Contract Time, and that has been accepted by County, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both County and the Contractor.

C. Ownership Project Float: Neither the County nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.

1. Float defined as the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any of the activities in the schedule. Float is not for the exclusive use of or benefit of either the Owner or the Contractor, but its use shall be determined solely by the Owner.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.
4. Party A would not be responsible for the time since it did not consume the entire Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.

D. The Project Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. The Contractor is responsible for developing the based on the critical path method (CPM), logical activity duration derivation, using standard scheduling best practices, and logical sequence of execution.

E. Failure of the Project Schedule to include any element of the Work, or if there are any inaccuracies, will not relieve Contractor from the responsibility of accomplishing the Work in accordance with the Contract. County's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon County, or act to relieve Contractor of its responsibility for means and methods of construction.

F. Recommended scheduling software is the latest version of Primavera P6 or an approved equivalent. Contractor shall transmit contract file to County on USB flash drive or project management system at times requested by County.

G. Transmit each item under the form approved by County.

1. Identify Project with County Contract number and name of Contractor as well as the data date.
2. Provide space for Contractor's approval stamp and County's review stamps.
3. Submittals received from sources other than Contractor will be returned to the Contractor without County's review.

1.05 Initial Schedule (90-day)

A. At the Notice to Proceed, Contractor shall immediately commence development of Initial and Baseline Schedules to ensure compliance with Project Schedule submittal requirements.

B. Within fourteen (14) calendar days of the Notice to Proceed and before request for first progress payment, the Contractor shall prepare and submit to the Owner an Initial Schedule conforming to, and containing, the milestones required by the Contract Documents.

C. The Initial Schedule is the basis for the subsequent Baseline Schedule.

D. Indicate detailed plan for the Work to be completed in first ninety (90) days of the Contract; details of planned mobilization of equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond ninety (90) calendar days in summary form.

E. Initial Schedule shall be time scaled.

F. County and Contractor shall meet to review and discuss the Initial Schedule within seven (7) calendar days after it has been submitted to County.

1. County's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).
2. Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by County. Contractor shall resubmit Initial Schedule if requested by County.
3. Prescheduling Conference: Conduct conference at Project site to review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

(a) Review software limitations and content and format for reports.
(b) Verify availability of qualified personnel needed to develop and update schedule.
(c) Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
(d) Review delivery dates for Owner-furnished products.
(e) Review schedule for work of Owner's separate contracts.
(f) Review time required for review of submittals and resubmittals.
(g) Review requirements for tests and inspections by independent testing and inspecting agencies.
(h) Review time required for completion and startup procedures.
(i) Review time required for Project closeout and Owner startup procedures, including commissioning activities.
(j) Review and finalize list of construction activities to be included in schedule.
(k) Review submittal requirements and procedures.
(l) Review procedures for updating schedule.

1.06 Baseline schedule

A. Contractor shall, within thirty (30) calendar days from the Notice to Proceed date, submit a detailed proposed Baseline Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.

B. The Baseline Schedule shall include or comply with following requirements:

1. No activity on schedule shall have duration longer than fifteen (15) work days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by County.
   (a) Activity durations shall be total number of actual work days required to perform that activity.
   (b) It is recommended activity durations are derived using one of the following best practices methods:
      (i) Analogous
      (ii) Parametric
      (iii) PERT Method
2. Constraints: Should be limited to 'start on or after' or 'finish on or before'.
3. Phasing: Arrange list of activities on schedule by phase.
4. Work under More Than One Contract: Include a separate activity for each contract.
5. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
6. Products Ordered in Advance: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.
7. Owner-Furnished Products: Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.
8. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   (a) Submittals.
   (b) Purchases.
   (c) Mockups.
   (d) Fabrication.
   (e) Sample testing.
   (f) Deliveries.
   (g) Installation.
   (h) Tests and inspections.

(i) Adjusting.
(j) Curing.
(k) Building flush-out.
(l) Startup and placement into final use and operation.
(m) Commissioning.

9. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

   (a) Structural completion.
   (b) Permanent space enclosure.
   (c) Completion of mechanical installation.
   (d) Completion of electrical installation.
   (e) Substantial Completion.

10. County furnished materials and equipment, if any, identified as separate activities.
11. Activities for maintaining Project Record Documents.
12. Dependencies (or relationships) between activities.

    (a) Relationships shall consist of finish-start, finish-finish, and start-start only.
    (b) Open-end activities should be seen on the Notice to Proceed (NTP) and Final Completion milestones only.
    (c) Finish-start relationships with positive lag are not allowed.
    (d) Negative lag is not allowed.

13. Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.

    (a) Include time for submittals, re-submittals and reviews by County. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.
    (b) Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.
    (c)

14. Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.

    (a) Include time for fabrication and delivery of manufactured products for the Work.
    (b) Show dependencies between procurement and construction.

15. Activity description; what Work is to be accomplished avoiding duplicates.
16. The Work Plan Cash Flow will provide the cash flow used as the basis for subsequent earned value metric calculation. The total cost of performing each activity shall be total of labor, material, and equipment, as well as overhead and profit of Contractor. Sum of cost for all activities shall equal total Contract value and be correlated with the Schedule of Values.
    (a) The intent is to identify the monthly cash-flow for the duration of the project.
17. Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.
18. Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (10) days.
19. Twenty (20) working days for developing punch list(s), completion of punch-list items, and final clean-up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.
20. Interface with, and coordinate, the work of other contractors, County, and agencies such as, but not limited to, utility companies.
21. Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which the Project Schedule was built.
    (a) Also furnish for each Subcontractor, as determined by County, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Baseline Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.
    (b) Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.
    (c) In addition to Contractor's schedule, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by County, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.
    (d) Furnish schedule for Contractor/Subcontractor schedule meetings which shall be held prior to submission of Baseline Schedule to County. County shall be permitted to attend scheduling meetings as an observer.
22. Activity durations shall be in Work days.

23. Submit with the schedule a list of anticipated non-Work days, such as weekends and holidays. The Project Schedule shall exclude in its Work day calendar all non-Work days on which Contractor anticipates critical Work will not be performed.
24. The anticipated days lost due to weather shall be included as a single Adverse Weather Allowance activity with a duration defined in table below prorated for the length of the project and based on NOAA historical data. The duration shall be in working days and be the predecessor to the Substantial Completion milestone on the critical path. Adverse weather day impacts will be managed as prescribed in section 1.12F.

Month	Adverse Weather Allowance (days)
January	6
February	7
March	6
April	4
May	1
June	0
July	0
August	0
September	0
October	2
November	4
December	8

C. Baseline Schedule Review Meeting: Contractor shall, within fourteen (14) calendar days from the Notice to Proceed date, meet with County to review the Baseline Schedule submittal.

1. Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by County, in attendance. The meeting will take place over a continuous one (1) day period.
2. County's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:

   (a) Clarifications of Contract Requirements.

(b) Directions to include activities and information missing from submittal.
(c) Requests to Contractor to clarify its schedule.

3. Within seven (7) calendar days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by County at the Meeting.

1.07 Baseline Schedule Revisions

A. Adjustments to Baseline Schedule: Contractor shall have adjusted the Baseline Schedule submittal to address all review comments from Baseline Schedule review meeting and resubmit network diagrams and reports for County's review.

1. County, within fourteen (14) calendar days from date that Contractor submitted the revised schedule, will either:

(a) Accept schedule as submitted, or
(b) Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for County to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.

2. When schedule is accepted, it shall be considered the "Baseline Schedule" which will then be immediately updated to reflect the current status of the work.
3. County reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

B. Acceptance of Contractor's schedule by County will be based solely upon schedule's compliance with Contract requirements.

1. By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.
2. Upon submittal of schedule update, updated schedule shall be considered "current" Project Schedule.
3. Submission of Contractor's schedule to County shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.

C. Submittal of Baseline Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.

D. Contractor shall distribute Baseline Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to County for the record.

1.08 Progress Schedule (monthly schedule update)

A. Following acceptance of Contractor's Baseline Schedule, Contractor shall monitor progress of Work and adjust schedule on at least a monthly basis to reflect actual progress and any anticipated changes to planned activities.

1. Each schedule update submitted shall be complete, including all information requested for the Baseline Schedule submittal.
2. Each update shall continue to show all work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed. The "as-built" activities shall be reviewed and accepted prior to the update schedule review.

B. A meeting will be held on approximately the twenty-fifth (25th) of each month to review the schedule update submittal and progress payment application.

1. At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays
2. These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.
3. Contractor shall plan on the meeting taking no less than four (4) hours.

C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the Progress Schedule.

D. Within five (5) work days of receipt of above noted revised submittals, County will either accept or reject Progress Schedule.

E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to County by Contractor under this Contract, nor County's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations

1.09 Progress Schedule Review and Revisions

A. County, within seven (7) days from date that Contractor submitted the schedule update, will either:
   1. Accept schedule as submitted, or
   2. Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for County to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.

B. Updating the Project Schedule to reflect actual progress shall not be considered revisions to the Schedule.

C. To reflect revisions to the Schedule, the Contractor shall provide County with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.

D. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by County. County may request further information and justification for schedule revisions and Contractor shall, within three (3) working days, provide County with a complete written narrative response to County's request.

E. If the Contractor's revision is still not accepted by County, and the Contractor disagrees with County's position, the Contractor has seven (7) calendar days from receipt of County's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of County's written rejection of a schedule revision shall be contractually interpreted as acceptance of County's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding County's position.

F. At County's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

1.10 Recovery Schedule

A. A Recovery Schedule will be submitted when a delay of fourteen (14) calendar days or more to the Final Completion milestone is identified.

B. The Recovery Schedule is herein defined as the Contractor plan to reconcile current delay days to complete the project on the contract completion date.

1.11 Completion Schedule

A. If schedule performance, estimated through earned value analysis, is forecasting a trending delay of greater than 21 days over 3 or more months, the Contractor and PMCM will meet to discuss remediation through a Completion Schedule.

B. The Completion Schedule is herein defined as the Contractor plan to establish a project completion date when the current Final Completion date is deemed no longer achievable. When this happens, the Contractor will submit a schedule to complete that demonstrates a new probable project completion (for example, using cash flow analysis).

1.12 Project Delays

A. Time Allowances

1. Time is of the essence. Contract Time may only be changed by Change Order, and all time limits stated in the Contract Documents are to mean that time is of the essence.

B. Excusable Delay and Inexcusable Delay Defined

1. In the event the Contractor requests an extension of Contract Time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing Claims and Disputes (Division F, Section 33 and 34). When requesting time, requests must be submitted with full justification and documentation. If the Contractor fails to submit justification, it waives its right to a time extension at a later date. Such justification must be based on the official Construction Schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the Scope of Work. Any Claim for delay must include the following information as support, without limitation.
2. Excusable Delay. Subject to the provisions on Notice of Delay below, Contract Time may be adjusted in an amount equal to the time lost due to:

   (a) Changes in the Work ordered by County (“Changes”);
   (b) Acts or neglect by County, Architect/Engineer, any County Representative, utility owners or other contractors performing other work, not permitted or provided for in the Contract Documents, provided that Contractor has performed its responsibilities under the Contract Documents (including but not limited to pre-bid investigations) (“Acts or Neglect”); or

(c) Fires, floods, epidemics, **pandemics,** quarantines, abnormal weather conditions beyond the parameters otherwise set forth in this Article, earthquakes, civil or labor disturbances, **acts of war or terrorism**, or acts of God (together, “force majeure events”), provided damages resulting therefrom are not the result of Contractor’s failure to protect the Work as required by Contract Documents (“Force Majeure”).

(d) Work delayed which is out of the control of the Contractor may be an Excusable Delay.

3. Inexcusable Delay. Contract Time shall not be extended for any period of time where Contractor (and/or any Subcontractor) is delayed or prevented from completing any part of the Work due to a cause that is within Contractor’s risk or responsibility under the Contract Documents. Delays attributable to or within the control of a Subcontractor, or its subcontractors, or supplier, are deemed delays within the control of Contractor.

   (a) Work delayed which is in the control of the Contractor is an Inexcusable Delay.

4. Float. Float shall be treated as a Project resource. Contractor shall not be entitled to a time extension for impacts that consume float, but do not impact the critical path.

C. Notice of Delay

1. Within seven (7) calendar days of the beginning of any delay (excepting adverse weather delays), Contractor shall notify County in writing, by submitting a Notice of Delay that shall describe the anticipated delays resulting from the delay event in question. If Contractor requests an extension of time, Contractor shall submit a Time Impact Evaluation (TIE) within 10 calendar days of the Notice of Delay. County will determine all claims and adjustments in the Contract Time. No claim for an adjustment in the Contract Time will be valid and such claim will be waived if not submitted in accordance with the requirements of this subparagraph. In cases of substantial compliance with the seven- day notice requirement here (but not to exceed twenty-one calendar days from the beginning of the delay event), County may in its sole discretion recognize a claim for delay accompanied with the proper TIE, provided Contractor also shows good faith and a manifest lack of prejudice to County from the late notice. Contractor will follow the guidelines set forth in section 1.13 and include description of activities impacted by the delay, including the activity ID.

D. Compensable Time Extensions

1. Subject to other applicable provisions of the Contract Documents, Contractor may be entitled to adjustment in Contract Sum in addition to Contract Time only when all of the following conditions are met:

   (a) The Owner is the sole cause of the delay to the current critical path;
   (b) The delay is unreasonable under the circumstances involved;
   (c) The delay was not within the contemplation of Owner and Contractor; and
   (d) Contractor complies with the claims procedure of the Contract Documents.
   (e) Excusable delay caused solely by Changes in the Work ordered by County, as provided above, and/or
   (f) Excusable delay caused solely by Acts or Neglect by County or other person, as provided above.

E. Non-Compensable Time Extensions

1. Subject to other applicable provisions of the Contract Documents, Contractor may be entitled to adjustment in Contract Time only, without adjustment in Contract Sum, for

   (a) Periods of excusable delay caused solely by weather (beyond the adverse weather day allowance shown herein) or Force Majeure events as provided above in this Article, or
   (b) Periods of concurrent delay, where delay results from two or more causes, one of which is compensable (resulting from Changes or Acts or Neglect as set forth above in this Article), and the other of which is non-compensable or inexcusable, such as: acts or neglect of Contractor, Subcontractors or others for whom Contractor is responsible; other acts, omissions and conditions which would not entitle Contractor to adjustment in Contract Time; adverse weather; and/or actions of Force Majeure as provided above in this Article.

F. Adverse Weather

1. The Contract Adverse Weather Time has been determined with consideration given to the average climate weather conditions prevailing in the County in which the Project is located. (1.06B.24)
2. Contractor shall provide proof that adverse weather actually caused delays to work on the critical path. The proof shall contain the activity ID and name of impacted critical activity. Contractor shall give written notice of intent to claim an adverse weather day within one day of the adverse weather day occurring (1.06B.24).

3. In order to qualify as an adverse weather delay with respect to the foregoing parameters: daily rainfall must exceed 0.1 inch at the NOAA station located closest to the Project site, as measured and reported by NOAA. Notwithstanding these allowances, Contractor shall at all times employ all available mitigation measures to enable Work to continue, Contractor shall take reasonable steps to mitigate potential weather delays, such as dewatering the Site, lime treatment, and covering Work and material that could be affected adversely by weather. Failure to do so shall be cause for County to not grant a time extension due to adverse weather, where Contractor could have avoided or mitigated the potential delay by exercising reasonable care.
4. Contractor shall include the foregoing precipitation parameters as a monthly activity in its progress schedule. As Work on the critical path is affected by precipitation, Contractor shall notify County and request that the days be moved to the affected activities. Any adverse weather days remaining shall be considered Project float available to either County or Contractor.
5. Adverse weather delay for precipitation shall be recognized for the actual period of time Contractor proves it was delayed by precipitation exceeding the specified parameters. For example, and not by way of limitation, if precipitation exceeding the specified parameters does not in fact delay Contractor's progress on the critical path, then no time extension shall be recognized; and conversely, if Contractor proves to County's satisfaction that precipitation exceeding the specified parameters causes delay to Contractor for a period longer than the number of precipitation days incurred (e.g., if it rains or snows during grading work), then Contractor shall be entitled to a time extension equal to the actual period of such delay. Note: Time extension is mitigated in the weather day allowance activity (see section 1.06B24),
6. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall employ best practices to protect the Work, manage the construction site and rainwater during inclement weather. Persons performing the Work shall examine surfaces to receive their Work and shall report in writing to Contractor, with copy to County representative and the Architect conditions detrimental to the Work. Failure to examine and report discrepancies makes the Contractor responsible, at no increase in Contract Sum, for correction, County may require. Commencement of Work constitutes acceptance of surface.

G. Liquidated Damages

1. Time is of the essence. Execution of Contract Documents by Contractor shall constitute its acknowledgement that County will actually sustain damages in the form of Contract administration expenses (such as Project management and consultant expenses) in the amount fixed in the Contract Documents for each and every Day during which completion of Work required is delayed beyond expiration of time fixed for completion plus extensions of time allowed pursuant to provisions hereof.
2. Contractor and County agree that because of the nature of the Project, it would be impractical or extremely difficult to fix the amount of such actual damages incurred by County because of a delay in completion of all or any part of the Work. Contractor and County agree that specified measures of liquidated damages shall be presumed to be the amount of such damages actually sustained by County, and that because of the nature of the Project, it would be impracticable or extremely difficult to fix the actual damages.
3. Liquidated damages for delay shall cover administrative, overhead, interest on bonds, and general loss of public use damages suffered by County as a result of delay. Liquidated damages shall not cover the cost of completion of the Work, damages resulting from Defective Work, lost revenues or costs of substitute facilities, or damages suffered by others who then seek to recover their damages from County (for example, delay claims of other contractors, subcontractors, tenants, or other third-parties), and defense costs thereof. County may deduct from any money due or to become due to Contractor subsequent to time for completion of entire Work and extensions of time allowed pursuant to provisions hereof, a sum representing then-accrued liquidated damages.
4. Contractor shall not be charged for liquidated damages because of any delays in completion of Work on the critical path which are not the fault or negligence of Contractor or its Subcontractors, including acts of God as defined in Public Contract Code Section 7105, acts of enemy, epidemics, and quarantine restrictions. Contractor shall, within ten (10) days of beginning of any delay, notify Owner in writing of causes of delay including documentation and facts explaining the delay. Owner shall review the facts and extent of any delay and shall grant extension(s) of time for completing Work when, in its judgment, the findings of fact justify an extension. Extension(s) of time shall apply only to that portion of Work affected by delay and shall not apply to other portions of Work not so affected. An extension of time may only be granted if Contractor has timely submitted the notice and supporting documentation required by all relating Contract Documents as required herein.

1.13 Time Impact Evaluation ("tie") for Change Orders, and Other Delays

A. Owner Directed Added Work

1. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within seven (7) calendar days from the Notice to Proceed a TIE which includes both a written narrative and a delay fragnet integrated into the contemporaneous schedule depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable County to evaluate the impact of changed Work to the scheduled critical path.
2. Contractor shall be responsible for all costs associated with the preparation of TIEs, and the process of incorporating them into the current schedule update.
3. Once agreement has been reached on a TIE, the Contract Time will be adjusted accordingly (via Change Order Request and Change Order). If agreement is not reached on a TIE, the Contract Time may be extended in an amount County allows, and the Contractor may submit a claim for additional time claimed by contractor.

B. Contract Added Work Claim

1. If the schedule final completion date is extended due to added work scope, the Contractor is required to provide a time and cost impact within fourteen (14) calendar days and prior to proceeding with added work, unless approved by Owner.
2. If the Contractor believes critical work has been delayed due to circumstances beyond their control, a TIE shall be submitted as described above.
3. The TIE will be reviewed with fourteen (14) calendar days and assessed as excusable / compensable, excusable / non-compensable, or non- excusable / non-compensable.
4. Delay Fragnet
   (a) The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform the activities within the stated duration.
   (b) Specific logical ties to the Contract Schedule for the proposed changes and/or delay showing the activity/activities in the Construction Schedule that are affected by the change and/or delay. (A portion of any delay of seven (7) days or more must be provided.)

(c) A revised Construction Schedule must be submitted showing the delay and impact on the Final Completion date.

1.14 Time Extensions

A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current Progress Schedule update. Notice of time impacts shall be given in accord with the General Conditions.

B. Where an event for which County is responsible impacts the projected Final Completion date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor would expend to mitigate County-caused time impact. The Contractor shall submit its mitigation plan to County within fourteen (14) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.

C. Failure to request time, provide A, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.

D. No time will be granted under this Contract for cumulative effect of changes.

E. County will not be obligated to consider any time extension request unless the Contractor complies with the requirements of Contract Documents.

F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.

G. If the Contractor does not submit a TIE within the required seven (7) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

H. To avoid possible delay risks, the Contractor is aware that governmental agencies, including, without limitation, the County, gas companies, electrical utility companies, water districts, and other agencies may have to approve Contractor-prepared drawings or approve a proposed installation. Accordingly, Contractor shall include in its schedule and bid, time for possible review of its drawings and for reasonable delays and damages that may be caused by such agencies. Thus, Contractor is not entitled to make a claim for damages or delays arising from the required review of Contractor's drawings by third parties.

1.15 Schedule Reports

A. Submit the following reports with the Baseline Schedule and each monthly update.

B. Required Reports:

1. Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.
2. Report showing the longest critical path.
3. Work Plan Cash Flow Report including the following: percentage of Work accomplished, earned value- to date, previous payments, and amount earned for current update period.
4. Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.
5. Upon request, the Contractor may be required to submit a Planned versus Actual labor histogram calculated by early start.
6. 3-week look-ahead schedule. The 3-week look ahead shall be derived from the update schedule with referenced correlating activities.
7. Actual dates achieved on activities for the past period. This report should be submitted to the County prior to the overall update submittal for field verification.
8. Schedule update narrative describing items such as current critical path, issues, schedule revisions, and other.
9. All reports noted above shall be clearly dated (including data date) and titled.

C. Other Reports:

In addition to above reports, County may request, from month to month, any of the following reports.

1. Activities by early start.
2. Activities by late start.
3. Activities grouped by Subcontractors or selected trades.

D. Furnish County with report files on media as described previously in this document.

1.16 Progress Schedule Narrative

A. In addition to report submittal requirements for Project Schedule identified in the previous Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each schedule as specified herein. Status reporting shall be in form specified below.

B. Contractor shall prepare monthly written narrative reports of status of Project for submission to County. Written status reports shall include:

1. Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.
2. Progress made on critical activities indicated on Project Schedule.
3. Explanations for any lack of work on critical path activities planned to be performed during last month.
4. Explanations for any schedule changes, including changes to logic or to activity durations.
5. List of critical activities scheduled to be performed next month.
6. Status of major material and equipment procurement.
7. Any delays encountered during reporting period.
8. Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by County at no additional cost.
9. Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

1.17 Lookahead Schedule Report

By the end of the business day on the day prior to the Weekly Progress Meeting, the Contractor shall provide a time-scaled three (3) week Look-ahead Schedule that is based on, and correlated by activity number to, the current accepted schedule (i.e., Initial, Baseline or Progress Schedule). Look-ahead Schedule shall reflect ALL schedule activities that were planned to take place during this period based on the current schedule. Schedule shall include at least the following: area/building, activity ID, activity description, responsible contractor/subcontractor, as well as planned start date, duration and completion date. Activities noted to be on the critical path per the current schedule shall be highlighted accordingly. Contractor may include multiple activities that relate to a single activity ID if this provides clarity to sequencing, etc.

1.18 Daily Construction Reports

On a daily basis (prior to the end-of-business on the day of the work being reported), Contractor shall submit via the Project Management Software a Daily Construction Report to County for each workday, including weekends and holidays. Contractor shall develop the Daily Construction Reports on a computer-generated database capable of sorting daily Work, manpower, and man-hours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Obtain County's written approval of Daily Construction Report data base format prior to implementation. Include in report:

A. Project name and Project number.

B. Contractor's name and address.
C. Weather, temperature, and any unusual site conditions. Contractor shall note on this report any Notices issued that day relating to these conditions.
D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to scheduled activities and include all related schedule activity IDs (as well as CORs, CDs, etc).
E. Worker quantities for its own Work force and for Subcontractors of any tier.
F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.
G. Material deliveries.
H. High and low temperatures and general weather conditions.
I. Accidents.
J. Meetings and significant decisions.
K. Unusual events (refer to special reports).
L. Stoppages, delays, shortages, and losses.
M. Meter readings and similar recordings.
N. Emergency procedures.
O. Orders and requests of authorities having jurisdiction.
P. Change Orders received and implemented.
Q. Construction Change Directives received and implemented.
R. Services connected and disconnected.
S. Equipment or system tests and startups.
T. Partial Completions and occupancies.
U. Updates to any and all Activity IDs projected to have activity based on the current accepted Project Schedule.

PART 2 Products – Not used

PART 3 Execution - Not used

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SECTION 01 32 19

SUBMITTAL SCHEDULES / DAILY REPORTS / FIELD REPORTS

PART 1 - General

1.01 Summary

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Submittals Schedule.
2. Daily construction reports.
3. Field condition reports.

B. See Section 01 29 00 "Payment Procedures" for submitting the Schedule of Values.

C. See Section 01 32 33 "Photographic Documentation" for submitting construction photographs.

1.02 Definitions

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

C. Major Area: A story of construction, a separate building, or a similar significant construction element.

1.03 Submittals

A. Submittals Schedule: Submit via the web-based project management software. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

B. Daily Construction Reports: Submit PDF file via the web-based project management software prior to close-of-business on the day covered by the report.

C. Field Condition Reports: Submit PDF file via the web-based project management software at time of discovery of differing conditions.

1.04 Coordination

A. Coordinate preparation and processing of reports with performance of construction activities and with scheduling and reporting of separate contractors.

PART 2 - products

2.01 Submittals Schedule

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.02 Reports

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site and quantities relating to labor force.
2. Equipment at Project site.
3. Material deliveries.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Stoppages, delays, shortages, and losses.
7. Meter readings and similar recordings.
8. Orders and requests of authorities having jurisdiction.
9. Services connected and disconnected.
10. Equipment or system tests and startups.
11. Progress on any schedule activity, including all related activity IDs.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation [**on CSI Form 13.2A**]. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

Part 3 - Execution – (not used)

END OF SECTION 01 32 19

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 - General

1.01 Summary

A. This Section describes the requirements for furnishing photographs depicting work progress.

1.02 Description

A. Furnish photographs of the site construction, for each day worked, throughout the progress of the Work.

B. Take photographs on cutoff date for each Application for Payment.

C. In addition, take photographs at beginning and completion of the following elements:

1. Site clearing.
2. Excavation
3. Utility Trenching & Placement
4. Foundations
5. Structural Framing
6. Steel Erections
7. Enclosure of Building
   (a) Interior
   (b) Exterior
8. Landscaping
9. Substantial Completion
10. Final Completion
11. As requested by Owner.

1.03 Prints

A. NOT USED

1.04 Electronic Files

A. Upload photos to web-based project management software, indexed in folders by date and in chronological order.

B. All photos to be in a JPEG format.

C. Make photos available to Architect at any time in electronic format.

D. Provide a progress photo from 2 agreed upon vantages with each payment application.

1.05 Technique

A. Factual presentation, with correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

1.06 Views

A. Take ten (10) photographs at each specified time, until Date of Substantial Completion. Consult with Architect at each time for instructions on views required.

PART 2 – products (Not Used)

PART 3 – execution (Not Used)

END OF SECTION 01 32 33-

SECTION 01 33 00

SUBMITTAL PROCEDURES

Part 1. General

1.01 Summary

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:

1. Section 01 32 16"Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
2. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

C. See Section 01 77 00 "Closeout Procedures" for submitting warranties.

1.02 Definitions

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.03 Action Submittals

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect additional time for handling and reviewing submittals required by those corrections.

1.04 Submittal Administrative Requirements

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

   (a) Architect and County reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal. Contractor is to notify the Architect when new materials for review have been posted to the designated web-based project management software. Time will begin upon successful download of that information. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

1. Initial Review: Allow fourteen (14) calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow fourteen (14) calendar days for review of each re- submittal.

C. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

   (a) Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
   (b) Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement as well as any further waivers required by the Architect.

D. Submittals are to be submitted electronically via the web-based project management software.

1. The following submittals are to be submitted electronically:

   (a) Product Data
   (b) Shop Drawings

(c) Certifications
(d) Test Data
(e) Schedules

2. Samples shall not be submitted electronically but a transmittal should be to document delivery of such samples.

E. Identification and Information: Place a permanent label or title block on each cover of submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6x8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

(a) Project name.
(b) Date.
(c) Name of Architect.
(d) Name of Contractor.
(e) Name of subcontractor.
(f) Name of supplier.
(g) Name of manufacturer.
(h) Submittal number or other unique identifier, including revision identifier.

(i) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Re- submittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

(i) Number and title of appropriate Specification Section.
(j) Drawing number and detail references, as appropriate.
(k) Location(s) where product is to be installed, as appropriate.
(l) Other necessary identification.

F. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

(a) File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01- LNHS). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A-LNHS).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect
4. Include the following information on an inserted cover sheet:

(a) Project name.
(b) Date.
(c) Name and address of Architect.
(d) Name of Contractor.
(e) Name of firm or entity that prepared submittal.
(f) Name of subcontractor.
(g) Name of supplier.
(h) Name of manufacturer Number and title of appropriate Specification Section.
(i) Drawing number and detail references, as appropriate.
(j) Location(s) where product is to be installed, as appropriate.
(k) Related physical samples submitted directly.
(l) Other necessary identification.

G. Options: Identify options requiring selection by the Architect.

H. Deviations: Highlight, encircle, and otherwise specifically identify deviations from the Contract Documents on submittals.

I. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial electronic submittal may serve as final submittal.

J. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

K. Re-submittals: Make re-submittals in same form as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

L. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

M. Use for Construction: Retain complete set of paper copies of submittals on Project site. Use only final submittals that are marked with approval notation from Architect's action stamp.

1.05 Contractor's use of architect's cad files

A. At Contractor's written request, copies of Architect's CAD files of select plans will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions.

1. Only major site/floor/ceiling/roof plans, or building elevations/sections will be provided.
2. Wall section, details, schedules will not be provided.
3. Title blocks will be removed from the file.
4. Notes and dimensions may be removed from the file.
5. Compliance of the requests for consultant files is at the discretion of the consultant.
6. The following disclaimer will be added to the file:

Disclaimer and indemnification agreement for computer-based information

The attached computer-based information for the **Construction of Radio Shop** are provided to **(The User**) as a courtesy for their sole convenience. The User recognizes that computer-based information is easily changeable, that changes are difficult to detect and that use or conversion of the information provided may introduce errors, inaccuracies or anomalies that the Architect and their consultants can neither predict nor control. The delivery of this electronic data does not constitute the delivery of the professional work product of the Architect shall not be responsible for any modifications made to the electronic files or any products derived from the electronic files which are not prepared by us. By accepting and utilizing this electronic data in lieu of the corresponding drawings and specifications prepared by the Architect, the User agrees that such data is an instrument of service of the Architect, who shall be deemed to be the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights. The User, by accepting the electronic files, agrees to assume all risk and liabilities associated with the use of the information provided by the Architect and understand the Architect makes no claim or warranty as to the suitability or usefulness of the information for any purpose. The User also agrees, to the fullest extent permitted by law, to hold harmless and indemnify the Architect from and against any and all claims, liabilities, losses, damages and costs, including but not limited to attorney's fees, arising from or in connection with the use, misuse, modification, or misinterpretation of the electronic data provided by the Architect. Use of the attached computer-based information indicates acceptance and constitutes agreement to abide by the terms and conditions of this agreement.

Part 2. Products

2.01 Submittal Procedures

A. General Submittal Procedure Requirements:

1. Post electronic submittals as PDF electronic files directly to the web-based project management software (Basecamp) Notify the County Project Manger and Architect of the presence of the submittal(s) via email with identification of the specific materials posted. In web-based project management software, include link for all submittal register items associated with the submittal package. Where possible, endeavor to include all required action submittals for that specification section.
   (a) Architect, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Submit electronic submittals via email as PDF files.
   (a) Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
3. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   (a) Provide a digital signature with digital certificate on electronically- submitted certificates and certifications where indicated.
   (b) Provide a notarized statement on original paper copy certificates and certifications where indicated.
5. Test and Inspection Reports Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

   (a) Manufacturer's catalog cuts.
   (b) Manufacturer's product specifications.
   (c) Standard color charts.
   (d) Statement of compliance with specified referenced standards.
   (e) Testing by recognized testing agency.
   (f) Application of testing agency labels and seals.
   (g) Notation of coordination requirements.
   (h) Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

   (a) Wiring diagrams showing factory-installed wiring.
   (b) Printed performance curves.
   (c) Operational range diagrams.
   (d) Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

   (a) PDF electronic file with transmittal as noted above.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submittals based upon Architect's digital data drawing files will be permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

   (a) Identification of products.
   (b) Schedules.
   (c) Compliance with specified standards.
   (d) Notation of coordination requirements.
   (e) Notation of dimensions established by field measurement.
   (f) Relationship and attachment to adjoining construction clearly indicated.
   (g) Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Provide hard copies as required by the Architect.

3. Submit Shop Drawings in the following format:
   (a) PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package. Provide transmittal listing all samples submitted along with quantities.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   (a) Generic description of Sample.
   (b) Product name and name of manufacturer.
   (c) Sample source.
   (d) Number and title of applicable Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   (a) Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   (b) Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   (a) Number of Samples: Submit one (1) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

(a) Number of Samples: Submit three (3) sets of Samples. Architect will retain two (2) Sample sets; remainder will be returned. Mark up and retain one returned sample set as a project record sample.

(i) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:

(a) PDF electronic file.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 16 "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Section 01 29 00 “Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Wherever possible, including CSI numbers with description of work being completed. Also, provide DIR numbers for all subcontractors and vendors listed. Provide an updated list when any changes take place along with and explanation of what changed and why.

1. Submit subcontract list in the following format:

(a) PDF electronic file.

J. Coordination Drawings: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American

Welding Society (AWS) forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

T. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 40 00 “Quality Requirements."

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.02 Delegated-Design Services (Including Deferred Approvals)

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file and three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

Part 3. Execution

3.01 Contractor's Review

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to County Project Manager and Architect

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 Architect's Action

A. General: County Project Manager and Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Submittals: County Project Manager and Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Final Unrestricted Release: Where the submittal is marked "No Exceptions Taken," the Work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.
2. Final-but-Restricted Release: Where the submittal is marked "Reviewed with Exceptions as Noted," the Work covered by the submittal may proceed provided it complies with both Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.
3. Returned for Resubmittal: Where the submittal is marked "Revise and Resubmit," do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise or prepare a new submittal according to Architect's notations and corrections.
4. Rejected: Where the submittal is marked "Rejected," do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.
5. Incomplete: Where the submittal is marked "Submit Specified Item," do not proceed with the Work covered by the submittal. Prepare additional information requested, or required by the Contract Documents, that indicates compliance with requirements.

C. Informational Submittals: County Project Manager and Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

SECTION 01 35 33.21

NOVEL CORONAVIRUS (COVID-19) SAFETY REQUIREMENTS

Part 1. General

1.01 Summary

A. Section Includes: COVID-19 safety requirements in response to the need for work on essential construction projects that are permissible under the San Mateo County Public Health Department COVID-19 Health Officer Orders and applicable State and Federal guidelines/orders, to continue as safely as possible.

B. These COVID-19 safety requirements are not all encompassing and may need to be modified by the Contractor to individual construction tasks and updated as the COVID-19 pandemic evolves.

C. The Contractor and all its sub-tier level subcontractors and suppliers shall account in their Bid and sub-bids for all cost impacts whether affecting labor (including, but not limited to obtaining qualified workers, quantity of workers, as well as their productivity), deliveries, supervision, testing and/or procurement of materials and/or equipment and time caused by COVID-19 safety requirements found in this Section 01 11 70 and also all public health and/or governmental directives in place at the time Bids are received by the County for this Project.

D. Related Sections:

1. Section 01 33 00 – Submittal Procedures

1.02 Covid-19 Exposure Prevention, Preparedness, and Response Plan

A. Contractor's Responsibility

1. The Contractor shall prepare a COVID-19 Exposure Prevention, Preparedness and Response Plan specific to this Project that describes how to prevent worker exposure to coronavirus, protective measures to be taken on the jobsite, personal protective equipment and work practice controls to be used, cleaning and disinfecting procedures, and what to do if a worker(s) shows symptoms of COVID-19 illness or tests positive for COVID-19. The Contractor should review the latest OSHA COVID-19 Workplace Safety Guidance document (https://www.osha.gov/Publications/OSHA3990.pdf) as a resource in preparation of their Site Specific Health and Safety Plan. Other reliable and current sources of COVID-19 information can be found at California Department of Public Health (CDPH, State) https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/nCOV20 1 9.aspx

   Centers for Disease Control and Prevention
   (CDC, National)
   http://www.cdc.gov/coronavirus/novel-coronavirus- 2019.html

2. This plan shall at a minimum address the following COVID-19 safety guidelines:

   (a) COVID-19 Employee and Visitor training and check-list before entering worksite.
   (b) Employee distancing and strategies to maximize distancing when possible.
   (c) Limitations on gathering size.
   (d) Personal Protective Equipment (PPE) requirements.
   (e) Identify “choke points” and “high risk areas” such as hallways, hoists and elevators, break areas and vehicles.
   (f) Stagger trades and modify work schedules to reduce worker density to maximize distancing opportunities.
   (g) COVID-19 employee good personal hygiene measures.
   (h) Disinfecting and cleaning requirements.
   (i) Personal prevention actions requirements for all employees.
   (j) Toolbox and Tailgate COVID-19 employee training.
   (k) Recognizing COVID-19 Symptoms.
   (l) Establish a COVID-19 Exposure Action and Notification Plan.
   (m) Establish daily screening protocols for arriving workers and visitors to ensure potentially infected workers and visitors do not enter the Site.
   (n) Maintain daily attendance log of all workers and visitors who enter the Site.

3. Also, as part of this Plan, the Contractor shall draft and implement a COVID-19 Code of Safe Practices that is posted in areas visible to all employees and visitors.
4. The Contractor shall be prepared at each Progress and Coordination Meeting, if requested by the Owner to provide information relevant to the application, enforcement and implementation of such COVID-19 Safe Practices.
5. All Contractor managers and supervisors **(from forepersons to project managers)** must be familiar with this Plan and be ready to answer questions from employees, subcontractors, suppliers and visitors. Managers and supervisors must set a good example by following this Plan at all times. This involves practicing good personal hygiene and jobsite safety practices to prevent the spread of the virus. Managers and supervisors must encourage this same behavior from all employees, subcontractors, suppliers and visitors.
6. The Contractor shall immediately notify the Owner if any person under the Contractor's control on this Project has tested positive for COVID-19.

1.03 Submittals

A. The following information shall be provided in accordance with Section 01 33 00, Submittal Procedures, after the Award of Contract and before any work begins at the Site:
   1. COVID-19 Exposure Prevention, Preparedness and Response Plan.
   2. COVID-19 Code of Safe Practices.

B. To the extent that there are material amendments or modifications made to any of the above plans or practices during the performance of the Work, the Contractor shall provide to the Owner as soon as practicable the amendments and shall post them as part of the notification plan to all employees and visitors who enter the Site.

Part 2. **Products (Not used)**

Part 3. **Execution (Not used)**

END OF SECTION 01 35 33

SECTION 01 35 44

STORMWATER POLLUTION PREVENTION

Part 1. General

1.01 Description

A. The work of this section consists of implementing measures to prevent Storm Water Pollution during construction activities, in accordance with Federal, State, and local regulations, and in accordance with the Storm Water Pollution Prevention Plan (SWPPP) to be prepared for this project.

1.02 Submittals

A. Submit SWPPP to Owner after contract award and before the preconstruction conference.

B. Plans showing proposed arrangements and methods for control of erosion, sedimentation, and pollutant conveyance in storm water resulting from construction activities (refer construction drawings) The contractor shall provide final arrangement, methods of control and conveyance in the Storm Water Pollution Prevention Plan that satisfies all State NPDES permit requirements.

C. Provide sufficient information for evaluation of the following:

1. Erosion protection measures and products
2. Drainage management strategies
3. Surface restoration

D. Submit schedules for inspection and monitoring of all SWPPP measures.

E. Submit manufacturer's product information and installation recommendations for silt fence, filter fabric and erosion control blanket, straw bales, and any other materials proposed for use on this project.

F. Contractor shall register on the State Water Resources Control Board (SWRCB) on- line Storm Water Multiple Application and Report Tracking System (SMARTS) database and submit the User Identification (ID) to the Owner. Owner will file a Notice of Intent (NOI) and link the Contractor User ID as a Data Entry Person for required entries (i.e., SWPPP, Annual Reports, Ad Hoc Reports) in accordance with the determined Risk Level monitoring and sampling requirements.

1.03 Quality Assurance

A. Before commencing construction activities, such as grading, excavation or filling in any part of the site, Contractor shall plan for temporary structures to guide runoff away from the work area and to capture eroded material before it reaches natural water courses. The measures shall be in accordance with reviewed and approved SWPPP. Arrange construction activities to minimize erosion to the maximum practical extent. Clearing, excavation, and grading shall be limited to those areas of the project site necessary for construction. Minimize the area exposed and unprotected.

B. Clearly mark and delineate the limits of work activities. Do not allow equipment to operate outside the limits of work or to disturb existing vegetation. Complete excavation and grading during the dry season to the maximum extent possible.

1.04 Regulatory Requirements

A. The Contractor shall comply with provisions of Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non- storm water discharges from the project site and areas outside the project limits during construction.

B. If the project site is more than one acre it requires compliance with the State Water Resources Control Board statewide general permit entitled "Order No. 2009-0009–DWQ (as amended by Order No. 2010-0014-DWQ), National Pollutant Discharge Elimination System General Permit No. CAS000002, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities" (Construction General Permit) that regulates discharges of storm water and non-storm water from construction activities disturbing one acre or more of land surface, or that are part of a common plan of development. The Construction General Permit is available for review at:

http://www.waterboards.ca.gov/water_issues/programs/stormwater/

This project shall conform to applicable provisions of this Permit and modifications thereto.

C. This project lies within the boundaries of the San Francisco Bay Region (2) Regional Water Quality Control Board (SFRWQCB). The SFRWQCB has issued Waste Discharge Requirements and National Pollutant Discharge Elimination System (NPDES) Permit for the discharge of stormwater runoff from the municipal separate storm sewer systems (MS4s) including construction sites (San Francisco Bay Region Municipal Regional Stormwater NPDES Permit Order No. R2-2015-0049 NPDES Permit No. CAS612008 November 19, 2015). The MS4 Regional Stormwater NPDES Permit is available to review at:

https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/Municipal/R2_2015_0049_amended.pdf

This project shall conform to applicable provisions of this Permit and modifications thereto.

D. Storm Water Pollution Prevention Plan (SWPPP)

1. The SWPPP will include a description of best management practices (BMPs) that will be implemented to reduce the pollutants in stormwater and non-stormwater discharges to assure compliance with the terms and conditions of the Construction General Permit.
2. A Qualified Stormwater Developer (QSD) shall prepare the SWPPP and a Qualified Stormwater Practitioner shall ensure implementation of the SWPPP.
3. The SWPPP shall include the following information and forms:

   (a) Site description
   (b) Expected sequencing of operations and construction schedule
   (c) Weather monitoring procedure
   (d) Descriptions and details of erosion controls, including dust control
   (e) Erosion control plans
   (f) Controls for other potential onsite storm water pollutants
   (g) Applicable specifications
   (h) i. Maintenance and inspection procedures and forms
   (i) Description of potential non-storm water discharges at site
   (j) Notice of Intent (NOI) form
   (k) Notice of Termination (NOT) form
   (l) QSD/QSP Certification forms
   (m) Other record keeping forms and procedures
   (n) Good housekeeping practices and procedures, including vehicle wash- down areas, protection of equipment storage and maintenance areas, and sweeping of roadways related to hauling activities

4. The Owner will review the draft SWPPP. Contractor QSD will address Owner review comments and submit revised SWPPP for Owner approval. Upon Owner approval, Contractor QSD and Owner representative will sign the approved SWPPP.
5. Contractor will upload approved SWPPP onto SMARTS database for Notice of Intent (NOI) submittal.
6. When the SWRCB approves the NOI, the SWPPP will be the document in force on the project.
7. Place the SWPPP and all updates in a three-ring binder so that completed inspection forms and other records may be inserted. The Contractor shall maintain a copy of the SWPPP and all associated records and forms on site throughout the construction period.

8. The SWPPP shall be available for public inspection. The Contractor shall notify the Owner immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Owner shall provide copies of correspondence, notices of violation, enforcement actions, or proposed fines by regulatory agencies to the requesting regulatory agency.
9. Implement the SWPPP as required throughout the construction period and maintain all erosion control elements in proper working order until final acceptance of project. Do not perform clearing and grubbing or earthwork until applicable BMPs have been installed.
10. Prior to construction, the Contractor and all subcontractors shall sign certifications (included in the SWPPP) that they understand the requirements of the Construction General Permit and SWPPP. All Contractor and subcontractor crews shall comply with the requirements of the Construction General Permit under the supervision of the Contractor QSP who will be responsible for implementing the SWPPP. The Contractor QSP shall ensure that emergency procedures and the SWPPP are updated as needed and available for inspection. The SWPPP (including inspection forms) and all data used to complete the NOI shall be provided to the Owner at the completion of the project.
11. SWPPP Inspections and Amendments

    (a) The Contractor QSP and/or trained crew under QSP supervision will perform weekly inspections of the project site in accordance with the SWPPP. Inspections shall be documented on forms provided in the SWPPP binder.
    (b) It may be necessary to revise the SWPPP during construction to make necessary improvements or to respond to unforeseen conditions noted during construction or site inspections. For that purpose, the SWPPP shall specify the mechanism whereby revisions may be proposed by the Contractor or the Owner and incorporated into the SWPPP, including review and acceptance of minor changes. The Contractor and the Owner will jointly accept and sign each revision to the SWPPP before implementation. Accepted modifications will be implemented within 7 calendar days following the date of the inspection when deficiencies or necessary corrections are first noted.

(c) Temporary erosion and pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during design, that are needed prior to installation of permanent control features, or that are needed temporarily to control erosion that developed during normal construction practices but are not associated with permanent control features on the project.

(d) Provide additional temporary erosion and pollution controls made necessary by Contractor's errors or negligence at no additional cost to the Owner.

E. Notice of Intent (NOI)

1. Owner will complete NOI form on SMARTS and submit to SWRCB after accepted SWPPP has been uploaded by Contractor.
2. Annual Reports are due to the SWRCB SMARTS by September 1 of each year. Contractor shall submit Annual Reports and any Ad Hoc Reports onto SMARTS by August 15 for Owner review.

F. Notice of Termination (NOT)

G. Upon final acceptance, the Owner will file the NOT.

1.05 Project Conditions

A. The Contractor shall maintain records of work performed on the sediment control structures.

B. The Contractor shall not remove any erosion or sediment control measure without prior permission from the Owner.

C. The Contractor shall obtain approval from the Owner prior to making changes to erosion control plans.

1.06 Sequence of Construction

A. The Contractor shall be responsible for arranging and conducting an Erosion and Sediment Control meeting/briefing to inform all parties scheduled to be on-site during the project of the measures to be implemented for proper erosion and sediment control (may be included as part of the preconstruction meeting).

1. Installation of silt fences, storm drain protection, and all other forms of erosion and sediment control shall not begin until after this meeting has occurred.

B. The Contractor shall notify the Owner in writing and by telephone of the following events:

1. The required erosion and sediment control meeting/briefing.
2. Following installation of required sediment control structures.
3. Prior to removal of or modification to sediment control structures.
4. Prior to removal of all sediment control structures.

C. Silt fences, storm drain protection, and all other forms of erosion and sediment control shall be installed, inspected, and accepted by the Contractor before beginning any utility excavation.

D. Temporary silt fences shall be installed around any stockpiles and/or excavated material that cannot be backfilled during the same day in which it was excavated. Temporary silt fences shall also be placed immediately downstream of any utility trench that has not been backfilled at the end of the working day. Temporary silt fences shall be installed prior to leaving the work site for the day.

E. Silt fences and storm drain protection shall be inspected by the Contractor weekly. Repairs to these devices shall be completed prior to leaving the work site for the day.

F. The Contractor shall prevent the deposition of materials onto paved areas. The Contractor shall inspect the paved areas for deposited materials weekly and remove the materials immediately.

G. Silt fences shall be removed with permission of the Owner within 20 working days after final acceptance of the project and/or after the establishment of permanent stabilization of all excavations and fill areas.

Part 2. Products

2.01 Equipment

A. Before the work begins, sufficient equipment shall be available on the site to assure that the operation and adequacy of the erosion control plans can be continuously maintained.

2.02 Erosion Control Measures

A. Erosion control measures shall consist of silt fencing or equivalent (eg. wattles, etc.), barrier protectors, straw bales, temporary soil retention blankets, excelsior drainage filters, sediment traps and berms.

B. Berms and excelsior drainage filters shall be used to form sediment traps and to control run- on and run-off into other areas, including creeks, streams, marshes, access roads, well areas, and the staging areas.

C. Erosion control measures shall be used to contain only direct precipitation in the construction zone. The contained water shall be allowed to percolate into the ground or drain slowly through the drainage filter sediment traps.

D. Earthen sediment traps or holding ponds shall not be used unless accepted by the Owner.

Part 3. Execution

3.01 General Description

A. Furnish, install, maintain, and operate necessary control measures and other equipment necessary to prevent erosion to the maximum extent practical, including implementation of Best Management Practices (BMPs).

1. Temporary measures shall be to Contractor's own design and Contractor shall be solely responsible for risks related to the management of erosion control during construction.

B. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operations that will disturb the natural erosion protection.

C. Schedule work to expose areas subject to erosion for the shortest possible time, and preserve natural vegetation to the greatest extent practicable. Temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion. Temporary fast-growing vegetation or other suitable ground cover shall be provided as necessary to control runoff.

3.02 Methods

A. Construct berms to reduce runoff velocity as well as direct surface runoff around and away from all fuel containment, storage, and borrow areas.

B. Divert surface runoff around and away from cut and fill slopes by constructing berms or ditches at the base of disturbed slopes. Provide conveyance for the runoff in temporary pipes or protected channels to temporary sediment traps.

C. Place drainage filters around all catch basins to create sediment traps to control run- off from the construction area.

D. Excess water used for dust control shall be contained within the demolition areas by the erosion control measures.

3.03 Maintenance of Temporary Facilities

A. Inspect erosion and sediment control structures weekly. Ensure erosion and sediment control structures remain effective throughout excavation and grading operations. Relocate structures as necessary.

B. Inspect control structures after each significant rainfall. Promptly repair breaches which occur.

C. The Contractor shall remove entrapped sediment from behind excelsior drainage filter after each storm.

3.04 Disposal of Sediment from Stormwater Pollution Control Structures

A. Sediment excavated from temporary sediment control structures shall be disposed on the site with general fill, or with topsoil. Sediment shall be allowed to dry out as required before reuse.

B. Contractor shall place the sediment removed from traps and other structures where it will not enter a storm drain or watercourse and where it will not immediately reenter the basin.

3.05 Removal of Temporary Storm Water Pollution Control Measures

A. All temporary control measures shall be removed with permission of the Owner within 20 working days after final acceptance of the Project or once grading is completed and slopes have stabilized.

SWPPP Contents

(a) SWPPP Certifications and Approval
(b) Risk Level
(c) Table of Contents
(d) Qualified SWPPP Developer
(e) Legally Responsible Person
(f) Amendment Log
(g) SWPPP Requirements

- *(i) Permit registration documents*
- *(ii) SWPPP availability and implementation*
- *(iii) SWPPP amendments*
- *(iv) Retention of records*
- *(v) Required non-compliance reporting*
- *(vi) Annual report*
- *(vii) Changes to permit coverage*
- *(viii) Notice of Termination*

(h) Project Information

- *(i) Site description*
- *(ii) Existing conditions*
- *(iii) Existing drainage*
- *(iv) Geology and groundwater*
- *(v) Project description*
- *(vi) Developed condition*
- *(vii) Permits and governing documents*
- *(viii) Stormwater run-on from off-site areas*
- *(ix) Findings of the construction site sediment and receiving water risk determination*
- *(x) Construction schedule*
- *(xi) Potential construction activity and pollutant sources*
- *(xii) Identification of non-stormwater discharges*
- *(xiii) Required site map information*

(i) Best Management Practices

   - *(i) Schedule for BMP implementation*
   - *(ii) Erosion and sediment control*
   - *(iii) Non-stormwater controls and waste and materials management*
   - *(iv) Post-construction stormwater management measures*
- (j) BMP inspection and maintenance
   - *(i) Rain Event Action Plans*
- (k) Training
- (l) Responsible parties and operators
   - *(i) Responsible parties*
   - *(ii) Contractor list*
- (m) Construction Monitoring Program
   - *(i) Weather and rain event tracking*
   - *(ii) Monitoring locations*
   - *(iii) Safety and monitoring exemptions*
   - *(iv) Visual monitoring*
   - *(v) Routine observations and inspections: Routine BMP inspections, Non- stormwater discharge observations*
   - *(vi) Rain-event triggered observations and inspections: Visual observations prior to a forecasted qualifying rain event, BMP inspections during an extended storm event, Visual observations following a qualifying rain event*
   - *(vii) Visual monitoring procedures*
   - *(viii) Visual monitoring follow-up and reporting*
   - *(ix) Visual monitoring locations*
   - *(x) Water quality sampling and analysis*
   - *(xi) Sampling and analysis plan for non-visible pollutants in stormwater runoff discharges: Sampling scheduled, sampling locations, monitoring preparation, analytical constituents, sample collection, sample analysis, data evaluation and reporting*
   - *(xii) Sampling and analysis plan for pH and turbidity and stormwater runoff discharges: Sampling schedule, sampling locations, monitoring preparation, field parameters, sample collection, field measurements, data evaluation and reporting*
   - *(xiii) Sampling and analysis plan for non-stormwater discharges: Sampling schedule, sampling locations, monitoring preparation, analytical constituents, sample collection, sample analysis, data evaluation and reporting*
   - *(xiv) Additional monitoring following an NEL exceedance*
   - *(xv) Training of sampling personnel*
   - *(xvi) Sample collection and handling*
   - *(xvii) Sample documentation procedures*
   - *(xviii) Records retention*
- (n) Attachments

(i) Construction General Permit
(ii) Risk Level calculations
(iii) Water Pollution Control Drawings
(iv) Permit Registration Documents/Amendments
(v) QSD/QSP Certifications
(vi) SWPPP Amendment Certifications
(vii) Construction Schedule
(viii) Construction Activities, Materials Used, and Associated Pollutants
(ix) CASQA Stormwater BMP Handbook Portal: Construction Fact Sheets
(x) BMP Inspection Form
(xi) Training Reporting Form
(xii) Weather forecast reports
(xiii) Monitoring records
(xiv) Field meter instructions

END OF SECTION 01 35 44

SECTION 01 40 00

QUALITY REQUIREMENTS

Part 1. General

1.01 Summary

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
3. Specific test and inspection requirements are not specified in this Section.

1.02 Definitions

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

K. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to Tradespeople of the corresponding generic name.

L. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction. See specific specification sections for additional experience requirements.

1.03 Conflicting Requirements

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement as defined in the General Conditions. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.04 Submittals

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.05 Quality Assurance

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed, unless otherwise indicated.

J. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 48.

1.06 Quality Control

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor (contract sum adjusted through change order procedures).

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

   (a) Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Does not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality- assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.07 Special Tests and Inspections

A. Special Tests and Inspections: Owner will engage a qualified testing agency, special inspector and/or Essential Services Inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality- control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, this includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

Part 2. Products (Not Used)

Part 3. Execution

3.01 Test and Inspection Log

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect during normal working hours.

3.02 Repair and Protection

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Section 01 73 29 "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00

REFERENCES

Part 1. General

1.01 Definitions

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.02 Industry Standards

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

D. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.03 Abbreviations and Acronyms

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA	Aluminum Association, Inc. (The)
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists (The)
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	International (American Concrete Institute)
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association (Now part of CPA)
AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects (The)

AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc
APA	Architectural Precast Association
APA EWA	APA - The Engineered Wood Association
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems
API	American Petroleum Institute
SpI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	AWCI International (Association of the Wall and Ceiling Industry International)
AWCMA	American Window Covering Manufacturers Association
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association

BIA	Brick Industry Association (The)
BICSI	BICSI
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
CCC	Carpet Cushion Council
CDA	Copper Development Association
CEA	Canadian Electricity Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
10	Cool Roof Rating Council
CPA	Composite Panel Association
CPPA	Corrugated Polyethylene Pipe Association
CRI	Carpet & Rug Institute (The)
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Cast Stone Institute
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee

EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association
FIBA	Federation International de Basketball (The International Basketball Federation)
FM Approvals/FM Global	(Formerly: FMG - FM Global)
FMRC	Factory Mutual Research
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GRI	(Now GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IBF	International Badminton Federation
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance

ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc
MFMA	Metal Framing Manufacturers Association, Inc.
MH	Material Handling
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE (international)	(National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association

NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	(National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	(National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)
NWWDA	National Wood Window and Door Association (Now WDMA)
OPL	Omega Point Laboratories, Inc. (Now ITS)
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PLANET	Professional Landcare Network
PTI	Post-Tensioning Institute
RFCI	Resilient Floor Covering Institute
ACLA	Associated Landscape Contractors of America
RCSC	Research Council on Structural Connections
RIS	Redwood Inspection Service
SAE	SAE International

SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance
SPFD	The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute
UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball

USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCSC	Window Covering Safety Council
WCMA	Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association
NWWDA	National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC	Woodwork Institute of California (Now WI)
WMMPA	Wood Moulding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

BOCA	BOCA International, Inc
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
ICBO ES	ICBO Evaluation Service, Inc.
ICC	International Code Council
ICC-ES	ICC Evaluation Service, Inc.
SBCCI	Southern Building Code Congress International, Inc. (See ICC)
UBC	Uniform Building Code

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

ACE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency

FAA	Federal Aviation Administration
FCC	Federal Communications Commission
GSA	Food and Drug Administration
FDA	General Services Administration
HUD	Department of Housing and Urban Development
LBL	Lawrence Berkeley National Laboratory
NCHR P	National Cooperative Highway Research Program
NIST	National Institute of Standards and Technology
TRB	Transportation Research Board
OSHA	Occupational Safety & Health Administration
PBS	Public Building Service
PHS	Office of Public Health and Science
RUS	Rural Utilities Service
SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

ADA	Americans with Disabilities Act
ABA	Architectural Barriers Act
CFR	Code of Federal Regulations
DOD	Department of Defense Military Specifications and Standards
DSCC	Defense Supply Center Columbus
FED-STD	Federal Standard
FS	Federal Specification
FTMS	Federal Test Method Standard
MILSPEC	Military Specification and Standards
UFAS	Uniform Federal Accessibility Standards

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list

CALTRANS	California Transportation Agency
CBHFT	California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation
CCR	California Code of Regulations
CPUC	California Public Utilities Commission
TFS	Texas Forest Service
FRD	Forest Resource Development

Part 2. Products (Not Used)

Part 3. Execution (Not Used)

END OF SECTION 01 42 00

SECTION 01 43 39

MOCKUPS

PART 1 – GENERAL

1.01 Mockup Summary

A. Mockups will be used to review of appearance, quality of workmanship, coordination, compatibility, and relationships with adjacent materials. Unless otherwise specifically indicated mockups shall be constructed in place at location directed by Architect. Approved mock ups may remain as part of the work.

1.02 Submittals

A. General: Comply with Section 01 33 00.

B. Mockups shall not be fabricated until after acceptance of required submittals for all materials to be incorporated into the mockups. This means that the Project schedule shall take into account early submittal of these components to the Architect.

C. Samples: Prior to construction of mockups, provide samples as specified in the respective Specification Sections included as part of the mockups.

1.03 Quality Assurance

A. Design Concept: Mockup requirements are intended to establish function, workmanship, finish, and color for conformance with the architectural design intent.

B. Purpose: To verify suitability of colors, finishes, and satisfactory integration of building materials and components indicated and required.

C. Performance: Mockups shall be constructed for the Architect's review for compliance with the Contract Documents and shall be used as a standard for the final installation.

D. Make necessary additions and modifications to mockups as directed by the Architect.

E. Modify mockups, or construct or install new components if requested by the Architect, until final acceptance is obtained.

F. Mockups shall serve as the standard for subsequent work of like kind after approval by the Architect. Be prepared, at no additional cost to the Owner, to make as many modifications as required to achieve mockups that are acceptable to the Architect and of sufficient quality to serve as the standard for the complete Project.

G. Following acceptance, mockups shall serve as a performance standard of quality and appearance of the work it represents, including the interface with adjacent

H. materials and components as applicable.

I. Coordinate fabrication, delivery, assembly, and installation with related materials to be included in the mockups. Construction of the mockup assemblies shall be under the supervision of the same personnel who will be employed for the subsequent work.

J. Maintain mockups in neat, clean condition until removal or final acceptance. Repair damage as required to maintain in condition suitable for review and approval.

K. Scheduling:

1. Construct mockups in a timely manner to permit review and modifications such that the work is not delayed.
2. Do not proceed with ordering of components or construction subject to mockup approval until after approvals have been obtained.
3. Provide the Architect not less than 10 working days notice of the time each component is ready for review.
4. Include line item in the construction schedule for the building section mockup, showing submittals, construction, review, and approval periods.

Part 2. Products

2.01 Materials

A. As specified in the respective Sections of the Specifications.

Part 3. Execution

3.01 EXTERIOR BUILDING MOCKUP

A. Provide building mockup of building area indicated where directed by the Architect.

B. Purpose: Establish standards for work indicated and specified to be included in mock-ups to demonstrate quality of workmanship, materials, colors, and textures required by the Contract Documents. Include roof, roof overhang, soffits, windows, doors, glazing, sealants, siding and cladding, flashings, and other exterior materials.

1. Mockup will be used by the Architect to test color and material alternatives and to approve final colors, textures and workmanship.
2. Interior finishes will not be required to be installed on the interior side of the exterior building mockup.

END OF SECTION 01 43 39

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

Part 1. General

1.01 Summary

A. This Section includes requirements for temporary fencing, utilities, support facilities, and security and protection facilities.

B. See Section 01 73 00 "Execution Requirements" for progress cleaning requirements.

C. See Divisions 02 through 33 Sections for products in those Sections.

1.02 Definitions

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weather tight; exterior walls are insulated and weather tight; and all openings are closed with permanent construction or substantial temporary closures.

1.03 Use Charges

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water Service: Water from Owner's existing water system is not available for use without metering and without payment of use charges. Contractor is responsible for coordination of this activity with the local municipality.

C. Electric Power Service: Contractor to provide connections and extensions of services as required for construction operations including the office trailers. Contractor will be responsible to coordinate and make arrangements with PG&E to provide temporary power to the construction site. Contractor will be responsible for all costs associated with the installation of temporary power and any and all use charges for the duration of the contract. Owner shall provide temporary power as required to allow for operation of office trailers, and construction power. Contractor shall pursue engineering and installation of temporary power at their own cost.

1. If using a generator, contractor to abide by all local laws and regulation including.

D. Internet Service/Data: Temporary hardwired service is not currently available in the immediate area of the site, but contractor may pursue engineering and installation of temporary hardwired service at their own cost. Contractor may need to pursue other options to meet the contractual temporary service requirements (satellite, etc.).

E. Temporary Fencing: Contractor to provide temporary fencing at the perimeter of the project site with adequate protection provided to pedestrians outside of the project site. If there is any exposure to falling objects outside of the project site then the Contractor must provide a covered walkway

1.04 Submittals

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel and Architect.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.05 Quality Assurance

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.06 Project Conditions

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner’s acceptance, regardless of previously assigned responsibility.

Part 2. Products

2.01 Materials

A. Temporary Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fence with privacy screening fabric mesh; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Galvanized Steel posts will be required to be driven into the ground for support and stability or portable fencing, if appropriate, with sufficient hold down weight to prevent overturning.

2.02 Temporary Facilities for Project Site

A. Field Offices for each site, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Field Offices: Provide and maintain for the duration of the Work temporary offices on site for use by the Contractor and a <u>separate</u> onsite trailer for use by the Owner's representatives (including Owner, and Architect).

1. Offices shall be equipped with secure wireless internet capabilities to allow for onsite users access to email and the internet.
2. Offices shall be provided with a door and lock with security bar and a window with a minimum size of 4 feet x 3 feet and security screen. Provide and maintain an electric heater and air conditioning along with adequate electric lighting for each office.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

D. Temporary Field Fencing: Provide fence size, material and privacy screen fabric mesh to encompass each site, furnish and installed, equipped for entrance of utility trucks (16- foot gates) and man gates for easy access.

E. Network Setup: The network shall have the following requirements:

F.

1. The internet connection must be separate service and independent of the Contractor's and shall be the fastest speed available in the area with a minimum a 20-Meg upload / 20-Meg download speed. This should be accomplished via a hard-wired connection.

   (a) Wired network connections must be provided at
      (i) The Office, Plan room, and the Printer/Scanner.

   (b) Reasonable access to power for the equipment must be provided.

2. If it is necessary to "piggyback" off of an existing hard-wired line, the line provided to the Owner's Representative shall be an unfiltered line, with no limitations set by the main line holder, such as access restrictions or DNS port blocking.
3. In the cases where a hard-wired connection is not available, the wireless connection provided must meet the same speed needs of 20-Meg upload / 20-Meg download. It shall also be of sufficient bandwidth to meet the needs of the staff.

4. In the case of sites where the internet speeds do not meet the above requirements, a cellular “hot-spot” is to be provided if resulting in a faster connection, along with a local storage device must be provided for the location to save the project data.

2.03 Equipment

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

Part 3. Execution

3.01 Installation, General

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 Temporary Utility Installation for Project Site

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Electrical Power and Lighting:

1. Contractor will furnish and pay for power during the course of the work to the extent power is not in the building(s) or on the Site. Contractor shall be responsible for providing temporary facilities required on the Site to point of intended use.
2. Contractor shall furnish, wire for, install and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/ or observe of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.

3. Contractor shall be responsible for maintaining existing lighting levels in the Project vicinity should temporary outage or service interruptions occur.

C. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction. Coordination is the responsibility of the Contractor.

D. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction and modular passenger terminal.

E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Provide connection to existing sanitary sewer for temporary passenger terminal modular.

F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

H. Electric Power Service: County to provide. Contractor shall provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations including office trailers.
   1. See Section 1.3.C

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.03 Temporary Controls

A. Noise Control

1. Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work, and it shall take all reasonable precaution to minimize noise as required by applicable class and the Contract Documents.
2. Notices of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the County a minimum of forty-eight (48) hours in advance of their performance. Contractor responsible for obtaining all permits required for construction noise outside of the times allowable within the noise ordinance.
3. Contractor to meet the Conditions of Approval related to Noise Control as defined in the Contract Documents.

B. Noise and Vibration

1. Equipment and impact tools shall have intake and exhaust mufflers.
2. Contractor shall cooperate with the County to minimize and /or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.
3. Contractor to meet the Conditions of Approval related to noise and vibration as defined in the Contract Documents.

C. Dust and Dirt

1. Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.
2. Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.
3. Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.
4. Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.
5. Contractor to meet the Conditions of Approval related to dust and dirt as defined in the Contract Documents.
6. Comply with FAA Orders and Standards.

3.04 Support Facilities Installation

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within thirty (30) feet of building lines. Comply with NFPA 241.

2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
   1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

C. Temporary Roads and Paved Areas: All areas are currently paved.

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Contractor is to provide temporary parking for construction personnel within confines of the designated construction site. If parking within the designated construction site becomes unavailable due to number of Trades, Subcontractors and Vendors, Contractor shall be responsible for coordinating with the County, or local jurisdiction for parking requirements, locations, permits, shuttle services, etc. Contractor is to review and follow all related Conditions of Approval, Laws and Regulations from the Contra Costa County.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water. (Refer to demolition drawings for specifics)

G. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

H. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on drawings or required by the County or the City. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
   1. Provide temporary, directional signs for construction personnel and visitors.
   2. Maintain and touchup signs so they are legible at all times.

I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Section 01 73 00 "Execution Requirements" for progress cleaning requirements.

J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.05 Security and Protection Facilities Installation

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

E. Temporary Site Enclosure Fence: All costs associated with the install, monthly fencing rental fees and demobilization of the fencing will be the responsibility of the contractor. Furnish and install any additional site enclosure fence panels in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Temporary Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations and protection of the public. Operations include temporary offices, parking, staging areas, actual construction site.

F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Contractor is responsible to ensure that the fencing and all gates are secured and locked prior to leaving the site on a daily basis to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather-tight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
2. Insulate partitions to provide noise protection to occupied areas.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air-handling equipment.
5. Weather strip openings.
6. Provide walk-off mats at each entrance through temporary partition.

I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Smoking is prohibited in all construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.06 Operation, Termination, and Removal

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 60 00

PRODUCT REQUIREMENTS

Part 1. General

1.01 Summary

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. See Section 01 77 00 "Closeout Procedures" for submitting warranties for Contract closeout.

C. See Divisions 02 through 48 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.02 Definitions

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.03 Submittals

A. Substitution Requests: Must comply with the requirements of the Contract and General Conditions.

B. Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: CSI Form 13.1A.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   (a) Statement indicating why specified material or product cannot be provided.
   (b) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
   (c) Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   (d) Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   (e) Samples, where applicable or requested.
   (f) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
   (g) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
   (h) Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
   (i) Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
   (j) Cost information, including a proposal of change, if any, in the Contract Sum.

(k) Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

(l) Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fourteen (14) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

(a) Form of Acceptance: Change Order.

(b) Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fourteen (14) calendar days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

(a) Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."

(b) Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.04 Quality Assurance

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.05 Product Delivery, Storage, and Handling

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage: Store products to allow for inspection and measurement of quantity or counting of units.

1. Store materials in a manner that will not endanger Project structure.
2. Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
3. Store cementitious products and materials on elevated platforms.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.06 Manufacturer’s Labels and Name Plates

A. Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer’s or producer’s nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on the exterior of the completed project. Visible, non-required labels and nameplates shall be removed.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- connected or power-operated equipment. Locate the nameplate on an easily accessible surface which is inconspicuous in occupied spaces. The name plate shall contain the following information as well as other essential operating data:

   (a) Name of manufacturer.
   (b) Model number.
   (c) Serial number.
   (d) Capacity.

1.07 Product Warranties

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

   1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

   1. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
   2. Refer to Divisions 2 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section 01 77 00 "Closeout Procedures."

Part 2. Products

2.01 Product Selection Procedures

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in the Contract, General Conditions, and Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in the Contract, General Conditions, and Part 2 "Comparable Products" Article for consideration of an unnamed product.

7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in the Contract, General Conditions, and Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in the Contract, General Conditions, and Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
   (a) If no product available within specified category matches and complies with other specified requirements, comply with provisions in the Contract, General Conditions, and Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns and textures" or a similar phrase, select a product that complies with other specified requirements.
    (a) Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    (b) Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.02 Comparable Products

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
   1. Procedures within the General Conditions and Contract are followed.

2. Evidence that the proposed product does not require extensive revisions to the contract documents that it is consistent with the contract documents and will produce the indicated results, and that it is compatible with other portions of the Work.
3. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
4. Evidence that proposed product provides specified warranty.
5. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
6. Samples, if requested.

Part 3. Execution (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00

EXECUTION REQUIREMENTS

Part 1. General

1.01 Summary

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. See Section 01 78 39 "Project Record Documents" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

C. Related Requirements:

1. Division 00 General Conditions and Special Conditions
2. Section 01 10 00 "Summary" for limits on use of Project site.
3. Section 01 77 00 "Closeout Procedures" for submitting final property survey (not required for this project) with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.02 Submittals

A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Survey reports and plots as detailed below.

1.03 Quality Assurance

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

1.04 Examination

A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

1.05 Preparation

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

1.06 Construction Layout

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

1.07 Field Engineering

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

1.08 Installation

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

1.09 Cutting and Patching

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

1.10 Progress Cleaning

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than seven (7) days during normal weather or three (3) days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

1.11 Starting and Adjusting

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 01 40 00 "Quality Requirements."

1.12 Protection of Installed Construction

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

1.13 Correction of the Work

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 73 29 "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

SECTION 01 73 29

CUTTING AND PATCHING

Part 1. General

1.01 Summary

A. This Section includes procedural requirements for cutting and patching.

B. See Divisions 2 through 48 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.02 Submittals

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.03 Quality Assurance

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, and result in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

Part 2. Products

2.01 Materials

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

Part 3. Execution

3.01 Examination

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 Preparation

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.1 Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.03 Performance

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT

Part 1. General

1.01 Summary – Waste Management Goals

A. Section includes administrative and procedural requirements for salvaging, recycling and disposing of nonhazardous demolition and construction waste.

B. The Owner has established that this Project shall generate the least amount of waste possible and processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

C. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.

1.02 Definitions

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal of off-site waste and subsequent sale, recycling, reuse or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitability, corrosivity, toxicity or reactivity.

E. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

F. Recycle: Recovery of waste from the Project site to another site for subsequent processing in preparation for reuse

G. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of recycling. Recycling does not include burning, incinerating, or thermally destroying waste.

H. Salvage: To remove a waste material from the Project site for subsequent sale or reuse in another facility.

I. Salvage and Reuse: Recovery of waste and subsequent incorporation into the Work

1.03 Performance Requirements

A. Develop and implement a waste management program resulting in an end-of-project rates for salvage/recycling of minimum 65 percent by weight or volume of the total waste generated by the project.

B. Regulations: The Contractor shall be responsible for knowing and complying with regulatory requirements, Federal, State, and Local, pertaining to legal disposal of all construction and demolition waste materials.

C. Coordination: Coordinate the recycling of materials with Owner and Subcontractors as required to conform to the Construction Waste Management Plan.

D. Site Access and Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1.04 Quality Assurance

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Waste Management Meetings: Conduct on-site waste management meetings with all subcontractors. Review and discuss the waste management plan, methods, procedures and each party's roles and responsibilities.

C. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

D. Packing and Shipping

1. Shipping: Coordinate the schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
2. Packing: Arrange for the return of packing materials, such as wood pallets, where economically feasible.

E. Handling

1. Provide equipment and personnel to handle products by methods to prevent soiling or damage.
2. Promptly inspect shipments to assure products comply with requirements, quantities are correct, and products are undamaged.
3. Promptly return damaged shipments or incorrect orders to manufacturer for credit or refund.

F. Storage: Store products in accordance with manufactures recommendations and periodically inspect to assure that stored products are undamaged and are maintained under required conditions.

G. Preparation

1. Storage and Protection:

a. Designate receiving/storage areas for incoming material to be delivered according to installation schedule and to be placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
b. Store and handle materials in a manner as to prevent loss from weather and other damage. Keep materials covered and off the ground, and store in a dry, secure area.
c. Prevent contact with material that may cause corrosion, discoloration, or staining.
d. Protect all materials and installations from damage by the activities of other trades.

H. Waste Management
1. Source separated waste: Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in order to prevent contamination of materials and to maximize recyclability and salvageability of identified materials.
2. Comingled Waste: Waste may be commingled at the site and separated at a recycling facility.
3. Return: Set aside and protect missed-delivered and substandard products and materials and return to supplier for credit.
4. Reuse and Salvage: Set aside, sort, and protect separated products and materials for collection, re-use on site by contractor, and salvage by other.
5. Recycling: Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

1.05 Waste Management Plan

A. General: Develop a waste management plan according to the requirements in this Section, as well as the requirements indicated elsewhere in the documents. Construction Waste Management. Plan shall consist of the following sections: Waste Management Goals, Responsible Parties, Waste Identification, Waste Prevention and Diversion Measures, Contamination Prevention Measures, Communication and Education Measures, Onsite Recycling Operations, and Cost/Revenue Analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan. The plan shall result in end-of-Project rates for salvage/recycling of minimum 65 percent by weight or volume of the total waste generated by the work.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site- clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates

C. The list of these materials is to include, at minimum, the following materials:

1. Cardboard.
2. Clean dimensional wood.
3. Beverage containers.
4. Land clearing debris.
5. Concrete.
6. Bricks.
7. Concrete Masonry Units (CMU).
8. Metals from banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
9. Drywall.
10. Carpet and carpet pads.

Part 2. Products – NOT USED

Part 3. Execution

3.01 Waste Management Plan Implementation

A. Manager: The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.

B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Owner’s Representative.

C. Instruction and Training: The Contractor shall provide on-site instruction and train workers, subcontractors and suppliers of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used.

D. Separation facilities: The Contractor shall layout and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Waste may be commingled at the site in a specific label area for pickup by the waste hauler and separated at a recycling facility.

E. Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

F. Contractor shall provide a monthly summary with the following information:

G. The amount (in tons or cubic yards) of material landfilled from the Project, the identity of the landfill, the total amount of tipping fees paid at the landfill, and the total disposal cost. Include manifests, weight tickets, receipt, and invoices.

H. For each material recycled, reused, or salvaged from the Project, the amount (in tons or cubic yards), the date (removed from the jobsite, the receiving party, the transportation cost, the amount of any money paid or received for the recycled or salvaged material, and the net total cost or savings of salvage or recycling each material). Attach manifests, weight tickets, receipts, and invoices.

3.02 Recycling Demolition and Construction Waste, General

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan

D. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Regularly inspect bins for contamination.

E. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

F. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

G. Store components off the ground and protect from the weather.

H. Remove recyclable waste from Owner's property per approved Waste Management Plan.

3.03 Disposal of Waste

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.04 Installation

A. Install product(s) per manufacturer's recommendations to reduce damage to or waste of materials by required replacement.

3.05 Transportation

A. Transport materials in covered trucks to prevent contamination of product or littering of surrounding areas.

3.06 General Cleaning

A. Control accumulation of waste materials and trash. Recycle or dispose of off-site at intervals approved by the Owner and in compliance with waste management procedures.

B. Cleaning materials: Use cleaning materials that are non-hazardous.

3.07 Final Cleaning

A. Cleaning Materials: Only non-hazardous cleaning materials shall be used in the final cleanup.

B. Recycle, salvage, and return construction and demolition waste from Project.

C. Arrange for pick-up of salvageable materials in accordance with the Waste Management Plan.

D. Disposal Operations: Promptly and legally transport and dispose of any trash. Do not burn, bury, or otherwise dispose of trash on the Project site.

END OF SECTION 01 74 19

SECTION 01 74 20

CLEANING

Part 1. general

1.01 Section Includes

A. Cleaning throughout the construction period, and final project cleaning prior to the acceptance tour.

1.02 Related Sections

A. Section 01 50 00 - Temporary Facilities and Controls

1.03 Quality Assurance

A. Inspection: Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.

B. Codes and Standards: In addition to the requirements specified herein, comply with pertinent requirements of authorities having jurisdiction.

Part 2. Products

2.01 Cleaning Materials and Equipment

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.02 Compatibility

A. Use cleaning materials and equipment that are compatible with the surfaces being cleaned, as recommended by the manufacturer of the material to be cleaned.

Part 3. Execution

3.01 Progress Cleaning

A. General:

1. Retain stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this work. Debris shall be removed from the site and disposed of in a lawful manner. Disposal receipts or dump tickets shall be furnished to Architect upon request.

3. At least twice each month, and more often if necessary, remove scrap debris, and waste material from the job site. Provide adequate storage for items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove items to the place designated for their storage. Flammable waste shall be kept in sealed metal containers until removed from the site.
2. Weekly, and more often if necessary, inspect, arrangements of materials stored on the site; restack, tidy, or otherwise service arrangements to meet the requirements specified above.
3. Maintain the site in a neat and orderly condition.

C. Structures:

1. Weekly, and more often if necessary, inspect the structures and pick up scrap, debris, and waste material. Remove items to the place designated for their storage.
2. Weekly, and more often if necessary, sweep interior spaces clean.

a. “Clean”, for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a handheld broom, i.e., “broom-clean”.

3. As required preparatory to installation of succeeding materials, clean the structures of pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the required cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily, and more often if necessary, and while work is being performed in the space in which finish materials have been installed.

b. “Clean”, for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material that, in the opinion of the Architect, may be injurious to the finish floor material, i.e., “vacuum-clean”.

D. General: The General Conditions require general cleaning during construction. Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste, conduct final progress cleaning as described below.

E. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program.

Comply with manufacturer's instructions. Unless otherwise specifically directed by the Architect, water and broom clean paved areas on the site and public paved areas directly adjacent to the site. Remove resultant debris

F. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.

1. Remove labels that are not permanent labels. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

G. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces. Sweep and mop vinyl and rubber surfaces.

H. Structures:

1. Exterior: In areas affected by the work under this contract, visually inspect exterior surfaces and remove traces of soil, waste material, smudges, and other foreign matter. Remove traces of splashed material from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure.
2. In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the County.

I. Interior: In areas affected by the work under this contract, visually inspect interior surfaces and remove traces of soil waste material, smudges, and other foreign matter. Remove traces of splashed materials from adjacent surfaces. Remove paint drippings, spots, stains, and dirt from finished surfaces. Use only the cleaning materials and equipment instructed by the manufacturer of the surface material.

J. Glass: Clean glass inside and outside.

K. Polished surfaces: On surfaces requiring the routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished. Glossy surfaces shall be cleaned and shined as intended by the manufacturer

1. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

2. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

L. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

M. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

N. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the County's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

O. Extra Materials: Where extra materials of value remain after completion of associated Work, they become the County's property. Dispose of these materials as directed by the Owner.

P. Timing: Schedule final cleaning as accepted by the Architect to enable the County to accept a completely clean project.

Q. Cleaning During County's Occupancy

1. Should the County occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the County, responsibilities for interim and final cleaning of the occupied spaces shall be determined by the Architect in accordance with the General Conditions of the Contract.

END OF SECTION 01 74 20

SECTION 01 77 00

CLOSEOUT PROCEDURES

General

1.01 Summary

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Final Completion.
   3. Warranties.
   4. Final cleaning.
   5. Repair of work.

B. See Section 01 29 00 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.

C. See Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

D. See Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

E. See Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.

F. See Divisions 02 through 48 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.02 Substantial Completion

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
15. Successful completion of Functional Testing for equipment requiring LDD Commissioning.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.03 Final Completion

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.04 List of Incomplete Items (punch list)

A. Preparation: Submit electronic versions of list (including editable file and PDF file). Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in the following format:
   (a) MS Excel electronic file. Architect, will return annotated copy.

1.05 Warranties

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8- 1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

Products

2.01 Materials

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

Execution

3.01 Final Cleaning

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

   (a) Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   (b) Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   (c) Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   (d) Remove tools, construction equipment, machinery, and surplus material from Project site.
   (e) Remove snow and ice to provide safe access to building.
   (f) Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   (g) Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   (h) Sweep concrete floors broom clean in unoccupied spaces.
   (i) Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

(j) Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision- obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
(k) Remove labels that are not permanent.
(l) Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

(i) Do not paint over "UL" and similar labels, including mechanical and electrical name plates.

(m) Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
(n) Replace parts subject to unusual operating conditions.
(o) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
(p) Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
(q) Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
(r) Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

01 78 23

OPERATION AND MAINTENANCE DATA

Part 1. General

1.01 Summary

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Emergency manuals.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.

B. See Divisions 02 through 48 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.02 SUBMITTALS

A. Manual: Submit one copy of each manual in final form at least fifteen (15) days before final inspection. At discretion of Architect, initial submittals may be as PDF files with both hard copies and PDF files of final version. Architect will return copy with comments within fifteen (15) days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit three (3) copies of each corrected manual within fifteen (15) days of receipt of Architect's comments.

Part 2. Products

2.01 Manuals, General

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.

7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280- mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   (a) Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross- referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

   (a) If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   (b) If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.02 Emergency Manuals

A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, gas leak, water leak, power failure, water outage, equipment failure, and chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.03 Operation Manuals

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.04 Product Maintenance Manual

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross- reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.

2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.05 Systems And Equipment Maintenance Manual

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:

D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions, and demonstration and training videotape if available, that detail essential maintenance procedures:

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds

Part 3. Execution

3.01 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

F. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 36

WARRANTIES

Part 1. General

1.01 Summary

A. This Section includes administrative and procedural requirements for preparing warranties of products and installation.

B. All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

1. General Conditions, including, without limitation, Warranty/Guarantee Information;
2. Special Conditions.

1.02 Submittals

A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.

B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.

C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier, and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.

D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information, and using separate typed sheets as necessary. List each applicable and/or responsible Subcontractor(s), supplier(s), and manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.03 Preparation

A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten

B. (10) days after completion of the applicable item or work. Except for items put into use with City's permission, Contractor shall leave date of beginning of time of warranty until the date of completion is determined.

C. Contractor shall verify that documents are in proper form, contain full information, and are notarized, when required. Contractor shall co-execute submittals when required.

D. Contractor shall retain warranties until time specified for submittal.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to Work & delete references to info. not applicable.

F. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 36

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

Part 1. General

1.01 Summary

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.

B. See Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

C. See Divisions 02 through 48 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.02 Submittals

A. Record Drawings: Comply with the following:

1. Submit copies of Record Drawings as follows:
   (a) Initial Submittal: Submit one copy of marked-up Record Prints for review. Architect will initial and date each sheet and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return prints for organizing into sets, printing, binding, and final submittal.
   (b) Final Submittal: Submit one set of the marked-up Record Prints, and the following:
      (i) PDF file of complete set of record drawings.
      (ii) Record CAD Drawing Files and Plots.

B. Record Specifications: Submit copy of Project's Specifications, including addenda and contract modifications.

Part 2. Products

2.01 Record drawings

A. Record Prints (Progress): Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
2. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

3. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
4. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
5. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, RFI numbers and similar identification, where applicable. **Clearly mark revisions made to original documents – listing reference documents is not sufficient**

B. Record Prints (Final): Immediately before inspection for Certificate of Substantial Completion, review marked-up progress Record Prints with Architect. When authorized, prepare a full set of corrected copies of the Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
2. Refer instances of uncertainty to Architect for resolution.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets. Provide PDF file of full set of record documents.
2. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
3. Identification: As follows:
   (a) Project name.
   (b) Date.
   (c) Designation "PROJECT RECORD DRAWINGS."
   (d) Name of Architect.
   (e) Name of Contractor.

2.02 Record Specifications

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made, note related Change Orders, RFIs and Record Drawings where applicable (incl. revisions made not just referenced document umber).

2.03 Miscellaneous Submittals

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference. Miscellaneous records include, but are not limited to, the following:

1. Field records on underground construction and similar work.
2. Surveys showing locations and elevations of underground lines.
3. Invert elevations of drainage piping.
4. Surveys establishing building lines and levels.
5. Authorized measurements using unit prices or allowances.
6. Records of plant treatment.
7. Ambient and substrate condition tests.
8. Certifications received in lieu of labels on bulk products.
9. Batch mixing and bulk delivery records.
10. Testing and qualification of trade persons.
11. Documented qualification of installation firms.
12. Load and performance testing.
13. Inspections and certifications by governing authorities.
14. Final inspection and correction procedures

Part 3. Execution

3.01 Recording and Maintenance

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00

DEMONSTRATION AND TRAINING

Part 1. General

1.01 Summary

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Demonstration and training DVD's/digital storage device.

B. See Divisions 02 through 48 for specific requirements for demonstration and training for products in those Sections.

1.02 Submittals

A. Instruction Program: Submit two (2) copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

B. Demonstration and Training DVD's/digital storage device: Submit two (2) copies within seven (7) days of end of each training module.

1.03 Quality assurance

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Pre-instruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training.

D. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

Part 2. Products

2.01 Instruction program

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Maintenance and repair of PV system, including replacement of components, including PV Panels.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency
6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

Part 3. Execution

3.01 Instruction

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
    1. Owner Representative will describe County’s operational philosophy.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
    1. Schedule training w/ Owner, thru County Project Manager w/at least 7 days advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

3.02 Demonstration and training videotapes

A. General: Engage a qualified commercial photographer to record demonstration and training videos. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

B. At beginning of each training module, record each chart containing learning objective and lesson outline.

C. Media Format: Provide high-quality Digital Videos Discs (DVD’s) or digital storage device (per the preference of the Owner).

D. Narration: Describe scenes on video by audio narration by microphone while video is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

END OF SECTION 01 79 00

SECTION 32 01

13.62 FOG SEAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work and materials necessary for the completion of pavement seal coats as indicated on the drawings and specified herein.

1.2 REFERENCE STANDARDS

A. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; current edition at http://mutcd.fhwa.dot.gov.

B. California Department of Transportation (C.D.T.) Standard Specifications as follows:
1. Section 37 Bituminous Seals.
2. Traffic Manual
3. Highway Design Manual

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with State of California Department of Transportation standards.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public facilities.

1.5 FIELD CONDITIONS

A. Do not apply seal if temperature of pavement or the atmosphere is less than 50 degrees F or if the high within 24 hours after placement is less than 65 degrees F. Do not apply if rain is imminent or the air temperature is expected to be below 36 degrees F within 24 hours after placement.

1.6 PROTECTION OF EXISTING IMPROVEMENTS

A. Protect and cover existing manholes, valve and monument covers, grates, and other exposed facilities within the area of application using plastic or oil resistant construction paper secured by tape of adhesive to the facility being covered. Reference covered facilities with enough control points to locate the facilities after application of the seal coat.

B. Install measures to prevent spills and discharges into existing on-site stormwater facilities. Measures include, but are not limited to gravel bags, straw wattles, and fiber rolls.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Asphaltic Emulsion: California Department of Transportation Standards, Grade CSQS1h.

2.2 EQUIPMENT

A. Commercial mixing and spreading equipment that complies with California Department of Transportation standards for applying fog seal materials.

2.3 FOG SEAL MIXES AND MIX DESIGN

A. California Department of Transportation standards.

PART 3 - EXECUTION

3.2 PREPARATION

A. Thoroughly clean surfaces free of dirt, sand, gravel, oil and other foreign matter.

B. Protect adjacent curbs, walks, fences, and other items from receiving seal.

3.3 APPLICATION

A. Begin pavement sealing as soon as practicable after surface has been cleaned and dried.

B. Apply fog seal with mixing and spreading equipment per California Department of Transportation standards.

3.4 DRYING AND PROTECTION

A. Protect newly sealed pavement so that the seal is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly sealed pavement.

END OF SECTION

GEOTECHNICAL EXPLORATION

SAN MATEO COUNTY
REPLACEMENT CORRECTIONAL FACILITY
REDWOOD CITY, CALIFORNIA

Submitted to:
Mr. Sam Lin
San Mateo County Sheriff's Office
Jail Planning Unit
400 County Center, 3rd Floor
Redwood City, CA 94063

Prepared by:
ENGEO Incorporated

November 30, 2012

Project No.
9515.000.000

ENGEO
Expect Excellence

GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

Project No.
9515.000.000

November 30, 2012

Mr. Sam Lin
San Mateo County Sheriff's Office – Jail Planning Unit
400 County Center, 3rd Floor
Redwood City, CA 94063

Subject: San Mateo County Replacement Correctional Facility
Redwood City, California

GEOTECHNICAL EXPLORATION

Dear Mr. Lin:

ENGEO prepared this geotechnical report as part of our phase 2 geotechnical scope of service for the proposed replacement correctional facility project in Redwood City, California, as outlined in our agreement dated May 25, 2012. We characterized the subsurface conditions at the project site and provide geotechnical recommendations for design.

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to review the project plans and specifications and provide geotechnical observation and testing services during construction. We will be glad to discuss these additional services with you as the project design progresses.

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

Sincerely,

ENGEO Incorporated

REGISTERED PROFESSIONAL ENGINEER
YAN LAP KAN
No. 2880
Exp. 9/30/2014
GEOTECHNICAL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
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Janet Kan, PG, GE

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1.0 INTRODUCTION

1.1 SCOPE OF SERVICES

The purpose of this geotechnical report is to evaluate the subsurface conditions at the site and provide design-level geotechnical recommendations for the proposed replacement correctional facility and associated site improvements. The scope of our services included:

- Reviewing available literature, geologic maps, and geotechnical reports pertinent to the site.
- Drilling six hollow-stem auger and mud rotary borings.
- Analyzing the geological and geotechnical data.
- Developing geotechnical recommendations for site development.
- Preparing this report to summarize our findings.

This geotechnical exploration report supersedes the following geotechnical documents previously prepared by ENGEO for the project:

- Transmittal – Revised Vertical and Lateral Capacities for Driven Piles dated October 19, 2012.
- Geotechnical Feasibility Report dated July 11, 2012.
- Transmittal – Supplemental Vertical Capacities for Preliminary Pile Design dated September 14, 2012.
- Preliminary Foundation Design Recommendation Letter dated June 29, 2012.

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

1.2 PROJECT LOCATION AND DESCRIPTION

The roughly 4.8-acre site is located along Chemical Way in Redwood City, California, as shown on Figure 1. The site is bounded by Highway 101 to the south, Maple Street to the west, Blomquist Street to the north, and the Union Pacific Railroad and Malibu Grand Prix Mini Kart Racing Complex to the east. The project site is currently occupied by several single-story industrial buildings constructed around the cul-de-sac of Chemical Way. The majority of the site is paved, except for some vegetated areas bordering the road and in landscape strips. At this time, the above-grade structure at 70 Chemical Way has been demolished and the tenants of 20, 50 and 80 Chemical Way have moved out.

Figure 2 shows the approximate locations of our exploratory borings and cone penetration tests (CPTs) relative to the former site features. Based on the topographic map provided to us, site grades generally range from Elevation 9 to 11 feet (NAVD 88).

1.3 PROJECT DESCRIPTION

Based on our review of the fine grading and drainage plan dated October 12, 2012, and the conceptual architectural plans dated September 27, 2012, we understand that the main correctional building is to be located in the center of the site and is to be up to three stories high. Paved parking is to be located on the north and south side of the building with the main ingress and egress driveways along the east and west boundary of the site. A transformer/generator pad and a two-story-high central utility plant (CUP) is planned on the southeast side of the site. The approximate footprints of the proposed structures are shown on Figure 2. We anticipate the project site grades will be raised by 2 to 3 feet to achieve a finished grade of approximately Elevation 12 feet.

1.4 SITE HISTORY

We reviewed historic aerial photos from 1943, 1956, 1965, 1974, 1982, 1993, 1998 and 2005. These photos indicate that in 1943 the site was an undeveloped marshland surrounded by Smith Slough and tributaries of the Redwood Creek. By 1956, the project site appeared to be in the process of marshland reclamation. The general outline of the major slough channel was still visible on the 1956 historic aerial photo. By 1965, Highway US-101 and Maple Street was in place and the project site is shown to be entirely covered with fill. No major development is shown within the project site on the 1965 photo.

Aerial photos from 1974 to 1982 showed construction of Chemical Way and the four surrounding parcels. Buildings and structures are observed within the four parcels in these photos. Aerial photos from 1993, 1998, and 2005 show little change and resemble the current site conditions.

1.5 PREVIOUS GEOTECHNICAL STUDIES

ENGEO prepared a Geotechnical Feasibility Report dated July 11, 2012, for the subject project. During the feasibility studies, we reviewed relevant publically available geotechnical reports and performed a preliminary exploration including six cone penetration test (CPT) probes. Based on our preliminary findings, the major site development considerations were:

- Consolidation settlement of Bay Mud deposits
- Potential liquefaction-induced differential settlements
- Presence of existing fill

This design-level report includes supplemental exploration and provides geotechnical recommendations for design.

2.0 GEOLOGY AND SEISMICITY

The regional and local geology and seismicity were evaluated as part of this investigation. The evaluation was based on our review of published reports, our experience in the project area, and the results of the Phase 2 geotechnical investigation.

2.1 REGIONAL AND LOCAL GEOLOGY

Geologic mapping by Brabb (2000) indicates the site is underlain by artifical fill (af) and Bay Mud deposits (Qhb), as shown on Figure 3. Historic aerial photographs show the project site to be located within a former marshland through the late 1960s to early 1970s. The California Division of Mines and Geology (CDMG, 1974), currently known as the California Geological Survey, mapped the approximate thickness of younger Bay Mud at the site ranging from 0 to 20 feet. As mapped by CDMG, the depth to bedrock within the vicinity of the site is over 250 feet below ground surface (bgs).

2.2 FAULTING AND SEISMICITY

The project site is not located within a State of California zone for faulting and no known active faults cross the site. The Bay Area contains numerous active earthquake faults. The major active faults near the project site include the San Andreas and Monte Vista to the south, the Hayward to the northeast and San Gregorio to the west. The nearest active faults are summarized in the table below.

TABLE 2.2-1
Nearest Active Known Faults

Fault	Distance from Site (km)	Moment Magnitude
San Andreas	7.8	7.9
Monte Vista – Shannon	9.6	6.8
Hayward	22.3	7.1
San Gregorio	22.2	7.3
Calaveras	32.2	7.0

Although not zoned by the State of California, Bortugno (1991) and Jennings (1994) map the Palo Alto fault approximately ¼ mile east of the site. Recent geologic mapping of the Palo Alto area by Brabb (2000) does not show the fault trace on the map. The Palo Alto fault is not zoned as requiring further study by the State of California. The planning documents from the City of Palo Alto state that currently available geologic data does not indicate that this fault is considered active or considered a hazard. Therefore, the potential for surface fault rupture from seismic activity along the Palo Alto fault is considered low in our opinion.

Numerous small earthquakes occur every year in the San Francisco Bay Region, and larger earthquakes have been recorded and can be expected to occur in the future. Figure 4 shows the approximate locations of these faults and significant historic earthquakes recorded within the San Francisco Bay Region.

The site is located within an area susceptible to liquefaction according to the State of California Seismic Hazard Zones Map (CGS, Palo Alto Quadrangle, 2006) and site-specific liquefaction analysis should be performed to determine the level of liquefaction hazard. The Working Groups on California Earthquake Probabilities (2008) prepared the Uniform California Earthquake Rupture Forecast and predicted a 63 percent probability for one or more magnitude 6.7 or great earthquake from 2007 to 2036.

3.0 FIELD EXPLORATION

Our design-level field exploration included drilling six borings within the project site. During our feasibility study, six Cone Penetration Test (CPT) soundings were advanced within the project site.

The location and elevations of our explorations are approximate and were determined based on distances from existing site features; they should be considered accurate only to the degree implied by the method used. The approximate locations of our borings and former CPTs are shown on Figure 2.

3.1 BORINGS

ENGEO observed the drilling of six borings and logged the subsurface conditions at each location. We retained a truck-mounted drill rig and crew to advance the borings using 8-inch-diameter hollow-stem auger and mud rotary methods. Borings 1-BH1 through 1-BH5 were advanced to depths ranging from 64½ to 101½ feet below existing grade within the proposed main detention facility footprint. Boring 1-BH6 was advanced to a depth of 63½ feet within the proposed CUP footprint. Borings were backfilled in accordance with our approved San Mateo drilling permit.

Prior to drilling the boreholes, the upper 4 to 24 inches of surficial paving materials were cored and the upper 5 feet of soil was excavated by hand auger. We obtained soil samples at various intervals using standard penetration tests and California Modified Sampler (3-inch O.D. split-spoon with 2.5-inch I.D. liners). Shelby tubes samples were obtained in the soft Bay Mud soils. The blow counts were obtained by dropping a 140-pound hammer through a 30-inch free fall. The sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration. Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows required to drive the last 1 foot of penetration; the blow counts presented on the bore logs have not been converted using any correction factors. When sampler driving was difficult, penetration was recorded only as inches penetrated for 50 hammer blows.

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

3.2 SURFACE CONDITIONS

The majority of the site is covered by structures, parking lot pavement, or landscaping at the perimeter of the site. Based on the A.L.T.A. survey prepared by BKF dated November 17, 2010, the site grades generally range from Elevation 9 to 11 feet (NAVD 88 datum).

In general, the borehole locations encountered 3 to 8 inches of asphaltic concrete (AC) over 8 to 21 inches of aggregate base (AB) over subgrade soil. Within 70 Chemical Way (1-BH2 and 1-BH3), the asphaltic concrete was encountered directly over subgrade.

3.3 SUBSURFACE CONDITIONS

In general, the exploratory borings encountered a similar subsurface soil profile as described in the geotechnical feasibility report. Beneath the surficial pavement section, fill materials, including gravelly sand, clayey gravel, clayey silt, sandy silt, silty clay and fat clay were encountered. Occasional fragments of concrete, glass and wood were observed in the existing fill layer. The existing fill extends to approximately 4 to 6 feet below the ground surface.

Beneath the existing fill, the borings generally encountered soft to medium stiff organic clay deposits, known as young Bay Mud. The young Bay Mud extended to roughly 12 to 15 feet bgs and was at most 9 feet thick at the locations explored. The upper 2 to 3 feet of the young Bay Mud layer showed evidence of desiccation and was generally medium stiff to stiff. Within the cul-del-sac of Chemical Way, the Bay Mud deposits encountered at 1-B4 were medium stiff to stiff. Consistent with the subsurface soil encountered during the feasibility study, the bottom of Bay Mud was located at approximately Elevation 0 feet along the southern end to Elevation -2 feet at the northern end of the site.

A layer of medium stiff to stiff clay, also known as older Bay Mud, was encountered below the young Bay Mud at approximately 12 to 18 feet bgs with a thickness varying between 4 to 5 feet. Beneath the stiff clay, a layer of sandy and gravely deposits that extended to a depth of approximately 25 feet bgs was encountered. This sandy and gravelly layer was not encountered at the northern corner of the site near 1-CPT1.

Beneath the sandy and gravelly layer, fine-grained alluvial deposits including silty clay and clayey silt were encountered and extended to approximately 35 feet bgs. Then, interbedded layers of silty clay, silty sand and sand were encountered and extended to approximately 55 feet bgs. Below 55 feet, fine-grained alluvium consisting of silty clay and clayey silt was encountered and extended to the termination depths of our boreholes.

We have included our exploration logs in Appendix A. The logs contain the soil type, color, consistency, and visual classification in general accordance with the Unified Soil Classification

System. The logs graphically depict the subsurface conditions encountered at the time of the exploration. Appendix A also provides additional exploratory information in the general notes to the logs. The CPT plots from our geotechnical feasibility report are included in this report as Appendix B.

For project design purposes, we developed the following idealized subsurface profile.

TABLE 3.3-1
Idealized Subsurface Profile

Depth* (feet)	Soil Type	Soil Description
0 to 5	FILL	Clayey sand and gravelly clay with concrete, asphalt, brick fragments.
5 to 13	OH	Organic Clay (Bay Mud), soft to medium stiff and highly compressible
13 to 18	CL	Clay, stiff and moderately compressible
18 to 25	SP/SM	Sand, Silty Sand and Gravel, medium dense
25 to 30	GM/GP	Gravel and silty gravel, loose
30 to 35	CL/ML	Silty clay and Clayey Silt, medium stiff to stiff
35 to 55	ML/SM	Interbedded silty clay, silty sand, medium stiff to stiff
Below 55	CL-ML	Silty clay and clayey silt (Alluvium), stiff to very stiff

Cross section A-A showing the general subsurface soil profile beneath the project site is included as Figure 5.

3.4 GROUNDWATER CONDITIONS

Due to the drilling method, groundwater level was not measured from Borings 1-B1, 1-B2, 1-B3, 1-B4 and 1-B6. We encountered groundwater at approximately 12 feet below the ground surface at Boring 1-B5. During our feasibility studies, groundwater was encountered between 8 and 12 feet bgs in our CPT holes. The groundwater levels recorded between Spring 2007 through Spring 2010 at the monitoring wells within 70 Chemical Way fluctuated between 3 to 14 feet bgs.

Fluctuations in the level of groundwater may occur due to variations in rainfall, tides, and other factors not evident at the time measurements were made. For project sites located in close vicinity to the San Francisco Bay, groundwater generally exists within the Bay Mud, although it generally does not appear as free water. Instead, groundwater will seep slowly out of the Bay Mud. Moreover, groundwater levels within bayfront sites are usually influenced by tidal changes.

For design purposes, we recommend a design groundwater level of approximately Elevation 5 feet.

3.5 LABORATORY TESTING

Select samples recovered during drilling activities were tested to determine the following soil characteristics:

TABLE 3.5-1
Laboratory Testing Methods

Soil Characteristic	Testing Method	Location of Results
Natural Unit Weight and Moisture Content	ASTM D-2216	Appendix A
Plastic Limit and Liquid Limit	ASTM D-4318	Appendix C
Grain Size Distribution and Percent Passing No. 200 Sieve	ASTM D-1140	Appendix C
Unconfined Compression	ASTM D-2166	Appendix C
Laboratory Miniature Vane Shear	ASTM D4648	Appendix C
Incremental Consolidation	ASTM D-2435	Appendix C
Triaxial Compression – Undrained, Unconsolidated (TXUU)	ASTM-D2850	Appendix C

Select soil samples were transported under a chain of custody to CERCO Analytical for laboratory corrosion testing. Test results are discussed later in this report and included as Appendix D.

4.0 CONCLUSIONS

From a geologic and geotechnical standpoint, the project site is suitable for the proposed replacement correctional facility development provided that the recommendations presented in this report are incorporated into project design and are implemented during construction. Based on this geotechnical exploration and findings from our feasibility studies, the main geotechnical/geological issues to be addressed at the site include compressible soil and risk of liquefaction.

We summarize below the significant geologic and geotechnical hazards that should be considered in design of the project. The major geologic and geotechnical site hazards include potential seismic hazards, settlement of compressible soils, strong ground shaking during an earthquake, corrosive soil, and the impact of shallow groundwater on building design and construction.

4.1 SEISMIC HAZARDS

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

4.1.1 Ground Rupture

The site is not located within a State of California Earthquake Fault Hazard Zone and no known active faults cross the site. As discussed under the Site Seismicity section, although the Palo Alto Fault mapped by Jennings (1994) and Bortugno (1991) is near the site, the Palo Alto fault is mapped as a concealed fault and not zoned as requiring further study by the State of California. Therefore, it is our opinion that ground rupture is not likely to occur at the site.

4.1.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay Region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, planned structures should be designed using sound engineering judgment and conform to the 2010 California Building Code (CBC) requirements.

Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The prescribed lateral forces are generally considered to be substantially smaller than the actual peak forces that would be associated with a major earthquake.

The California Geological Survey supports a web database that includes probabilistic peak horizontal ground accelerations (PHGA) for the state. The probabilistic data is based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA, 2008) model, and yielded the following PHGA for various earthquake events.

TABLE 4.1.2-1
Probabilistic Peak Horizontal Ground Acceleration
Latitude: 37.492541 Longitude: -122.219241

Probability of Exceedance (%)	Return Period (years)	PHGA
10% in 50 years	475	0.47g
2% in 50 years	2475	0.71g

4.1.3 Soil Liquefaction

Liquefaction is a phenomenon in which saturated, cohesionless soil is subject to a temporary, but essentially total, loss of shear strength because of pore pressure buildup under the reversing cyclic shear stresses associated with earthquakes. The project site is mapped within a potentially liquefiable zone as identified by the State of California Seismic Hazard Zone Map, Palo Alto Quadrangle (2006). Maps prepared by the Associations of Bay Area Governments (ABAG, 2001) indicate that the site has a very high potential for liquefaction.

The ABAG and USGS maps are intended to be used for baseline studies since they are based on correlation between liquefaction potential and geologic units applied across a region mapped with a scale 1:24,000 to 1:200,000. These maps are acknowledged to be limited and detailed liquefaction potential evaluation with geotechnical borings and site-specific studies by a licensed professional are necessary.

During our feasibility study, we performed a preliminary liquefaction assessment of the soil conditions encountered in the CPT probes using the computer program CLIQ Version 1.3. As discussed in the geotechnical feasibility report, sandy and silty deposits encountered between 17 and 50 feet are potentially liquefiable.

We performed liquefaction analyses on the test borings based on guidelines provided in CGS Special Publication 117A (2008), Youd et al. (1997), Seed et al. (1982), Boulanger and Idriss (2004) and Bray and Sancio (2006). SPT blow counts of saturated silt and sand layers previously identified in the feasibility report as potentially liquefiable were utilitized to calculate the Cyclic Stress Ratio (CSR). The scaled Cyclic Resistance Ratio (CRR) is divided by the CSR to determine the factor of safety (F.S.) against liquefaction within the given soil profile layer. Our analysis considers a peak acceleration of 0.71g (2% in 50 years) and a groundwater level at 5 feet bgs (approximately at Elevation 5). Results of the liquefaction analyses are included in Appendix E.

Based on the liquefaction analysis performed during the feasibility study, thin sandy and silty layers encountered within the western and southern portion of the site between 34 and 50 feet bgs (1-CPT1, 1-CPT2 and 1-CPT3) are potentially liquefiable. Upon review of the nearby Borelogs 1-B1 and 1-B5, these potentially liquefiable deposits are classified as sandy silt and silty sand lenses in a clayey soil stratum. The sandy silt and silty sand lenses have a Plasticity Index (PI) of 13 to 19, a water content at approximately 50 to 70 percent of the Liquid Limit (w_c=0.5 to 0.7LL) and a fines content of over 50%. According to Bray and Sancio (2006), silty and sandy lenses with these properties are not susceptible to liquefaction.

For the central to northeastern portion of the site, results of the liquefaction analysis performed during feasibility study show that sandy and silty deposits encountered at 1-CPT4, 1-CPT5 and 1-CPT6 between 15 to 30 feet bgs are potentially liquefiable. Upon review of Borelogs 1-B2, 1-B3, 1-B4 and 1-B6, old bay clay, a soil deposit with low susceptibility to liquefaction hazard, was encountered between 15 to 18 feet bgs. Then, an upper sandy deposit layer classified as medium dense silty sand and clayey sand with gravel was encountered between 20 to 25 feet. The lower gravelly deposits between 25 to 30 feet bgs are classified as loose sandy gravel. The upper sandy deposit has a PI of 19, a water content at approximately 60 to 70 percent of the Liquid Limit (w_c=0.6 to 0.7LL) and a fines content ranging from 12 to 34 percent. According to Bray and Sancio (2006), soil with these properties is not susceptible to liquefaction. The lower gravelly deposits have less than 5 percent fines and SPT blow counts (N) of 8. According to Seed et al. (1982), gravelly deposits with these properties may be potentially liquefiable.

Ishihara (1985) has shown that the presence of a sufficient thickness of a non-liquefiable surface layer may prevent the observable effect of at-depth liquefaction from reaching the surface. A more recent study by Youd and Garris (1995) expanded on the work of Ishihara to include data from over 308 exploratory borings, 15 different earthquakes, and several ranges of recorded peak ground acceleration. Considering the capping effects from overlying non-liquefiable layers and additional engineered fill to be placed to raise site grades, the soil above the potentially liquefiable soils are thick enough to resist upward pressure and the liquefiable lenses are thin enough to provide only a limited reservoir of water. Accordingly, we do not anticipate the occurrence of sand boils at the site should liquefaction occur.

4.1.4 Liquefaction-Induced Ground Settlement

As discussed in the feasibility study and according to methods outlined in Seed and Tokimatsu (1984), Ishihara and Yoshimine (1992) and Zhang et al. (2002), should liquefaction of the sandy deposits occur, theoretical liquefaction-induced settlements in the range of approximately ½ to 2 inches may occur at the project site as a result of a large seismic event.

As discussed above, potentially liquefiable sandy and silty deposits between 15 and 25 feet bgs within the central and northeast portion and deposits between 34 and 50 feet bgs within the west and south portion of the site are not susceptible to liquefaction due to the relatively high fines content and plasticity of the fine particles. We performed a liquefaction induced ground settlement analysis on the potentially liquefiable gravelly deposits between 25 and 35 feet within the central and northeast portion of the site according to methods outline in Youd et al. (2001). Our analysis show theoretical liquefaction-induced settlements up to 2 inches may occur at the project site as a result of a large seismic event.

In general, differential settlement across building footprints is considered roughly half of the total settlement value. For design purposes, we recommend considering up to 1 inch of liquefaction induced differential settlements across building footprint in the event that liquefaction of susceptible layers were to occur.

4.1.5 Earthquake-Induced Densification

Densification of granular soils above groundwater level can cause settlement during an earthquake. Since the soil deposits encountered above groundwater at the site are considered medium dense to dense and generally cohesive, it is our opinion that the potential for densification due to an earthquake is considered low.

4.1.6 Lateral Spreading

Lateral spreading involves lateral ground movements caused by earthquake vibrations. These lateral ground movements are often associated with a weakening or failure of an embankment or soil mass overlying a layer of liquefied sands or weak soils.

The northern boundary of the project site is located approximately 500 feet from a major tributary of the Redwood Creek. Based on published nautical charts for the Redwood Creek, the bottom of the creek channel near the project site is anticipated at approximately Elevation -2 feet. The potentially liquefiable soils encountered within the project site are located below the bottom of the creek channel and do not intersect with the free face created by the creek banks. Thus, it is our opinion that the risk of lateral spreading within the project site is low.

4.2 EXISTING FILL

As noted above, the project site was capped with approximately 4 to 6 feet of fill. Placement of fill within the site appears to have been performed as early as the 1970s. Concrete, asphalt and brick fragments were observed in the near-surface soil samples collected from the boreholes. During site exploration, the auger rig was able to penetrate through the existing fill, indicating that debris within the existing fill may likely consist of smaller size fragments, at least at the locations explored.

It should be noted that due to the relatively small diameters of geotechnical exploratory holes, the amount and size of the debris and rubble within the existing fill cannot be accurately evaluated. Moreover, it is common for marshland along the San Francisco Bay reclaimed in the 1960s and 1970s to receive construction debris and rubble as fill. If information about the amount and size of debris and rubble within the existing fill is important for the construction bid, test pits or 12- to 18-inch-diameter bucket auger holes can be excavated during site demolition activities to obtain additional information related to the characteristic of the existing fill.

In addition, environmental remediation excavations are planned at 70 Chemical Way. Limits, including depth, of environmental remediation excavations should be surveyed and carefully documented. Backfill within environmental remediation excavations should be compacted and tested under the observation of the geotechnical engineer.

4.3 COMPRESSIBLE BAY MUD

The site is underlain by compressible Bay Mud approximately 8 feet thick, extending to Elevation -2 to -5 feet. Based on our review of historical aerial photos and geotechnical documents, the existing fills and structures appear to have been placed approximately 40 years ago.

The upper 2 to 3 feet of the young Bay Mud layer showed evidence of desiccation and were generally medium stiff to stiff. Soft to medium stiff Bay Mud was generally encountered beneath the desiccated crust within the project site, with the exception of 1-B4 (cul-de-sac of Chemical Way) where medium stiff to stiff Bay Mud deposits were encountered.

We anticipate the Bay Mud deposits to be moderately compressible and will undergo additional consolidation settlement from the weight of new fill and new building loads supported shallow foundations. The design of surface grades, underground utilities, and all structures and improvements must accommodate or resist potential differential settlement.

4.3.1 Total Settlement Estimate

We calculated the consolidation settlement based on several loading scenarios and results of laboratory tests, as presented in Table 4.3.1-1. Figure 6 shows the estimated consolidation settlement under various fill thicknesses for the 30 years following fill placement

TABLE 4.3.1-1
Estimated Consolidation Settlement in 30 Years

Loading Type	Load (psf)	Approximate Consolidation Settlement in 30 years (inches)
2 feet of Import Fill	250	1
3 feet of Import Fill	375	2
3 feet of Lightweight Fill	165	½
Mat Foundation without ground improvement*	1,000	6
Deep Foundation	**	Less than ½ inch

* Design recommendations related to mat foundations and ground improvement methods are discussed in subsequent sections of the report.

**For structures supported on properly designed deep foundation or mat foundation over improved soil, the structural loads will be transferred to competent soils at depth and will not result in consolidation of Bay Mud deposits. However, downdrag forces on deep foundation systems should be considered as surrounding areas undergo consolidation settlement.

Consolidation settlement is usually most significant within the first year after placement of new fill or addition of structural load. Settlement rates will then slow down and gradually achieve the above estimated settlement. Based on laboratory test results, we anticipate approximately 80 percent of the estimated settlement to occur within the first year after placement of fill or structural loads. Design recommendations for shallow foundations and ground improvement methods are provided in subsequent sections.

Liquefaction settlement, discussed in Section 4.1.3, should be considered in addition to long-term consolidation settlement if the liquefaction hazard is not mitigated.

4.3.2 Long-Term Differential Settlement

Differential settlement can occur between areas receiving different amount of fills, between structures supported on different foundation systems and between pile-supported structures and surrounding areas. We estimate differential settlement between pile-supported structures and surrounding areas to range from approximately 1 to 2 inches. In addition, differential settlement between shallow foundations and surrounding areas is estimated to range from 3 to 5 inches.

4.4 EXPANSIVE SOIL

The existing fill materials include gravelly sand, clayey gravel, clayey silt, sandy silt, silty clay and fat clay. Some of the clayey fill materials appear to contain reconditioned Bay Mud deposits. Based our observation on surficial soil samples collected during field exploration, the clayey existing fill may be moderately to highly expansive. Expansive soil can experience volume changes with fluctuations in moisture content.

This can cause heaving and cracking of lightly loaded slab-on-grade, pavements, and structures founded on shallow foundations. We understand that site grades will be raised by 2 to 3 feet to achieve planned finished grades. Import fill should consist of relatively non-expansive soil, with a Plasticity Index less than 15. Recommendations on import fill are provided in later sections of this report.

4.5 CORROSIVE SOIL

Seven select soil samples were transported under a chain of custody to Cerco Analytical, Inc. for laboratory corrosion testing. The soil samples were tested for soluble sulfate concentrations, chloride ion concentration, resistivity and pH. These tests provide an indication of the corrosion potential of the soil environment on buried concrete structures and metal pipes.

TABLE 4.5-1
Soil Corrosivity Test Results

Sample Number	Soil Type	Soluble Sulfate (ppm)	Chloride Ion (ppm)	Resistivity (Ohm-cm)	pH	Redox (mV)
1-B2@3'	Clayey Gravel (Existing Fill)	310	N.D	1,900	8.0	310
1-B2@8.5'	Clay (Bay Mud)	610	3,800	900	8.1	480
1-B6@9'	Clay (Bay Mud)	130	360	610	7.9	140
1-B3@20'	Sand with silt	98	580	850	8.2	480
1-B4@31'	Silty Clay	730	4,000	140	7.8	330
1-B4@46'	Silty Clay	230	2,100	230	8.1	480
1-B4@71'	Clayey Silt	16	110	1,600	8.7	250

As indicated in the Cerco laboratory letters included in Appendix D, the soil samples tested show "corrosive" to "severely corrosive" properties to buried metal and steel embedded in a concrete mortar because of the resistivity and chloride ion measurements. In addition, the sulfate ion concentrations for some of the tested samples indicate that the soil may be potentially detrimental to reinforce concrete structures and cement mortar-coated steel.

We recommend retaining a corrosion consultant to provide specific design recommendations for corrosion protection for buried metals and concrete elements. The design team should also consider Redwood City's specific requirements for underground improvements constructed in a

Bay Mud environment. For example, City Standard Section 02661 requires cathodic protection such as epoxy coatings for buried metallic improvements.

The 2010 CBC references the 2008 American Concrete Institute Manual, ACI 318 (Chapter 4, Sections 4.2 and 4.3) for concrete requirements. ACI Tables 4.2.1 and 4.3.1 provide sulfate exposure categories and classes, and concrete requirements in contact with soil based upon the exposure risk as excerpted below.

ACI TABLE 4.5-2

Sulfate Exposure Categories and Classes

Sulfate Exposure Category	Exposure Class (S)	Water-Soluble Sulfate in Soil (% by Weight)
Not Applicable	S0	$SO_4 < 0.10$
Moderate	S1	$0.10 \leq SO_4 < 0.20$
Severe	S2	$0.20 \leq SO_4 \leq 2.00$
Very Severe	S3	$SO_4 > 2.00$

ACI TABLE 4.5-3

Requirements for Concrete by Exposure Class

Exposure Class	Max w/cm	Min f'c (psi)	Cement Type			Calcium Chloride Admixture
			ASTM C150	ASTM C595	ASTM C1157	
S0	N/A	2500	No Type restriction	No Type restriction	No Type restriction	No restriction
S1	0.5	4000	II†‡	IP(MS), IS(<70), (MS)	MS	No restriction
S2	0.45	4500	V‡	IP(HS), IS(<70), (HS)	HS	Not permitted
S3	0.45	4500	V + pozzolan or slag§	IP(HS) + pozzolan or slag or IS(<70) (HS) + pozzolan or slag§	HS + pozzolan or slag§	Not permitted

Notes:

† For seawater exposure, other types of portland cements with tricalcium aluminate (C_3A) contents up to 10 percent are permitted if the w/cm does not exceed 0.40.

‡ Other available types of cement such as Type III or Type I are permitted in Exposure Classes S1 or S2 if the C_3A contents are less than 8 or 5 percent, respectively.

§ The amount of the specific source of the pozzolan or slag to be used shall not be less than the amount that has been determined by service record to improve sulfate resistance when used in concrete containing Type V cement. Alternatively, the amount of the specific source of the pozzolan or slag to be used shall not be less than the amount tested in accordance with ASTM C1012 and meeting the criteria in ACI 4.5.1.

In accordance with the criteria presented in Table 19-A-4 of the 2007 CBC, the test results indicate "negligible" to "moderate" sulfate exposure.

5.0 EARTHWORK RECOMMENDATIONS

As used in this report, the term "moisture condition" refers to adjusting the moisture content of the soil by either drying if too wet or adding water if too dry. We define "structural areas" as any area sensitive to settlement of compacted soil. These areas include, but are not limited to building pads, sidewalks, pavement areas, and retaining walls. The relative compaction and optimum moisture content of soil and aggregate base referred to in this report are based on the most recent ASTM D1557 test method. Compacted soil is not acceptable if it is unstable. It should exhibit only minimal flexing or pumping, as determined by an ENGEO representative.

Due to the presence of Bay Mud, special grading techniques and lighter earthwork equipment than normal may be required when site grades are lowered close to or exposing the Bay Mud deposits underlying the existing fills and the desiccated Bay Mud crust. The underlying Bay Mud is soft and sensitive to repeated loading from heavy equipment. In areas with open excavations in Bay Mud, lightweight equipment with mud tracks will likely be necessary.

We understand that environmental remediation excavations will be backfilled with engineered fill. ENGEO should also be present during backfill operations. We recommend notifying ENGEO at least 48 hours prior to backfilling activities in order to coordinate field testing activities. The as-built location of the excavation should be provided to ENGEO for review.

Grading and site development plans should be developed in coordination with ENGEO.

5.1 SITE DEMOLITION CONSIDERATIONS

Based on our discussions with the project team, a demolition contractor is under contract to remove site improvements, their foundations, buried structures including abandoned utilities, and associated backfill soil. Under the existing demolition contract, the contractor is required to remove buried structures and associated backfill located within the upper 4 feet of existing grade. We understand that the demolition contractor will loosely backfill the resulting demolition excavations with onsite soil.

In addition, contaminated soils identified in the Site Management Plan (West, 2010) will be excavated by the demolition contractor. The environmental remediation excavation is planned to extend 8 feet below finished grade. As shown on the demolition plans prepared by West Environmental Service & Technology dated April 2012, the excavation will be backfilled with crushed rock wrapped in filter fabric (Mirafi 140NC or approved equivalent) up to at least 1 foot above groundwater level. Engineered fill compacted to at least 95 percent of maximum dry density will be used to backfill the remainder of the excavation. The upper 6 inches of the excavation will be capped with Class 2 Aggregate Base compacted to at least 95 percent of maximum dry density. Based on the subsurface conditions encountered in our field exploration, Bay Mud deposits may be exposed at the base of the environmental remediation excavation. The environmental remediation contractor should be aware of potential soft soil conditions.

If during site demolition activities any existing structures are found to be supported on piles or piers, the Geotechnical Engineer and Structural Engineer should be notified. Depending on the locations of the pile/piers, they may remain in-place or be partially removed. We recommend that the location of the piles/piers be surveyed if they are left in place. Moreover, tree root bulb excavations, if any, should extend at least 3 feet from existing grade.

We recommend the layout and depth of demolition excavations be surveyed and accurately recorded for future site grading and foundation construction purposes. In addition, any buried structures extending beyond the contracted removal depth should be documented, including the type, size, direction and location, prior to backfilling the demolition excavations. Buried structures not removed during site demolition activities may be in conflict with future foundation elements or utilities. Thus, buried structures not removed during site demolition activities and located within future structural areas should be removed or properly abandoned during mass grading activities. It may be more efficient to remove buried structures entirely or abandon them in-place by grouting or other techniques during the demolition phase.

Since demolition activities can significantly affect the project design, we recommend that ENGEO be present to document the location and extent of the demolition excavations together with the demolition contractor. In addition, we recommend that ENGEO be retained to perform compaction tests during backfill activities of the environmental remedial excavation(s).

5.2 GENERAL SITE GRADING

All debris and loose backfill from demolition activities and other non-engineered fill should be removed from areas to be graded, from areas to receive fill or structures, and from those areas to serve as borrow. The Geotechnical Engineer in the field should determine the depth of removal of such materials at the time of grading.

The bottom of all excavations should be cleaned to a firm undisturbed soil surface determined by the Geotechnical Engineer. This surface should then be scarified, moisture conditioned, and backfilled with compacted engineered fill. No loose or uncontrolled backfilling of depressions resulting is permitted during site grading activities.

5.3 EXISTING FILL REMOVAL

The subsurface exploration shows the project site is generally capped by approximately 4 to 6 feet of fill consisting of clayey, sandy and gravelly soils mixed with debris. Based on the blow counts and tip resistance recorded on our borelogs and CPT logs, the fills are generally stiff and medium dense. For portions of the site development that are not supported on driven piles, we recommend the existing fills be overexcavated to provide a minimum engineered fill cap at least 5 feet thick. This will require partial overexcavation where new fills are proposed. For example, if 3 feet of new fill is proposed, then a 2-foot-deep overexcavation would be required to provide the minimum 5-foot-thick engineered fill cap. The bottom of the over-excavated areas should be scarified, mixed, moisture conditioned to a depth of 12 inches, and compacted. The condition of the base of the over-excavated areas should be evaluated by an ENGEO representative prior to backfilling. The depth of over-excavation may need to be increased if unstable conditions such as large voids or presence of organics are observed by the ENGEO representative at the time of grading.

The over-excavated areas should be backfilled with engineered fill. The excavated existing fill may be suitable for use as engineered fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 8 inches in maximum dimension (see Acceptable Fill below).

5.4 ACCEPTABLE FILL

Onsite soil material is generally suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 8 inches in maximum dimension.

5.4.1 Recycled Materials

If desired, the existing asphaltic concrete and aggregate base could be considered for use as engineered fill provided the materials are broken down to meet a 6-inch or less particle size and placed in a separate stockpile outside the limits of grading. The material may be blended with site soils and placed within street or parking areas below subgrade. We understand that the Regional Water Quality Control Board generally accepts the reuse of asphaltic concrete as recycled aggregate base without additional analytical testing provided that the material will be encapsulated under an asphalt/concrete roadway. The roadway surface should be relatively impervious to infiltration to limit percolation. Additionally, recycled asphaltic concrete materials must be placed at least five feet above the seasonal high groundwater elevation. As discussed above, we recommend a project design groundwater Elevation of 5 feet.

We do not recommend placement of recycled material within the main correctional facility footprint. Reuse of existing paving materials as engineered fill in roadways could increase the R-value of the subgrade soil, add a "green" recycling component to the project and reduce the cost to export and dispose these materials.

5.4.2 Import Fill

Imported fill materials should have a plasticity index less than 12 and have at least 20 percent passing the No. 200 sieve. Environmental testing should also be performed on imported fill. Import fill containing recycled asphaltic concrete should not be placed within the main correctional facility footprint. ENGEO should be allowed to sample and test proposed imported fill materials at least 72 hours prior to delivery to the site.

If the stormwater infiltration opportunities are considered during civil design, imported fill should also meet permeability requirements provided by the Civil Engineer.

5.4.3 Lightweight Fill

Lightweight fill should meet requirements of imported fill and have a maximum wet density (total unit weight after compaction) of 70 pounds per cubic foot (pcf). Lightweight fill includes lightweight aggregates (e.g., pumice rock from Clear Lake, California or approved equivalent), lightweight slurry (e.g., cell-crete or approved equivalent), or polystyrene blocks (e.g., geofoam or approved equivalent).

5.5 FILL PLACEMENT

During site grading activities, once a suitable firm base is achieved for general fill areas, the exposed non-yielding surface should be scarified, moisture conditioned, and recompacted to provide adequate bonding with the initial lift of fill. All fills should be placed in lifts not to exceed 10 inches in thickness or the depth of penetration of the compaction equipment used, whichever is less.

5.5.1 General Fill

The following compaction control requirements should be applied to site soils and import soils with Plasticity Index less than 12:

Test Procedures:	ASTM D-1557.
Required Moisture Content:	Not less than 2 percentage points over optimum moisture content.
Minimum Relative Compaction:	Not less than 90 percent.

The following compaction control requirements should be applied to site soils with Plasticity Index over 12:

Test Procedures:	ASTM D-1557.
Required Moisture Content:	Not less than 3 percentage point over optimum moisture content.
Minimum Relative Compaction:	Not less than 90 percent. Soil with high plasticity should not be used as pavement subgrade.

The upper 12 inches of pavement subgrade should achieve the following compaction specifications:

Test Procedures:	ASTM D-1557.
Required Moisture Content:	Not less than 2 percentage point over optimum moisture content.
Minimum Relative Compaction:	Not less than 95 percent. As noted above, soil with high plasticity should not be used as pavement subgrade.

Relative compaction refers to in-place dry density of the fill material expressed as a percentage of the maximum dry density based on ASTM D-1557. Optimum moisture is the moisture content corresponding to the maximum dry density. Additional compaction requirements may be required based on additional laboratory testing during grading.

It is important that all site preparations for site grading be done under the observation of the Geotechnical Engineer's field representative. The Geotechnical Engineer's field representative should observe all graded area preparation, including demolition and stripping, following the recommendations contained in this report. The final grading plans should be submitted to the Geotechnical Engineer for review.

5.5.2 Underground Utility Backfill

The contractor is responsible for conducting all trenching and shoring in accordance with CALOSHA requirements. Project consultants involved in utility design should specify pipe bedding materials. In general, trench backfill should have a maximum particle size of 6 inches. We recommend moisture conditioning trench backfill to at least 2 percent above the optimum moisture content and compact to a minimum relative compaction of 90 percent. The trench backfill should be placed in loose lifts not exceeding 8 inches. Jetting of backfill is not an acceptable means of compaction.

5.5.3 Landscape Fill

Landscape fill should be process, place and compact in lifts not to exceed 10 inches in thickness or the depth of penetration of the compaction equipment used, whichever is less. Landscape fill should be compacted to at least 85 percent relative compaction (ASTM D1557).

5.6 GROUND IMPROVEMENTS

Various ground improvement techniques are available to reduce and mitigate the potential risk of settlement due to consolidation of the Bay Mud and liquefaction and seismic settlement. Common ground improvement techniques deemed suitable for the project conditions includes:

- Surcharge Program
- Placement of Light Weight Fill

The above-ground improvement options are discussed in following sections.

5.6.1 Surcharge Program

One alternative to mitigate post-construction settlement around structures supported on deep foundation is to surcharge the site to account for new fill loads. It is our opinion that a surcharge program for the planned CUP area can also reduce the amount of differential settlement within the building footprint and also allow the CUP building to be supported on shallow foundation.

The practicality of a surcharge program is highly dependent on the construction schedule and availability of surcharge fill material. If the construction schedule allows for a 3-month surcharge window, we anticipate that 2 to 3 inches of settlement will occur when a 5-foot-high surcharge fill is placed at finished grade of the CUP building footprint for 3 months. This will reduce the post construction settlement of the CUP building to approximately 2 to 3 inches assuming a uniform foundation load of 1,000 pounds per square foot (psf).

5.6.2 Placement of Lightweight Fill

Bay Mud settlement can be mitigated by removing the existing fill and replacement with lightweight fill. In addition, utilizing lightweight fill to achieve finished grades will also reduce the amount of consolidation settlement. Depending on the type of lightweight fill, total settlement could be reduced by 40 to 60 percent when lightweight fill is used in lieu of regular soil fill.

5.7 GRADED SLOPES

Graded cut or fill slope, including surcharge fills, should be no steeper than 2:1 (horizontal:vertical) and less than 5 feet high. Excavations extending into soft Bay Mud deposits should consider temporary shoring. Steeper and higher graded slopes can be constructed based on results of supplemental slope stability analysis and may require geogrid reinforcement or use of select fill.

5.8 SURFACE DRAINAGE

The project Civil Engineer is responsible for designing surface drainage. As a minimum, we recommend the following to allow positive drainage as the project site settles due to compression of Bay Mud deposits.

1. Design surface grades to avoid grade reversal from long-term differential settlement of the Bay Mud.

2. Slope finished grade away from building exteriors at a minimum of 3 percent for a distance of at least 5 feet. It should be noted that long-term settlement around pile-supported areas could increase drainage and slope gradient. Such change in grade may affect ADA ramps design and other site improvements.

The building pads should be positively graded at all times to provide rapid removal of surface water runoff away from the foundation systems and to prevent ponding of water under foundations or seepage toward the foundation systems at any time during or after construction. All surface water should be collected and discharged into outlets approved by the Civil Engineer. Landscape mounds must not interfere with this requirement.

All roof stormwater should be collected and directed to downspouts. Stormwater from roof downspouts should not be allowed to discharge onto splashblocks or into landscape areas within 5 feet from the foundation; rather they should discharge through the curb and into the street or onto an impermeable material that drains into the street. If discharging into a landscape area is required, the finished surface should be sloped away from the foundation at a gradient of at least 3 percent within 5 feet from the foundation. ENGEO should be consulted to develop alternate recommendations if these criteria are not feasible.

During demolition and mass grading activities, ponding of stormwater must not be allowed at the site and particularly on the building pads during work stoppage for rainy weather. Before the grading is halted by rain, positive slopes should be provided to carry surface runoff in a controlled manner to a discharge point approved by the Civil Engineer.

5.9 STORMWATER INFILTRATION OPPORTUNITIES

We understand that site grades will be raised by 2 to 3 feet of imported fill. If permeable surfaces are planned for the proposed development, the permeability of the import fill should be considered to allow stormwater infiltration. As discussed in Section 5.4.1, we do not recommend recycled aggregate base containing asphaltic concrete fragments to be used for roadways covered with permeable pavers unless further environmental testing is performed.

Based on the subsurface condition encountered in this study, the upper 5 feet of the soil at the site generally consists of fill with variable amounts of clay. Thus, the existing site soils may not have adequate permeability values to handle stormwater infiltration in grassy swales or permeable pavers, unless subdrains are installed. Thus, we recommend assuming little stormwater infiltration will occur through the existing site soils. To reduce soil saturation and undermining adjacent pavements, earthen-sided bioretention systems should be situated entirely outside a 1:1 (horizontal:vertical) line of projection extending downwards from adjacent curbs, hardscape/pavements, and shallow foundations. Alternatively, the bioretention systems should have 2:1 or flatter sloping excavations below the exposed surface.

A structural solution comprising bioretention retaining side walls could also be considered where the bioretention areas are located within a 1:1 line of projection of planned improvements and structures. The bioretention retaining walls should be designed for the full height of the bioretention area excavation using recommendations in Section 9.0 and considering at-rest earth pressures (drained or undrained, whichever is required). Surcharges from vehicular traffic and buildings should also be incorporated if within a 1:1 line of projection extending upward from the bottom of the outer edge of the excavation.

We recommend that planned bioretention areas within 10 feet from a building, street, or site retaining wall incorporate a minimum 10-mil vapor retarder lining for the bioswale excavations. The vapor retarder should line the entire excavation. If the bioretention area is constructed with concrete side walls and bottom, the vapor retarder lining may be omitted unless there are instances where the building walls and bioretention retaining walls are combined.

We also recommend the permeable material and sandy loam material receive moderate compaction effort during construction to achieve at least 85 percent relative compaction, but not more than 90 percent.

5.10 LANDSCAPING CONSIDERATION

It is important to avoid adverse drainage or irrigation conditions near building foundations. We recommended planted areas adjacent to a structure to use of watertight planter boxes with controlled discharge or the use of plants that require very little moisture.

Sprinkler systems should not be installed where they may cause ponding or saturation of foundation soils within 3 feet from walls. Irrigation of landscaped areas should be limited to that necessary to sustain vegetation. The Landscape Architect and prospective owners should be informed of the surface drainage and irrigation requirements included in this report.

6.0 FOUNDATION RECOMMENDATIONS

The major consideration in foundation design for this project is the total and differential settlements due to compressible Bay Mud under static loading conditions, such as those imposed by fills and foundation loads. In addition, the Bay Mud is generally soft and will not sustain heavy loads without significant deflection or even bearing capacity failure.

We recommend that the proposed main detention facility be supported on a deep foundation (driven piles) system. Small standalone ancillary structures that have lighter loads and are not settlement sensitive may be supported on mat foundations bearing in the engineered fill.

6.1 2010 CBC SEISMIC DESIGN PARAMETERS

As discussed in Section 4.1.2, the effects of seismic shaking can be partially mitigated by designing the proposed structures in accordance with the 2010 CBC requirements. Based on the seismic shear wave velocities obtained from 1-CPT6, site soils generally have a Vs_{30} of 200 m/s (656 ft/s). Considering the thickness of the young Bay Mud, the measured Vs_{30} value and the

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stiffness of site soils, the project site can be classified as a Site Class D, stiff soil profile, in accordance with the 2010 CBC Section 1613.5.2. The site may be characterized for design based on Chapter 16 of the 2010 CBC using the following information:

TABLE 6.1-1
2010 CBC Design Criteria
Latitude: 37.493 Longitude: -122.219

Categorization/Coefficient	Design Value
Mapped MCE Spectral Response Acceleration at Short Periods, S_S	1.564
Mapped MCE Spectral Response Acceleration at a Period of 1 second, S_1	0.775
Site Class	D
MCE, 5% Damped, Spectral Response Acceleration at Short Periods Adjusted for Site Class Effects, S_{MS}	1.564
MCE, 5% Damped, Spectral Response Acceleration at a Period of 1 second Adjusted for Site Class Effects, S_{M1}	1.163
Design, 5% Damped, Spectral Response Acceleration at Short Periods, S_{DS}	1.043
Design, 5% Damped, Spectral Response Acceleration at a Period of 1 second, S_{D1}	0.775
Long-period Transition Period, T_L	12 seconds

Based on seismic design criteria provided by the Jail Planning Unit, the planned correctional facility is not considered an essential structural and will be designed according to the 2010 CBC.

6.2 PILE FOUNDATIONS

Deep foundation systems are suitable for the main correctional facility and the CUP structure. Based on our experience, driven precast pre-stressed concrete piles are generally used for larger or settlement-sensitive structures in the vicinity of the project site.

Pile driving will generate minor vibrations and could adversely affect nearby improvements, particularly freshly placed concrete. If concerned about the impacts of pile driving on offsite facilities, we recommend that the conditions of buildings and improvements within 150 feet of the site boundaries be photographed and surveyed to document existing conditions prior to the start of pile driving activities. Additionally, vibration monitoring could be performed during the driving of the initial piles to further evaluate the impacts of pile driving. If vibrations during pile driving will negatively influence the adjacent structures and improvements, consideration should be given to supporting the structure on drilled in-place piles such as a CIDH, Fundex or Tubex piles. Recommendations for these piles can be provided separately.

As discussed above, differential settlement between pile-supported structures and surrounding areas is anticipated to be up to approximately 2 inches. Thus, entries and pipe connections to pile-supported buildings will require flexibility to accommodate the anticipated differential settlement.

6.2.1 Vertical Capacities

We reviewed the subsurface data and using our experience in the area and professional judgment developed an idealized soil profile to represent the general soil conditions for design. Vertical pile capacity charts showing the calculated allowable vertical capacity versus foundation depth of each pile type from existing ground elevation are provided in Appendix F.

Pile lengths are highly dependent on the structural loads and the downdrag caused by settlement of the Bay Mud. The piles will derive their vertical capacity primarily from skin friction within the stiff soil layers below the Bay Mud. We understand that depending on the thickness of the pile cap, the top of the driven piles may range from 0 to 5 feet below existing grade. Vertical capacities of driven piles are shown in Tables F-1A and F-1B of Appendix F. The vertical capacities consider skin friction and partial end bearing. Under seismic conditions, the allowable capacities can be increased by one-third. The allowable vertical capacities provided in Appendix Finclude a downdrag force caused by the long-term settlement of the Bay Mud under static fill loads. The structural engineer should confirm that the total structural load on the pile plus the downdrag load will not exceed the structural capacity of the selected pile. To reduce pile group effects, space piles at least 3 diameters apart, center to center. For square piles, use the least dimension for determining the effective diameter.

Foundation plans are not available at this time. On a preliminary basis, we estimate that post-construction pile foundation settlements will be less than 1 inch. Differential settlement between adjacent columns will be dependent on the final design of these foundation elements, although we anticipate that differential settlement will be less than about ¾ to ½ inch between columns. Once column spacings, loads and pile group configurations are determined, we should be retained to review the information and update our recommendations.

Entries and pipe connections to pile-supported buildings require flexibility to accommodate the significant differential settlement that can occur. Vibrations and noise related to pile driving may impact neighboring infrastructure and improvement such as sidewalks, curbs and streets and appropriate existing conditions surveys and construction monitoring program should be considered.

6.2.2 Lateral Capacities

Lateral load resistance for pile-supported structures is developed through pile bending/soil interaction. The magnitude of the lateral load resistance is dependent upon several factors, including axial load on the pile, pile stiffness, pile embedment length, conditions of fixity at the pile cap, the physical properties of surrounding soil, and the magnitude of allowable lateral deflections. General concrete and steel pile properties were provided to us by the Structural Engineer and summarized under Table F-2 in Appendix F.

We developed two generalized subsurface profiles and developed LPILE soil input criteria for lateral pile capacity and load-deflection computation. LPILE analysis soil parameters provided in

Tables F-3A and F-3B in Appendix F consider the top of the pile at the ground surface and alternatively embedded 5 feet below ground surface. In addition, the groundwater table is estimated to be at Elevation 5 feet (5 feet bgs).

We used the computer program LPILE to estimate lateral pile loads for the various concrete piles and steel H piles under free head and fixed head conditions. The free head condition also considers ¼- and ½-inch pile top deflections. We estimated maximum bending moments and points of fixity for driven piles for ¼- and ½-inch pile top deflection for both fixed and free head conditions. We consider "point of fixity" as a point of zero lateral deflection. We also assumed a minimum 28-day compressive strength of 6,000 pounds per square inch (psi) for pile concrete.

Tables F-4A, F-4B, F-5A and F-5B in Appendix F summarized the lateral deflection and bending moment obtained from the LPILE analysis. If actual pile stiffness varies by no more than 20 percent of those included in Table F-2, then load deflection characteristics can be approximated by multiplying the deflection values by the ratio of the pile stiffness. For pile stiffness significantly different from the values listed in Table F-2, we should be contacted to provide revised lateral pile characteristics.

The lateral capacities and bending moments provided in Appendix F represent the probable response of a single pile under short-term loading conditions and do not include a factor of safety. Suitable factors of safety should be selected based on the type of loading.

6.2.3 Lateral Capacity Group Reduction

Research has shown that the lateral capacity of a group of piles is generally less than that of a single pile for pile spacing less than 6 to 8 pile diameters. We recommend the multipliers provided in Table 6.2.3-2 to be considered in the LPILE/GROUP analysis. These multipliers are based on AASHTO LRFD BDS where "D" is pile diameter.

TABLE 6.2.3-1
Preliminary Design P-Multiplier Values By Row Position

	Design P-Multiplier			
Pile Spacing (Center-to-Center)	3D	5D	7D	8D
Lead Row	0.75	1.0	1.0	1.0
Second Row	0.55	0.85	1.0	1.0
Third and Higher Rows	0.40	0.70	0.90	1.0

6.2.4 Passive Resistance Against Pile Caps and Grade Beams

Lateral loads may also be resisted by passive pressure along the sides of pile caps and grade beams where poured neatly against undisturbed native soil or newly constructed engineered fill. The passive pressure is based on an equivalent fluid pressure in pounds per cubic foot (pcf). We recommend an allowable passive lateral pressure of 300 pcf (FS=1.5) for use in design. The allowable passive lateral pressure should be reduced to 175 pcf (FS=1.5) if the pile caps and grade beams are backfilled instead of excavated. Appropriate factor of safety should be applied to the ultimate passive lateral pressure value in the structural design.

6.2.5 Corrosion Protection

As discussed in Section 4.5, some site soils are considered corrosive to buried metal and steel embedded in a concrete mortar coating. We recommend that all concrete, at or below grade, be designed for "moderate" sulfate exposure conditions. As outlined in the table under Section 4.2 above, Type II cement may be used for concrete, provided it has a minimum 28-day concrete compressive strength of at least 4,000 psi and a water-cement ratio no greater than 0.50; however, it should be noted that structural engineering design requirements for concrete might result in more stringent concrete specifications.

A corrosion consultant should be retained to provide specific design recommendations for corrosion protection for buried metals and piles.

6.2.6 Pile Driving and Testing

6.2.6.1 Predrilling

We recommend predrilling the upper 5 feet to avoid pile damage and reduce the effect of soil heave. This is critical where stiff soil overlies soft Bay Mud. As discussed above, existing fill within the upper 5 feet of the project site generally may contain concrete, asphalt, rubble and construction debris. The diameter of the predrilled hole should be no larger than the minimum pile dimension (i.e. 14-inch-diameter hole for a 14-inch-square pile). Where pile caps are embedded at least 5 feet, the depth of predrilling may be reduced or eliminated; we should consulted in the field to evaluate the actual conditions at these locations.

6.2.6.2 Indicator Pile Driving

We recommend installing indicator piles to assist in evaluating the driving system performance and establishing the final pile driving criteria. The indicator piles should be driven to:

- Develop production-driving criteria.
- More accurately estimate production pile lengths based on driving resistance and depth to various soil layers.
- Assist in identifying driving issues prior to ordering and casting the final production piles.
- Determine any necessary changes to the recommended pre-drill depth.
- Evaluate the contractors pile driving system.

In general, it is desired that the indicator and production piles be driven with the same pile driving system. Determination of pile driving equipment and pile section for the production piles can be based on hammer energy required to drive the selected piles efficiently without damaging them.

Based on our experience with the soil conditions in the Redwood City area, a pile-driving hammer capable of delivering a minimum rated driving energy of approximately 70,000 foot-pounds would be the minimum size necessary to drive piles to a 100-ton capacity. We recommend that the contractor perform a wave equation analysis to confirm the compatibility and drivability of the pile driving system with the pile type and soil conditions at the site. The wave equation analysis will also help confirm that the pile driving stresses will not exceed the allowable pile stresses. We should be retained to review the wave equation results prior to mobilization of pile-driving equipment to the site.

We recommend indicator piles be cast at least 5 feet longer than needed to confirm field pile capacities and final design lengths. Indicator piles may be driven as production piles provided that minimum recommended tip elevations are achieved and no structural damage occurs to the pile from installation.

The Geotechnical Engineer should be retained prepare an indicator pile program, including the number and layout, once foundation plans are finalized.

6.2.6.3 Pile Load Tests

When a large number of piles are planned, performing a pile load test prior to production pile installation can aid in optimizing pile foundation design and likely reduce foundation costs by reducing pile lengths. Pile load tests are optional and can be performed if desired by the Owner to further optimize the pile foundation design.

Prior to test pile installation, we will review the indicator pile driving logs and the wave equation analysis to select the appropriate test locations. The contractor is generally responsible for the design, operation, and safety of the load test system. This includes supplying and installing all of the necessary components, including the dial gauges and reference beams. The load test should be performed in accordance with ASTM D1143 (Reapproved 1994) *Standard Test Method for Piles Under Static Axial Compressive Load*, *Standard Loading Procedure*. The Standard Loading Procedure requires loading up to 200 percent of the design load. Because testing a pile to failure can provide the best information for determining actual capacities, we recommend that additional loading be performed if the pile does not fail under 200 percent of the design load. In this case, we recommend that Section 5.1 of ASTM D1143 be performed, *Loading in Excess of Standard Test Load*, and the maximum load be increased to 300 percent of design load. An optional uplift capacity load test may be performed in accordance with ASTM D3689-90 *Standard Test Method for Individual Piles Under Static Axial Tensile Load*.

Test piles should be driven to between the recommended minimum and probable tip elevations using the same hammer as that used for indicator and production pile driving. Load test piles should not be used as production piles. It may be feasible to use at least one of the indicator piles for the load test reaction piles.

The Geotechnical and Structural Engineer should be retained to review the load test program prior to mobilization of pile test equipment to the site. We should also be retained to monitor and evaluate the entire pile load test, including test pile installation. Following our analysis of the load testing, revised minimum pile lengths necessary to achieve the desired pile capacities can be developed jointly with the Structural Engineer. The Geotechnical Engineer should be retained to observe and record the results of all production pile driving.

6.2.6.4 Production Pile Installation

Following our analysis of the indicator pile installation and load tests, we should be retained to establish the minimum and probable pile tip elevations necessary to achieve the desired pile capacities.

Production piles should be driven using the same hammer and system as the indicator and load test piles. We will use data obtained from the indicator pile program, load tests, wave equation analysis, and this geotechnical report to develop pile driving criteria for production piles. The Geotechnical Engineer should be retained to observe and record the results of all production pile driving.

6.3 SHALLOW FOUNDATIONS

Shallow foundations may be considered for light to moderately loaded smaller structures, such as the CUP and the transformer pad. Shallow foundations should be designed to resist estimated settlements (total and differential). We recommend implementing a surcharge program within the CUP and transformer pad footprint to reduce post-construction differential settlements, if these structures are supported on shallow foundations.

6.3.1 Conventional Mat Foundations

Conventional mat foundation should have a minimum thickness of 15 inches and be designed to have an edge cantilever span distance of 5 feet and an interior span distance of minimum 15 feet. It should also be designed to withstand one inch of differential movement over a 20-foot distance without experiencing distress to the structure to address the potential for liquefaction-induced settlement and consolidation settlement. The rigid mats may be designed to impose a maximum average bearing pressure of 1,000 pounds per square foot (psf) for dead-plus-live loads. The allowable bearing capacity may be increased to 1,500 psf in areas of loading concentration. These values may be increased by one-third when considering transient loads, such as wind or seismic. If a spring constant is needed for initial design, a modulus of subgrade reaction (k_s) of 40 pounds per square inch per inch of deflection (psi/in) can be used. However, the true subgrade reaction of the mat will result in a variable subgrade modulus that matches the tendency for dishing settlement. Once the dimensions and loads for the proposed mat foundations are known, we should be retained to perform additional settlement analysis to refine the mat design and develop a variable subgrade modulus that properly models the future settlement.

Resistance to lateral loads may be provided by frictional resistance between the foundation concrete and the subgrade soils and by passive earth pressure acting against the side of the foundation. A coefficient of friction of 0.35 can be used between concrete and the subgrade. Passive pressures can be taken as equivalent to the pressure developed by a fluid having a weight of 300 pounds per cubic foot (pcf).

We anticipate differential settlement between mat supported structures and surrounding areas to range from 3 to 5 inches without a surcharge program and 1 to 2 inches if a surcharge program is implemented. Thus, entries and pipe connections to the mat supported structures will require flexibility to accommodate the estimated differential settlement that will occur. Without surcharging, the mat will tend to settle more than the surrounding area so surface grades will need to be designed to maintain positive drainage away from the building.

6.3.2 Auxiliary Structure Foundations

We anticipate that auxiliary structures such as isolated light poles, carport shelters and trellis may be planned. We anticipate the auxiliary structures to be lightly loaded, with less than 200 pounds per square foot of structural load. We recommend lightly loaded auxiliary be supported on shallow spread footings to avoid drilled pier excavations that could penetrate into the Bay Mud. The intent is to provide a shallow embedded footing wide enough to resist overturning.

Shallow light pole footings should be embedded a minimum of 3 feet below adjacent grade and designed for a maximum average allowable bearing pressure of 250 pounds per square foot (psf) for dead plus live loads. For overturning resistance, use a maximum heel bearing pressure of 300 psf due to temporary wind and seismic loading.

The maximum allowable bearing pressure is a net value; the weight of the footing may be neglected for design purposes. All footings located adjacent to utility trenches should have their bearing surfaces below an imaginary 1:1 (horizontal:vertical) plane projected upward from the bottom edge of the trench to the footing.

We recommend that we review the preliminary foundation plans and structural loads to check that these recommendations are appropriate.

7.0 FLOOR SLABS AND SLABS-ON-GRADE

7.1 INTERIOR CONCRETE FLOOR SLABS

Interior concrete slabs for the main detention facility should be designed to structurally span between the pile foundations. Thickness and reinforcement of the interior floor slab should be designed by the Structural Engineer.

Due to the shallow groundwater within the project site, groundwater may rise by capillary action to depths near the bottom of interior floor slabs, resulting in damp or wet floor conditions. To protect the concrete first floor against subsurface seepage, subsurface drainage should be provided around the entire perimeter of main correctional facility. Where applicable, the subdrainage trench should be at least 12 inches wide and extend at least 6 inches below the bottom of the perimeter grade beam. It should contain a minimum 4-inch-diameter perforated pipe (SDR 35 or equivalent, with perforations down) surrounded with either drain rock wrapped in filter fabric or Class 2 permeable material. All trenches and pipes should have a minimum slope of 1 percent, and should be located within 12 inches horizontally of the foundation.

Area drains, closed roof downspout collector pipes, and perimeter/underfloor subdrainage can be constructed in a single trench, if desired. The perimeter or underfloor subdrains should not be connected to area drains or downspout collector pipes. The discharge locations and connections should be designed to prevent backup of water into the perimeter or underfloor subdrains.

7.2 EXTERIOR FLATWORK

Exterior flatwork includes items such as concrete walkways, steps and outdoor courtyards exposed to foot traffic only. Exterior flatwork should be constructed structurally independent of the foundation system. This allows movement to occur within the flatwork with minimum foundation distress. The expansive soils and settlement magnitudes will likely result in cracking of conventional exterior slabs. To reduce potential for damage from expansive soil as well as settlement, we recommend that exterior slab design include a minimum section of 4 inches of concrete over 4 inches of aggregate base. Compact the aggregate base to at least 90 percent relative compaction (ASTM D1557). Slabs-on-grade should be reinforced and provided with frequent control joints to reduce and control the cracking. The Structural Engineer should design the reinforcement, which in our opinion, should consist of a minimum of No. 3 bars spaced 12 inches on center each way. Construct control and construction joints in accordance with current Portland Cement Association Guidelines. The potential for damage from expansive soils can be reduced by attaining a near-saturation condition of the subgrade soil before concrete placement.

Due to the anticipated consolidation settlement surrounding pile-supported structures, flatwork connecting to a pile-supported building entrance area should be designed as a hinged slab to prevent separation at the joint with the building. Flatwork should be reinforced to allow for the appropriate span in the event of settlement. Where the flatwork forms a corner with the building, dowels should only be placed on the side where separation between the foundation and the flatwork is not desirable to provide for flexible movements in the remaining portion of the flatwork. Maintenance or replacement of entry slabs should be expected as the ground settles at the perimeter of pile-supported buildings.

8.0 UNDERGROUND UTILITIES

As discussed above, consolidation settlements are expected within the project site. Buried utilities require special designs to tolerate estimated settlements by including flexible connections. Moreover, buried gravity-flow pipes may need a steeper drainage gradient to allow a positive flow if significant differential settlement occurs. This is important where utilities enter pile-supported structures or surcharged areas.

For the site, we anticipate manholes extending beneath Elevation -2 feet will penetrate through the existing Bay Mud. These manholes will not experience consolidation settlement and may appear to "rise out of the ground" as the surrounding areas settle. Surcharging would be a beneficial approach in reducing consolidation settlement and alleviate the above problems.

8.1 UTILITY TRENCH DEWATERING

Groundwater is expected to be shallow at the site. Utility trench excavations extending beneath an Elevation of 5 feet may require temporary dewatering during construction to keep the excavation and working areas reasonably dry. In general, excavations should be dewatered such that water levels are maintained at least 2 feet below the bottom of the excavation prior to and continuously during shoring installation and the backfill process to control the tendency for the bottom of the excavation to heave under hydrostatic pressures and to reduce inflow of soil or water from beneath temporary shoring. We anticipate that dewatering for underground utility construction will be accomplished by pumping from sumps.

8.2 UTILITY TRENCH EXCAVATION AND BACKFILL

Due to the soft nature of the Bay Mud, deep excavations extending into Bay Mud deposits can become unstable. Temporary shoring such as sheet piling or continuous hydraulic shoring should be anticipated for excavations over 6 feet deep. We recommend undrained temporary braced shoring be designed for the restrained condition below the water table, with pressures of 80 pcf in the Bay Mud. In Bay Mud, a passive resistance of 150 pcf should be used. The contractor should not stockpile soils, place heavy construction materials or park equipment near trenches or excavations extending into Bay Mud.

It is the responsibility of the Contractor to provide stable, safe trench and construction slope conditions and to follow OSHA safety requirements. Since excavation procedures may be very dangerous, it is also the responsibility of the Contractor to provide a trained "competent person" as defined by OSHA to supervise all excavation operations, ensure that all personnel are working in safe conditions, and have thorough knowledge of OSHA excavation safety requirements.

Backfill for deep excavations extending into Bay Mud should consist of similar soils or lightweight fill to reduce long-term total and differential settlement. Supplemental recommendations for shoring design will be provided if needed.

9.0 RETAINING WALLS

Unrestrained drained retaining walls constructed on level ground may be designed using active pressures. Retaining walls that are structurally connected to the permanent structures should be designed to resist at-rest earth pressures.

9.1 LATERAL SOIL PRESSURES

Lateral earth pressures are provided in the following table for retaining wall design and assume level backfill conditions.

TABLE 9.1-1
Retaining Wall Design Earth Pressures

Retained Soil	Elevation, feet (NAVD 88)	Static Conditions		Seismic Conditions*
		Active	At-rest	Seismic Load (H=height of wall, feet)
Existing or Engineered Fill	Above El. 5	45 pcf	60 pcf	$12H^2$ pounds
Bay Mud	El. 5 to -5	65 pcf	80 pcf	$10H^2$ pounds

*Wall should be designed for the more critical loading condition of at-rest or active + seismic conditions. H equals the height of the wall in feet. Seismic load should be applied at 0.6H from the base of the wall.

Where traffic is expected within 10 feet of the walls, a surcharge of 100 psf (rectangular distribution) should be added to the top 10 feet of the wall. Where surcharge loads are adjacent to unrestrained walls, design walls to resist an additional uniform pressure equivalent to one-third of the loads applied at the surface. Design restrained walls to resist an additional uniform pressure equivalent to one-half of any surcharge loads applied at the surface.

9.2 RETAINING WALL DRAINAGE

Drainage facilities should be installed behind retaining walls to prevent the build-up of hydrostatic pressures on the walls above the groundwater level. Wall drainage may be provided using 4-inch-diameter perforated (SDR 35 or approved equivalent) pipe encapsulated in either Class 2 permeable material (Appendix H, Part I - Guide Contract Specifications, Section 2.05B), or free-draining gravel surrounded by synthetic filter fabric. The width of the gravel-type drain blanket should be at least 12 inches. The drain blanket should extend from the design groundwater level or the base of the wall, whichever is higher, to about one foot below the finished grade. The upper one foot of wall backfill should consist of onsite clayey soil. If preapproved by the Geotechnical Engineer, prefabricated wall drain panels could be considered in lieu of the granular drain blanket above the pipe system. Drainage should be collected by solid pipes and directed to an outlet approved by the Civil Engineer.

Damp-proofing/waterproofing of the walls should be included in areas where wall moisture transmission would be problematic. The damp-proofing/waterproofing should be designed by a consultant that specializes in this area.

9.3 BACKFILL

Backfill behind retaining walls should be placed and compacted in accordance with Section 5.5. Use light compaction equipment within 5 feet of the wall face. If heavy compaction equipment is used, the walls should be temporarily braced to avoid excessive wall movement.

9.4 WALL FOUNDATIONS

Walls structurally connected to the proposed buildings should be supported on the same foundation system as the building. Other site retaining walls can be supported on shallow footings in accordance with recommendations provided in Section 6.3.2. Passive pressures acting on wall foundations may be assumed as 300 pcf for engineered fill provided that the area in front of the retaining wall is level for a distance of at least 10 feet. Unless the surface in front of the wall is confined by a slab or pavement, the upper 1 foot of soil should be neglected when calculating passive resistance.

10.0 PAVEMENT DESIGN

Preliminary pavement design is provided based on assumed Traffic Indices and subgrade resistance values (R-value). The Traffic Index should be determined by the Civil Engineer or appropriate public agency. The sections provided below should be reviewed and revised, if applicable, based on R-value tests performed on samples of actual subgrade materials recovered at the time of grading. Pavement construction and materials should comply with the requirements of the Standard Specifications of the State of California Department of Transportation, City of Redwood City requirements and the following recommendations.

10.1 FLEXIBLE PAVEMENT

We anticipate the pavement subgrade soil will consist of engineered fill. At this time, the engineered fill may consist of site soils or imported material. The following preliminary pavement sections have been determined based on an assumed R-value of 5 according to the method contained in Chapter 610 of Highway Design Manual by CALTRANS (2012).

TABLE 10.1-1
Preliminary Flexible Pavement Design

Traffic Index (TI)	R-Value of 5	
	AC (inches)	AB (inches)
5.0	3.0	10.0
6.0	3.5	13.0
7.0	4.0	16.0

Notes: AC is asphalt concrete
AB is aggregate base Class 2 Material with minimum R = 78

10.2 RIGID PAVEMENT

Rigid pavement section should consist of Portland cement concrete paving (PCCP) over Class 2 aggregate base over prepared subgrade. The PCCP should achieve a minimum 28-day concrete compressive strength of 3,500 psi. Control joints, spaced in accordance with Caltrans guidelines, should also be considered. To reduce concrete cracking, No. 3 bars at 16 inches on center each way placed at mid-depth of the concrete section may be considered.

TABLE 10.2-1
Preliminary Rigid Pavement Design

Traffic Index (TI)	R-Value of 5 (untreated subgrade)	
	PCCP (inches)	AB (inches)
5	6	8
6	6	10
7	6	13

10.3 PAVEMENT SUBGRADE PREPARATION

Pavement subgrades should be scarified to a depth of 12 inches below finished subgrade elevation. The subgrade soil should be moisture conditioned to at least 2 percentage points above optimum and compacted to at least 95 percent relative compaction and in accordance with City of Redwood City requirements (ASTM Test Methods). If subgrade soils consist of granular soils with a Plasticity Index less than 15, the required compaction specifications may be modified to achieve at least a 95 percent relative compaction at a moisture content of at least optimum as determined by ENGEO's field representative.

Subgrade soils should be in a stable, non-pumping condition at the time aggregate baserock materials are placed and compacted. Proof-rolling with a heavy wheel-loaded piece of construction equipment should be implemented. Yielding materials should be appropriately mitigated, with suitable mitigation measures developed in coordination with the client, contractor and Geotechnical Engineer.

Aggregate baserock materials should meet current Caltrans specifications for Class 2 aggregate baserock and should be compacted to at least 95 percent of maximum dry density at a moisture content of at least optimum (ASTM Test Methods). Proof-rolling with a heavy wheel-loaded piece of construction equipment should be implemented after placement and compaction of the aggregate base. Yielding materials should be appropriately mitigated, with suitable mitigation measures developed in coordination with the client, contractor, and Geotechnical Engineer. Asphalt paving materials should also meet current Caltrans specifications for asphalt concrete.

All concrete curbs separating pavement and irrigated landscaped areas should extend into the subgrade and below the bottom of adjacent aggregate baserock materials. An undercurb drain may also be considered to help collect and transport subsurface seepage.

10.4 CUT-OFF CURBS

Saturated pavement subgrade or aggregate base can cause premature failure or increased maintenance of asphalt concrete pavements. This condition often occurs where landscape areas directly abut and drain toward pavements. If desired to install pavement cutoff barriers, they should be considered where pavement areas lie downslope of any landscape areas that are to be sprinklered or irrigated, and should extend to a depth of at least 4 inches below the base rock layer. Cutoff barriers may consist of deepened concrete curbs or deep-root moisture barriers. If reduced pavement life and greater than normal pavement maintenance are acceptable to the owner, then the cutoff barrier may be eliminated.

11.0 PLAN REVIEW AND CONSTRUCTION MONITORING

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to:

1. Review the final grading and foundation plans and specifications prior to construction to determine whether our recommendations have been implemented and to provide additional or modified recommendations, if necessary. This also allows us to check if any changes have occurred in the nature, design or location of the proposed improvements and provides the opportunity to prepare a written response with updated recommendations.

2. Perform construction monitoring to check the validity of the assumptions we made to prepare this report. All earthwork operations should be performed under the observation of our representative to check that the site is properly prepared, the selected fill materials are satisfactory, and that placement and compaction of the fills has been performed in accordance with our recommendations and the project specifications. Sufficient notification to us prior to earthwork is essential.

3. Perform observation during foundation construction, such as pile installation and indicator pile installation. We should be retained to review the load test program prior to mobilization of pile test equipment to the site. ENGEO could provide supplemental recommendations for optimization of pile foundation based on pile load test results.

If we are not retained to perform the services described above, then we are not responsible for any party's interpretation of our report (and subsequent addenda, letters, and verbal discussions).

12.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical opinions regarding development at the San Mateo County Detention Center site in Redwood City, California. This report is issued with the understanding that it is the responsibility of the owner to transmit this report to contractors, architects, engineers, and designers for the project so that the design and construction team could consider the recommendations provided herein. The conclusions and recommendations contained in this report are solely professional opinions.

The professional staff of ENGEO Incorporated strive to perform services in a proper and professional manner with reasonable care and competence but is not infallible. There are risks of earth movement and property damages inherent in land development. We are unable to eliminate all risks or provide insurance; therefore, we are unable to guarantee or warrant the results of our services.

This geotechnical exploration report is based upon field and other conditions discovered at the time of preparation of ENGEO's documents of service. This document must not be subject to unauthorized reuse, that is, reuse without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time. Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds.

If ENGEO's scope of services does not include onsite construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims, including, but not limited to claims arising from or resulting from the performance of such services by other persons or entities, and any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

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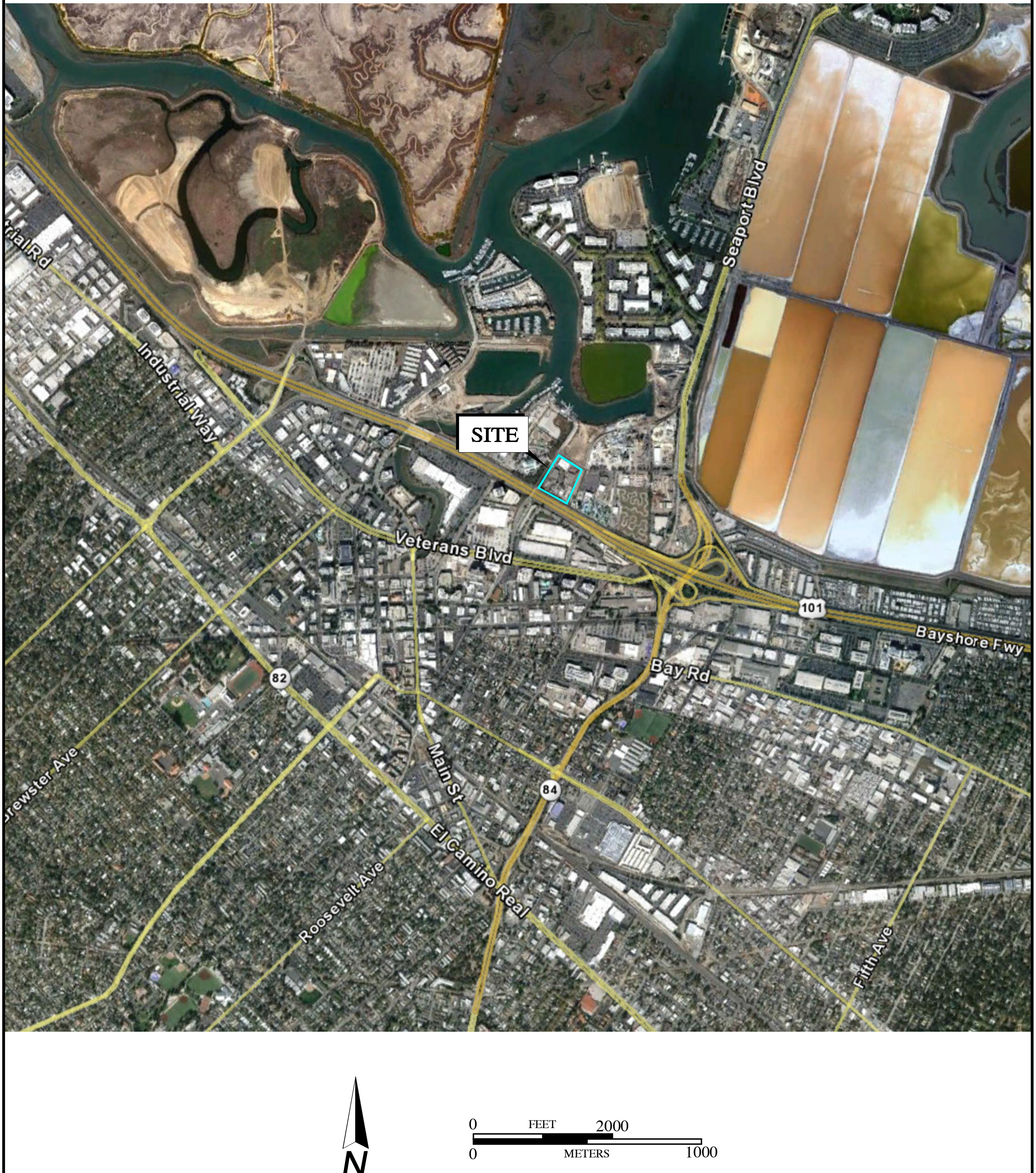
FIGURES



BASE MAP SOURCE: GOOGLE EARTH

ENGEO
Expect Excellence

VICINITY MAP
SAN MATEO COUNTY REPLACEMENT CORRECTIONAL FACILITY
REDWOOD CITY, CALIFORNIA

PROJECT NO.: 9515.000.000
SCALE: AS SHOWN
DRAWN BY: SRP
CHECKED BY: MMG
FIGURE NO. 1

G:\Drafting\DRAFTING2_Dwg\9515\000\9515000000-1-VicMap-1012.dwg Plot Date: 11-29-12 SPATTERS

ORIGINAL FIGURE PRINTED IN COLOR

G:\Drafting\DRAFTING2_Dwg\9515\000\9515000000-2-ExplorationPlan-1012.dwg Plot Date:11-30-12 SPATTERS

EXPLANATION

1-B6 — APPROXIMATE LOCATION OF PROPOSED BORING (ENGEO, CURRENT STUDY)

1-CPT6 — APPROXIMATE LOCATION OF CONE PENETRATION TEST (ENGEO, 2012)

A — A' — APPROXIMATE LOCATION OF CROSS SECTION

MAIN CORRECTIONAL FACILITY FOOTPRINT

GENERATOR/TRANSFORMER PAD AND CUP LOCATION

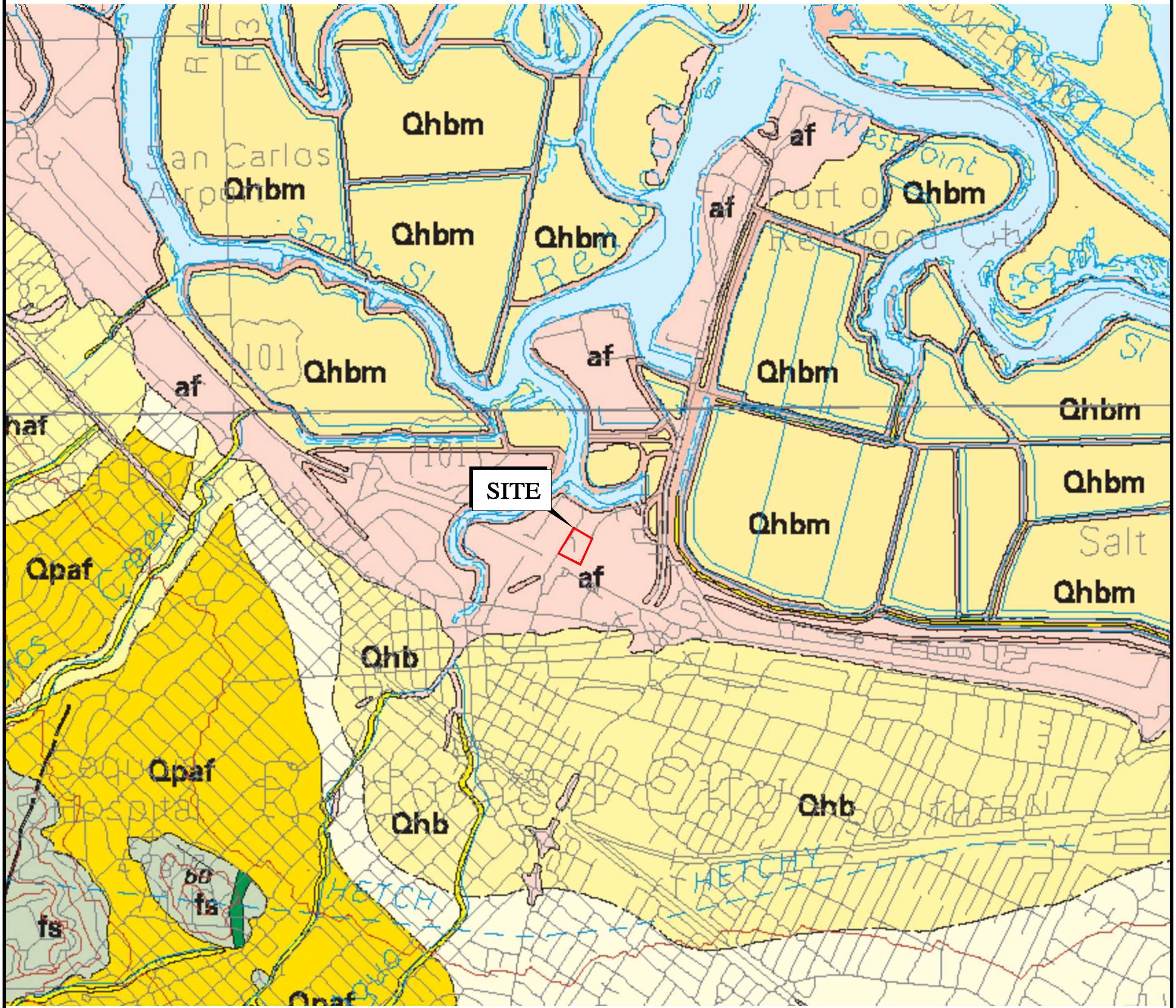
N

0 FEET 80
0 METERS 40

BASE MAP SOURCE: HOK

ENGEO Expect Excellence	SITE EXPLORATION PLAN SAN MATEO COUNTY REPLACEMENT CORRECTIONAL FACILITY REDWOOD CITY, CALIFORNIA	PROJECT NO.: 9515.000.000 SCALE: AS SHOWN DRAWN BY: SRP CHECKED BY: MMG	FIGURE NO. 2

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

af	ARTIFICIAL FILL
Qhbm	BAY MUD
Qhb	BASIN DEPOSIT
Qpaf	ALLUVIAL FAN DEPOSITS

N

0 FEET 3000
0 METERS 1500

BASE MAP SOURCE: GRAYMER, 1998

ENGEO Expect Excellence	REGIONAL GEOLOGIC MAP SAN MATEO COUNTY REPLACEMENT CORRECTIONAL FACILITY REDWOOD CITY, CALIFORNIA	PROJECT NO.: 9515.000.000 SCALE: AS SHOWN DRAWN BY: SRP CHECKED BY: MMG	FIGURE NO. 3

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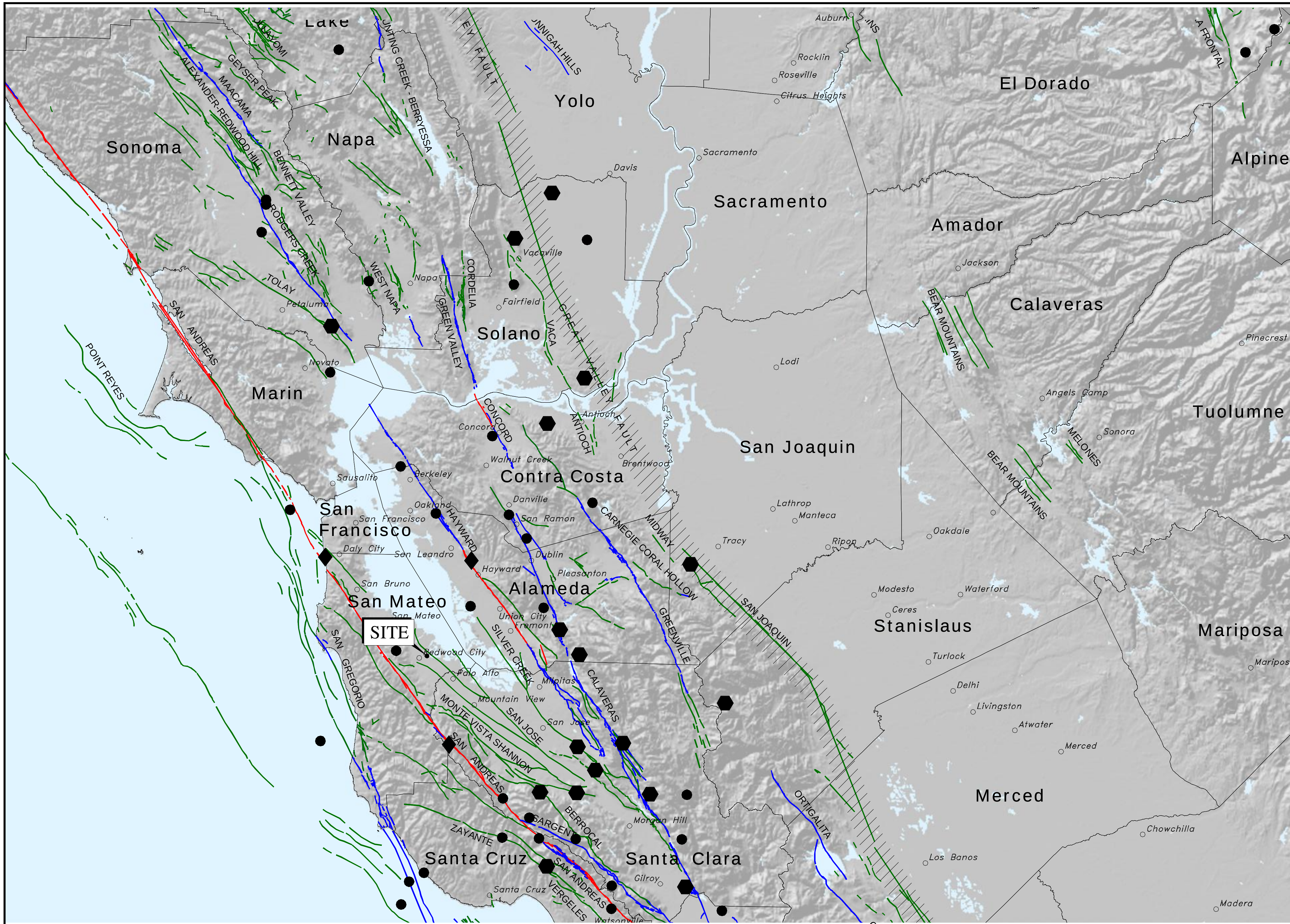
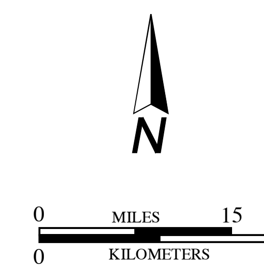
ORIGINAL FIGURE PRINTED IN COLOR





EXPLANATION

- MAGNITUDE 7+
- MAGNITUDE 6-7
- MAGNITUDE 5-6
- HISTORIC FAULT
- HOLOCENE FAULT
- QUATERNARY FAULT
- HISTORIC BLIND THRUST FAULT ZONE

BASE MAP SOURCE:
U.S.G.S. 1-ARC SECOND S.R.T.M. DATABASE
U.S.G.S. QUATERNARY FAULT DATABASE, MARCH, 2006
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-2000)

ENGEO
Expect Excellence

REGIONAL FAULTING AND SEISMICITY SAN MATEO COUNTY REPLACEMENT CORRECTIONAL FACILITY REDWOOD CITY, CALIFORNIA	PROJECT NO.: 9515.000.000		FIGURE NO
	SCALE: AS SHOWN		4
	DRAWN BY: SRP	CHECKED BY: MMG	

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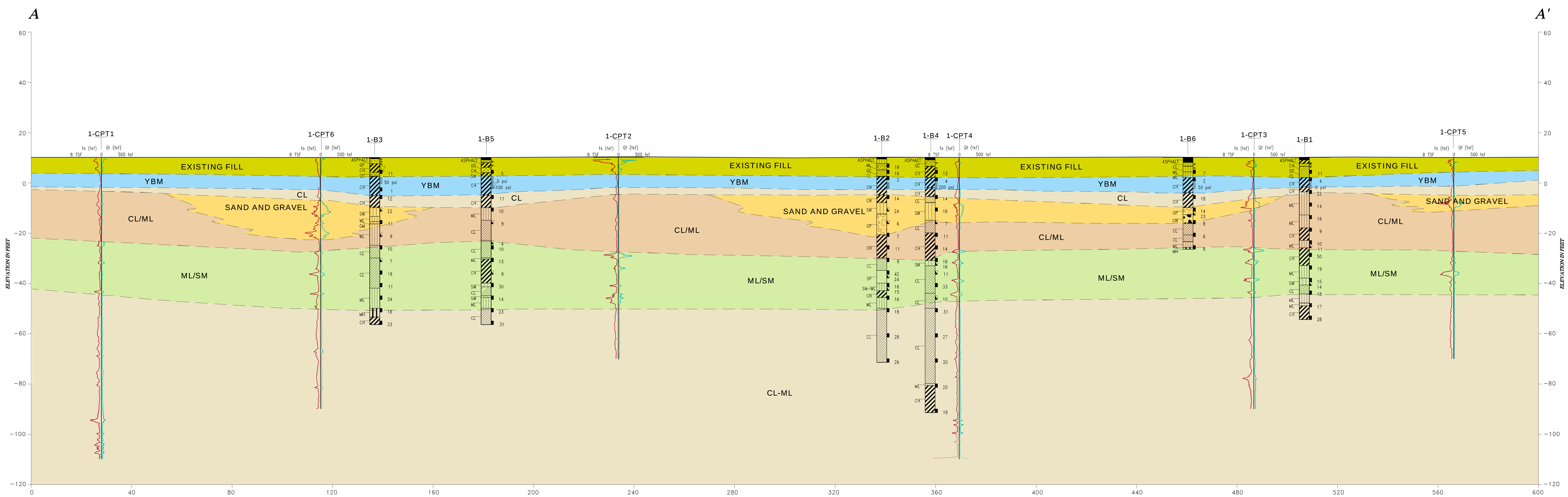
ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

EXISTING FILL	CLAYEY SAND AND GRAVELLY CLAY WITH CONCRETE, ASPHALT, BRICK FRAGMENTS
YOUNG BAY MUD (YBM)	ORGANIC CLAY, SOFT TO MEDIUM STIFF AND HIGHLY COMPRESSIBLE
OLD CLAY (CL)	CLAY, STIFF AND MODERATELY COMPRESSIBLE
SAND AND GRAVEL	SAND, SILTY SAND AND GRAVEL, MEDIUM DENSE
CL/ML	SILTY CLAY AND CLAYEY SILT, MEDIUM TO STIFF
ML/SM	INTERBEDDED SILTY CLAY, SILTY SAND, MEDIUM STIFF TO STIFF
CL-ML	SILTY CLAY AND CLAYEY SILT (ALLUVIUM), STIFF TO VERY STIFF
1-B6	APPROXIMATE LOCATION OF BORING
1-CPT6	APPROXIMATE LOCATION OF CONE PENETRATION TEST

ASPHALT
USCS LOW PLASTICITY CLAY
USCS CLAYEY GRAVEL
USCS SILTY GRAVEL
USCS HIGH PLASTICITY CLAY
USCS SILT
USCS POORLY-GRADED GRAVEL
USCS ELASTIC SILT
USCS POORLY-GRADED SAND
USCS SILTY SAND
SILTY SAND/SANDY SILT
USCS WELL-GRADED SAND

SCALE IN FEET

ENGEO Expect Excellence

CROSS SECTION A-A'
SAN MATEO COUNTY REPLACEMENT CORRECTIONAL FACILITY
REDWOOD CITY, CALIFORNIA

PROJECT NO.: 9515.000.000
SCALE: AS SHOWN
DRAWN BY: SRP
CHECKED BY: MMG
FIGURE NO. 5

ORIGINAL FIGURE PRINTED IN COLOR

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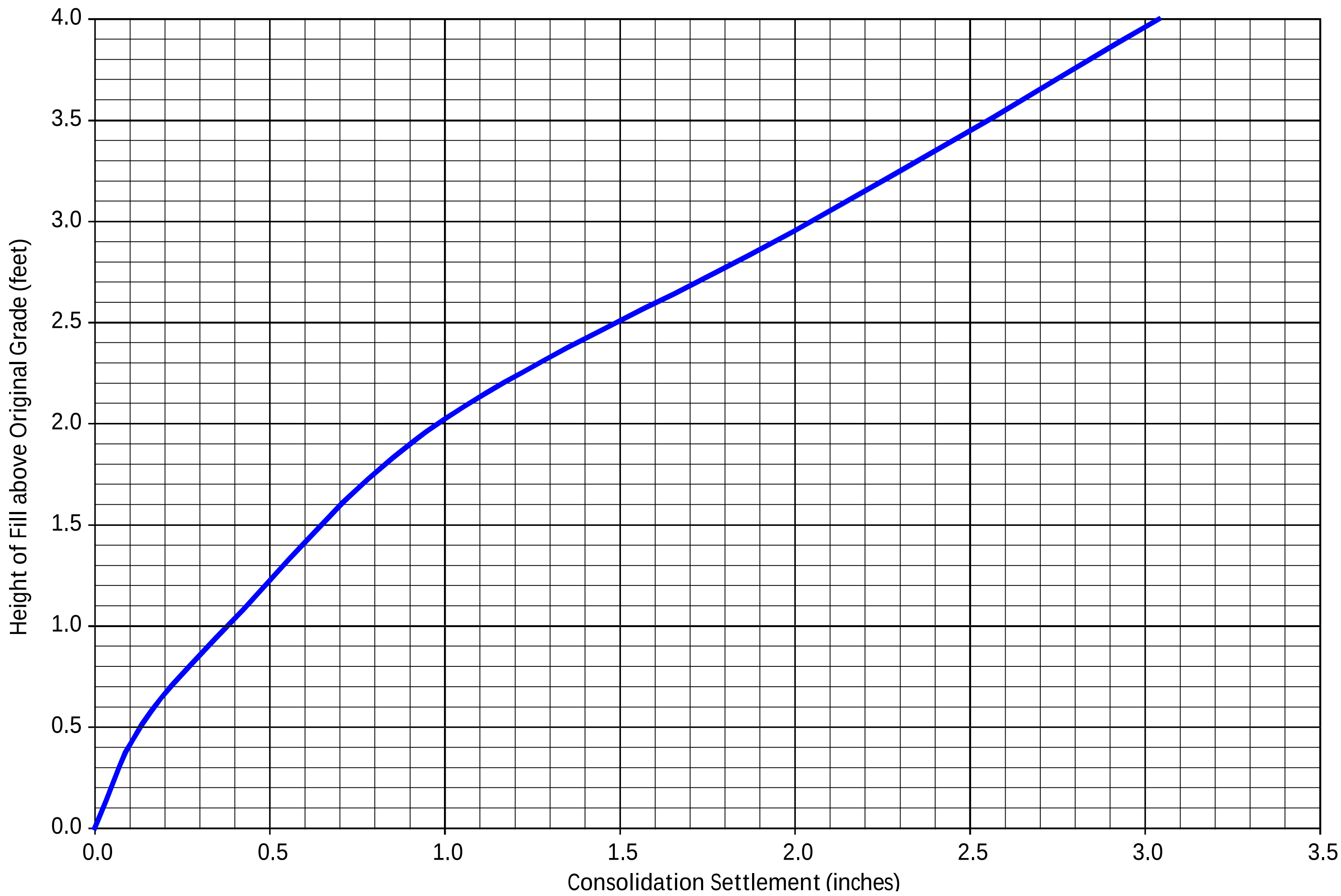
Estimated Consolidation Settlement in 30 years



NOTES:

1. WEIGHT OF FILL IS ASSUMED TO BE 125 PCF/FT.
2. APPROXIMATELY 80 PERCENT OF THE ESTIMATED SETTLEMENT IS EXPECTED TO OCCUR WITHIN THE FIRST YEAR AFTER PLACEMENT OF FILL.
3. LIQUEFACTION SETTLEMENT SHOULD BE CONSIDERED IN ADDITION TO LONG TERM CONSOLIDATION SETTLEMENT.

ENGEO Expect Excellence

CONSOLIDATION SETTLEMENT CHART

SAN MATEO COUNTY REPLACEMENT CORRECTIONAL FACILITY

REDWOOD CITY, CALIFORNIA

PROJECT NO.: 9515.000.000

SCALE: NO SCALE

DRAWN BY: SRP

CHECKED BY: MMG

FIGURE NO. 6

ORIGINAL FIGURE PRINTED IN COLOR

APPENDIX A

ENGEO

Key to Boring Logs
Boring Logs

APPENDIX A

KEY TO BORING LOGS

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

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

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

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE — CLEAR SQUARE SIEVE OPENINGS

	200		40	10	4	3/4 "	3"	12"
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

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

CONSISTENCY

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

MOISTURE CONDITION

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

SAMPLER SYMBOLS

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

LINE TYPES

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

GROUND-WATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

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

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

ENGEO INCORPORATED

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LOG OF BORING 1-B1

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/16/2012
HOLE DEPTH: Approx. 64½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			3 inches of AC over 8 inches of AB over subgrade.										
			FAT CLAY (CH), black, stiff, moist, Trace medium-grained sands. [FILL]										
	1		GRAVELLY SAND (SP), dark brown, moist, Coarse to medium-grained sands. Few subangular gravel.										
5	2		SANDY CLAY (CL), dark olive gray mottled with brown, medium stiff, moist, Few fine-grained gravels.			11					17.4	107.1	
10	3		FAY CLAY (CH), light gray mottled with dark gray, medium stiff, wet [BAY MUD] Lab Mini Vane Shear = 454 psf			4 0 psi							
	4		FAT CLAY (CH), light gray mottled with yellowish brown, stiff, wet, Few medium-grained sands. Pocket Torvane = 1434 psf [OLD BAY CLAY]			22							4.00*
15 20	5 6 7		CLAYEY SILT (ML), light gray mottled with yellowish brown, hard, wet, Few medium-grained sands. Pocket Torvane = 1843 psf [ALLUVIUM] Becomes yellowish brown mottled with light gray.			14	33	14	19	85	22.1	96.1	2.00*
25			SANDY SILT (ML), yellowish brown mottled with light brown, very stiff, wet, fine- to coarse-grained sand, trace coarse gravel, Pocket Torvane = 1331 psf.			16							2.25*

LOG OF BORING 1-B1

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/16/2012
HOLE DEPTH: Approx. 64½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	8		SANDY SILT (ML), yellowish brown mottled with light brown, very stiff, wet, fine- to coarse-grained sand, trace coarse gravel, Pocket Torvane = 1331 psf.										
30	9		SILTY CLAY (CH), yellowish brown mottled with light gray, stiff, wet, Pocket Torvane = 1127 psf.			9							0.75*
35	10		SANDY SILT (ML), light gray mottled with yellowish brown, stiff, wet, Fine-grained sand.			10				52			0.75*
						11							
40	11–12		SILTY CLAY (CH), light gray, very stiff, wet, Some fine-grained rounded gravels.			50							3.00*
45	13–14		CLAYEY SILT (ML), light gray, very stiff, wet, Pocket Torvane = 1024 psf.			19							1.75*
50	15		SANDY CLAY TO SILTY SAND (SM), light gray, medium dense, wet, Pocket Torvane = 1280 psf.			15							0.75*

LOG OF BORING 1-B1

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/16/2012
HOLE DEPTH: Approx. 64½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), light gray, medium dense, wet, Mostly fine-grained sands.			14							1.50*
	16		SILTY CLAY (CL), light gray, very stiff, wet			18							0.75*
55	17		SILT (ML), light gray, medium stiff to stiff, wet, Pocket torvane = 512 psf.										
			CLAYEY SILT (ML), light gray, stiff, wet			17					38.5	85.4	1.00*
60	18 19		SILTY CLAY (CH), light gray, stiff, wet, Pocket torvane = 1229 psf.										
			Pocket Torvane = 1536 psf			28					32.6	88.3	

Bottom of the borehole at 64.5 feet below ground surface.
Ground water not encountered during drilling due to the drilling method used.

ENGEO INCORPORATED

LOG OF BORING 1-B2

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED:	8/17/2012	LOGGED / REVIEWED BY:	L. Chan / JK
HOLE DEPTH:	Approx. 81½ ft.	DRILLING CONTRACTOR:	Pitcher Drilling
HOLE DIAMETER:	4.0 in.	DRILLING METHOD:	Mud Rotary
SURF ELEV ():	Approx. 10 ft.	HAMMER TYPE:	140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			8 inches of AC overlying subgrade. No AB present.										
			CLAYEY SILT (ML), dark gray, moist, Few fine-grained gravels. Few coarse-grained sands.										
	1		CLAYEY GRAVEL (GC), black, medium dense, moist, Fine-grained angular gravel. Few angular coarse-grained gravel. Fine-to-coarse gravels. Few coarse-grained sand. Few asphalt and concrete fragments			19							
5	2		[FILL] SILTY CLAY (CL), black, medium stiff, moist, Trace medium-grained sand. Trace coarse-grained sand. Brick fragments. Pocket Torvane = 870 psf.			16							0.75*
			FAT CLAY (CH), gray mottled with black, soft to medium stiff, wet, Pocket Torvane = 410 psf.			2					66.7	58.5	0.00*
10	3		[BAY MUD]			0 psi 0 psi 0 psi 150 psi 150 psi					35.7	84.5	
	4		Becomes medium stiff										0.75*
15	5		SILTY CLAY (CH), light gray mottled with black, stiff, wet, Pocket torvane = 1331 psf. [OLD BAY CLAY]			14					22.7	105.3	1.50*
20	6		[ALLUVIUM] SILTY SAND (SM), dark yellowish brown, medium dense, wet, fine- to coarse-grained sand			24				12			
25	7		POORLY GRADED GRAVEL WITH SILT AND SAND (GP), grayish brown, loose, wet										

LOG OF BORING 1-B2

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/17/2012
HOLE DEPTH: Approx. 81½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	DESCRIPTION	Blow Count/Foot	Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	8	POORLY GRADED GRAVEL WITH SILT AND SAND (GP), grayish brown, loose, wet	6				6			
30	9	SILTY CLAY (CH), light yellowish brown mottled with yellowish brown, stiff, wet, Pocket Torvane = 1290 psf.	7							0.75*
35	10–11	BECOME yellowish brown mottled with gray, medium stiff, Trace coarse-grained sands. Pocket Torvane = 614 psf.	11							0.50*
40	12–13	SILTY CLAY (CL), light gray, medium stiff, wet, Few coarse-grained sands. Pocket Torvane = 922 psf.	9	30	18	12	74	18.3		0.75*
45	14–15	POORLY GRADED SAND (SP), gray, medium dense, wet, Mostly medium-graded sand.	42 24							
50										

LOG OF BORING 1-B2

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/17/2012
HOLE DEPTH: Approx. 81½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	DESCRIPTION	Blow Count/Foot	Liquid Limit	Plastic Limit	Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
		SILTY SAND TO SANDY SILT (SM-ML), light gray, medium dense, wet, Fine-to-medium-grained sands. Pocket Torvane = 1075 psf.	16							0.75*
	16		15							
		CLAY (CH), light gray, stiff, wet, Pocket Torvane = 1229 psf.								
55	17	SILT (ML), light gray, stiff, wet, Pocket Torvane = 573 psf.	16							1.25*
	18									
60		SILTY CLAY (CL), light gray, stiff, wet, Pocket torvane = 1413 psf.	18							1.25*
	19									
65	20									
	21									
70		INCREASING SILT CONTENT Pocket Torvane = 1352 psf. SILTY CLAY (CL), gray, very stiff, wet	28					29.2	96.9	2.32
	22									
75										

ENGEO INCORPORATED	LOG OF BORING 1-B2

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED:	8/17/2012	LOGGED / REVIEWED BY:	L. Chan / JK
HOLE DEPTH:	Approx. 81½ ft.	DRILLING CONTRACTOR:	Pitcher Drilling
HOLE DIAMETER:	4.0 in.	DRILLING METHOD:	Mud Rotary
SURF ELEV ():	Approx. 10 ft.	HAMMER TYPE:	140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	23												
	24												
80			SILTY CLAY (CL), gray, very stiff, wet, Pocket Torvane = 1434 psf.			26					29.5	91.6	2.00*
			Bottom of the borehole at 81.5 feet below ground surface. No ground water was encountered during drilling due to the drilling method used.										

LOG OF BORING 1-B3

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED:	8/13/2012	LOGGED / REVIEWED BY:	L. Chan / JK
HOLE DEPTH:	Approx. 66½ ft.	DRILLING CONTRACTOR:	Pitcher Drilling
HOLE DIAMETER:	4.0 in.	DRILLING METHOD:	Mud Rotary
SURF ELEV ():	Approx. 10 ft.	HAMMER TYPE:	140 lb. Auto Trip

DESCRIPTION	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
4 inches of AC overlying 2 inches of AB over subgrade.								
POORLY GRADED GRAVEL WITH SILT AND SAND (GP), brown, moist, Fine-to-coarse gravel. medium-grained sand.								
FAT CLAY (CH), olive gray, moist, few coarse-grained sand. Trace fragment of glass.								
FAT CLAY (CH), black mottled with reddish brown, stiff, moist, Trace glass fragments. [FILL]	11							
CLAYEY GRAVEL (GC), olive gray, medium dense, wet, Coarse-grained subrounded gravel. Trace medium-grained sand.								
FAT CLAY (CH), olive gray, soft, wet, Pocket Torvane = 287 psf. Lab Mini Vane Shear = 430 psf [BAY MUD]	50 psi					51.2	70.7	
SILTY CLAY (CH), mottled with yellowish brown, very soft to soft, Pocket Torvane = 307 psf.	1							
SILTY CLAY (CH), mottled with yellowish brown, stiff, Pocket Torvane = 1331 psf. [OLD BAY CLAY]	12					25.3	99.7	2.00*
SILTY SAND (SM), yellowish brown, medium dense, fine- to coarse-grained sand, trace fine gravel [ALLUVIUM]	22					11.1		
SANDY SILT (ML), yellowish brown, soft, wet, Contains fine-grained sand.								

Depth in Feet: 5, 10, 15, 20, 25
Depth in Meters: 1, 2, 3, 4, 5, 6, 7

ENGEO INCORPORATED

LOG OF BORING 1-B3

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/13/2012
HOLE DEPTH: Approx. 66½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	8		SILTY GRAVEL (GM), yellowish brown, loose, wet, Fine-grained subangular gravel. Trace fine-grained sands.			11							0.5*
			SANDY SILT (ML), yellowish brown, medium stiff, wet, Contains fine-grained sands.										
30	9		Becomes medium stiff. Contains fine-grained sands. Trace coarse-grained sand. 1-inch thick sandy gravel layer. Medium-grained sand. Fine-grained gravel.			9					19.9		
35	10, 11		SANDY LEAN CLAY (CL), yellowish brown, medium stiff, wet, medium- to coarse-grained sand, Pocket Torvane = 512 psf.			10	37	13	24	65			0.75*
40	12, 13		SILTY CLAY (CL), yellowish brown mottled with gray, medium stiff, wet			7							
45	14		SILTY CLAY (CL), olive gray, medium stiff, wet, Contains trace gravels. Pocket Torvane = 1434 psf			19							0.5*
50	15												

ENGEO INCORPORATED

LOG OF BORING 1-B3

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/13/2012
HOLE DEPTH: Approx. 66½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY CLAY (CL), olive gray, medium stiff, wet, Contains trace gravels. Pocket Torvane = 1434 psf			11					37.2	85.5	1.0*
55	16, 17		SILT (ML), olive gray, stiff, wet, Pocket Torvane = 1577 psf			34							1.25*
60	18, 19		CLAYEY SILT (MH), light gray, stiff, wet, Pocket Torvane = 512 psf			18					29.7	97.8	1.75*
65	20		SILTY CLAY (CH), light gray, very stiff, wet, Pocket Torvane = 1106 psf			23							

Bottom of the borehole at 66.5 feet below ground surface.
Ground water table encountered at 5.5 feet below ground surface during drilling.

LOG OF BORING 1-B4

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED:	8/14/2012	LOGGED / REVIEWED BY:	L. Chan / JK
HOLE DEPTH:	Approx. 101½ ft.	DRILLING CONTRACTOR:	Pitcher Drilling
HOLE DIAMETER:	4.0 in.	DRILLING METHOD:	Mud Rotary
SURF ELEV ():	Approx. 10 ft.	HAMMER TYPE:	140 lb. Auto Trip

Depth in Feet	Depth in Meters	DESCRIPTION	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
		4 inches of AC overlying 8 inchs of AB over subgrade.								
		[FILL] CLAYEY SAND (GC), dark greenish gray, moist, Medium-to-coarse-grained sand. Few coarse-grained gravel.								
	1	FAT CLAY (CH), black, moist, Trace fine-grained sands.								
5	2	Become light gray mottled with black, stiff, trace rootles and organics. Pocket Torvane = 1024 psf	13							2.00*
		FAT CLAY (CH), black, medium stiff, moist, Pocket Torvane = 1024 psf	4							
10	3	[BAY MUD]	200 psi							
		SILTY CLAY (CH), light gray mottled with yellowish brown, medium stiff, wet	300 psi					20.9	105.5	
	4	[OLD BAY CLAY]								
15	5	SANDY CLAY (CL), yellowish brown mottled with gray, stiff, wet, fine-grained sands, trace silts. Pocket Torvane = 1024 psf.	14					23	105.1	1.25*
		SILTY SAND (SM), yellowish brown, medium dense, wet								
20	6	[ALLUVIUM]	16	31	12	19	34			
25	7									

LOG OF BORING 1-B4

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/14/2012
HOLE DEPTH: Approx. 101½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	8		SILTY CLAY (CL), yellowish brown mottled with gray, stiff, wet			7							
30	9		SILTY CLAY (CH), yellowish brown mottled with olive gray, stiff, wet, Trace medium-grained sands.			11					33.7	91.1	1.25*
35	10, 11					14							1.01
40	12		Become olive gray, few fine-grained gravel. Pocket Torvane = 1484 psf			16							
	13		SILTY SAND (SM), olive gray, medium dense, wet, Mostly fine-grained sands.			16							
			SILTY CLAY (CL), olive gray, stiff, wet										
45	14					11							1.25*
50	15												

ENGEO INCORPORATED

LOG OF BORING 1-B4

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/14/2012
HOLE DEPTH: Approx. 101½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	16		SILTY CLAY (CL), olive gray, stiff, wet Interbedded sand and silt layers. Pocket Torvane = 1434 psf			33							1.25*
55	17		SILTY CLAY (CL), olive gray mottled with reddish brown, medium stiff, wet, Pocket Torvane = 1127 psf			10	37	22	15	96			0.50*
60	18, 19		CLAYEY SILT (ML), light gray mottled with yellowish brown, very stiff, wet, Pocket Torvane = 1639 psf			31							1.50*
65, 70	20, 21, 22		CLAYEY SILT (ML), light gray, very stiff, wet, Trace coarse-grained sands. Pocket Torvane = 1536 psf.			27					25.6	104.4	1.50*
75													

LOG OF BORING 1-B4

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/14/2012
HOLE DEPTH: Approx. 101½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	23												
	24												
80			SILTY CLAY (CL), light gray mottled with dark gray, very stiff, wet, Pocket Torvane = 2048 psf			30							2.25*
	25												
85	26												
	27												
90			CLAYEY SILT (ML), light gray mottled with reddish brown, very stiff, wet			20					44.7	75.9	1.75*
	28		SILTY CLAY (CH), light gray, very stiff, wet, Pocket Torvane = 2304 psf										
95	29												
	30												
100													

LOG OF BORING 1-B4

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/14/2012
HOLE DEPTH: Approx. 101½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY CLAY (CH), light gray, very stiff, wet			19					42.7	74.4	3.25*
			Bottom of the borehole at 101.5 feet below ground surface. Ground water table not encountered due to the drilling method used.										

ENGEO INCORPORATED

LOG OF BORING 1-B5

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/14/2012
HOLE DEPTH: Approx. 66½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			4 inches of AC over 8 inches of AB over subgrade.										
			CLAYEY GRAVEL (GC), dark olive, moist, Coarse-grained gravel. Fine-to-medium-grained sands.										
	1		FAT CLAY WITH GRAVEL (CH), dark olive gray, moist, Fine-grained angular gravel. Trace medium-grained sands. [FILL]										
5			WELL GRADED SAND (SW), olive mottled with gray, medium dense, wet, Fine-to-coarse-grained sands. Little fine-grained subrounded gravel.			5							1.00*
	2		FAT CLAY (CH), olive gray, stiff, wet, Pocket Torvane = 1127 psf										
			[BAY MUD]										
			Become very soft.			0 psi							
10	3												
			FAT CLAY (CH), olive gray, soft, wet		▽	100 psi 150 psi							
	4												
15			SILTY CLAY (CH), yellowish brown, medium stiff, wet, trace fine-grained sand, Pocket Torvane = 665 psf			11							
	5		TXUU = 677.4 psf										
			[OLD BAY CLAY]										
20	6												
			CLAYEY SILT (ML), yellowish brown mottled with light gray, medium stiff, wet, Few subrounded fine-grained gravel. Pocket Torvane = 901 psf			10					16.9		1.00*
	7		[ALLUVIUM]										
25													

ENGEO INCORPORATED

LOG OF BORING 1-B5

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/14/2012
HOLE DEPTH: Approx. 66½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	8		SANDY CLAY (CL), yellowish brown mottled with light gray, medium stiff to stiff, wet, Fine-grained sands.			9	31	13	18	55			
30	9												
	10		SILTY CLAY (CL), yellowish brown, medium stiff, wet, Trace fine-grained subangular gravel.			4					24	102.9	
35	11		Pocket Torvane = 881 psf.			10							0.50*
	12												
40			CLAYEY SILT (ML), olive gray, medium stiff, wet										
			FAT CLAY (CH), olive gray, medium stiff, wet, Pocket Torvane = 666 psf.			13							0.25*
	13												
45	14					9					24.2		
	15												
50													

ENGEO INCORPORATED

LOG OF BORING 1-B5

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/14/2012
HOLE DEPTH: Approx. 66½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), dark yellowish brown mottled with olive gray, medium dense, wet, fine-grained sand			30							2.50*
	16		SILTY CLAY (CL), dark yellowish brown mottled with olive gray, stiff, wet, Pocket Torvane = 1331 psf.										
55	17		SILTY SAND (SM), olive gray, medium dense, fine-grained sand			14							1.00*
	18		CLAYEY SILT (ML), light gray, medium stiff to stiff, wet										
60	19		SILTY CLAY (CL), olive gray, very stiff, wet, Pocket torvane = 1331 psf			23							2.50*
65	20		Pocket Torvane = 1639 psf.			31					25.7	101.3	3.00*
			Bottom of the borehole at 66.5 feet below ground surface. Ground water table encountered at 12 feet below ground surface during drilling.										

LOG OF BORING 1-B6

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/16/2012
HOLE DEPTH: Approx. 36½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	DESCRIPTION	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
		2.5 inches of AC over 21.5 inches of AB over subgrade.								
	1	SILTY CLAY (CL), brown, stiff, moist, Trace coarse-grained sands. [FILL]								
5		SANDY SILT (ML), yellowish brown, stiff, moist, fine- to medium-grained sand								
	2	SANDY SILT (ML), black, medium stiff, wet, Contains brick fragments	7					23.8		
10	3	FAT CLAY (CH), light gray mottled with black, soft, wet, Few organics. Pocket Torvane = 246 psf.	2					70.1	58.9	
		[BAY MUD]	50 psi	103	29	74				
	4	Lab Mini Vane Shear = 551 psf								
15	5	FAT CLAY (CH), olive gray, very stiff, wet, Trace coarse-grained sands. Pocket Torvane = 2048 psf TXUU = 2048.5 psf	18	63	13	50				2.00*
		[OLD BAY CLAY]								
20	6	POORLY GRADED GRAVEL (GP), gray, medium dense, wet, Fine-to-coarse-grained gravel. Trace silts.	14							
		[ALLUVIUM]	23							
	7	SANDY GRAVEL (GP), yellowish brown, wet, Fine-grained sands. Coarse-grained gravel with silt.								
25										

LOG OF BORING 1-B6

ENGEO INCORPORATED

Geotechnical Exploration
San Mateo County Jail
Redwood City, CA
9515.000.000

DATE DRILLED: 8/16/2012
HOLE DEPTH: Approx. 36½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (): Approx. 10 ft.

LOGGED / REVIEWED BY: L. Chan / JK
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	8	■	POORLY GRADED GRAVEL WITH SILT (GP), dark gray, wet, Fine-to-coarse-grained gravel, trace silts.			8							0.5*
			CLAYEY SILT (CL), brown, medium stiff, wet, Few coarse-grained sands.										
30	9	■											0.43
			SILTY CLAY (CL), brown, medium stiff, wet, Pocket Torvane = 922 psf.			6							0.5*
	10												
35		■	SANDY SILT (ML), brown mottled with gray, medium stiff, wet, Pocket Torvane = 614 psf.										
	11		CLAYEY SILT (MH), brown mottled with gray, medium stiff, wet, Few fine-grained sands. Pocket Torvane = 1229 psf.			8					26.6	100.9	0.50*

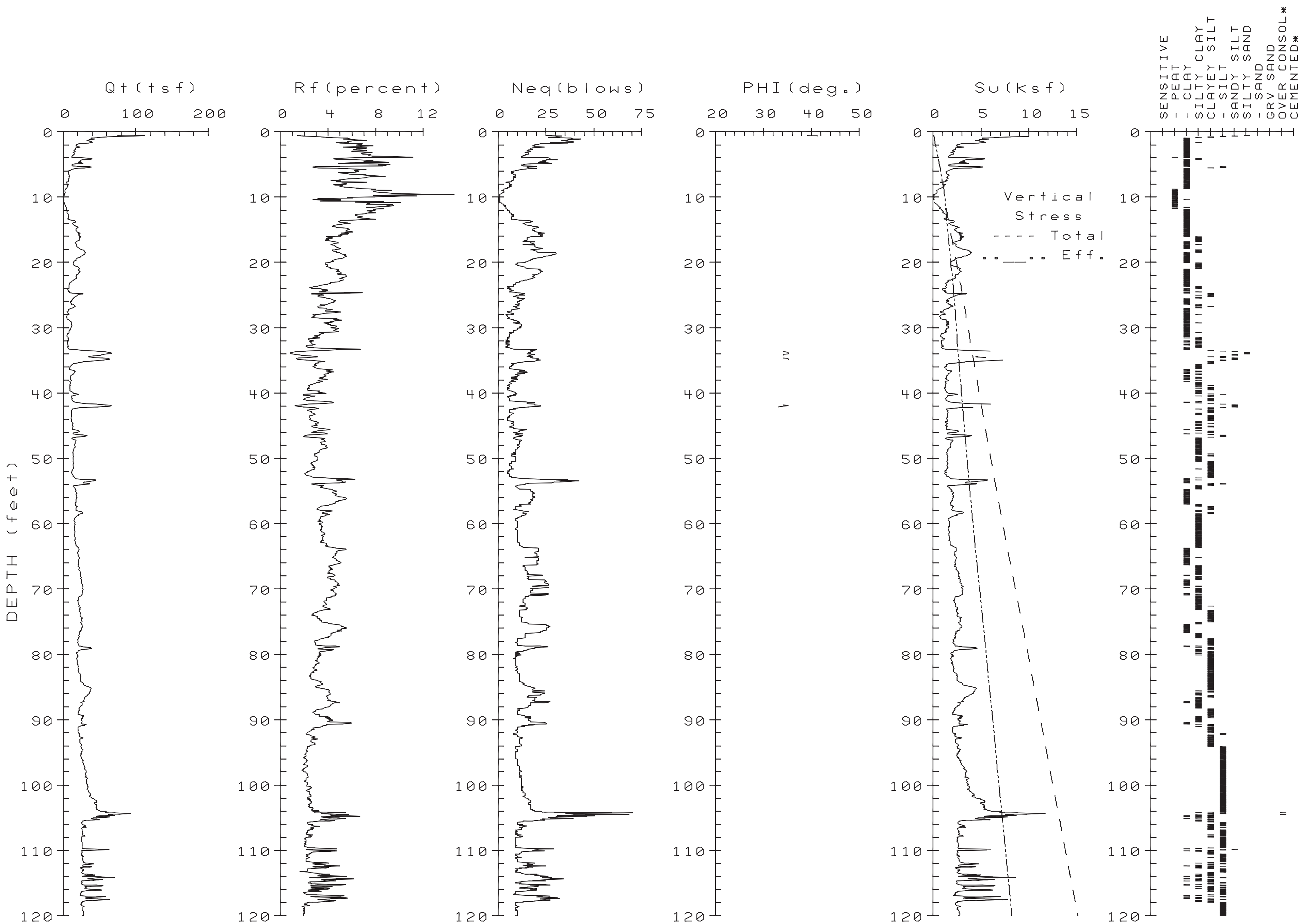
Bottom of the borehole at 36.5 feet below ground surface. No ground water was encountered during drilling.

APPENDIX B

JOHN SARMIENTO & ASSOCIATES

Cone Penetration Test Logs

APPENDIX B



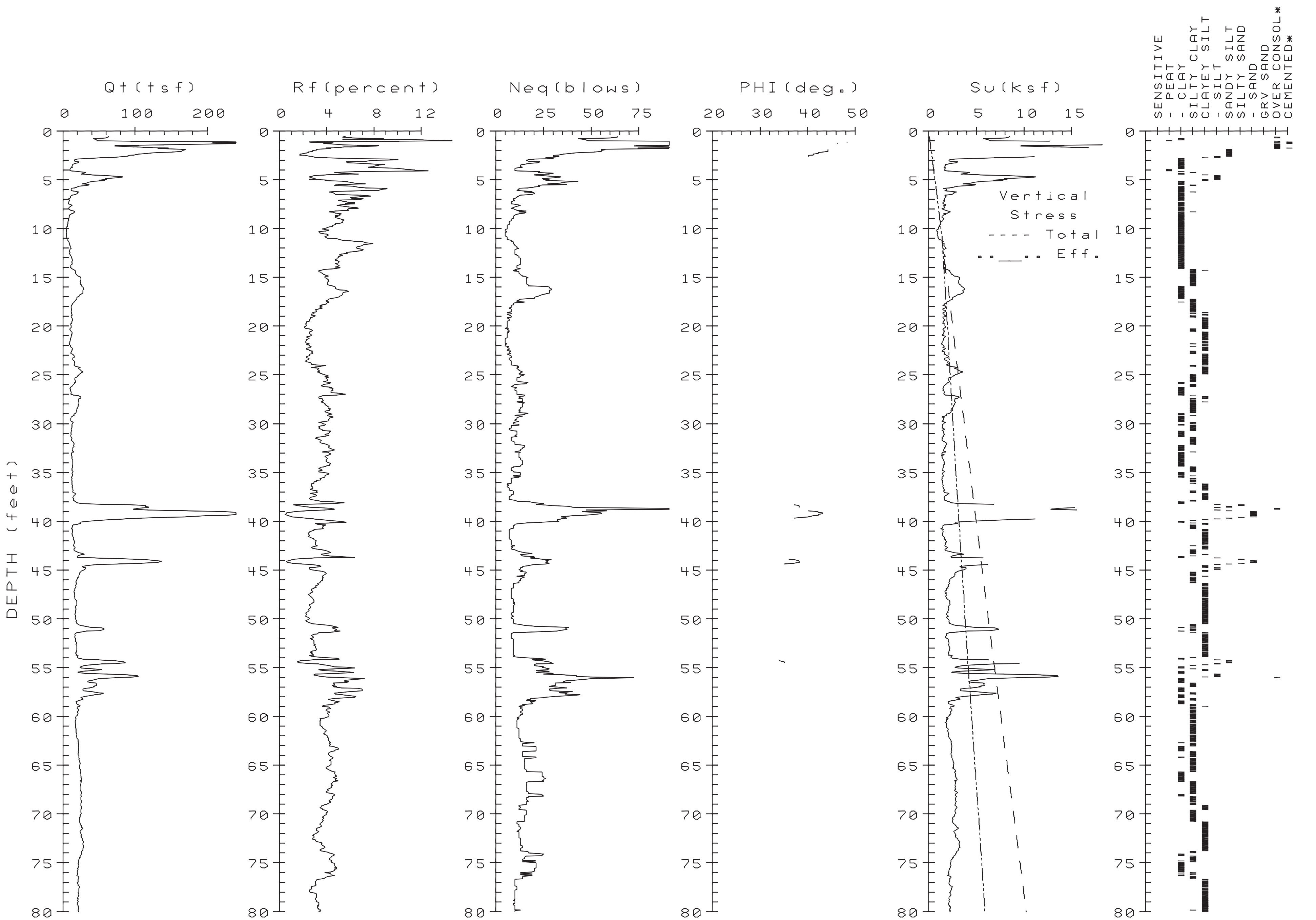
Terminated at 120.0 feet

Groundwater measured at 10.7 feet

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)

CPT NO.: 1-CPT1
DATE : 06-12-2012

ENGEO, INC.
cpts by John Sarmiento & Associates



Terminated at 80.0 feet

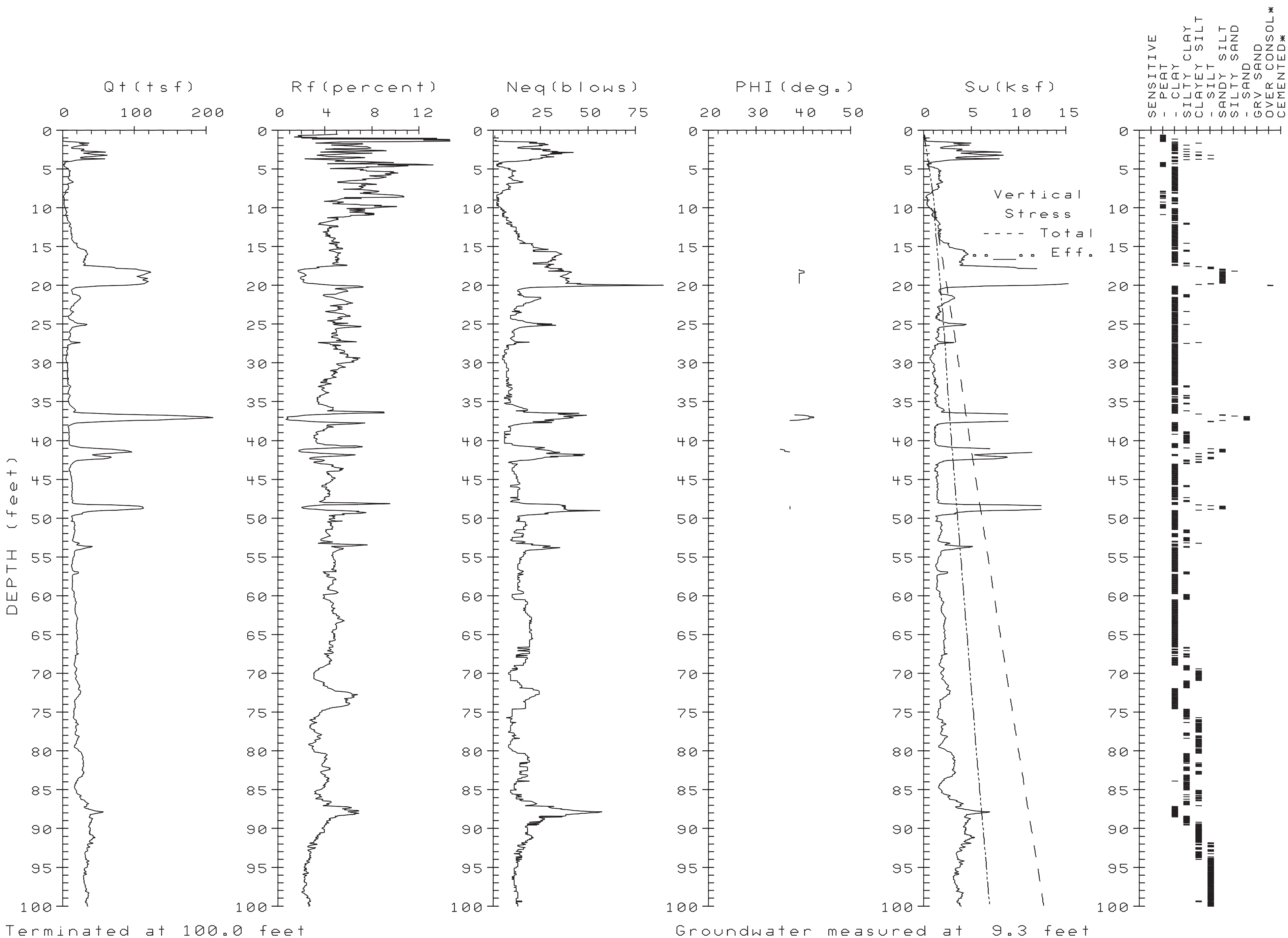
Groundwater measured at 11.3 feet

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)

CPT NO.: 1-CPT2
DATE : 06-11-2012

ENGEO, INC.

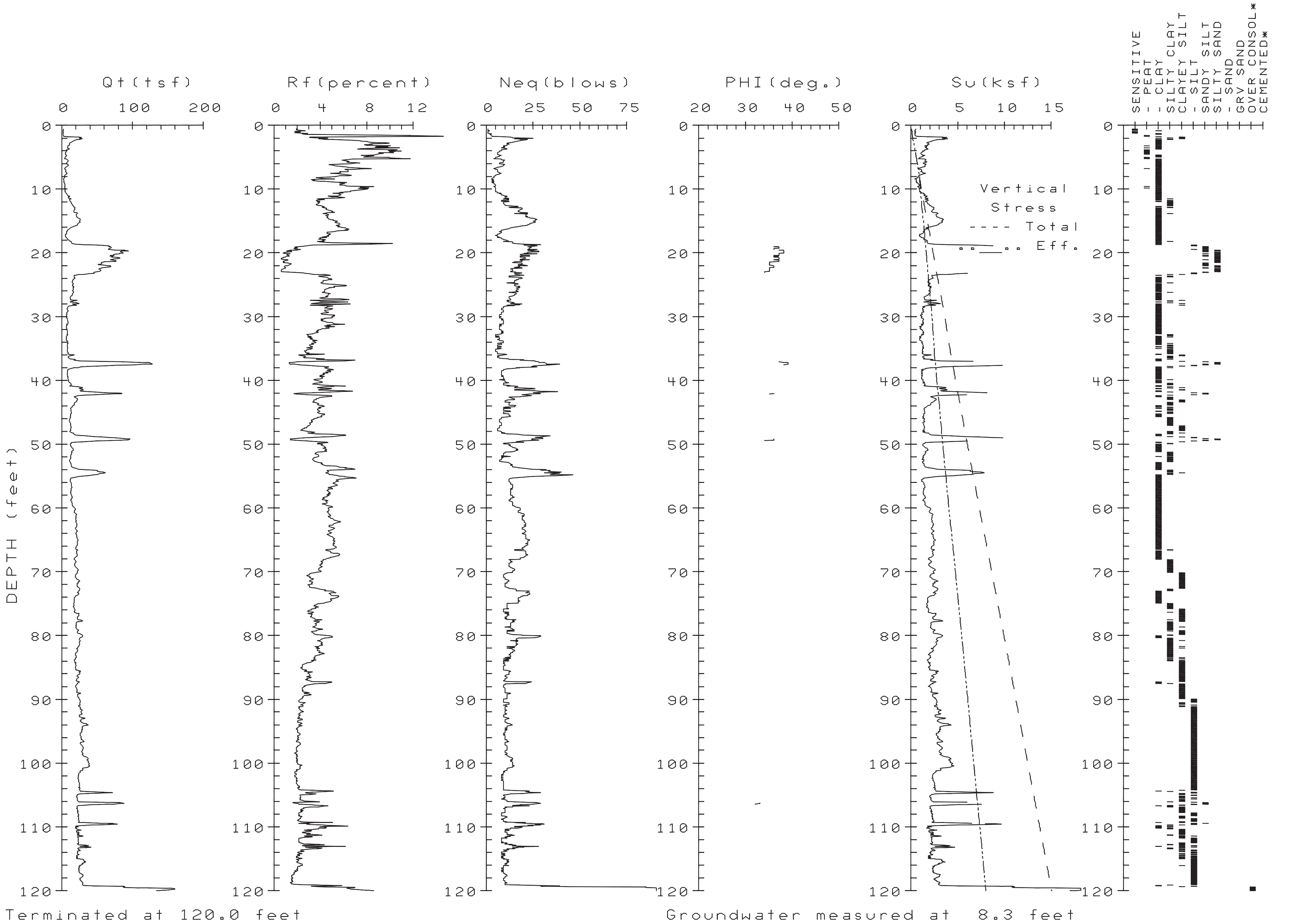
cpts by John Sarmiento & Associates



PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)

CPT NO.: 1-CPT3
DATE : 06-11-2012

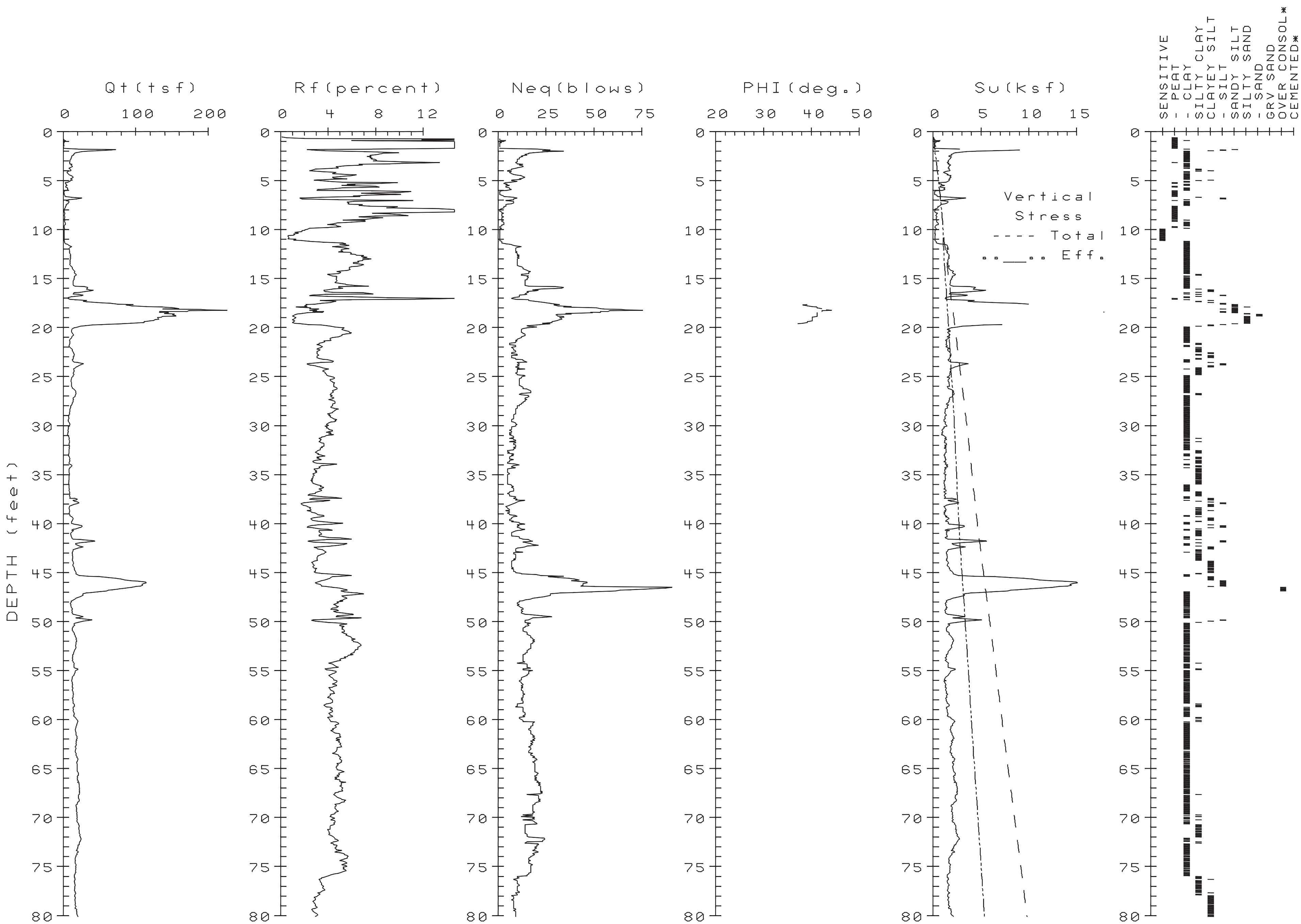
ENGEO, INC.
cpts by John Sarmiento & Associates



PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)

CPT NO.: 1-CPT4
DATE : 06-11-2012

ENGEO, INC.
cpts by John Sarmiento & Associates



Terminated at 80.0 feet

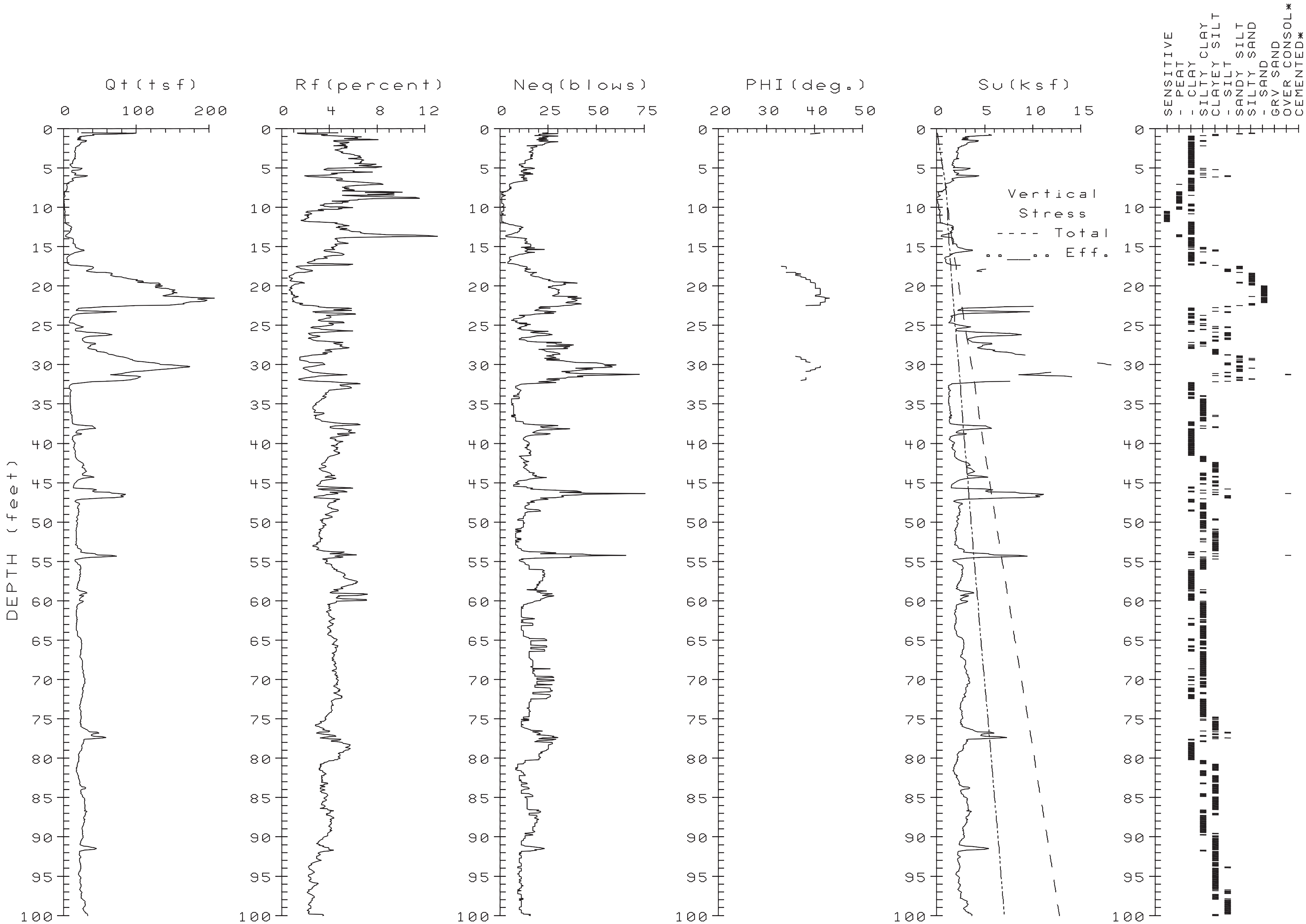
Groundwater measured at 9.3 feet

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)

CPT NO.: 1-CPT5
DATE : 06-12-2012

ENGEO, INC.

cpts by John Sarmiento & Associates



Terminated at 100.0 feet

Groundwater measured at 8.9 feet

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)

CPT NO.: 1-CPT6
DATE : 06-13-2012

ENGEO, INC.
cpts by John Sarmiento & Associates

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 120.0 feet

CPT NO.: 1-CPT1
DATE: 06-12-2012
TIME: 11:20:00
Groundwater measured at 10.7 feet

ENGEO, INC.

cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.52	75.6	120.96	1.27	1.7	25	40	0.06	39	----	Silty SAND to Sandy SILT	130-140
1.03	38.5	61.60	2.16	5.6	38	61	0.13	----	5.12	CLAY	"
1.52	39.7	63.52	2.19	5.5	39	63	0.20	----	5.28	"	"
2.01	18.8	30.08	1.22	6.5	19	30	0.26	----	2.49	"	"
2.51	17.8	28.48	1.28	7.2	18	28	0.33	----	2.35	"	"
3.01	17.0	27.20	1.00	5.9	17	27	0.40	----	2.24	"	"
3.50	14.6	23.36	1.10	7.5	15	23	0.46	----	1.92	"	120-130
4.02	25.6	40.96	1.58	6.2	26	41	0.53	----	3.38	"	130-140
4.51	23.5	37.60	1.70	7.2	23	37	0.59	----	3.09	"	"
5.01	13.4	21.44	1.21	9.0	13	21	0.66	----	1.74	"	"
5.55	31.0	49.60	0.97	3.1	16	25	0.73	----	4.08	Clayey SILT to Silty CLAY	"
6.00	8.5	13.60	0.54	6.4	9	14	0.79	----	1.62	CLAY	110-120
6.54	8.1	12.57	0.53	6.5	8	13	0.85	----	1.54	"	"
7.07	8.2	12.23	0.58	7.1	8	12	0.91	----	1.55	"	"
7.53	6.8	9.78	0.34	5.0	7	10	0.96	----	1.26	"	"
8.01	5.9	8.22	0.32	5.4	6	8	1.01	----	1.08	"	100-110
8.57	5.4	7.36	0.31	5.7	5	7	1.07	----	0.97	"	"
9.00	2.5	3.35	0.23	9.2	2	3	1.11	----	0.39	Organic Material	90-100
9.58	1.5	1.97	0.19	12.7	1	2	1.17	----	0.18	"	"
10.04	1.0	1.29	0.06	6.0	1	1	1.21	----	0.08	"	85-90
10.55	0.8	1.02	0.04	5.0	1	1	1.25	----	0.03	"	"
11.04	2.3	2.90	0.17	7.4	2	3	1.27	----	0.33	"	90-100
11.54	4.1	5.13	0.32	7.8	4	5	1.29	----	0.68	"	100-110
12.00	5.3	6.58	0.42	7.9	5	6	1.31	----	0.92	CLAY	"
12.54	6.7	8.23	0.48	7.2	7	8	1.34	----	1.19	"	110-120
13.05	7.4	8.99	0.50	6.8	7	9	1.36	----	1.33	"	"
13.55	11.2	13.44	0.67	6.0	11	13	1.40	----	1.73	"	120-130
14.05	13.2	15.64	0.77	5.8	13	16	1.43	----	1.65	"	"
14.55	19.8	23.12	0.88	4.4	20	23	1.46	----	2.53	"	130-140
15.03	17.9	20.61	0.99	5.5	18	20	1.50	----	2.27	"	"
15.52	24.0	27.31	1.19	5.0	24	27	1.53	----	3.08	"	"
16.05	22.9	25.74	1.02	4.5	23	26	1.57	----	2.93	"	"
16.55	23.1	25.67	0.88	3.8	15	17	1.61	----	2.95	Silty CLAY to CLAY	"
17.05	16.8	18.48	0.80	4.8	17	18	1.64	----	2.10	CLAY	120-130
17.54	19.0	20.69	0.86	4.5	19	20	1.67	----	2.39	"	"
18.07	26.5	28.48	1.18	4.5	17	19	1.71	----	3.39	Silty CLAY to CLAY	130-140
18.57	30.3	32.18	1.48	4.9	30	32	1.74	----	3.89	CLAY	"
19.06	25.4	26.74	1.40	5.5	25	26	1.78	----	3.23	"	"
19.56	18.0	18.81	0.83	4.6	18	19	1.81	----	2.24	"	120-130
20.05	14.5	15.05	0.58	4.0	14	15	1.84	----	1.77	"	"
20.55	16.8	17.31	0.65	3.9	11	11	1.87	----	2.07	Silty CLAY to CLAY	"
21.03	22.3	22.79	1.02	4.6	22	22	1.91	----	2.80	CLAY	130-140
21.54	22.2	22.49	1.12	5.0	22	22	1.95	----	2.78	"	"
22.03	19.0	19.09	1.02	5.4	19	19	1.98	----	2.35	"	"
22.53	17.4	17.40	0.90	5.2	17	17	2.01	----	2.14	"	120-130
23.02	10.9	10.89	0.49	4.5	11	11	2.04	----	1.58	"	"
23.52	8.6	8.59	0.28	3.3	8	8	2.06	----	1.43	"	100-110
24.03	6.5	6.49	0.22	3.4	6	6	2.09	----	1.01	"	"
24.51	9.7	9.68	0.31	3.2	6	6	2.11	----	1.37	Silty CLAY to CLAY	110-120
25.07	19.6	19.54	0.65	3.3	10	10	2.15	----	2.41	Clayey SILT to Silty CLAY	120-130
25.57	14.0	13.95	0.57	4.1	14	14	2.18	----	1.66	CLAY	"
26.00	11.4	11.35	0.50	4.4	11	11	2.20	----	1.64	"	"
26.53	15.4	15.33	0.51	3.3	10	10	2.24	----	1.84	Silty CLAY to CLAY	"
27.03	11.4	11.34	0.43	3.8	11	11	2.26	----	1.63	CLAY	110-120

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 120.0 feet

CPT NO.: 1-CPT1
DATE: 06-12-2012
TIME: 11:20:00
Groundwater measured at 10.7 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
27.54	5.6	5.57	0.26	4.6	5	5	2.29	----	0.79	CLAY	100-110
28.00	7.2	7.16	0.21	2.9	7	7	2.31	----	1.10	"	"
28.51	6.0	5.96	0.19	3.2	6	6	2.33	----	0.86	"	"
29.02	10.3	10.23	0.45	4.4	10	10	2.35	----	1.42	"	110-120
29.53	11.9	11.81	0.50	4.2	12	12	2.39	----	1.69	"	120-130
30.04	11.8	11.70	0.49	4.2	12	11	2.42	----	1.66	"	"
30.58	8.6	8.52	0.41	4.8	8	8	2.45	----	1.35	"	110-120
31.07	5.9	5.85	0.19	3.2	6	6	2.46	----	0.81	"	90-100
31.58	6.6	6.54	0.22	3.3	6	6	2.48	----	0.94	"	100-110
32.08	6.1	6.04	0.16	2.6	6	6	2.50	----	0.84	"	90-100
32.51	6.7	6.59	0.18	2.7	4	4	2.52	----	0.95	Silty CLAY to CLAY	100-110
33.02	6.4	6.26	0.15	2.3	4	4	2.54	----	0.89	"	90-100
33.52	33.8	32.66	1.01	3.0	17	16	2.57	----	4.24	Clayey SILT to Silty CLAY	130-140
34.01	60.7	58.04	0.61	1.0	15	14	2.60	35	----	SAND to Silty SAND	120-130
34.57	43.0	40.54	0.94	2.2	17	16	2.64	----	5.46	Sandy SILT to Clayey SILT	130-140
35.06	49.5	46.09	1.33	2.7	20	18	2.68	----	6.32	"	"
35.55	14.5	13.35	0.42	2.9	7	7	2.71	----	1.65	Clayey SILT to Silty CLAY	120-130
36.04	9.5	8.68	0.27	2.8	6	6	2.73	----	1.22	Silty CLAY to CLAY	100-110
36.54	13.7	12.38	0.56	4.1	14	12	2.76	----	1.53	CLAY	120-130
37.03	14.0	12.51	0.56	4.0	14	12	2.79	----	1.57	"	"
37.56	10.7	9.46	0.37	3.5	7	6	2.82	----	1.41	Silty CLAY to CLAY	110-120
38.07	11.5	10.07	0.38	3.3	7	6	2.85	----	1.54	"	"
38.57	10.3	8.93	0.29	2.8	7	6	2.87	----	1.33	"	"
39.08	9.7	8.34	0.23	2.4	6	5	2.89	----	1.23	"	100-110
39.58	9.9	8.44	0.23	2.3	6	5	2.92	----	1.26	"	"
40.08	14.9	12.55	0.56	3.8	9	8	2.95	----	1.67	"	120-130
40.50	11.1	9.27	0.32	2.9	7	6	2.97	----	1.45	"	110-120
41.05	12.5	10.34	0.25	2.0	6	5	2.99	----	1.34	Clayey SILT to Silty CLAY	100-110
41.55	23.2	19.06	0.99	4.3	15	12	3.03	----	2.76	Silty CLAY to CLAY	130-140
42.05	64.9	53.09	0.89	1.4	22	18	3.06	34	----	Silty SAND to Sandy SILT	120-130
42.56	12.7	10.35	0.30	2.4	6	5	3.09	----	1.35	Clayey SILT to Silty CLAY	110-120
43.00	11.9	9.67	0.31	2.6	6	5	3.11	----	1.56	"	"
43.52	11.5	9.30	0.28	2.4	6	5	3.14	----	1.48	"	"
44.06	11.3	9.11	0.27	2.4	5	4	3.17	----	1.45	"	"
44.58	13.0	10.44	0.42	3.2	8	7	3.19	----	1.38	Silty CLAY to CLAY	"
45.03	13.1	10.48	0.37	2.8	8	7	3.22	----	1.39	"	"
45.55	13.4	10.67	0.55	4.1	13	10	3.25	----	1.42	CLAY	120-130
46.08	17.3	13.71	0.53	3.1	8	7	3.28	----	1.94	Clayey SILT to Silty CLAY	"
46.52	33.2	26.20	0.67	2.0	13	10	3.31	----	4.06	Sandy SILT to Clayey SILT	"
47.04	13.7	10.76	0.47	3.4	9	7	3.34	----	1.45	Silty CLAY to CLAY	"
47.50	17.4	13.61	0.59	3.4	11	9	3.37	----	1.94	"	"
48.02	16.2	12.61	0.61	3.8	10	8	3.40	----	1.78	"	"
48.55	15.1	11.70	0.53	3.5	10	7	3.44	----	1.63	"	"
49.06	13.6	10.49	0.43	3.2	9	7	3.47	----	1.42	"	"
49.59	14.4	11.05	0.41	2.8	7	5	3.50	----	1.52	Clayey SILT to Silty CLAY	"
50.02	14.2	10.85	0.44	3.1	9	7	3.53	----	1.49	Silty CLAY to CLAY	"
50.52	14.1	10.73	0.40	2.8	7	5	3.56	----	1.48	Clayey SILT to Silty CLAY	110-120
51.01	14.1	10.69	0.37	2.6	6	5	3.58	----	1.47	"	"
51.54	14.6	11.02	0.41	2.8	7	5	3.61	----	1.54	"	"
52.06	12.4	9.32	0.27	2.2	6	4	3.64	----	1.24	"	"
52.58	13.8	10.33	0.29	2.1	6	5	3.66	----	1.42	"	"
53.02	16.7	12.45	0.63	3.8	10	8	3.69	----	1.80	Silty CLAY to CLAY	120-130
53.53	38.1	28.24	1.97	5.2	38	28	3.73	----	4.65	CLAY	130-140
54.01	28.1	20.71	0.78	2.8	14	10	3.76	----	3.31	Clayey SILT to Silty CLAY	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 120.0 feet

CPT NO.: 1-CPT1
DATE: 06-12-2012
TIME: 11:20:00
Groundwater measured at 10.7 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
54.52	16.1	11.81	0.57	3.5	10	8	3.80	----	1.71	Silty CLAY to CLAY	120-130
55.04	17.4	12.70	0.81	4.7	17	12	3.83	----	1.88	CLAY	"
55.55	18.3	13.29	0.85	4.6	18	13	3.86	----	2.00	"	"
56.06	18.8	13.57	1.02	5.4	18	13	3.90	----	2.06	"	130-140
56.57	17.8	12.78	0.86	4.8	17	12	3.93	----	1.92	"	120-130
57.06	17.4	12.43	0.72	4.1	11	8	3.96	----	1.86	Silty CLAY to CLAY	"
57.57	18.3	13.01	0.59	3.2	9	6	3.99	----	1.98	Clayey SILT to Silty CLAY	"
58.09	20.7	14.65	0.88	4.3	13	9	4.02	----	2.29	Silty CLAY to CLAY	"
58.51	23.6	16.65	0.91	3.9	15	11	4.05	----	2.68	"	130-140
59.02	17.8	12.51	0.58	3.3	11	8	4.09	----	1.90	"	120-130
59.53	15.1	10.57	0.50	3.3	9	6	4.12	----	1.53	"	"
60.04	16.8	11.71	0.54	3.2	10	7	4.15	----	1.76	"	"
60.53	15.7	10.91	0.55	3.5	10	7	4.18	----	1.61	"	"
61.04	16.0	11.07	0.53	3.3	10	7	4.21	----	1.64	"	"
61.55	16.2	11.16	0.59	3.6	10	7	4.25	----	1.66	"	"
62.06	16.5	11.33	0.58	3.5	10	7	4.28	----	1.70	"	"
62.57	16.1	11.01	0.58	3.6	10	7	4.31	----	1.64	"	"
63.08	17.3	11.78	0.66	3.8	11	7	4.34	----	1.80	"	"
63.55	20.1	13.64	0.80	4.0	13	9	4.37	----	2.17	"	"
64.06	21.9	14.79	1.12	5.1	21	14	4.41	----	2.40	CLAY	130-140
64.57	20.7	13.91	0.94	4.5	20	13	4.44	----	2.24	"	"
65.08	22.0	14.72	0.96	4.4	21	14	4.48	----	2.41	"	"
65.50	21.7	14.46	0.99	4.6	21	14	4.51	----	2.36	"	"
66.07	21.3	14.12	1.04	4.9	20	14	4.55	----	2.31	"	"
66.56	20.6	13.60	0.84	4.1	13	9	4.58	----	2.21	Silty CLAY to CLAY	120-130
67.06	22.6	14.85	0.93	4.1	14	9	4.62	----	2.47	"	130-140
67.55	24.4	15.96	0.96	3.9	15	10	4.66	----	2.71	"	"
68.04	24.0	15.63	1.06	4.4	15	10	4.69	----	2.65	"	"
68.54	25.7	16.66	1.09	4.2	16	11	4.73	----	2.87	"	"
69.05	25.1	16.19	1.19	4.7	24	16	4.76	----	2.79	CLAY	"
69.56	27.4	17.59	1.25	4.6	18	11	4.80	----	3.09	Silty CLAY to CLAY	"
70.00	27.3	17.45	1.19	4.4	18	11	4.83	----	3.07	"	"
70.52	26.8	17.04	1.21	4.5	17	11	4.87	----	3.00	"	"
71.04	25.5	16.13	1.14	4.5	16	10	4.91	----	2.82	"	"
71.55	21.0	13.23	0.80	3.8	13	8	4.94	----	2.22	"	120-130
72.07	21.2	13.30	0.78	3.7	13	8	4.97	----	2.24	"	"
72.58	22.1	13.80	0.77	3.5	11	7	5.01	----	2.35	Clayey SILT to Silty CLAY	"
73.01	23.4	14.57	0.97	4.1	15	9	5.04	----	2.52	Silty CLAY to CLAY	130-140
73.57	23.3	14.45	0.69	3.0	11	7	5.07	----	2.51	Clayey SILT to Silty CLAY	120-130
74.06	23.2	14.35	0.62	2.7	11	7	5.10	----	2.49	"	"
74.55	25.5	15.71	0.84	3.3	12	7	5.14	----	2.79	"	130-140
75.04	25.6	15.71	0.88	3.4	12	7	5.17	----	2.80	"	"
75.53	26.2	16.02	1.31	5.0	25	15	5.21	----	2.88	CLAY	"
76.01	25.5	15.53	1.40	5.5	25	15	5.24	----	2.78	"	"
76.52	23.5	14.26	1.11	4.7	23	14	5.28	----	2.51	"	"
77.02	21.8	13.18	0.91	4.2	14	8	5.32	----	2.28	Silty CLAY to CLAY	"
77.58	21.6	13.01	0.74	3.4	10	6	5.35	----	2.24	Clayey SILT to Silty CLAY	120-130
78.05	20.5	12.30	0.57	2.8	10	6	5.38	----	2.09	"	"
78.53	22.1	13.22	0.63	2.9	10	6	5.41	----	2.30	"	"
79.01	38.4	22.89	1.43	3.7	19	11	5.45	----	4.47	"	130-140
79.58	20.8	12.35	0.73	3.5	13	8	5.48	----	2.12	Silty CLAY to CLAY	120-130
80.04	20.3	12.01	0.64	3.2	9	5	5.51	----	2.05	Clayey SILT to Silty CLAY	"
80.53	19.4	11.44	0.60	3.1	9	5	5.54	----	1.93	"	"
81.06	19.6	11.52	0.59	3.0	9	5	5.58	----	1.95	"	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 120.0 feet

CPT NO.: 1-CPT1
DATE: 06-12-2012
TIME: 11:20:00
Groundwater measured at 10.7 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
81.53	20.7	12.12	0.61	2.9	9	6	5.60	----	2.09	Clayey SILT to Silty CLAY	120-130
82.07	21.4	12.49	0.58	2.7	10	6	5.64	----	2.18	"	"
82.54	20.9	12.16	0.59	2.8	10	6	5.67	----	2.11	"	"
83.04	24.0	13.91	0.60	2.5	11	6	5.70	----	2.52	"	"
83.58	23.8	13.74	0.59	2.5	11	6	5.73	----	2.49	"	"
84.04	24.8	14.27	0.76	3.1	11	7	5.76	----	2.62	"	"
84.55	28.5	16.33	1.00	3.5	14	8	5.80	----	3.11	"	130-140
85.02	35.8	20.44	1.05	2.9	17	10	5.83	----	4.07	"	"
85.57	37.3	21.20	1.52	4.1	24	14	5.87	----	4.27	Silty CLAY to CLAY	"
86.06	35.7	20.21	1.47	4.1	23	13	5.91	----	4.05	"	"
86.54	31.1	17.53	1.21	3.9	15	8	5.94	----	3.43	Clayey SILT to Silty CLAY	"
87.02	28.4	15.94	1.19	4.2	18	10	5.98	----	3.07	Silty CLAY to CLAY	"
87.51	26.8	14.99	1.15	4.3	17	10	6.01	----	2.85	"	"
88.01	24.1	13.44	0.96	4.0	16	9	6.05	----	2.49	"	"
88.58	22.3	12.39	0.64	2.9	11	6	6.09	----	2.24	Clayey SILT to Silty CLAY	120-130
89.07	20.9	11.58	0.58	2.8	10	5	6.12	----	2.05	"	"
89.55	26.3	14.53	1.02	3.9	17	9	6.15	----	2.77	Silty CLAY to CLAY	130-140
90.04	24.9	13.71	1.07	4.3	16	9	6.19	----	2.58	"	"
90.52	25.9	14.22	1.52	5.9	25	13	6.22	----	2.71	CLAY	"
91.07	22.0	12.04	0.78	3.5	14	8	6.26	----	2.18	Silty CLAY to CLAY	120-130
91.54	20.8	11.35	0.55	2.6	10	5	6.29	----	2.02	Clayey SILT to Silty CLAY	"
92.02	21.2	11.54	0.46	2.2	10	5	6.32	----	2.07	"	"
92.57	22.8	12.37	0.62	2.7	10	6	6.35	----	2.28	"	"
93.05	23.3	12.61	0.68	2.9	11	6	6.38	----	2.34	"	"
93.52	23.6	12.73	0.64	2.7	11	6	6.41	----	2.37	"	"
94.00	25.4	13.67	0.62	2.4	12	6	6.44	----	2.61	"	"
94.54	26.7	14.32	0.57	2.1	10	5	6.47	----	2.78	Sandy SILT to Clayey SILT	"
95.06	25.3	13.53	0.54	2.1	9	5	6.51	----	2.59	"	"
95.51	24.8	13.23	0.51	2.1	9	5	6.53	----	2.52	"	"
96.06	26.8	14.25	0.57	2.1	10	5	6.57	----	2.78	"	"
96.54	27.4	14.52	0.58	2.1	10	5	6.60	----	2.86	"	"
97.03	29.1	15.38	0.64	2.2	10	6	6.63	----	3.08	"	"
97.56	30.1	15.86	0.58	1.9	11	6	6.66	----	3.21	"	"
98.04	31.7	16.65	0.65	2.1	11	6	6.69	----	3.42	"	"
98.50	31.9	16.71	0.71	2.2	12	6	6.72	----	3.44	"	"
99.00	34.0	17.76	0.72	2.1	12	7	6.75	----	3.72	"	"
99.56	32.8	17.08	0.69	2.1	12	6	6.79	----	3.55	"	"
100.05	33.2	17.23	0.71	2.1	12	6	6.82	----	3.60	"	"
100.54	33.4	17.28	0.84	2.5	12	6	6.85	----	3.62	"	130-140
101.02	35.3	18.20	0.82	2.3	13	7	6.89	----	3.87	"	"
101.52	38.1	19.57	0.94	2.5	14	7	6.92	----	4.24	"	"
102.03	40.4	20.68	0.96	2.4	15	7	6.96	----	4.54	"	"
102.53	46.3	23.62	1.20	2.6	17	9	7.00	----	5.32	"	"
103.00	46.4	23.62	1.09	2.3	17	9	7.03	----	5.33	"	"
103.55	46.4	23.56	1.26	2.7	17	9	7.07	----	5.33	"	"
104.00	51.9	26.31	1.65	3.2	19	10	7.10	----	6.06	"	"
104.51	62.4	31.56	3.54	5.7	62	31	7.14	----	7.45	Very Stiff Fine Grained *	"
105.01	45.7	23.06	2.00	4.4	30	15	7.18	----	5.22	Silty CLAY to CLAY	"
105.53	26.8	13.49	0.99	3.7	13	6	7.22	----	2.70	Clayey SILT to Silty CLAY	"
106.01	27.1	13.62	0.62	2.3	10	5	7.25	----	2.73	Sandy SILT to Clayey SILT	120-130
106.50	29.2	14.65	0.76	2.6	11	5	7.28	----	3.01	"	"
107.02	26.6	13.32	0.61	2.3	10	5	7.31	----	2.66	"	"
107.51	27.4	13.69	0.58	2.1	10	5	7.34	----	2.76	"	"
108.04	26.1	13.02	0.58	2.2	9	5	7.37	----	2.58	"	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 120.0 feet

CPT NO.: 1-CPT1
DATE: 06-12-2012
TIME: 11:20:00
Groundwater measured at 10.7 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
108.54	25.5	12.70	0.54	2.1	9	5	7.40	----	2.50	Sandy SILT to Clayey SILT	120-130
109.04	26.3	13.07	0.55	2.1	9	5	7.44	----	2.60	"	"
109.54	26.4	13.09	0.58	2.2	9	5	7.47	----	2.61	"	"
110.04	27.3	13.51	1.20	4.4	18	9	7.50	----	2.73	Silty CLAY to CLAY	130-140
110.51	25.3	12.50	0.61	2.4	11	6	7.53	----	2.46	Clayey SILT to Silty CLAY	120-130
111.00	27.5	13.56	0.60	2.2	10	5	7.56	----	2.74	Sandy SILT to Clayey SILT	"
111.52	27.4	13.48	0.58	2.1	10	5	7.60	----	2.73	"	"
112.04	40.0	19.64	1.17	2.9	15	7	7.63	----	4.40	"	130-140
112.52	40.6	19.89	1.11	2.7	15	7	7.67	----	4.48	"	"
113.04	27.9	13.64	0.61	2.2	10	5	7.70	----	2.78	"	120-130
113.52	26.7	13.03	0.81	3.0	12	6	7.73	----	2.62	Clayey SILT to Silty CLAY	"
114.03	34.5	16.80	1.59	4.6	22	11	7.77	----	3.65	Silty CLAY to CLAY	130-140
114.51	49.7	24.15	1.68	3.4	24	11	7.80	----	5.67	Clayey SILT to Silty CLAY	"
115.04	25.8	12.51	0.64	2.5	12	6	7.84	----	2.48	"	120-130
115.53	32.9	15.92	1.34	4.1	21	10	7.87	----	3.43	Silty CLAY to CLAY	130-140
116.01	50.7	24.48	1.35	2.7	19	9	7.91	----	5.79	Sandy SILT to Clayey SILT	"
116.52	24.7	11.90	0.48	1.9	9	4	7.94	----	2.32	"	120-130
117.04	46.3	22.26	1.53	3.3	21	10	7.98	----	5.20	Clayey SILT to Silty CLAY	130-140
117.53	65.5	31.42	2.04	3.1	25	12	8.01	----	7.75	Sandy SILT to Clayey SILT	"
118.03	25.5	12.21	0.56	2.2	9	4	8.04	----	2.42	"	120-130
118.51	27.0	12.90	0.58	2.1	10	5	8.07	----	2.61	"	"
119.01	26.4	12.59	0.53	2.0	9	4	8.11	----	2.53	"	"
119.53	27.9	13.28	0.55	2.0	10	5	8.14	----	2.72	"	"
120.04	26.9	12.77	0.52	1.9	9	5	8.17	----	2.59	"	"

DEPTH = Sampling interval (~0.1 feet)
Qc = Tip bearing uncorrected   Qt = Tip bearing corrected   Fs = Sleeve friction resistance   Rf = Qt / Fs
SPT = Equivalent Standard Penetration Test   Qt' and SPT' = Qt and SPT corrected for overburden
EffVtStr = Effective Vertical Stress using est. density**   Phi = Soil friction angle*
Su = Undrained Soil Strength* (see classification chart)
References: * Robertson and Campanella, 1988   **Olsen, 1989   *** Durgunoglu & Mitchell, 1975

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 80.0 feet

CPT NO.: 1-CPT2
DATE: 06-11-2012
TIME: 10:55:00
Groundwater measured at 11.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.54	63.4	101.44	3.48	5.5	63	101	0.06	----	8.45	Very Stiff Fine Grained *	130-140
1.00	48.3	77.28	9.09	18.8	48	77	0.13	----	6.43	Organic Material	>140
1.53	72.0	115.20	5.84	8.1	72	115	0.20	----	9.59	Very Stiff Fine Grained *	"
2.01	166.1	265.76	4.69	2.8	55	89	0.27	44	----	Silty SAND to Sandy SILT	130-140
2.51	90.6	144.96	1.99	2.2	30	48	0.33	40	----	"	"
3.01	16.1	25.76	1.30	8.1	16	26	0.40	----	2.12	CLAY	"
3.58	12.7	20.32	1.01	8.0	13	20	0.47	----	1.66	"	120-130
4.04	10.4	16.64	1.18	11.3	10	17	0.53	----	1.69	Organic Material	"
4.50	40.2	64.32	1.58	3.9	20	32	0.59	----	5.32	Clayey SILT to Silty CLAY	130-140
5.05	51.1	81.76	2.15	4.2	26	41	0.67	----	6.77	"	"
5.53	36.4	58.24	1.72	4.7	24	39	0.73	----	4.80	Silty CLAY to CLAY	"
6.07	11.4	18.24	0.95	8.3	11	18	0.80	----	1.83	CLAY	120-130
6.55	13.3	20.51	0.88	6.6	13	21	0.86	----	1.72	"	"
7.02	8.8	13.05	0.57	6.5	9	13	0.92	----	1.67	"	"
7.53	11.0	15.61	0.58	5.3	11	16	0.98	----	1.75	"	"
8.03	9.5	13.09	0.54	5.7	10	13	1.04	----	1.50	"	"
8.52	11.4	15.34	0.57	5.0	11	15	1.10	----	1.81	"	"
9.01	8.2	10.79	0.43	5.2	8	11	1.16	----	1.52	"	110-120
9.55	6.6	8.49	0.31	4.7	7	8	1.22	----	1.20	"	100-110
10.05	5.8	7.31	0.21	3.6	6	7	1.27	----	1.03	"	"
10.51	5.1	6.32	0.19	3.7	5	6	1.31	----	0.89	"	90-100
11.03	5.8	7.04	0.28	4.8	6	7	1.37	----	1.02	"	100-110
11.54	8.9	10.66	0.69	7.8	9	11	1.40	----	1.64	"	120-130
12.01	11.6	13.73	0.75	6.5	12	14	1.43	----	1.81	"	"
12.53	9.9	11.56	0.56	5.7	10	12	1.46	----	1.52	"	"
13.04	12.6	14.52	0.61	4.8	13	15	1.49	----	1.57	"	"
13.51	12.9	14.72	0.63	4.9	13	15	1.52	----	1.61	"	"
14.04	11.4	12.88	0.57	5.0	11	13	1.56	----	1.75	"	"
14.52	18.3	20.47	0.64	3.5	12	14	1.59	----	2.32	Silty CLAY to CLAY	"
15.04	25.3	27.96	0.96	3.8	17	19	1.62	----	3.25	"	130-140
15.57	24.3	26.52	0.97	4.0	16	18	1.66	----	3.11	"	"
16.05	28.5	30.74	1.33	4.7	28	31	1.70	----	3.67	CLAY	"
16.52	28.2	30.07	1.52	5.4	28	30	1.73	----	3.62	"	"
17.06	19.9	20.99	0.96	4.8	20	21	1.77	----	2.51	"	"
17.53	15.4	16.14	0.64	4.2	15	16	1.80	----	1.91	"	120-130
18.00	11.6	12.09	0.40	3.4	8	8	1.83	----	1.74	Silty CLAY to CLAY	110-120
18.53	11.4	11.80	0.35	3.1	8	8	1.85	----	1.71	"	"
19.01	11.6	11.94	0.34	2.9	8	8	1.88	----	1.74	"	"
19.50	12.6	12.89	0.31	2.5	6	6	1.90	----	1.52	Clayey SILT to Silty CLAY	"
20.01	11.6	11.79	0.25	2.2	6	6	1.93	----	1.73	"	"
20.52	11.3	11.41	0.31	2.7	7	7	1.96	----	1.67	Silty CLAY to CLAY	"
21.03	11.6	11.64	0.30	2.6	6	6	1.99	----	1.72	Clayey SILT to Silty CLAY	"
21.51	10.3	10.30	0.23	2.2	5	5	2.01	----	1.50	"	100-110
22.01	10.7	10.69	0.27	2.5	5	5	2.03	----	1.56	"	110-120
22.57	12.0	11.99	0.33	2.8	8	8	2.06	----	1.41	Silty CLAY to CLAY	"
23.01	15.8	15.77	0.39	2.5	8	8	2.09	----	1.92	Clayey SILT to Silty CLAY	120-130
23.52	15.5	15.46	0.34	2.2	8	8	2.12	----	1.87	"	110-120
24.03	16.1	16.05	0.63	3.9	10	10	2.15	----	1.95	Silty CLAY to CLAY	120-130
24.53	24.9	24.81	0.83	3.3	12	12	2.18	----	3.12	Clayey SILT to Silty CLAY	130-140
25.04	21.6	21.50	0.87	4.0	14	14	2.22	----	2.67	Silty CLAY to CLAY	"
25.54	17.2	17.11	0.68	4.0	11	11	2.25	----	2.08	"	120-130
26.04	14.1	14.02	0.51	3.6	9	9	2.28	----	1.67	"	"
26.55	10.6	10.53	0.48	4.5	10	10	2.31	----	1.49	CLAY	110-120
27.05	15.1	15.00	0.72	4.8	15	15	2.34	----	1.79	"	120-130
27.55	21.9	21.74	0.78	3.6	14	14	2.37	----	2.69	Silty CLAY to CLAY	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 80.0 feet

CPT NO.: 1-CPT2
DATE: 06-11-2012
TIME: 10:55:00
Groundwater measured at 11.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.01	21.8	21.62	0.84	3.9	14	14	2.40	----	2.68	Silty CLAY to CLAY	120-130
28.55	19.3	19.13	0.82	4.2	12	12	2.44	----	2.34	"	"
29.01	15.9	15.75	0.70	4.4	15	15	2.46	----	1.88	CLAY	"
29.51	11.2	11.09	0.47	4.2	11	11	2.49	----	1.56	"	110-120
30.06	12.5	12.27	0.49	3.9	12	12	2.52	----	1.42	"	120-130
30.51	11.6	11.30	0.40	3.4	7	7	2.55	----	1.62	Silty CLAY to CLAY	110-120
31.04	11.7	11.29	0.46	3.9	11	11	2.58	----	1.63	CLAY	"
31.53	12.4	11.86	0.40	3.2	8	8	2.60	----	1.39	Silty CLAY to CLAY	"
32.04	15.8	14.94	0.60	3.8	10	10	2.63	----	1.84	"	120-130
32.53	13.9	13.00	0.60	4.3	14	13	2.66	----	1.59	CLAY	"
33.02	12.4	11.48	0.52	4.2	12	11	2.70	----	1.38	"	"
33.51	12.8	11.72	0.51	4.0	13	11	2.73	----	1.43	"	"
34.01	14.4	13.03	0.61	4.2	14	13	2.76	----	1.64	"	"
34.55	13.1	11.71	0.44	3.4	8	8	2.79	----	1.46	Silty CLAY to CLAY	"
35.00	13.3	11.76	0.51	3.8	13	11	2.82	----	1.49	CLAY	"
35.58	12.5	10.93	0.44	3.5	8	7	2.85	----	1.37	Silty CLAY to CLAY	110-120
36.07	13.0	11.26	0.38	2.9	8	7	2.88	----	1.44	"	"
36.56	13.8	11.83	0.38	2.8	7	6	2.90	----	1.54	Clayey SILT to Silty CLAY	"
37.05	14.6	12.37	0.46	3.2	9	8	2.93	----	1.64	Silty CLAY to CLAY	120-130
37.54	14.2	11.91	0.37	2.6	7	6	2.96	----	1.59	Clayey SILT to Silty CLAY	110-120
38.07	20.1	16.60	1.09	5.4	20	16	3.00	----	2.37	CLAY	130-140
38.52	119.7	98.35	3.03	2.5	40	33	3.03	38	----	Silty SAND to Sandy SILT	"
39.06	260.7	213.19	2.29	0.9	52	43	3.06	42	----	SAND	120-130
39.52	170.5	138.86	1.81	1.1	34	28	3.09	40	----	"	"
40.07	23.7	19.19	1.32	5.6	24	19	3.13	----	2.83	CLAY	130-140
40.54	13.4	10.81	0.50	3.7	9	7	3.16	----	1.45	Silty CLAY to CLAY	120-130
41.06	13.9	11.17	0.35	2.5	7	6	3.19	----	1.52	Clayey SILT to Silty CLAY	110-120
41.55	14.4	11.53	0.35	2.4	7	6	3.21	----	1.58	"	"
42.06	16.9	13.46	0.51	3.0	8	7	3.25	----	1.91	"	120-130
42.57	16.3	12.93	0.48	2.9	8	6	3.28	----	1.82	"	"
43.01	16.3	12.87	0.64	3.9	11	8	3.31	----	1.82	Silty CLAY to CLAY	"
43.53	21.2	16.65	0.88	4.2	14	11	3.34	----	2.47	"	130-140
44.02	132.1	103.37	1.05	0.8	26	21	3.37	38	----	SAND	110-120
44.52	33.1	25.76	1.13	3.4	17	13	3.41	----	4.05	Clayey SILT to Silty CLAY	130-140
45.04	27.9	21.60	0.86	3.1	14	11	3.44	----	3.35	"	"
45.54	22.8	17.55	0.84	3.7	15	12	3.48	----	2.66	Silty CLAY to CLAY	"
46.05	19.1	14.63	0.68	3.6	13	10	3.51	----	2.17	"	120-130
46.55	18.1	13.80	0.58	3.2	9	7	3.54	----	2.03	Clayey SILT to Silty CLAY	"
47.07	16.6	12.60	0.45	2.7	8	6	3.58	----	1.83	"	"
47.50	17.0	12.85	0.41	2.4	8	6	3.60	----	1.87	"	"
48.02	18.0	13.54	0.52	2.9	9	7	3.63	----	2.00	"	"
48.53	19.8	14.82	0.50	2.5	10	7	3.67	----	2.24	"	"
49.05	18.6	13.85	0.45	2.4	9	7	3.70	----	2.08	"	"
49.56	17.3	12.82	0.39	2.3	8	6	3.73	----	1.90	"	"
50.08	18.6	13.71	0.44	2.4	9	6	3.76	----	2.07	"	"
50.50	20.6	15.12	0.58	2.8	10	7	3.79	----	2.33	"	"
51.01	57.8	42.19	2.71	4.7	37	27	3.83	----	7.29	Silty CLAY to CLAY	130-140
51.52	17.3	12.56	0.55	3.2	8	6	3.86	----	1.88	Clayey SILT to Silty CLAY	120-130
52.03	18.3	13.22	0.48	2.6	9	6	3.89	----	2.01	"	"
52.54	18.9	13.59	0.54	2.9	9	6	3.92	----	2.09	"	"
53.05	19.9	14.23	0.61	3.1	9	7	3.95	----	2.21	"	"
53.55	19.1	13.59	0.52	2.7	9	6	3.99	----	2.10	"	"
54.05	22.0	15.58	1.06	4.8	20	14	4.02	----	2.49	CLAY	130-140
54.55	74.4	52.45	1.85	2.5	30	21	4.06	----	9.47	Sandy SILT to Clayey SILT	"
55.04	26.6	18.67	1.68	6.3	26	18	4.09	----	3.09	CLAY	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 80.0 feet

CPT NO.: 1-CPT2
DATE: 06-11-2012
TIME: 10:55:00
Groundwater measured at 11.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
55.50	21.4	14.96	1.32	6.2	21	15	4.13	----	2.39	CLAY	130-140
56.04	72.2	50.24	3.89	5.4	72	50	4.17	----	9.16	Very Stiff Fine Grained *	"
56.51	39.2	27.16	2.15	5.5	39	27	4.20	----	4.76	CLAY	"
57.04	37.4	25.79	1.96	5.2	37	26	4.24	----	4.51	"	"
57.54	49.5	33.98	2.43	4.9	33	23	4.28	----	6.12	Silty CLAY to CLAY	"
58.01	26.1	17.84	1.65	6.3	26	18	4.31	----	3.00	CLAY	"
58.55	18.9	12.87	0.90	4.8	19	13	4.34	----	2.03	"	120-130
59.02	20.7	14.04	0.84	4.1	14	9	4.37	----	2.27	Silty CLAY to CLAY	"
59.58	20.7	13.98	0.86	4.2	13	9	4.41	----	2.26	"	"
60.05	18.4	12.38	0.73	4.0	12	8	4.44	----	1.95	"	"
60.58	17.2	11.52	0.59	3.4	11	7	4.47	----	1.79	"	"
61.06	17.9	11.95	0.64	3.6	11	8	4.50	----	1.88	"	"
61.56	18.8	12.50	0.71	3.8	12	8	4.53	----	1.99	"	"
62.06	19.3	12.78	0.78	4.0	12	8	4.56	----	2.06	"	"
62.52	21.3	14.05	0.89	4.2	13	9	4.59	----	2.32	"	"
63.01	22.0	14.45	0.92	4.2	14	9	4.63	----	2.41	"	130-140
63.53	21.6	14.11	1.00	4.6	21	13	4.67	----	2.35	CLAY	"
64.00	22.0	14.31	0.93	4.2	14	9	4.70	----	2.40	Silty CLAY to CLAY	"
64.56	23.0	14.88	0.99	4.3	15	9	4.74	----	2.53	"	"
65.05	23.4	15.07	0.98	4.2	15	10	4.78	----	2.58	"	"
65.54	24.9	15.96	1.06	4.3	16	10	4.81	----	2.77	"	"
66.03	25.1	16.01	1.19	4.7	24	16	4.85	----	2.79	CLAY	"
66.52	26.0	16.51	1.21	4.7	25	16	4.88	----	2.91	"	"
67.06	24.7	15.60	1.09	4.4	16	10	4.92	----	2.73	Silty CLAY to CLAY	"
67.56	24.6	15.46	1.00	4.1	16	10	4.96	----	2.71	"	"
68.05	25.3	15.83	1.17	4.6	24	15	4.99	----	2.80	CLAY	"
68.53	25.2	15.70	1.09	4.3	16	10	5.03	----	2.79	Silty CLAY to CLAY	"
69.02	25.0	15.52	0.94	3.8	16	10	5.06	----	2.75	"	"
69.51	25.2	15.59	0.90	3.6	12	8	5.10	----	2.78	Clayey SILT to Silty CLAY	"
70.07	24.8	15.27	0.96	3.9	16	10	5.14	----	2.72	Silty CLAY to CLAY	"
70.55	23.4	14.36	0.84	3.6	15	9	5.18	----	2.53	"	"
71.04	25.1	15.34	0.86	3.4	12	7	5.21	----	2.75	Clayey SILT to Silty CLAY	"
71.52	27.2	16.57	0.85	3.1	13	8	5.25	----	3.03	"	"
72.08	25.8	15.65	0.75	2.9	12	7	5.28	----	2.83	"	120-130
72.56	27.3	16.50	0.77	2.8	13	8	5.32	----	3.03	"	130-140
73.03	28.4	17.10	0.99	3.5	13	8	5.35	----	3.17	"	"
73.53	28.0	16.80	1.04	3.7	13	8	5.39	----	3.11	"	"
74.00	26.4	15.78	1.12	4.2	17	10	5.42	----	2.90	Silty CLAY to CLAY	"
74.56	23.1	13.75	0.98	4.2	15	9	5.46	----	2.45	"	"
75.04	21.4	12.69	0.98	4.6	21	12	5.50	----	2.22	CLAY	"
75.52	21.6	12.76	1.00	4.6	21	12	5.53	----	2.24	"	"
76.07	20.5	12.06	0.86	4.2	13	8	5.57	----	2.09	Silty CLAY to CLAY	120-130
76.54	21.7	12.72	0.82	3.8	14	8	5.59	----	2.25	"	"
77.02	20.6	12.04	0.62	3.0	10	6	5.62	----	2.10	Clayey SILT to Silty CLAY	"
77.50	23.3	13.57	0.62	2.7	11	6	5.65	----	2.45	"	"
78.06	21.5	12.47	0.61	2.8	10	6	5.69	----	2.21	"	"
78.55	20.7	11.97	0.64	3.1	10	6	5.72	----	2.10	"	"
79.01	21.0	12.10	0.67	3.2	10	6	5.75	----	2.13	"	"
79.52	21.7	12.46	0.70	3.2	10	6	5.78	----	2.22	"	"
80.03	21.8	12.47	0.72	3.3	10	6	5.81	----	2.23	"	"

DEPTH = Sampling interval (~0.1 feet)
Qc = Tip bearing uncorrected   Qt = Tip bearing corrected   Fs = Sleeve friction resistance   Rf = Qt / Fs
SPT = Equivalent Standard Penetration Test   Qt' and SPT' = Qt and SPT corrected for overburden
EffVtStr = Effective Vertical Stress using est. density**   Phi = Soil friction angle*
Su = Undrained Soil Strength* (see classification chart)
References: * Robertson and Campanella, 1988   **Olsen, 1989   *** Durgunoglu & Mitchell, 1975

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 100.0 feet

CPT NO.: 1-CPT3
DATE: 06-11-2012
TIME: 15:47:00
Groundwater measured at 9.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.53	0.2	0.32	0.01	5.0	0	0	0.06	----	0.03	Organic Material	85-90
1.07	0.3	0.48	0.04	13.3	0	0	0.11	----	0.05	"	"
1.52	18.7	29.92	0.99	5.3	19	30	0.17	----	2.48	CLAY	130-140
2.00	25.6	40.96	1.42	5.5	26	41	0.23	----	3.40	"	"
2.52	30.2	48.32	1.63	5.4	30	48	0.30	----	4.01	"	"
3.05	36.0	57.60	2.15	6.0	36	58	0.37	----	4.78	"	"
3.53	25.5	40.80	1.85	7.3	25	41	0.44	----	3.37	"	"
4.06	6.5	10.40	0.49	7.5	7	10	0.50	----	1.25	"	110-120
4.50	3.1	4.96	0.26	8.4	3	5	0.54	----	0.57	Organic Material	90-100
5.00	7.9	12.64	0.51	6.5	8	13	0.60	----	1.52	CLAY	110-120
5.55	10.4	16.64	0.99	9.5	10	17	0.67	----	1.68	"	120-130
6.01	8.6	13.76	0.78	9.1	9	14	0.73	----	1.65	"	"
6.52	12.9	20.64	0.77	6.0	13	21	0.79	----	1.67	"	"
7.03	8.1	12.57	0.57	7.0	8	13	0.85	----	1.54	"	110-120
7.51	7.8	11.67	0.54	6.9	8	12	0.90	----	1.47	"	"
8.00	5.0	7.22	0.36	7.2	5	7	0.96	----	0.90	"	100-110
8.55	1.8	2.51	0.19	10.6	2	3	1.01	----	0.26	Organic Material	90-100
9.08	2.7	3.70	0.12	4.4	3	4	1.06	----	0.43	CLAY	"
9.50	2.8	3.82	0.13	4.6	3	4	1.07	----	0.45	"	"
10.04	3.8	5.13	0.30	7.9	4	5	1.09	----	0.64	Organic Material	100-110
10.56	7.2	9.62	0.43	6.0	7	9	1.12	----	1.32	CLAY	110-120
11.08	5.4	7.16	0.33	6.1	5	7	1.14	----	0.95	"	100-110
11.51	6.8	8.93	0.35	5.1	7	9	1.17	----	1.23	"	110-120
12.03	10.9	14.16	0.39	3.6	7	9	1.19	----	1.70	Silty CLAY to CLAY	"
12.55	12.5	16.03	0.54	4.3	12	16	1.23	----	1.57	CLAY	120-130
13.01	11.3	14.32	0.49	4.3	11	14	1.25	----	1.76	"	"
13.53	12.7	15.90	0.56	4.4	13	16	1.29	----	1.59	"	"
14.05	13.3	16.44	0.63	4.7	13	16	1.32	----	1.66	"	"
14.51	17.0	20.78	0.87	5.1	17	21	1.35	----	2.15	"	"
15.06	21.3	25.63	1.08	5.1	21	26	1.39	----	2.72	"	130-140
15.50	33.2	39.44	1.44	4.3	22	26	1.42	----	4.31	Silty CLAY to CLAY	"
16.02	35.2	41.18	1.77	5.0	35	41	1.46	----	4.57	CLAY	"
16.54	31.3	36.05	1.57	5.0	31	36	1.50	----	4.04	"	"
17.05	29.6	33.68	1.46	4.9	29	33	1.53	----	3.81	"	"
17.56	57.4	64.56	2.14	3.7	29	32	1.57	----	7.51	Clayey SILT to Silty CLAY	"
18.06	111.5	123.93	1.92	1.7	37	41	1.61	39	----	Silty SAND to Sandy SILT	"
18.55	115.9	127.36	2.71	2.3	39	42	1.64	39	----	"	"
19.05	114.9	124.76	2.21	1.9	38	42	1.68	39	----	"	"
19.55	118.0	126.58	2.49	2.1	39	42	1.71	39	----	"	"
20.03	66.9	70.92	3.84	5.7	67	71	1.75	----	8.76	Very Stiff Fine Grained *	"
20.52	13.9	14.63	0.74	5.3	14	15	1.78	----	1.69	CLAY	120-130
21.03	14.4	15.05	0.72	5.0	14	15	1.81	----	1.75	"	"
21.56	25.4	26.31	1.17	4.6	25	26	1.85	----	3.21	"	130-140
22.06	21.3	21.88	1.22	5.7	21	22	1.89	----	2.66	"	"
22.50	15.8	16.12	0.83	5.3	16	16	1.91	----	1.92	"	120-130
23.03	10.7	10.83	0.58	5.4	11	11	1.95	----	1.55	"	"
23.55	13.8	13.87	0.66	4.8	14	14	1.98	----	1.65	"	"
24.05	9.1	9.10	0.48	5.3	9	9	2.01	----	1.27	"	110-120
24.53	15.8	15.79	0.67	4.2	16	16	2.04	----	1.91	"	120-130
25.03	35.1	35.05	1.64	4.7	23	23	2.07	----	4.48	Silty CLAY to CLAY	130-140
25.54	13.1	13.07	0.65	5.0	13	13	2.10	----	1.54	CLAY	120-130
26.06	10.1	10.07	0.49	4.9	10	10	2.13	----	1.42	"	110-120
26.51	11.1	11.06	0.51	4.6	11	11	2.16	----	1.58	"	120-130
27.02	10.1	10.06	0.54	5.3	10	10	2.19	----	1.41	"	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 100.0 feet

CPT NO.: 1-CPT3
DATE: 06-11-2012
TIME: 15:47:00
Groundwater measured at 9.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
27.54	12.4	12.34	0.54	4.4	12	12	2.23	----	1.43	CLAY	120-130
28.06	7.8	7.76	0.38	4.9	8	8	2.25	----	1.22	"	110-120
28.55	6.3	6.27	0.35	5.6	6	6	2.27	----	0.91	"	100-110
29.04	5.6	5.57	0.33	5.9	6	5	2.29	----	0.77	"	"
29.54	5.2	5.17	0.35	6.7	5	5	2.32	----	0.68	"	"
30.05	6.9	6.85	0.37	5.4	7	7	2.34	----	1.01	"	110-120
30.52	6.9	6.85	0.39	5.7	7	7	2.37	----	1.01	"	"
31.07	7.1	7.04	0.35	4.9	7	7	2.40	----	1.04	"	"
31.52	6.9	6.84	0.32	4.6	7	7	2.41	----	1.00	"	100-110
32.08	8.4	8.33	0.33	3.9	8	8	2.44	----	1.29	"	110-120
32.51	8.5	8.42	0.31	3.6	8	8	2.47	----	1.31	"	"
33.01	12.1	11.98	0.41	3.4	8	8	2.49	----	1.35	Silty CLAY to CLAY	"
33.51	9.2	9.05	0.35	3.8	9	9	2.52	----	1.20	CLAY	"
34.02	9.5	9.26	0.37	3.9	9	9	2.55	----	1.24	"	"
34.54	9.1	8.79	0.30	3.3	6	6	2.57	----	1.17	Silty CLAY to CLAY	"
35.01	8.8	8.43	0.30	3.4	9	8	2.60	----	1.34	CLAY	"
35.51	12.0	11.37	0.50	4.2	12	11	2.63	----	1.31	"	120-130
36.01	17.9	16.77	0.84	4.7	18	17	2.66	----	2.10	"	"
36.50	44.8	41.44	2.82	6.3	45	41	2.70	----	5.68	"	130-140
37.04	210.0	192.26	1.62	0.8	42	38	2.73	42	----	SAND	110-120
37.58	53.7	48.48	1.68	3.1	21	19	2.76	----	6.86	Sandy SILT to Clayey SILT	130-140
38.06	9.7	8.68	0.40	4.1	10	9	2.79	----	1.23	CLAY	110-120
38.52	9.2	8.16	0.37	4.0	9	8	2.81	----	1.15	"	"
39.03	9.4	8.25	0.31	3.3	6	5	2.84	----	1.17	Silty CLAY to CLAY	"
39.52	9.3	8.08	0.29	3.1	6	5	2.87	----	1.15	"	"
40.01	9.5	8.18	0.30	3.2	6	5	2.89	----	1.18	"	"
40.51	10.4	8.86	0.41	3.9	10	9	2.92	----	1.33	CLAY	"
41.04	54.9	46.07	1.69	3.1	22	18	2.96	----	6.99	Sandy SILT to Clayey SILT	130-140
41.53	87.5	72.41	2.37	2.7	35	29	2.99	----	11.33	"	"
42.01	59.0	48.49	2.55	4.3	30	24	3.03	----	7.53	Clayey SILT to Silty CLAY	"
42.57	21.1	17.26	0.82	3.9	14	12	3.06	----	2.47	Silty CLAY to CLAY	120-130
43.05	13.5	10.99	0.55	4.1	13	11	3.09	----	1.45	CLAY	"
43.53	10.1	8.19	0.54	5.3	10	8	3.12	----	1.24	"	"
44.03	11.4	9.20	0.47	4.1	11	9	3.15	----	1.46	"	"
44.53	11.9	9.56	0.54	4.5	12	9	3.19	----	1.53	"	"
45.03	13.3	10.64	0.60	4.5	13	10	3.22	----	1.41	"	"
45.52	14.2	11.31	0.58	4.1	14	11	3.25	----	1.53	"	"
46.02	13.3	10.55	0.54	4.1	13	10	3.28	----	1.40	"	"
46.51	13.1	10.34	0.57	4.4	13	10	3.31	----	1.37	"	"
47.01	13.3	10.45	0.57	4.3	13	10	3.34	----	1.39	"	"
47.54	13.3	10.40	0.53	4.0	13	10	3.37	----	1.39	"	"
48.04	14.2	11.05	0.92	6.5	14	11	3.41	----	1.50	"	"
48.53	112.7	87.26	2.48	2.2	38	29	3.44	37	----	Silty SAND to Sandy SILT	130-140
49.03	55.8	42.98	2.98	5.3	56	43	3.48	----	7.04	CLAY	"
49.52	21.7	16.62	1.21	5.6	22	17	3.51	----	2.49	"	"
50.01	13.9	10.60	0.67	4.8	14	10	3.54	----	1.45	"	120-130
50.54	16.8	12.75	0.72	4.3	17	13	3.58	----	1.83	"	"
51.05	17.0	12.84	0.78	4.6	17	13	3.61	----	1.85	"	"
51.55	17.7	13.30	0.71	4.0	12	9	3.64	----	1.94	Silty CLAY to CLAY	"
52.06	16.3	12.19	0.70	4.3	16	12	3.67	----	1.75	CLAY	"
52.57	15.0	11.16	0.58	3.9	10	7	3.70	----	1.57	Silty CLAY to CLAY	"
53.08	17.2	12.74	0.79	4.6	17	13	3.74	----	1.86	CLAY	"
53.58	30.0	22.09	1.85	6.2	30	22	3.77	----	3.56	"	130-140
54.06	23.3	17.06	1.20	5.2	23	17	3.81	----	2.67	"	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 100.0 feet

CPT NO.: 1-CPT3
DATE: 06-11-2012
TIME: 15:47:00
Groundwater measured at 9.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
54.57	16.9	12.31	0.77	4.6	17	12	3.84	----	1.81	CLAY	120-130
55.07	15.0	10.87	0.69	4.6	15	11	3.87	----	1.55	"	"
55.57	14.3	10.32	0.68	4.8	14	10	3.90	----	1.45	"	"
56.07	13.0	9.33	0.62	4.8	13	9	3.93	----	1.28	"	"
56.57	13.6	9.71	0.61	4.5	13	9	3.96	----	1.35	"	"
57.01	22.4	15.92	0.90	4.0	15	10	4.00	----	2.52	Silty CLAY to CLAY	130-140
57.58	14.1	9.97	0.61	4.3	13	9	4.03	----	1.41	CLAY	120-130
58.00	14.5	10.22	0.67	4.6	14	10	4.06	----	1.46	"	"
58.50	13.7	9.62	0.63	4.6	13	9	4.09	----	1.35	"	"
59.00	13.4	9.38	0.57	4.3	13	9	4.12	----	1.30	"	"
59.50	16.6	11.57	0.82	4.9	16	11	4.15	----	1.73	"	"
60.00	16.1	11.18	0.62	3.9	10	7	4.18	----	1.66	Silty CLAY to CLAY	"
60.53	17.9	12.38	0.75	4.2	17	11	4.22	----	1.89	CLAY	"
61.03	18.8	12.95	0.89	4.7	18	12	4.25	----	2.01	"	"
61.53	17.9	12.29	0.82	4.6	17	12	4.28	----	1.88	"	"
62.03	17.7	12.10	0.82	4.6	17	11	4.31	----	1.85	"	"
62.52	19.8	13.48	0.98	4.9	19	13	4.35	----	2.13	"	130-140
63.01	20.7	14.03	1.09	5.3	20	13	4.38	----	2.24	"	"
63.55	20.4	13.76	0.99	4.9	20	13	4.42	----	2.20	"	"
64.00	19.5	13.09	0.95	4.9	19	12	4.45	----	2.07	"	"
64.58	20.3	13.56	0.93	4.6	19	13	4.50	----	2.18	"	"
65.07	20.7	13.76	0.98	4.7	20	13	4.53	----	2.23	"	"
65.56	21.0	13.90	1.01	4.8	20	13	4.57	----	2.26	"	"
66.05	19.8	13.05	0.86	4.3	19	12	4.60	----	2.10	"	120-130
66.54	20.1	13.20	0.93	4.6	19	13	4.63	----	2.13	"	"
67.07	20.7	13.53	0.87	4.2	13	8	4.66	----	2.21	Silty CLAY to CLAY	"
67.56	21.3	13.87	0.86	4.0	14	9	4.69	----	2.28	"	"
68.05	18.7	12.13	0.80	4.3	18	12	4.72	----	1.93	CLAY	"
68.53	17.4	11.24	0.76	4.4	17	11	4.75	----	1.76	"	"
69.02	16.9	10.87	0.67	4.0	11	7	4.78	----	1.69	Silty CLAY to CLAY	"
69.50	19.8	12.69	0.69	3.5	13	8	4.81	----	2.07	"	"
70.01	17.9	11.42	0.54	3.0	8	5	4.84	----	1.81	Clayey SILT to Silty CLAY	"
70.51	19.4	12.33	0.58	3.0	9	6	4.88	----	2.01	"	"
71.07	21.5	13.60	0.79	3.7	13	8	4.91	----	2.28	Silty CLAY to CLAY	"
71.55	24.1	15.17	0.92	3.8	15	9	4.95	----	2.62	"	130-140
72.03	22.5	14.10	1.02	4.5	21	13	4.98	----	2.41	CLAY	"
72.51	25.0	15.60	1.53	6.1	24	15	5.02	----	2.74	"	"
73.05	20.9	12.99	1.34	6.4	20	13	5.05	----	2.18	"	"
73.56	17.3	10.72	0.98	5.7	17	10	5.09	----	1.70	"	120-130
74.02	17.7	10.92	1.05	5.9	17	10	5.12	----	1.75	"	130-140
74.56	16.4	10.09	0.71	4.3	16	10	5.15	----	1.57	"	120-130
75.02	16.1	9.87	0.58	3.6	10	6	5.18	----	1.53	Silty CLAY to CLAY	"
75.56	15.6	9.53	0.51	3.3	10	6	5.22	----	1.46	"	"
76.03	19.7	12.00	0.54	2.7	9	6	5.25	----	2.00	Clayey SILT to Silty CLAY	"
76.55	22.4	13.59	0.62	2.8	10	6	5.28	----	2.35	"	"
77.06	19.1	11.55	0.53	2.8	9	5	5.31	----	1.91	"	"
77.53	18.6	11.21	0.57	3.1	8	5	5.34	----	1.84	"	"
78.07	22.5	13.52	0.76	3.4	10	6	5.37	----	2.35	"	"
78.54	21.1	12.63	0.69	3.3	10	6	5.40	----	2.16	"	"
79.01	19.2	11.46	0.55	2.9	9	5	5.43	----	1.91	"	"
79.50	17.0	10.11	0.50	2.9	8	5	5.46	----	1.61	"	"
80.04	23.8	14.11	0.72	3.0	11	6	5.50	----	2.51	"	"
80.51	27.5	16.24	1.15	4.2	17	10	5.53	----	3.00	Silty CLAY to CLAY	130-140
81.06	28.1	16.52	1.14	4.1	18	11	5.57	----	3.08	"	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 100.0 feet

CPT NO.: 1-CPT3
DATE: 06-11-2012
TIME: 15:47:00
Groundwater measured at 9.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
81.53	29.5	17.28	1.13	3.8	14	8	5.60	----	3.26	Clayey SILT to Silty CLAY	130-140
82.07	29.0	16.91	1.15	4.0	18	11	5.64	----	3.19	Silty CLAY to CLAY	"
82.54	28.3	16.44	1.12	4.0	18	10	5.68	----	3.09	"	"
83.01	28.8	16.67	1.10	3.8	14	8	5.71	----	3.15	Clayey SILT to Silty CLAY	"
83.56	22.0	12.67	0.93	4.2	14	8	5.75	----	2.24	Silty CLAY to CLAY	"
84.05	19.2	11.02	0.78	4.1	12	7	5.78	----	1.86	"	120-130
84.53	16.9	9.67	0.68	4.0	11	6	5.81	----	1.55	"	"
85.01	19.0	10.83	0.66	3.5	12	7	5.84	----	1.83	"	"
85.57	21.2	12.04	0.69	3.3	10	6	5.88	----	2.12	Clayey SILT to Silty CLAY	"
86.00	25.0	14.15	0.85	3.4	12	7	5.91	----	2.62	"	130-140
86.57	32.9	18.53	1.47	4.5	21	12	5.95	----	3.67	Silty CLAY to CLAY	"
87.06	35.1	19.69	1.32	3.8	17	9	5.99	----	3.96	Clayey SILT to Silty CLAY	"
87.53	37.3	20.85	2.11	5.7	36	20	6.02	----	4.25	CLAY	"
88.02	48.2	26.86	3.27	6.8	48	27	6.06	----	5.69	"	"
88.52	37.3	20.72	1.82	4.9	36	20	6.09	----	4.24	"	"
89.03	40.6	22.47	1.68	4.1	26	14	6.13	----	4.67	Silty CLAY to CLAY	"
89.53	37.8	20.85	1.53	4.0	23	13	6.17	----	4.29	"	"
90.05	38.8	21.33	1.49	3.8	18	10	6.20	----	4.42	Clayey SILT to Silty CLAY	"
90.51	37.6	20.61	1.44	3.8	17	10	6.24	----	4.26	"	"
91.03	42.6	23.27	1.44	3.4	20	11	6.27	----	4.92	"	"
91.52	38.5	20.96	1.23	3.2	18	10	6.31	----	4.37	"	"
92.02	36.2	19.64	1.19	3.3	17	9	6.35	----	4.06	"	"
92.54	34.2	18.49	1.07	3.1	16	9	6.38	----	3.79	"	"
93.05	32.3	17.41	0.90	2.8	15	8	6.42	----	3.53	"	"
93.54	32.1	17.24	0.88	2.7	15	8	6.46	----	3.50	"	"
94.03	34.0	18.20	0.91	2.7	12	7	6.49	----	3.75	Sandy SILT to Clayey SILT	"
94.56	36.4	19.42	0.85	2.3	13	7	6.53	----	4.06	"	"
95.00	34.2	18.20	0.76	2.2	12	7	6.56	----	3.77	"	120-130
95.55	33.4	17.71	0.79	2.4	12	6	6.59	----	3.65	"	"
96.00	30.5	16.13	0.72	2.4	11	6	6.62	----	3.26	"	"
96.52	29.4	15.50	0.67	2.3	10	6	6.65	----	3.11	"	"
97.00	30.6	16.09	0.72	2.4	11	6	6.68	----	3.27	"	"
97.51	32.6	17.09	0.72	2.2	12	6	6.72	----	3.53	"	"
98.01	32.5	16.99	0.70	2.2	12	6	6.75	----	3.51	"	"
98.54	36.0	18.75	0.87	2.4	13	7	6.79	----	3.98	"	130-140
99.04	33.7	17.49	0.92	2.7	12	6	6.82	----	3.66	"	"
99.53	32.7	16.91	0.86	2.6	12	6	6.86	----	3.53	"	"
100.04	36.0	18.55	0.94	2.6	13	7	6.89	----	3.96	"	"

DEPTH = Sampling interval (~0.1 feet)
Qc = Tip bearing uncorrected   Qt = Tip bearing corrected   Fs = Sleeve friction resistance   Rf = Qt / Fs
SPT = Equivalent Standard Penetration Test   Qt' and SPT' = Qt and SPT corrected for overburden
EffVtStr = Effective Vertical Stress using est. density**   Phi = Soil friction angle*
Su = Undrained Soil Strength* (see classification chart)
References: * Robertson and Campanella, 1988   **Olsen, 1989   *** Durgunoglu & Mitchell, 1975

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 120.0 feet

CPT NO.: 1-CPT4
DATE: 06-11-2012
TIME: 12:54:00
Groundwater measured at 8.3 feet

ENGEO, INC.

cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.55	2.6	4.16	0.05	1.9	1	2	0.06	----	0.51	Sensitive Fine Grained	85-90
1.04	2.2	3.52	0.05	2.3	1	2	0.10	----	0.43	"	"
1.53	2.2	3.52	0.06	2.7	2	4	0.14	----	0.43	CLAY	"
2.01	26.0	41.60	1.17	4.5	17	28	0.24	----	3.45	Silty CLAY to CLAY	130-140
2.54	15.9	25.44	1.25	7.9	16	25	0.31	----	2.10	CLAY	"
3.03	10.9	17.44	0.92	8.4	11	17	0.37	----	1.79	"	120-130
3.50	9.2	14.72	0.81	8.8	9	15	0.43	----	1.50	"	"
4.03	6.6	10.56	0.71	10.8	7	10	0.49	----	1.27	Organic Material	110-120
4.58	5.8	9.28	0.51	8.8	6	9	0.55	----	1.10	"	"
5.05	5.2	8.32	0.51	9.8	5	8	0.61	----	0.98	"	"
5.57	9.5	15.20	0.57	6.0	9	15	0.67	----	1.53	CLAY	120-130
6.04	7.2	11.52	0.47	6.5	7	12	0.72	----	1.37	"	110-120
6.54	6.9	11.04	0.43	6.2	7	11	0.78	----	1.30	"	"
7.04	6.0	9.37	0.38	6.3	6	9	0.84	----	1.12	"	"
7.50	7.3	11.00	0.40	5.5	7	11	0.89	----	1.37	"	"
8.01	4.3	6.27	0.23	5.3	4	6	0.94	----	0.77	"	90-100
8.53	3.7	5.34	0.12	3.2	4	5	0.96	----	0.64	"	"
9.05	4.1	5.84	0.23	5.6	4	6	0.98	----	0.72	"	"
9.51	5.0	7.03	0.31	6.2	5	7	0.99	----	0.89	"	100-110
10.08	5.0	6.95	0.39	7.8	5	7	1.02	----	0.89	"	"
10.54	6.2	8.56	0.35	5.6	6	9	1.04	----	1.12	"	"
11.08	9.6	13.08	0.52	5.4	10	13	1.07	----	1.49	"	120-130
11.55	13.7	18.46	0.51	3.7	9	12	1.10	----	1.74	Silty CLAY to CLAY	"
12.08	13.6	18.09	0.51	3.7	9	12	1.13	----	1.72	"	"
12.53	15.5	20.38	0.58	3.7	10	14	1.16	----	1.97	"	"
13.07	18.6	24.14	0.83	4.5	19	24	1.20	----	2.38	CLAY	"
13.53	17.2	22.06	0.86	5.0	17	22	1.23	----	2.19	"	"
14.02	20.7	26.18	0.97	4.7	21	26	1.26	----	2.65	"	130-140
14.54	23.5	29.29	1.08	4.6	23	29	1.30	----	3.02	"	"
15.03	25.4	31.23	1.37	5.4	25	31	1.33	----	3.27	"	"
15.52	23.2	28.12	1.29	5.6	23	28	1.37	----	2.97	"	"
16.07	14.2	16.98	0.82	5.8	14	17	1.40	----	1.77	"	120-130
16.55	8.2	9.71	0.46	5.6	8	9	1.43	----	1.44	"	110-120
17.03	6.7	7.87	0.32	4.8	7	8	1.45	----	1.14	"	100-110
17.56	6.8	7.91	0.28	4.1	7	8	1.47	----	1.15	"	"
18.04	11.1	12.78	0.46	4.1	11	13	1.50	----	1.67	"	110-120
18.50	14.5	16.53	0.95	6.6	14	16	1.53	----	1.79	"	120-130
19.01	69.5	78.34	1.55	2.2	23	26	1.56	37	----	Silty SAND to Sandy SILT	130-140
19.50	66.4	73.98	1.56	2.3	27	30	1.60	----	8.70	Sandy SILT to Clayey SILT	"
20.03	87.9	97.05	0.73	0.8	22	24	1.63	38	----	SAND to Silty SAND	110-120
20.51	68.7	75.12	0.92	1.3	23	25	1.66	36	----	Silty SAND to Sandy SILT	120-130
21.04	71.9	77.89	0.57	0.8	18	19	1.69	37	----	SAND to Silty SAND	110-120
21.54	56.3	60.45	0.46	0.8	14	15	1.71	35	----	"	"
22.01	66.1	70.28	0.77	1.2	22	23	1.74	36	----	Silty SAND to Sandy SILT	120-130
22.55	53.1	56.04	0.44	0.8	13	14	1.77	35	----	SAND to Silty SAND	110-120
23.03	47.7	50.00	0.60	1.3	16	17	1.80	34	----	Silty SAND to Sandy SILT	120-130
23.50	20.1	20.90	0.97	4.8	20	21	1.83	----	2.49	CLAY	130-140
24.06	18.7	19.29	0.86	4.6	19	19	1.87	----	2.30	"	120-130
24.54	15.1	15.47	0.64	4.2	15	15	1.90	----	1.82	"	"
25.04	15.4	15.66	0.86	5.6	15	16	1.93	----	1.85	"	"
25.50	17.0	17.17	0.83	4.9	17	17	1.96	----	2.06	"	"
26.05	16.6	16.63	0.71	4.3	17	17	1.99	----	2.01	"	"
26.54	15.4	15.39	0.71	4.6	15	15	2.02	----	1.84	"	"
27.04	12.3	12.29	0.51	4.1	12	12	2.05	----	1.42	"	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 120.0 feet

CPT NO.: 1-CPT4
DATE: 06-11-2012
TIME: 12:54:00
Groundwater measured at 8.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
27.53	17.4	17.37	0.67	3.9	12	12	2.09	----	2.10	Silty CLAY to CLAY	120-130
28.06	15.3	15.26	1.00	6.5	15	15	2.12	----	1.82	CLAY	"
28.55	8.9	8.87	0.40	4.5	9	9	2.14	----	1.44	"	110-120
29.04	9.4	9.37	0.40	4.3	9	9	2.17	----	1.28	"	"
29.54	7.7	7.67	0.31	4.0	8	8	2.20	----	1.19	"	"
30.04	7.8	7.77	0.38	4.9	8	8	2.22	----	1.20	"	"
30.54	8.5	8.46	0.36	4.2	8	8	2.25	----	1.33	"	"
31.04	9.4	9.35	0.47	5.0	9	9	2.28	----	1.26	"	"
31.51	7.3	7.26	0.34	4.7	7	7	2.30	----	1.08	"	"
32.01	7.2	7.15	0.29	4.0	7	7	2.32	----	1.06	"	100-110
32.51	8.4	8.34	0.31	3.7	8	8	2.35	----	1.29	"	110-120
33.01	7.7	7.64	0.22	2.9	5	5	2.37	----	1.15	Silty CLAY to CLAY	100-110
33.51	6.8	6.75	0.21	3.1	7	7	2.39	----	0.96	CLAY	"
34.02	9.4	9.32	0.33	3.5	9	9	2.42	----	1.23	"	110-120
34.56	8.6	8.52	0.27	3.1	6	5	2.44	----	1.31	Silty CLAY to CLAY	100-110
35.05	8.2	8.12	0.27	3.3	8	8	2.46	----	1.23	CLAY	"
35.55	8.8	8.72	0.24	2.7	6	6	2.48	----	1.34	Silty CLAY to CLAY	"
36.04	18.5	18.23	0.38	2.1	9	9	2.51	----	2.18	Clayey SILT to Silty CLAY	120-130
36.54	10.9	10.65	0.37	3.4	7	7	2.54	----	1.46	Silty CLAY to CLAY	110-120
37.02	51.9	50.10	1.81	3.5	26	25	2.57	----	6.63	Clayey SILT to Silty CLAY	130-140
37.58	102.6	97.68	2.23	2.2	34	33	2.61	38	----	Silty SAND to Sandy SILT	"
38.07	18.3	17.24	0.78	4.3	18	17	2.65	----	2.14	CLAY	120-130
38.55	8.2	7.65	0.39	4.8	8	8	2.67	----	1.18	"	110-120
39.04	8.3	7.68	0.35	4.2	8	7	2.70	----	1.20	"	"
39.52	9.0	8.25	0.37	4.1	9	8	2.72	----	1.11	"	"
40.08	9.9	8.98	0.38	3.8	10	9	2.75	----	1.25	"	"
40.57	13.3	11.93	0.44	3.3	9	8	2.78	----	1.45	Silty CLAY to CLAY	120-130
41.04	24.8	21.96	1.07	4.3	16	14	2.82	----	2.98	"	130-140
41.52	31.1	27.18	1.19	3.8	15	13	2.85	----	3.82	Clayey SILT to Silty CLAY	"
42.01	84.3	72.70	1.77	2.1	28	24	2.89	36	----	Silty SAND to Sandy SILT	"
42.58	18.3	15.57	0.82	4.5	18	15	2.92	----	2.10	CLAY	120-130
43.07	23.0	19.29	0.78	3.4	11	10	2.96	----	2.72	Clayey SILT to Silty CLAY	130-140
43.55	18.7	15.50	0.68	3.6	12	10	2.99	----	2.15	Silty CLAY to CLAY	120-130
44.04	15.6	12.84	0.67	4.3	15	13	3.02	----	1.73	CLAY	"
44.55	13.3	10.89	0.49	3.7	9	7	3.05	----	1.42	Silty CLAY to CLAY	"
45.05	13.9	11.34	0.52	3.7	9	7	3.08	----	1.49	"	"
45.54	12.9	10.48	0.52	4.0	13	10	3.11	----	1.36	CLAY	"
46.04	11.7	9.47	0.40	3.4	8	6	3.14	----	1.49	Silty CLAY to CLAY	110-120
46.54	11.6	9.35	0.38	3.3	7	6	3.17	----	1.47	"	"
47.04	13.1	10.52	0.39	3.0	8	7	3.19	----	1.37	"	"
47.56	13.2	10.56	0.34	2.6	6	5	3.22	----	1.38	Clayey SILT to Silty CLAY	"
48.06	12.4	9.88	0.40	3.2	8	6	3.25	----	1.27	Silty CLAY to CLAY	"
48.56	19.6	15.54	1.19	6.1	19	15	3.28	----	2.23	CLAY	130-140
49.04	76.1	60.01	2.00	2.6	30	24	3.32	----	9.75	Sandy SILT to Clayey SILT	"
49.53	48.3	37.89	1.42	2.9	19	15	3.35	----	6.04	"	"
50.03	12.2	9.53	0.51	4.2	12	9	3.38	----	1.23	CLAY	120-130
50.51	14.5	11.27	0.64	4.4	14	11	3.41	----	1.53	"	"
51.04	16.3	12.61	0.71	4.4	16	12	3.45	----	1.76	"	"
51.53	14.4	11.09	0.51	3.5	9	7	3.48	----	1.51	Silty CLAY to CLAY	"
52.04	12.6	9.66	0.47	3.7	8	6	3.51	----	1.26	"	"
52.54	11.4	8.70	0.39	3.4	7	6	3.54	----	1.37	"	110-120
53.05	13.8	10.48	0.55	4.0	13	10	3.57	----	1.41	CLAY	120-130
53.56	14.6	11.04	0.80	5.5	14	11	3.60	----	1.52	"	"
54.00	32.1	24.15	1.91	6.0	32	24	3.63	----	3.85	"	130-140

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 120.0 feet

CPT NO.: 1-CPT4
DATE: 06-11-2012
TIME: 12:54:00
Groundwater measured at 8.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
54.58	59.0	44.11	2.63	4.5	39	29	3.67	----	7.43	Silty CLAY to CLAY	130-140
55.08	25.0	18.58	1.49	6.0	25	18	3.71	----	2.89	CLAY	"
55.58	12.0	8.88	0.65	5.4	12	9	3.74	----	1.15	"	120-130
56.07	13.6	10.01	0.69	5.1	13	10	3.77	----	1.36	"	"
56.57	14.4	10.55	0.75	5.2	14	10	3.80	----	1.46	"	"
57.05	14.2	10.35	0.65	4.6	14	10	3.83	----	1.43	"	"
57.55	13.3	9.65	0.62	4.7	13	9	3.86	----	1.31	"	"
58.08	14.6	10.54	0.68	4.7	14	10	3.90	----	1.48	"	"
58.58	13.7	9.84	0.57	4.2	13	9	3.93	----	1.35	"	"
59.06	14.7	10.51	0.66	4.5	14	10	3.96	----	1.48	"	"
59.54	14.9	10.60	0.65	4.4	14	10	3.99	----	1.51	"	"
60.02	19.1	13.53	0.87	4.6	18	13	4.02	----	2.06	"	"
60.55	18.1	12.77	0.83	4.6	17	12	4.05	----	1.92	"	"
61.02	21.5	15.11	1.02	4.7	20	14	4.09	----	2.37	"	130-140
61.52	20.4	14.27	0.98	4.8	19	14	4.12	----	2.22	"	"
62.02	20.9	14.56	1.12	5.4	20	14	4.16	----	2.28	"	"
62.53	21.7	15.05	1.10	5.1	21	14	4.20	----	2.39	"	"
63.03	21.0	14.50	1.01	4.8	20	14	4.23	----	2.29	"	"
63.52	21.6	14.84	1.01	4.7	21	14	4.27	----	2.36	"	"
64.00	20.2	13.82	0.97	4.8	19	13	4.30	----	2.17	"	"
64.50	21.9	14.92	1.07	4.9	21	14	4.34	----	2.40	"	"
65.00	23.5	15.94	1.19	5.1	23	15	4.38	----	2.60	"	"
65.58	22.0	14.84	1.14	5.2	21	14	4.42	----	2.40	"	"
66.07	20.6	13.83	1.10	5.3	20	13	4.45	----	2.21	"	"
66.57	23.1	15.44	1.01	4.4	15	10	4.49	----	2.54	Silty CLAY to CLAY	"
67.08	21.4	14.24	1.10	5.1	21	14	4.53	----	2.31	CLAY	"
67.57	21.6	14.31	1.14	5.3	21	14	4.56	----	2.33	"	"
68.05	18.2	12.01	0.80	4.4	18	12	4.59	----	1.87	"	120-130
68.53	20.1	13.21	0.84	4.2	13	8	4.62	----	2.12	Silty CLAY to CLAY	"
69.02	18.6	12.17	0.73	3.9	12	8	4.65	----	1.92	"	"
69.57	23.0	14.98	0.87	3.8	15	10	4.69	----	2.50	"	130-140
70.08	22.4	14.52	0.81	3.6	14	9	4.72	----	2.41	"	120-130
70.55	19.9	12.85	0.57	2.9	9	6	4.75	----	2.08	Clayey SILT to Silty CLAY	"
71.03	21.0	13.51	0.68	3.2	10	6	4.78	----	2.22	"	"
71.52	26.0	16.66	0.77	3.0	12	8	4.81	----	2.88	"	"
72.00	22.3	14.23	0.70	3.1	10	6	4.84	----	2.38	"	"
72.57	24.9	15.80	0.87	3.5	12	7	4.89	----	2.73	"	130-140
73.06	24.4	15.41	1.20	4.9	23	15	4.92	----	2.65	CLAY	"
73.57	23.6	14.83	1.13	4.8	23	14	4.96	----	2.54	"	"
74.04	18.5	11.58	0.99	5.4	18	11	4.99	----	1.86	"	120-130
74.52	17.8	11.10	0.87	4.9	17	11	5.02	----	1.76	"	"
75.00	17.3	10.76	0.69	4.0	11	7	5.05	----	1.69	Silty CLAY to CLAY	"
75.57	17.0	10.53	0.64	3.8	11	7	5.08	----	1.65	"	"
76.05	19.0	11.73	0.57	3.0	9	6	5.11	----	1.91	Clayey SILT to Silty CLAY	"
76.54	21.6	13.30	0.69	3.2	10	6	5.14	----	2.25	"	"
77.06	23.2	14.23	0.72	3.1	11	7	5.18	----	2.46	"	"
77.55	24.7	15.10	1.01	4.1	16	9	5.21	----	2.66	Silty CLAY to CLAY	130-140
78.03	20.6	12.55	0.74	3.6	13	8	5.24	----	2.11	"	120-130
78.51	20.6	12.51	0.72	3.5	13	8	5.27	----	2.10	"	"
79.06	22.6	13.67	0.94	4.2	14	9	5.31	----	2.36	"	130-140
79.52	22.6	13.62	0.74	3.3	11	7	5.34	----	2.36	Clayey SILT to Silty CLAY	120-130
80.07	30.4	18.25	1.43	4.7	29	18	5.38	----	3.39	CLAY	130-140
80.53	25.5	15.25	1.04	4.1	16	10	5.41	----	2.74	Silty CLAY to CLAY	"
81.00	25.4	15.13	1.02	4.0	16	10	5.45	----	2.72	"	"

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DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
81.54	24.9	14.77	1.02	4.1	16	9	5.49	----	2.65	Silty CLAY to CLAY	130-140
82.01	23.0	13.60	0.82	3.6	11	7	5.52	----	2.39	Clayey SILT to Silty CLAY	120-130
82.52	22.5	13.25	0.88	3.9	14	9	5.55	----	2.32	Silty CLAY to CLAY	130-140
83.03	19.6	11.50	0.76	3.9	12	7	5.59	----	1.93	"	120-130
83.54	19.8	11.58	0.70	3.5	13	7	5.62	----	1.95	"	"
84.07	19.0	11.07	0.62	3.3	9	5	5.65	----	1.84	Clayey SILT to Silty CLAY	"
84.51	20.4	11.85	0.51	2.5	10	6	5.68	----	2.02	"	"
85.05	20.0	11.57	0.47	2.3	9	5	5.71	----	1.97	"	"
85.50	23.7	13.67	0.67	2.8	11	6	5.74	----	2.45	"	"
86.03	25.3	14.54	0.75	3.0	12	7	5.77	----	2.66	"	"
86.56	23.9	13.68	0.73	3.1	11	6	5.81	----	2.47	"	"
87.00	21.1	12.04	0.60	2.8	10	6	5.84	----	2.10	"	"
87.52	22.1	12.56	0.97	4.4	21	12	5.87	----	2.22	CLAY	130-140
88.06	20.4	11.55	0.52	2.5	9	5	5.91	----	1.99	Clayey SILT to Silty CLAY	120-130
88.52	21.7	12.24	0.52	2.4	10	6	5.94	----	2.16	"	"
89.06	27.3	15.34	0.70	2.6	13	7	5.97	----	2.90	"	"
89.53	23.1	12.94	0.58	2.5	11	6	6.00	----	2.34	"	"
90.07	25.8	14.41	0.58	2.2	9	5	6.03	----	2.70	Sandy SILT to Clayey SILT	"
90.54	26.3	14.65	0.71	2.7	12	7	6.06	----	2.76	Clayey SILT to Silty CLAY	"
91.04	24.4	13.55	0.60	2.5	11	6	6.09	----	2.50	"	"
91.51	26.7	14.79	0.58	2.2	10	5	6.12	----	2.80	Sandy SILT to Clayey SILT	"
92.07	27.9	15.40	0.63	2.3	10	6	6.16	----	2.96	"	"
92.55	24.9	13.71	0.54	2.2	9	5	6.19	----	2.56	"	"
93.04	32.8	18.01	0.70	2.1	12	7	6.22	----	3.61	"	"
93.52	28.0	15.33	0.55	2.0	10	6	6.25	----	2.96	"	"
94.04	38.1	20.79	0.81	2.1	14	8	6.29	----	4.30	"	130-140
94.53	29.0	15.78	0.58	2.0	10	6	6.32	----	3.09	"	120-130
95.02	28.9	15.68	0.58	2.0	10	6	6.35	----	3.07	"	"
95.50	26.1	14.12	0.57	2.2	10	5	6.38	----	2.69	"	"
96.07	27.4	14.78	0.56	2.0	10	5	6.41	----	2.86	"	"
96.56	31.2	16.78	0.59	1.9	11	6	6.44	----	3.36	"	"
97.04	27.4	14.69	0.64	2.3	10	5	6.47	----	2.85	"	"
97.52	31.0	16.58	0.60	1.9	11	6	6.50	----	3.33	"	"
98.08	28.9	15.41	0.57	2.0	10	6	6.54	----	3.04	"	"
98.56	30.0	15.95	0.56	1.9	11	6	6.57	----	3.19	"	"
99.04	34.5	18.29	0.67	1.9	12	7	6.60	----	3.78	"	"
99.51	36.1	19.08	0.73	2.0	13	7	6.63	----	3.99	"	"
100.07	39.5	20.81	0.78	2.0	14	8	6.66	----	4.44	"	"
100.54	39.1	20.53	0.85	2.2	14	7	6.70	----	4.38	"	130-140
101.06	30.3	15.86	0.59	1.9	11	6	6.73	----	3.20	"	120-130
101.57	25.1	13.10	0.46	1.8	9	5	6.76	----	2.51	"	"
102.05	23.3	12.13	0.43	1.8	8	4	6.79	----	2.26	"	"
102.53	24.3	12.61	0.47	1.9	9	4	6.82	----	2.39	"	"
103.01	24.9	12.88	0.48	1.9	9	5	6.85	----	2.47	"	"
103.57	25.9	13.35	0.55	2.1	9	5	6.89	----	2.60	"	"
104.08	25.5	13.11	0.53	2.1	9	5	6.92	----	2.54	"	"
104.55	59.7	30.59	1.93	3.2	23	12	6.95	----	7.09	"	130-140
105.06	22.5	11.49	0.50	2.2	9	4	6.99	----	2.13	"	120-130
105.54	22.2	11.31	0.50	2.3	10	5	7.02	----	2.09	Clayey SILT to Silty CLAY	"
106.02	24.2	12.31	0.83	3.4	11	6	7.05	----	2.35	"	"
106.51	52.2	26.50	1.45	2.8	21	11	7.08	----	6.08	Sandy SILT to Clayey SILT	130-140
107.00	22.3	11.30	0.59	2.6	10	5	7.11	----	2.09	Clayey SILT to Silty CLAY	120-130
107.51	23.5	11.88	0.55	2.3	10	5	7.14	----	2.24	"	"
108.03	24.3	12.26	0.50	2.1	8	4	7.18	----	2.35	Sandy SILT to Clayey SILT	"

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ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
108.51	24.3	12.24	0.55	2.3	11	5	7.21	----	2.34	Clayey SILT to Silty CLAY	120-130
109.01	24.6	12.37	0.50	2.0	9	4	7.24	----	2.38	Sandy SILT to Clayey SILT	"
109.51	66.1	33.17	1.98	3.0	26	13	7.27	----	7.91	"	130-140
110.03	20.4	10.22	0.92	4.5	19	9	7.31	----	1.81	CLAY	120-130
110.53	27.7	13.85	0.71	2.6	12	6	7.34	----	2.78	Clayey SILT to Silty CLAY	"
111.01	23.8	11.88	0.67	2.8	11	5	7.37	----	2.25	"	"
111.53	25.7	12.79	0.79	3.1	12	6	7.41	----	2.50	"	130-140
112.04	23.5	11.68	0.50	2.1	8	4	7.44	----	2.20	Sandy SILT to Clayey SILT	120-130
112.52	24.1	11.95	0.53	2.2	8	4	7.47	----	2.28	"	"
113.02	32.6	16.13	1.28	3.9	16	8	7.50	----	3.41	Clayey SILT to Silty CLAY	130-140
113.52	23.7	11.71	0.69	2.9	11	5	7.53	----	2.22	"	120-130
114.02	22.4	11.04	0.46	2.1	8	4	7.57	----	2.04	Sandy SILT to Clayey SILT	"
114.52	21.3	10.48	0.47	2.2	9	5	7.60	----	1.89	Clayey SILT to Silty CLAY	"
115.04	26.3	12.92	0.56	2.1	9	5	7.63	----	2.55	Sandy SILT to Clayey SILT	"
115.52	34.5	16.91	0.65	1.9	12	6	7.66	----	3.64	"	"
116.02	26.8	13.11	0.65	2.4	10	5	7.69	----	2.61	"	"
116.52	24.3	11.87	0.49	2.0	8	4	7.72	----	2.27	"	"
117.02	24.8	12.09	0.46	1.9	8	4	7.75	----	2.34	"	"
117.53	30.9	15.03	0.49	1.6	11	5	7.79	----	3.15	"	"
118.04	27.4	13.30	0.43	1.6	10	5	7.82	----	2.67	"	"
118.50	28.0	13.57	0.44	1.6	10	5	7.85	----	2.75	"	"
119.01	29.6	14.32	0.51	1.7	10	5	7.88	----	2.96	"	"
119.55	106.4	51.33	7.24	6.8	101	49	7.92	----	13.19	Very Stiff Fine Grained *	>140
120.02	134.1	64.54	11.43	8.5	130	63	7.96	----	16.88	"	"

DEPTH = Sampling interval (~0.1 feet)
Qc = Tip bearing uncorrected   Qt = Tip bearing corrected   Fs = Sleeve friction resistance   Rf = Qt / Fs
SPT = Equivalent Standard Penetration Test   Qt' and SPT' = Qt and SPT corrected for overburden
EffVtStr = Effective Vertical Stress using est. density**   Phi = Soil friction angle*
Su = Undrained Soil Strength* (see classification chart)
References: * Robertson and Campanella, 1988   **Olsen, 1989   *** Durgunoglu & Mitchell, 1975

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 80.0 feet

CPT NO.: 1-CPT5
DATE: 06-12-2012
TIME: 13:13:00
Groundwater measured at 9.3 feet

ENGEO, INC.

cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.53	0.8	1.28	0.00	0.1	1	1	0.06	----	0.15	Organic Material	<80
1.04	1.4	2.24	1.22	20.0	1	2	0.11	----	0.27	"	100-110
1.50	0.0	2.24	0.76	20.0	1	2	0.11	----	0.27	"	"
2.01	33.6	53.76	1.75	5.2	34	54	0.18	----	4.47	CLAY	130-140
2.54	12.7	20.32	0.92	7.2	13	20	0.25	----	1.68	"	120-130
3.02	9.6	15.36	0.76	7.9	10	15	0.31	----	1.57	"	"
3.55	12.7	20.32	0.64	5.0	13	20	0.37	----	1.67	"	"
4.05	7.9	12.64	0.23	2.9	5	8	0.43	----	1.54	Silty CLAY to CLAY	100-110
4.51	11.8	18.88	0.70	5.9	12	19	0.49	----	1.93	CLAY	120-130
5.00	10.4	16.64	0.34	3.3	7	11	0.54	----	1.69	Silty CLAY to CLAY	110-120
5.51	6.3	10.08	0.32	5.1	6	10	0.59	----	1.20	CLAY	100-110
6.05	2.0	3.20	0.15	7.5	2	3	0.65	----	0.34	Organic Material	90-100
6.55	2.5	4.00	0.15	6.0	3	4	0.69	----	0.43	"	"
7.04	4.0	6.40	0.44	11.0	4	6	0.74	----	0.73	"	100-110
7.53	4.3	6.88	0.28	6.5	4	7	0.80	----	0.78	CLAY	"
8.03	1.5	2.33	0.28	18.7	1	2	0.84	----	0.22	Organic Material	90-100
8.55	1.8	2.71	0.19	10.6	2	3	0.89	----	0.27	"	"
9.02	2.9	4.24	0.15	5.2	3	4	0.94	----	0.49	CLAY	"
9.54	2.4	3.47	0.11	4.6	2	3	0.96	----	0.38	"	"
10.01	2.0	2.87	0.04	2.0	1	1	0.97	----	0.30	Sensitive Fine Grained	85-90
10.56	1.8	2.56	0.02	1.1	1	1	0.98	----	0.25	"	80-85
11.07	1.8	2.54	0.02	1.1	1	1	0.99	----	0.25	"	"
11.54	7.2	10.03	0.38	5.3	7	10	1.01	----	1.32	CLAY	110-120
12.08	9.2	12.68	0.46	5.0	9	13	1.04	----	1.43	"	"
12.54	10.5	14.31	0.65	6.2	10	14	1.07	----	1.64	"	120-130
13.03	10.1	13.61	0.74	7.3	10	13	1.10	----	1.57	"	"
13.58	9.7	12.90	0.67	6.9	10	13	1.14	----	1.50	"	"
14.08	14.2	18.65	0.83	5.8	14	18	1.17	----	1.79	"	"
14.58	18.5	23.99	0.73	3.9	12	16	1.20	----	2.36	Silty CLAY to CLAY	"
15.04	15.4	19.74	0.71	4.6	15	19	1.23	----	1.95	CLAY	"
15.55	13.8	17.47	0.75	5.4	14	17	1.26	----	1.73	"	"
16.05	32.4	40.45	1.39	4.3	22	27	1.29	----	4.20	Silty CLAY to CLAY	130-140
16.54	13.6	16.78	1.05	7.7	14	17	1.33	----	1.69	CLAY	120-130
17.03	7.2	8.78	1.18	16.4	7	9	1.36	----	1.25	Organic Material	"
17.52	66.9	80.41	2.28	3.4	27	32	1.39	----	8.79	Sandy SILT to Clayey SILT	130-140
18.05	160.2	189.59	3.80	2.4	53	63	1.43	42	----	Silty SAND to Sandy SILT	"
18.54	139.9	163.18	2.48	1.8	35	41	1.47	41	----	SAND to Silty SAND	"
19.06	131.4	151.19	1.55	1.2	33	38	1.50	40	----	"	120-130
19.54	93.1	106.12	1.13	1.2	23	27	1.53	38	----	"	"
20.03	15.4	17.38	0.81	5.3	15	17	1.56	----	1.90	CLAY	"
20.53	12.8	14.30	0.76	5.9	13	14	1.59	----	1.55	"	"
21.03	11.8	13.05	0.51	4.3	12	13	1.62	----	1.77	"	"
21.52	9.4	10.31	0.33	3.5	9	10	1.65	----	1.36	"	110-120
22.03	10.1	10.98	0.34	3.4	7	7	1.67	----	1.48	Silty CLAY to CLAY	"
22.55	14.5	15.60	0.44	3.0	7	8	1.71	----	1.76	Clayey SILT to Silty CLAY	120-130
23.06	14.5	15.43	0.44	3.0	7	8	1.74	----	1.76	"	"
23.51	15.5	16.37	0.67	4.3	15	16	1.77	----	1.89	CLAY	"
24.02	18.5	19.39	0.61	3.3	9	10	1.80	----	2.28	Clayey SILT to Silty CLAY	"
24.55	14.5	15.08	0.53	3.7	10	10	1.83	----	1.75	Silty CLAY to CLAY	"
25.00	13.7	14.16	0.57	4.2	13	14	1.86	----	1.64	CLAY	"
25.52	11.0	11.30	0.47	4.3	11	11	1.89	----	1.59	"	110-120
26.01	12.4	12.64	0.54	4.4	12	12	1.92	----	1.45	"	120-130
26.50	17.6	17.81	0.76	4.3	17	18	1.95	----	2.14	"	"
27.06	16.4	16.46	0.69	4.2	16	16	1.98	----	1.98	"	"
27.51	14.2	14.20	0.64	4.5	14	14	2.01	----	1.68	"	"

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 80.0 feet

CPT NO.: 1-CPT5
DATE: 06-12-2012
TIME: 13:13:00
Groundwater measured at 9.3 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
28.00	10.6	10.59	0.46	4.3	10	10	2.04	----	1.50	CLAY	110-120
28.57	9.3	9.29	0.41	4.4	9	9	2.07	----	1.28	"	"
29.03	7.9	7.89	0.33	4.2	8	8	2.09	----	1.25	"	"
29.52	7.4	7.38	0.34	4.6	7	7	2.12	----	1.14	"	"
30.04	8.9	8.87	0.33	3.7	9	9	2.15	----	1.43	"	"
30.53	6.9	6.88	0.30	4.3	7	7	2.17	----	1.03	"	100-110
31.02	7.4	7.37	0.28	3.8	7	7	2.19	----	1.12	"	"
31.57	9.1	9.06	0.30	3.3	9	9	2.22	----	1.21	"	110-120
32.03	9.1	9.06	0.33	3.6	9	9	2.24	----	1.21	"	"
32.56	8.6	8.55	0.27	3.1	5	5	2.26	----	1.35	Silty CLAY to CLAY	100-110
33.00	7.6	7.56	0.26	3.4	7	7	2.28	----	1.14	CLAY	"
33.53	9.6	9.54	0.28	2.9	6	6	2.30	----	1.28	Silty CLAY to CLAY	"
34.01	11.4	11.32	0.48	4.2	11	11	2.33	----	1.58	CLAY	110-120
34.50	8.1	8.04	0.23	2.8	5	5	2.35	----	1.23	Silty CLAY to CLAY	100-110
35.01	8.8	8.73	0.25	2.8	5	5	2.37	----	1.36	"	"
35.58	8.5	8.43	0.21	2.5	5	5	2.40	----	1.29	"	"
36.05	8.1	8.03	0.25	3.1	7	7	2.42	----	1.21	CLAY	"
36.53	8.7	8.62	0.30	3.4	8	8	2.44	----	1.32	"	"
37.01	9.6	9.51	0.23	2.4	6	6	2.46	----	1.25	Silty CLAY to CLAY	"
37.57	18.5	18.32	0.55	3.0	9	9	2.49	----	2.18	Clayey SILT to Silty CLAY	120-130
38.04	14.8	14.57	0.27	1.8	7	7	2.52	----	1.68	"	110-120
38.52	8.9	8.70	0.22	2.5	6	5	2.54	----	1.34	Silty CLAY to CLAY	100-110
39.00	9.1	8.83	0.27	3.0	6	6	2.56	----	1.15	"	"
39.56	13.5	12.97	0.35	2.6	6	6	2.59	----	1.50	Clayey SILT to Silty CLAY	110-120
40.04	15.0	14.27	0.64	4.3	14	14	2.62	----	1.70	CLAY	120-130
40.52	17.6	16.57	0.58	3.3	12	11	2.65	----	2.04	Silty CLAY to CLAY	"
41.01	10.6	9.89	0.36	3.4	7	6	2.67	----	1.38	"	110-120
41.56	14.0	12.90	0.82	5.9	13	12	2.71	----	1.55	CLAY	120-130
42.04	17.2	15.68	0.94	5.5	17	15	2.74	----	1.97	"	"
42.51	20.5	18.49	0.61	3.0	10	9	2.77	----	2.41	Clayey SILT to Silty CLAY	"
43.06	12.8	11.40	0.46	3.6	8	7	2.80	----	1.38	Silty CLAY to CLAY	"
43.54	13.3	11.73	0.40	3.0	9	8	2.83	----	1.44	"	110-120
44.05	14.5	12.64	0.39	2.7	7	6	2.86	----	1.60	Clayey SILT to Silty CLAY	120-130
44.52	15.5	13.36	0.43	2.8	8	6	2.89	----	1.73	"	"
45.00	18.0	15.33	0.52	2.9	9	7	2.92	----	2.06	"	"
45.51	62.3	52.32	2.60	4.2	31	26	2.96	----	7.96	"	130-140
46.04	115.0	95.10	3.39	2.9	46	38	2.99	----	14.98	Sandy SILT to Clayey SILT	"
46.58	86.7	71.20	4.22	4.9	87	71	3.03	----	11.20	Very Stiff Fine Grained *	"
47.03	38.9	31.80	2.30	5.9	39	32	3.07	----	4.82	CLAY	"
47.54	20.8	16.91	1.13	5.4	21	17	3.10	----	2.41	"	"
48.08	10.6	8.58	0.51	4.8	10	8	3.14	----	1.30	"	120-130
48.56	11.7	9.43	0.55	4.7	12	9	3.17	----	1.48	"	"
49.05	12.3	9.87	0.56	4.6	12	10	3.20	----	1.26	"	"
49.56	23.2	18.52	1.35	5.8	23	18	3.23	----	2.71	"	130-140
50.07	21.4	16.99	0.83	3.9	14	11	3.27	----	2.46	Silty CLAY to CLAY	"
50.58	14.1	11.14	0.72	5.1	14	11	3.30	----	1.49	CLAY	120-130
51.02	14.2	11.18	0.75	5.3	14	11	3.33	----	1.50	"	"
51.53	17.3	13.54	1.00	5.8	17	13	3.37	----	1.91	"	130-140
52.04	19.0	14.79	1.14	6.0	19	15	3.41	----	2.13	"	"
52.55	17.6	13.63	1.14	6.5	17	13	3.44	----	1.94	"	"
53.06	15.0	11.56	0.91	6.1	15	11	3.47	----	1.59	"	120-130
53.54	13.3	10.20	0.73	5.5	13	10	3.50	----	1.35	"	"
54.05	13.6	10.38	0.64	4.7	13	10	3.54	----	1.39	"	"
54.56	15.1	11.47	0.70	4.6	15	11	3.57	----	1.59	"	"
55.07	16.8	12.70	0.78	4.6	16	12	3.60	----	1.81	"	"

PROJECT: 20-80 CHEMICAL WAY SITE
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DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
55.50	15.1	11.37	0.61	4.0	15	11	3.63	----	1.58	CLAY	120-130
56.01	11.8	8.84	0.55	4.7	11	8	3.66	----	1.42	"	"
56.52	12.8	9.54	0.60	4.7	12	9	3.69	----	1.26	"	"
57.06	13.5	10.01	0.58	4.3	13	9	3.72	----	1.35	"	"
57.57	14.0	10.33	0.58	4.1	13	10	3.76	----	1.41	"	"
58.08	13.8	10.13	0.60	4.3	13	9	3.79	----	1.38	"	"
58.51	15.9	11.63	0.58	3.6	10	7	3.81	----	1.66	Silty CLAY to CLAY	"
59.02	14.3	10.41	0.60	4.2	13	10	3.85	----	1.44	CLAY	"
59.52	15.3	11.08	0.62	4.1	14	10	3.88	----	1.57	"	"
60.10	20.1	14.47	0.82	4.1	13	9	3.91	----	2.21	Silty CLAY to CLAY	"
60.51	18.9	13.55	0.86	4.6	18	13	3.94	----	2.04	CLAY	"
61.02	16.8	11.98	0.74	4.4	16	11	3.97	----	1.76	"	"
61.52	18.4	13.06	0.90	4.9	18	12	4.00	----	1.97	"	"
62.03	18.8	13.29	0.92	4.9	18	13	4.04	----	2.02	"	"
62.52	18.5	13.03	0.90	4.9	18	13	4.07	----	1.97	"	"
63.02	17.5	12.28	0.82	4.7	17	12	4.10	----	1.84	"	"
63.51	18.0	12.58	0.83	4.6	17	12	4.13	----	1.90	"	"
64.01	20.8	14.48	1.02	4.9	20	14	4.16	----	2.27	"	130-140
64.58	19.5	13.51	0.93	4.8	19	13	4.20	----	2.09	"	120-130
65.08	19.6	13.52	0.93	4.7	19	13	4.24	----	2.10	"	130-140
65.58	21.0	14.42	1.02	4.9	20	14	4.27	----	2.28	"	"
66.07	20.4	13.95	0.91	4.5	20	13	4.31	----	2.20	"	"
66.51	21.9	14.92	1.12	5.1	21	14	4.34	----	2.39	"	"
67.08	22.8	15.45	1.17	5.1	22	15	4.38	----	2.51	"	"
67.57	22.6	15.24	1.02	4.5	22	15	4.42	----	2.48	"	"
68.06	21.6	14.51	1.08	5.0	21	14	4.45	----	2.34	"	"
68.55	19.9	13.30	0.97	4.9	19	13	4.49	----	2.11	"	"
69.04	18.9	12.59	0.85	4.5	18	12	4.52	----	1.97	"	120-130
69.53	19.0	12.60	0.86	4.5	18	12	4.55	----	1.98	"	"
70.07	19.0	12.55	0.86	4.5	18	12	4.58	----	1.97	"	"
70.57	20.9	13.74	0.92	4.4	20	13	4.62	----	2.22	"	130-140
71.08	21.9	14.33	0.90	4.1	14	9	4.66	----	2.35	Silty CLAY to CLAY	"
71.58	22.4	14.59	0.92	4.1	14	9	4.69	----	2.41	"	"
72.08	24.6	15.94	1.11	4.5	24	15	4.73	----	2.70	CLAY	"
72.58	22.5	14.51	0.94	4.2	14	9	4.77	----	2.42	Silty CLAY to CLAY	"
73.02	20.3	13.04	0.94	4.6	19	12	4.80	----	2.12	CLAY	"
73.52	21.5	13.74	0.97	4.5	21	13	4.83	----	2.28	"	"
74.03	17.5	11.14	0.96	5.5	17	11	4.87	----	1.74	"	120-130
74.55	16.9	10.71	0.91	5.4	16	10	4.90	----	1.65	"	"
75.07	18.0	11.36	0.94	5.2	17	11	4.93	----	1.80	"	"
75.59	17.9	11.24	0.89	5.0	17	11	4.96	----	1.78	"	"
76.02	15.6	9.76	0.60	3.8	10	6	4.99	----	1.47	Silty CLAY to CLAY	"
76.57	15.7	9.79	0.52	3.3	10	6	5.02	----	1.48	"	"
77.01	16.3	10.13	0.59	3.6	10	6	5.05	----	1.55	"	"
77.53	16.7	10.35	0.57	3.4	11	7	5.08	----	1.60	"	"
78.05	16.2	10.00	0.49	3.0	8	5	5.12	----	1.53	Clayey SILT to Silty CLAY	"
78.57	17.1	10.52	0.47	2.7	8	5	5.15	----	1.65	"	"
79.08	17.7	10.85	0.53	3.0	8	5	5.18	----	1.72	"	"
79.56	19.1	11.67	0.52	2.7	9	5	5.21	----	1.91	"	"
80.08	20.8	12.67	0.61	2.9	9	6	5.24	----	2.13	"	"

DEPTH = Sampling interval (~0.1 feet)
Qc = Tip bearing uncorrected   Qt = Tip bearing corrected   Fs = Sleeve friction resistance   Rf = Qt / Fs
SPT = Equivalent Standard Penetration Test   Qt' and SPT' = Qt and SPT corrected for overburden
EffVtStr = Effective Vertical Stress using est. density**   Phi = Soil friction angle*
Su = Undrained Soil Strength* (see classification chart)
References: * Robertson and Campanella, 1988 **Olsen, 1989 *** Durgunoglu & Mitchell, 1975

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 100.0 feet

CPT NO.: 1-CPT6
DATE: 06-13-2012
TIME: 15:18:00
Groundwater measured at 8.9 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
0.52	25.0	40.00	1.17	4.7	25	40	0.06	----	3.33	CLAY	130-140
1.01	22.3	35.68	1.41	6.3	22	35	0.13	----	2.96	"	"
1.55	30.7	49.12	1.38	4.5	20	32	0.20	----	4.08	Silty CLAY to CLAY	"
2.01	22.7	36.32	1.21	5.3	22	36	0.26	----	3.01	CLAY	"
2.56	17.0	27.20	0.83	4.9	17	27	0.33	----	2.24	"	120-130
3.04	16.6	26.56	0.82	4.9	17	26	0.39	----	2.19	"	"
3.57	16.1	25.76	1.05	6.5	16	26	0.46	----	2.12	"	130-140
4.05	13.5	21.60	0.89	6.6	13	21	0.52	----	1.77	"	120-130
4.52	9.9	15.84	0.77	7.8	10	16	0.58	----	1.60	"	"
5.03	26.5	42.40	1.01	3.8	18	28	0.65	----	3.49	Silty CLAY to CLAY	130-140
5.52	11.7	18.72	0.88	7.5	12	19	0.71	----	1.89	CLAY	120-130
6.05	30.5	48.80	0.67	2.2	12	19	0.78	----	4.01	Sandy SILT to Clayey SILT	"
6.52	13.9	21.75	0.63	4.5	14	22	0.84	----	1.80	CLAY	"
7.05	4.9	7.39	0.41	8.4	5	7	0.89	----	0.89	Organic Material	100-110
7.53	5.0	7.29	0.28	5.6	5	7	0.94	----	0.91	CLAY	"
8.05	1.4	1.98	0.14	10.0	1	2	0.99	----	0.18	Organic Material	85-90
8.59	2.0	2.76	0.13	6.5	2	3	1.03	----	0.30	"	"
9.04	0.8	1.10	0.05	6.3	1	1	1.05	----	0.05	"	"
9.59	1.7	2.33	0.06	3.5	2	2	1.06	----	0.23	CLAY	"
10.02	1.7	2.32	0.10	5.9	2	2	1.07	----	0.22	Organic Material	"
10.50	2.4	3.26	0.05	2.1	1	1	1.08	----	0.36	Sensitive Fine Grained	"
11.03	2.2	2.97	0.05	2.3	1	1	1.10	----	0.32	"	"
11.56	2.5	3.36	0.05	2.0	1	1	1.11	----	0.37	"	"
12.01	3.6	4.81	0.16	4.4	3	4	1.12	----	0.59	CLAY	90-100
12.56	12.0	15.81	0.54	4.5	12	15	1.16	----	1.51	"	120-130
13.04	9.9	12.89	0.57	5.8	10	13	1.19	----	1.53	"	"
13.52	3.7	4.78	0.41	11.1	4	5	1.21	----	0.59	Organic Material	100-110
14.02	13.7	17.47	0.60	4.4	14	17	1.24	----	1.72	CLAY	120-130
14.51	13.3	16.76	0.71	5.3	13	16	1.27	----	1.66	"	"
15.06	17.5	21.77	0.72	4.1	11	14	1.30	----	2.22	Silty CLAY to CLAY	"
15.55	25.5	31.27	0.93	3.6	13	15	1.34	----	3.28	Clayey SILT to Silty CLAY	130-140
16.06	9.4	11.41	0.47	5.0	9	11	1.37	----	1.41	CLAY	110-120
16.57	5.6	6.75	0.17	3.0	5	6	1.38	----	0.93	"	90-100
17.01	6.2	7.43	0.13	2.1	4	5	1.40	----	1.05	Silty CLAY to CLAY	"
17.53	40.7	48.16	0.49	1.2	14	16	1.43	34	----	Silty SAND to Sandy SILT	120-130
18.04	32.2	37.52	0.84	2.6	13	15	1.47	----	4.16	Sandy SILT to Clayey SILT	130-140
18.53	65.8	75.72	0.66	1.0	16	19	1.50	36	----	SAND to Silty SAND	120-130
19.07	88.7	100.97	0.82	0.9	22	25	1.53	38	----	"	"
19.51	102.1	115.05	1.78	1.7	34	38	1.56	39	----	Silty SAND to Sandy SILT	130-140
20.03	135.0	150.80	1.03	0.8	27	30	1.59	40	----	SAND	110-120
20.51	153.7	170.28	0.94	0.6	31	34	1.62	41	----	"	"
21.02	149.2	163.57	1.24	0.8	30	33	1.65	41	----	"	120-130
21.55	207.8	225.35	1.81	0.9	42	45	1.68	43	----	"	"
22.03	174.8	187.68	1.88	1.1	35	38	1.71	42	----	"	"
22.56	76.1	80.66	2.38	3.1	30	32	1.75	----	9.97	Sandy SILT to Clayey SILT	130-140
23.02	18.8	19.80	0.80	4.3	19	20	1.78	----	2.33	CLAY	120-130
23.52	21.1	22.03	1.29	6.1	21	22	1.82	----	2.63	"	130-140
24.02	10.8	11.21	0.43	4.0	11	11	1.84	----	1.57	"	110-120
24.57	8.1	8.35	0.41	5.1	8	8	1.87	----	1.33	"	"
25.04	21.6	22.09	0.82	3.8	14	15	1.90	----	2.68	Silty CLAY to CLAY	130-140
25.51	16.7	16.96	0.55	3.3	11	11	1.93	----	2.03	"	120-130
26.05	58.6	58.97	1.33	2.3	23	24	1.97	----	7.61	Sandy SILT to Clayey SILT	130-140
26.56	28.8	28.80	0.67	2.3	11	11	2.01	----	3.63	"	120-130
27.02	28.6	28.58	1.03	3.6	14	14	2.04	----	3.60	Clayey SILT to Silty CLAY	130-140

PROJECT: 20-80 CHEMICAL WAY SITE
LOCATION: Redwood City CA
PROJ. NO.: 9515.000.000(EGO-205)
Terminated at 100.0 feet

CPT NO.: 1-CPT6
DATE: 06-13-2012
TIME: 15:18:00
Groundwater measured at 8.9 feet

ENGEO, INC.
cpts by John Sarmiento & Associates

DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
27.54	37.0	36.94	1.82	4.9	37	36	2.08	----	4.72	CLAY	130-140
28.01	40.9	40.81	1.69	4.1	20	20	2.11	----	5.23	Clayey SILT to Silty CLAY	"
28.56	61.4	61.21	2.31	3.8	31	31	2.15	----	7.96	"	"
29.01	83.8	83.49	1.27	1.5	28	28	2.18	37	----	Silty SAND to Sandy SILT	"
29.53	101.8	101.35	2.16	2.1	34	34	2.22	38	----	"	"
30.03	150.1	149.33	4.83	3.2	60	60	2.26	----	19.77	Sandy SILT to Clayey SILT	"
30.53	143.1	142.26	2.68	1.9	48	47	2.29	40	----	Silty SAND to Sandy SILT	"
31.03	86.0	85.43	2.62	3.0	34	34	2.33	----	11.22	Sandy SILT to Clayey SILT	"
31.52	106.7	105.92	2.97	2.8	43	42	2.37	----	13.97	"	"
32.00	83.5	82.83	1.62	1.9	28	28	2.40	37	----	Silty SAND to Sandy SILT	"
32.58	10.1	10.01	0.48	4.8	10	10	2.43	----	1.36	CLAY	110-120
33.00	8.7	8.62	0.49	5.6	9	9	2.45	----	1.34	"	"
33.50	9.7	9.61	0.37	3.8	10	10	2.48	----	1.28	"	"
34.02	10.3	10.17	0.35	3.4	7	7	2.51	----	1.38	Silty CLAY to CLAY	"
34.54	9.5	9.30	0.30	3.2	6	6	2.53	----	1.24	"	"
35.07	9.7	9.40	0.28	2.9	6	6	2.56	----	1.27	"	"
35.50	10.2	9.81	0.27	2.6	7	6	2.58	----	1.34	"	"
36.04	10.8	10.29	0.29	2.7	7	7	2.61	----	1.44	"	"
36.56	12.3	11.61	0.34	2.8	6	6	2.64	----	1.35	Clayey SILT to Silty CLAY	"
37.09	12.0	11.21	0.39	3.3	8	7	2.67	----	1.30	Silty CLAY to CLAY	"
37.53	13.8	12.77	0.87	6.3	13	12	2.70	----	1.54	CLAY	120-130
38.06	44.9	40.98	1.91	4.3	30	27	2.73	----	5.68	Silty CLAY to CLAY	130-140
38.58	17.4	15.66	1.01	5.8	17	15	2.77	----	2.01	CLAY	"
39.00	16.1	14.35	0.87	5.4	16	14	2.80	----	1.83	"	120-130
39.50	12.2	10.75	0.55	4.5	12	10	2.83	----	1.31	"	"
40.01	16.0	13.93	0.74	4.6	15	13	2.86	----	1.81	"	"
40.54	14.1	12.12	0.66	4.7	13	11	2.89	----	1.55	"	"
41.06	17.2	14.60	0.77	4.5	16	14	2.93	----	1.96	"	"
41.53	16.7	14.02	0.71	4.3	16	13	2.96	----	1.89	"	"
42.05	19.3	15.99	0.72	3.7	12	10	2.99	----	2.23	Silty CLAY to CLAY	"
42.58	27.5	22.60	0.92	3.3	13	11	3.03	----	3.32	Clayey SILT to Silty CLAY	130-140
43.02	25.6	20.94	0.91	3.6	12	10	3.06	----	3.07	"	"
43.57	32.1	26.12	1.14	3.6	15	12	3.10	----	3.93	"	"
44.01	27.1	21.95	1.12	4.1	17	14	3.13	----	3.26	Silty CLAY to CLAY	"
44.55	23.2	18.68	0.98	4.2	15	12	3.17	----	2.73	"	"
45.08	15.8	12.66	0.51	3.2	10	8	3.20	----	1.74	"	120-130
45.53	14.1	11.26	0.55	3.9	14	11	3.23	----	1.51	CLAY	"
46.05	40.7	32.31	2.13	5.2	40	32	3.27	----	5.05	"	130-140
46.53	84.6	66.83	3.14	3.7	42	33	3.30	----	10.90	Clayey SILT to Silty CLAY	"
47.03	35.5	27.90	1.56	4.4	24	19	3.34	----	4.35	Silty CLAY to CLAY	"
47.53	20.6	16.11	0.83	4.0	14	11	3.37	----	2.36	"	120-130
48.03	20.0	15.57	0.76	3.8	13	10	3.40	----	2.28	"	"
48.53	21.1	16.34	0.99	4.7	21	16	3.44	----	2.42	CLAY	130-140
49.03	20.9	16.11	0.76	3.6	13	10	3.47	----	2.39	Silty CLAY to CLAY	120-130
49.53	19.4	14.88	0.73	3.8	12	10	3.50	----	2.18	"	"
50.03	19.3	14.74	0.66	3.4	12	9	3.53	----	2.17	"	"
50.53	18.9	14.36	0.66	3.5	12	9	3.57	----	2.11	"	"
51.04	17.2	13.01	0.56	3.3	11	8	3.60	----	1.88	"	"
51.55	17.6	13.25	0.55	3.1	8	6	3.63	----	1.93	Clayey SILT to Silty CLAY	"
52.06	17.9	13.41	0.60	3.4	11	8	3.66	----	1.96	Silty CLAY to CLAY	"
52.56	17.6	13.12	0.52	3.0	8	6	3.69	----	1.92	Clayey SILT to Silty CLAY	"
53.06	19.8	14.69	0.52	2.6	9	7	3.72	----	2.21	"	"
53.56	24.5	18.09	0.76	3.1	11	8	3.75	----	2.83	"	"
54.07	44.0	32.29	2.37	5.4	43	32	3.79	----	5.42	CLAY	130-140

PROJECT: 20-80 CHEMICAL WAY SITE
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ENGEO, INC.
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DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
54.57	26.5	19.34	1.04	3.9	18	13	3.83	----	3.09	Silty CLAY to CLAY	130-140
55.07	18.3	13.29	0.68	3.7	12	9	3.86	----	1.99	"	120-130
55.57	23.4	16.89	0.98	4.2	15	11	3.90	----	2.66	"	130-140
56.07	22.7	16.30	1.04	4.6	22	16	3.93	----	2.57	CLAY	"
56.51	23.3	16.64	1.21	5.2	23	16	3.96	----	2.64	"	"
57.01	22.6	16.05	1.17	5.2	22	16	4.00	----	2.55	"	"
57.51	21.6	15.27	1.33	6.2	21	15	4.04	----	2.41	"	"
58.01	20.0	14.08	1.10	5.5	20	14	4.07	----	2.19	"	"
58.51	20.0	14.01	0.91	4.6	19	14	4.11	----	2.19	"	"
59.01	32.4	22.60	1.35	4.2	21	15	4.15	----	3.83	Silty CLAY to CLAY	"
59.53	25.1	17.43	1.16	4.6	24	17	4.18	----	2.86	CLAY	"
60.07	28.0	19.35	1.27	4.5	18	13	4.22	----	3.24	Silty CLAY to CLAY	"
60.54	19.2	13.22	0.76	4.0	12	8	4.25	----	2.06	"	120-130
61.07	18.7	12.82	0.74	4.0	11	8	4.29	----	1.99	"	"
61.55	17.9	12.23	0.70	3.9	11	7	4.32	----	1.88	"	"
62.04	18.5	12.59	0.76	4.1	11	8	4.35	----	1.95	"	"
62.58	19.0	12.88	0.75	3.9	12	8	4.38	----	2.02	"	"
63.08	17.9	12.08	0.76	4.2	17	11	4.41	----	1.87	CLAY	"
63.50	18.1	12.18	0.70	3.9	11	7	4.44	----	1.89	Silty CLAY to CLAY	"
64.01	19.5	13.07	0.77	3.9	12	8	4.47	----	2.07	"	"
64.52	20.8	13.88	0.88	4.2	13	8	4.50	----	2.24	"	"
65.03	25.0	16.61	1.13	4.5	24	16	4.54	----	2.80	CLAY	130-140
65.53	25.3	16.73	1.05	4.2	16	11	4.57	----	2.83	Silty CLAY to CLAY	"
66.02	24.9	16.39	1.11	4.5	16	10	4.61	----	2.77	"	"
66.54	23.6	15.46	1.03	4.4	15	10	4.65	----	2.60	"	"
67.05	23.0	14.99	0.99	4.3	15	9	4.68	----	2.51	"	"
67.55	26.5	17.19	1.12	4.2	17	11	4.72	----	2.97	"	"
68.05	26.6	17.17	1.17	4.4	17	11	4.76	----	2.98	"	"
68.55	26.4	16.96	1.19	4.5	17	11	4.79	----	2.95	"	"
69.05	27.0	17.26	1.21	4.5	17	11	4.83	----	3.03	"	"
69.56	28.6	18.20	1.30	4.5	18	12	4.87	----	3.24	"	"
70.06	29.4	18.62	1.37	4.7	28	18	4.90	----	3.34	CLAY	"
70.56	28.9	18.21	1.32	4.6	19	12	4.94	----	3.27	Silty CLAY to CLAY	"
71.06	26.8	16.81	1.23	4.6	26	16	4.98	----	2.98	CLAY	"
71.55	27.1	16.92	1.28	4.7	26	16	5.01	----	3.02	"	"
72.04	26.5	16.48	1.26	4.8	26	16	5.05	----	2.93	"	"
72.58	24.6	15.24	1.05	4.3	16	10	5.09	----	2.67	Silty CLAY to CLAY	"
73.06	23.2	14.32	0.98	4.2	15	9	5.12	----	2.48	"	"
73.55	23.1	14.20	0.94	4.1	15	9	5.16	----	2.47	"	"
74.04	24.5	15.01	1.00	4.1	16	10	5.19	----	2.65	"	"
74.53	24.2	14.77	0.91	3.8	15	9	5.23	----	2.60	"	"
75.02	24.3	14.77	0.89	3.7	15	9	5.26	----	2.61	"	"
75.50	23.7	14.36	0.78	3.3	11	7	5.29	----	2.53	Clayey SILT to Silty CLAY	120-130
76.07	26.5	15.99	0.85	3.2	12	7	5.33	----	2.90	"	130-140
76.55	34.4	20.67	1.38	4.0	22	13	5.37	----	3.95	Silty CLAY to CLAY	"
77.04	39.1	23.41	1.53	3.9	19	11	5.40	----	4.57	Clayey SILT to Silty CLAY	"
77.52	40.0	23.86	1.55	3.9	20	12	5.44	----	4.68	"	"
78.00	27.4	16.28	1.38	5.0	27	16	5.47	----	3.00	CLAY	"
78.55	26.0	15.38	1.41	5.4	25	15	5.51	----	2.81	"	"
79.00	25.0	14.74	1.33	5.3	24	14	5.55	----	2.67	"	"
79.55	20.7	12.15	1.00	4.8	20	12	5.59	----	2.09	"	"
80.03	21.1	12.33	1.01	4.8	20	12	5.62	----	2.14	"	"
80.56	20.4	11.88	0.72	3.5	13	7	5.66	----	2.04	Silty CLAY to CLAY	120-130
81.02	19.0	11.03	0.62	3.3	9	5	5.68	----	1.85	Clayey SILT to Silty CLAY	"

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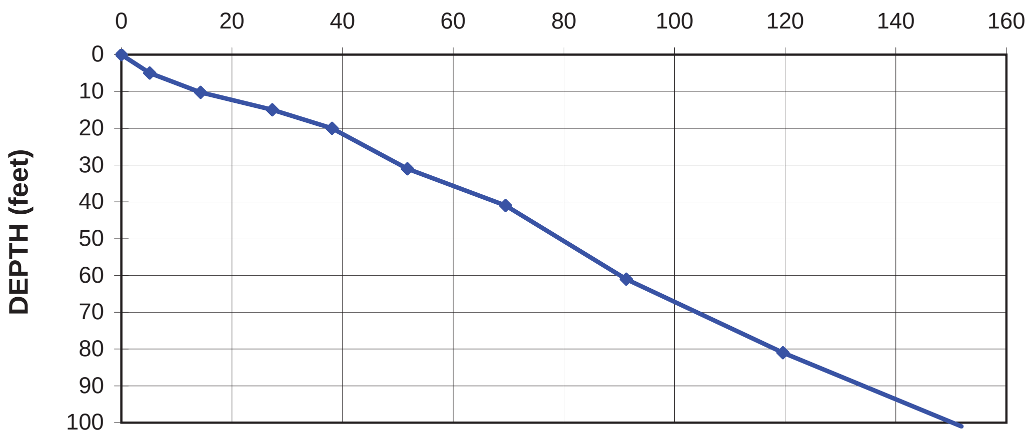
DEPTH (feet)	Qt (tsf)	Qt' (tsf)	Fs (tsf)	Rf (%)	SPT (N)	SPT' (N')	EffVtStr (ksf)	PHI (deg.)	SU (ksf)	SOIL BEHAVIOR TYPE	DENSITY RANGE (pcf)
81.51	18.6	10.76	0.59	3.2	9	5	5.71	----	1.80	Clayey SILT to Silty CLAY	120-130
82.06	20.3	11.70	0.72	3.5	13	7	5.75	----	2.02	Silty CLAY to CLAY	"
82.52	21.3	12.24	0.70	3.3	10	6	5.78	----	2.15	Clayey SILT to Silty CLAY	"
83.07	22.9	13.10	0.75	3.3	11	6	5.81	----	2.36	"	"
83.54	24.6	14.03	0.81	3.3	11	7	5.84	----	2.58	"	"
84.02	24.7	14.03	0.88	3.6	12	7	5.88	----	2.59	"	130-140
84.51	24.6	13.92	0.92	3.7	15	9	5.91	----	2.57	Silty CLAY to CLAY	"
85.00	27.9	15.72	1.01	3.6	13	7	5.95	----	3.01	Clayey SILT to Silty CLAY	"
85.57	28.9	16.20	0.99	3.4	14	8	5.99	----	3.13	"	"
86.05	30.0	16.76	1.07	3.6	14	8	6.02	----	3.28	"	"
86.53	30.2	16.82	1.15	3.8	15	8	6.06	----	3.30	"	"
87.06	31.0	17.21	1.16	3.7	15	8	6.10	----	3.40	"	"
87.54	28.1	15.55	1.20	4.3	18	10	6.13	----	3.01	Silty CLAY to CLAY	"
88.02	28.9	15.94	1.17	4.0	19	10	6.17	----	3.11	"	"
88.58	27.1	14.89	1.06	3.9	18	10	6.21	----	2.87	"	"
89.05	26.7	14.63	1.06	4.0	17	10	6.24	----	2.81	"	"
89.53	27.1	14.80	1.02	3.8	13	7	6.28	----	2.86	Clayey SILT to Silty CLAY	"
90.03	27.3	14.86	0.95	3.5	13	7	6.31	----	2.88	"	"
90.51	24.1	13.08	0.75	3.1	11	6	6.34	----	2.45	"	120-130
91.07	25.1	13.58	0.77	3.1	12	6	6.38	----	2.58	"	"
91.55	43.0	23.19	1.69	3.9	21	12	6.41	----	4.96	"	130-140
92.03	22.0	11.83	0.67	3.0	10	6	6.44	----	2.16	"	120-130
92.50	24.2	12.98	0.71	2.9	11	6	6.47	----	2.45	"	"
93.05	22.4	11.98	0.69	3.1	10	5	6.51	----	2.20	"	"
93.51	23.5	12.53	0.58	2.5	11	6	6.54	----	2.34	"	"
94.06	23.7	12.60	0.55	2.3	11	6	6.57	----	2.37	"	"
94.54	21.5	11.39	0.58	2.7	10	5	6.60	----	2.07	"	"
95.01	22.9	12.10	0.51	2.2	10	5	6.63	----	2.25	"	"
95.57	23.5	12.38	0.54	2.3	11	6	6.66	----	2.33	"	"
96.04	24.5	12.87	0.70	2.9	11	6	6.69	----	2.46	"	"
96.58	23.0	12.04	0.57	2.5	10	5	6.73	----	2.25	"	"
97.05	25.7	13.42	0.55	2.1	9	5	6.76	----	2.61	Sandy SILT to Clayey SILT	"
97.53	24.6	12.81	0.67	2.7	11	6	6.79	----	2.46	Clayey SILT to Silty CLAY	"
98.03	27.9	14.48	0.70	2.5	10	5	6.82	----	2.89	Sandy SILT to Clayey SILT	"
98.50	30.4	15.73	0.69	2.3	11	6	6.85	----	3.22	"	"
99.05	27.2	14.03	0.65	2.4	10	5	6.88	----	2.79	"	"
99.52	30.0	15.43	0.68	2.3	11	6	6.91	----	3.16	"	"
100.01	33.5	17.17	1.14	3.4	16	8	6.95	----	3.62	Clayey SILT to Silty CLAY	130-140

DEPTH = Sampling interval (~0.1 feet)
Qc = Tip bearing uncorrected   Qt = Tip bearing corrected   Fs = Sleeve friction resistance   Rf = Qt / Fs
SPT = Equivalent Standard Penetration Test   Qt' and SPT' = Qt and SPT corrected for overburden
EffVtStr = Effective Vertical Stress using est. density**   Phi = Soil friction angle*
Su = Undrained Soil Strength* (see classification chart)
References: * Robertson and Campanella, 1988   **Olsen, 1989   *** Durgunoglu & Mitchell, 1975

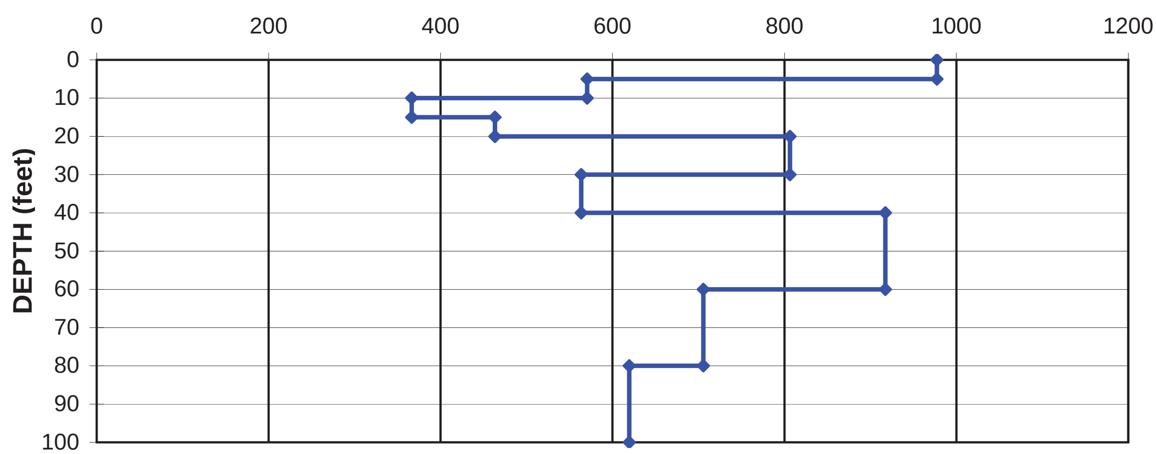
Chemical Way Site - Redwood City, Ca
Downhole Geophysical Survey
(at 1-CPT6)

test depth interval (feet)	horiz. distance (feet)	incidence angle (degree)	initial arrival time (msec)	Shear wave corrected vertical time (msec)	Shear wave vertical time difference (msec)	Shear wave wave velocity for depth interval (ft/sec)	(m/sec)
			0.0	0.0			
0 - 5	10.5	64.5	11.9	5.12	5.12	977	298
5 - 10	10.5	45.7	20.5	14.32	9.20	570	174
10 - 15	10.5	35.0	33.3	27.28	12.96	367	112
15 - 20	10.5	27.7	43.0	38.07	10.79	463	141
20 - 30	10.5	18.7	54.6	51.71	13.64	806	246
30 - 40	10.5	14.4	71.7	69.46	17.74	564	172
40 - 60	10.5	9.8	92.6	91.26	21.80	917	280
60 - 80	10.5	7.4	120.6	119.60	28.34	706	215
80 - 100	10.5	5.9	152.7	151.88	32.28	620	189

SHEAR WAVE ARRIVAL TIMES
Corrected Time (msec)



SHEAR WAVE VELOCITIES (ft./sec.)
depth interval



ENGEO, INC.

Geophysical Survey by
John Sarmiento & Associates

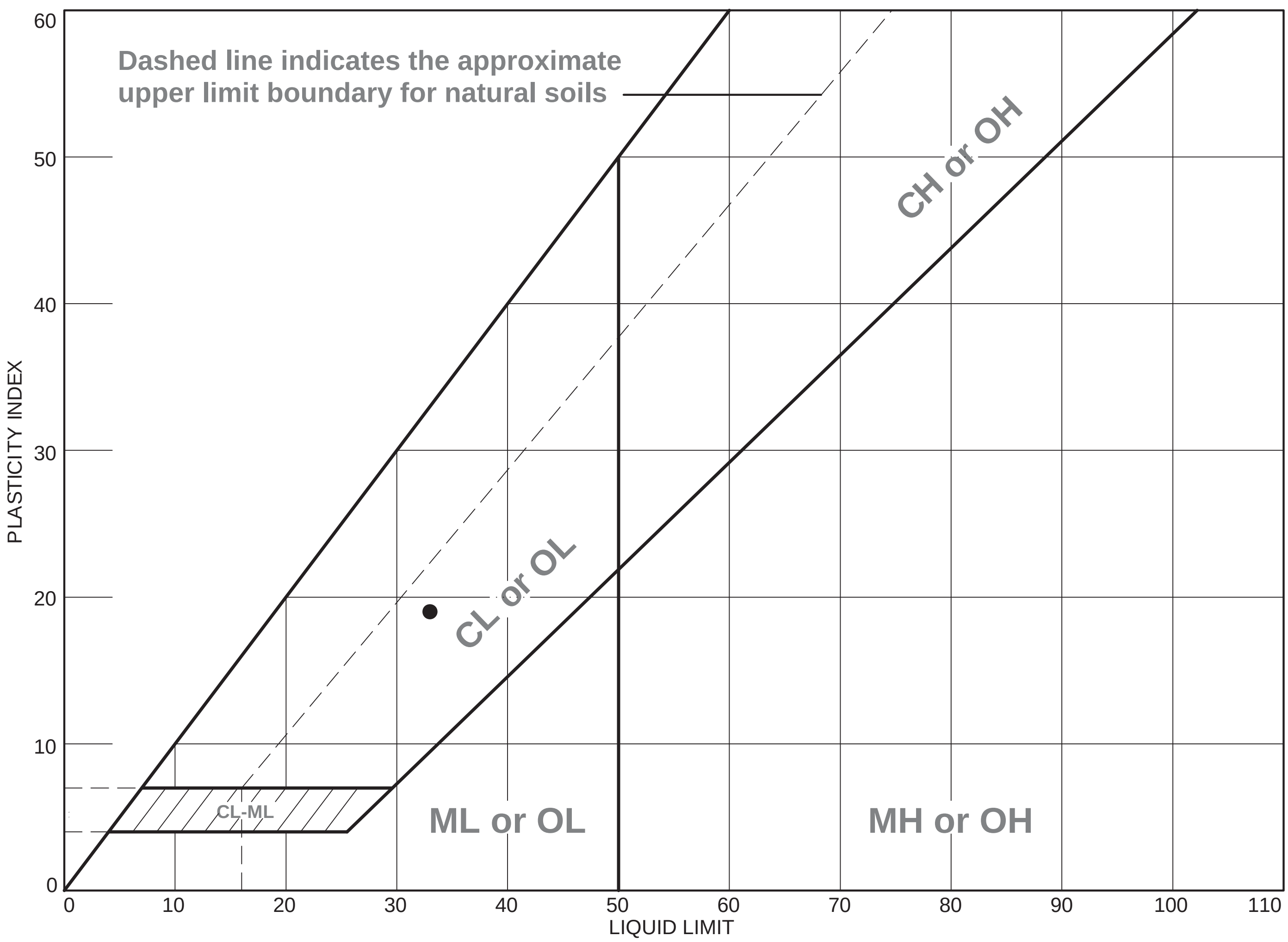
APPENDIX C

ENGEO

Laboratory Test Results

APPENDIX C

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs.	33	14	19		85.3	

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

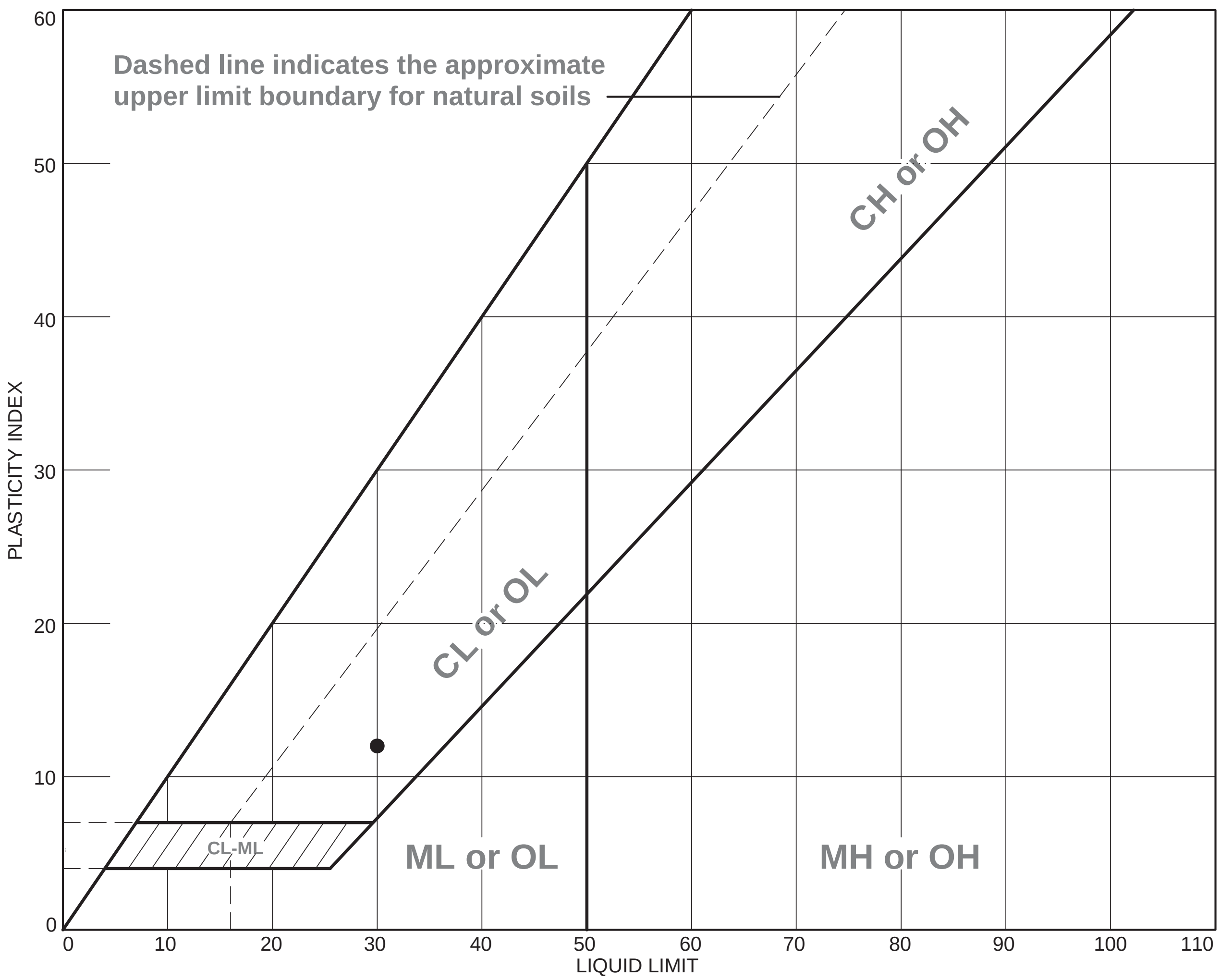
● **Depth:** 18.0 feet **Sample Number:** 1-B1 @ 18

Remarks:

ENGEO INCORPORATED

Tested By: GC **Checked By:** DS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs.	30	18	12			

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

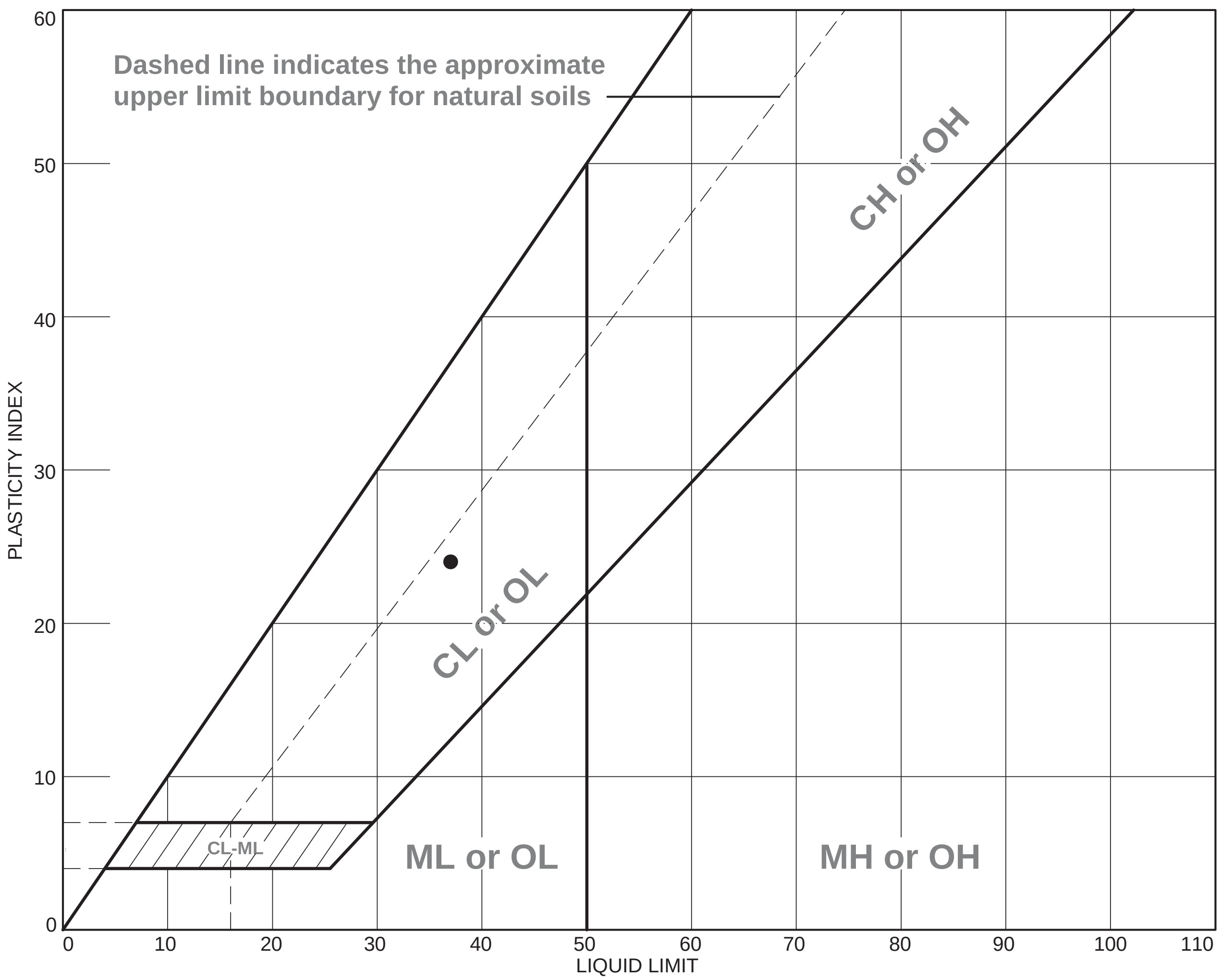
● **Depth:** 40.0 feet **Sample Number:** 1-B2 @ 40

Remarks:

ENGEO INCORPORATED

Tested By: GC **Checked By:** DS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs.	37	13	24			

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

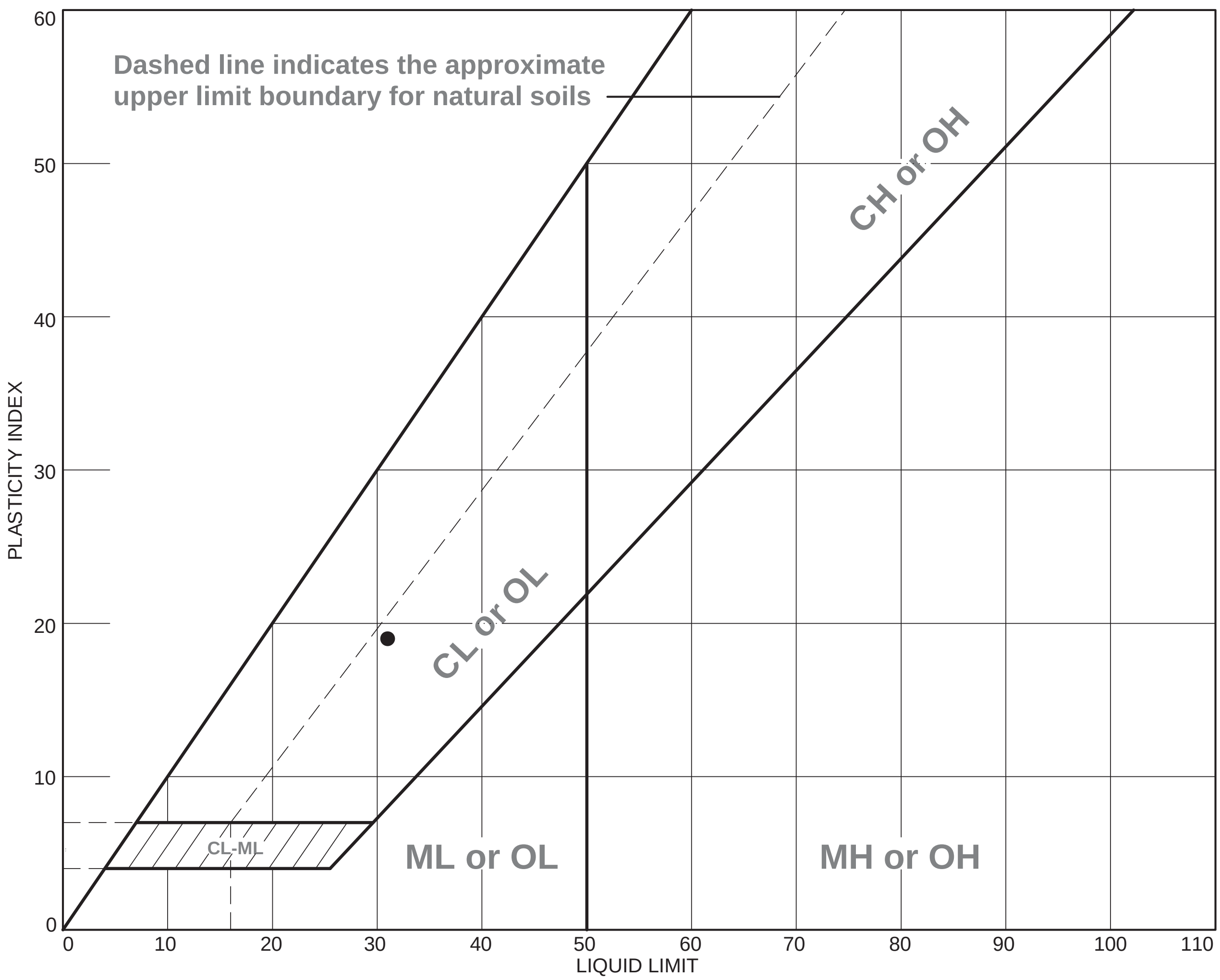
● **Depth:** 35.0 feet **Sample Number:** 1-B3 @ 35

Remarks:

ENGEO INCORPORATED

Tested By: GC **Checked By:** DS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs.	31	12	19			

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

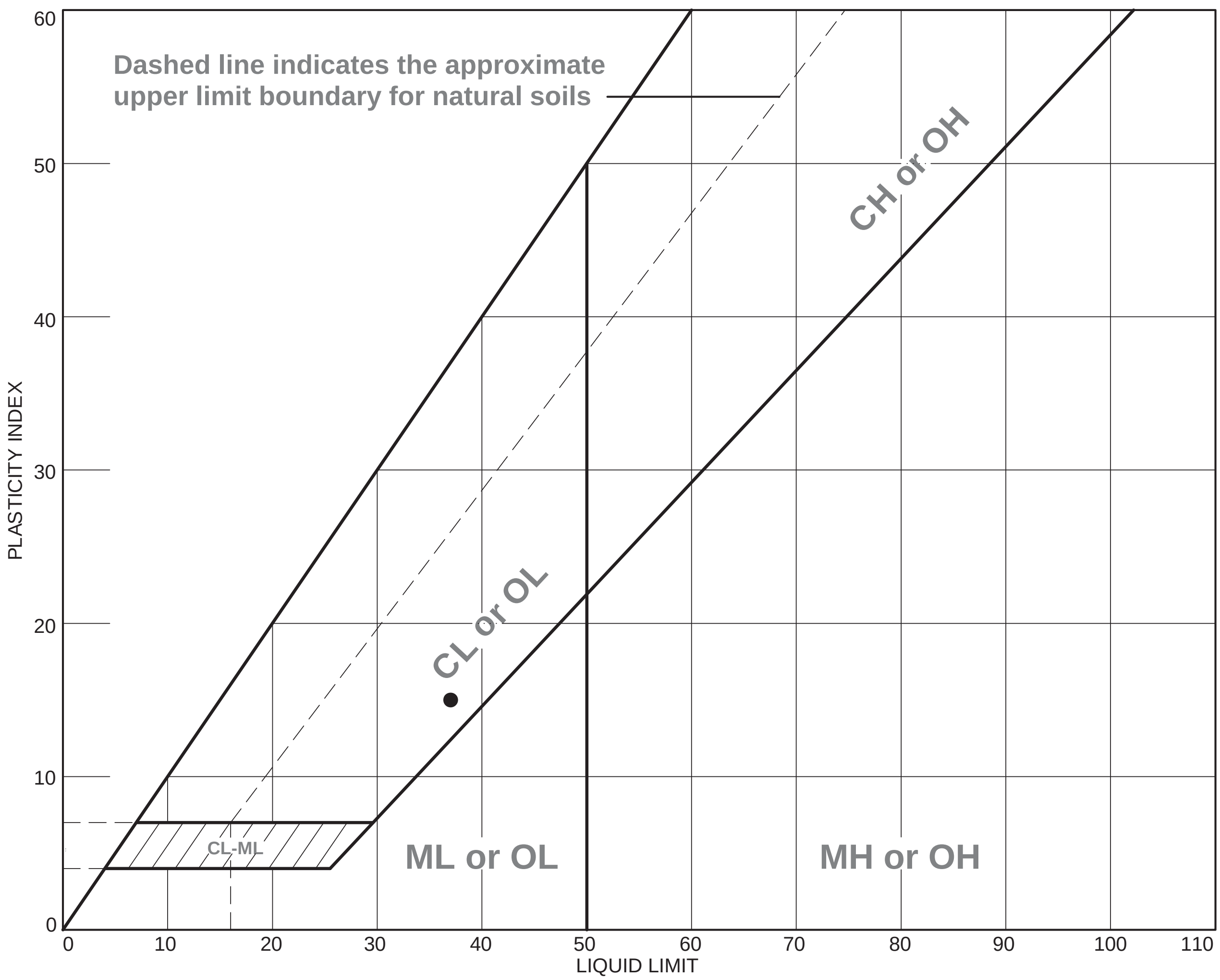
● **Depth:** 20.0 feet **Sample Number:** 1-B4 @ 20

Remarks:

ENGEO INCORPORATED

Tested By: GC **Checked By:** DS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs.	37	22	15			

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

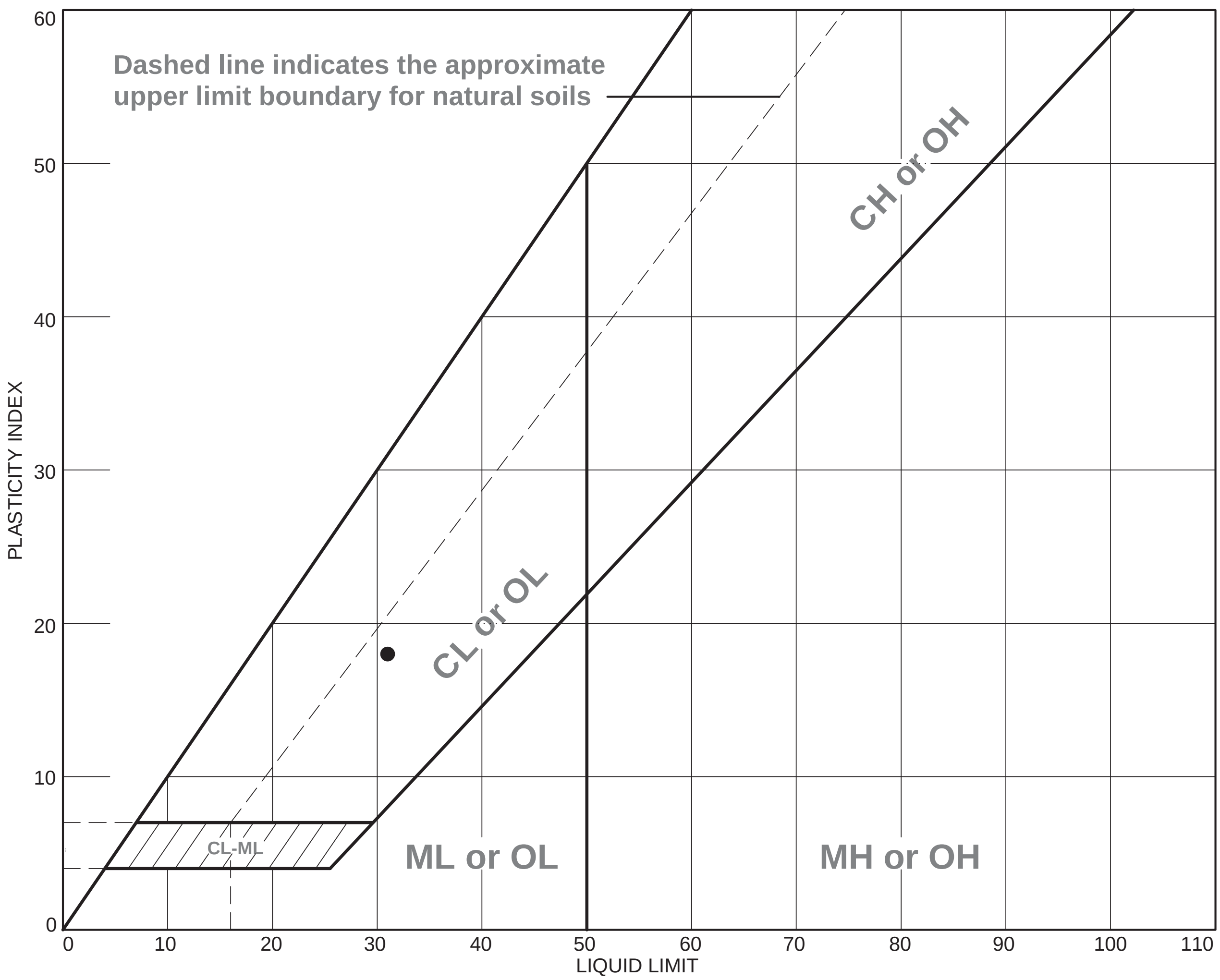
● **Depth:** 55.0 feet **Sample Number:** 1-B4 @ 55

Remarks:

ENGEO INCORPORATED

Tested By: GC **Checked By:** DS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs.	31	13	18			

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

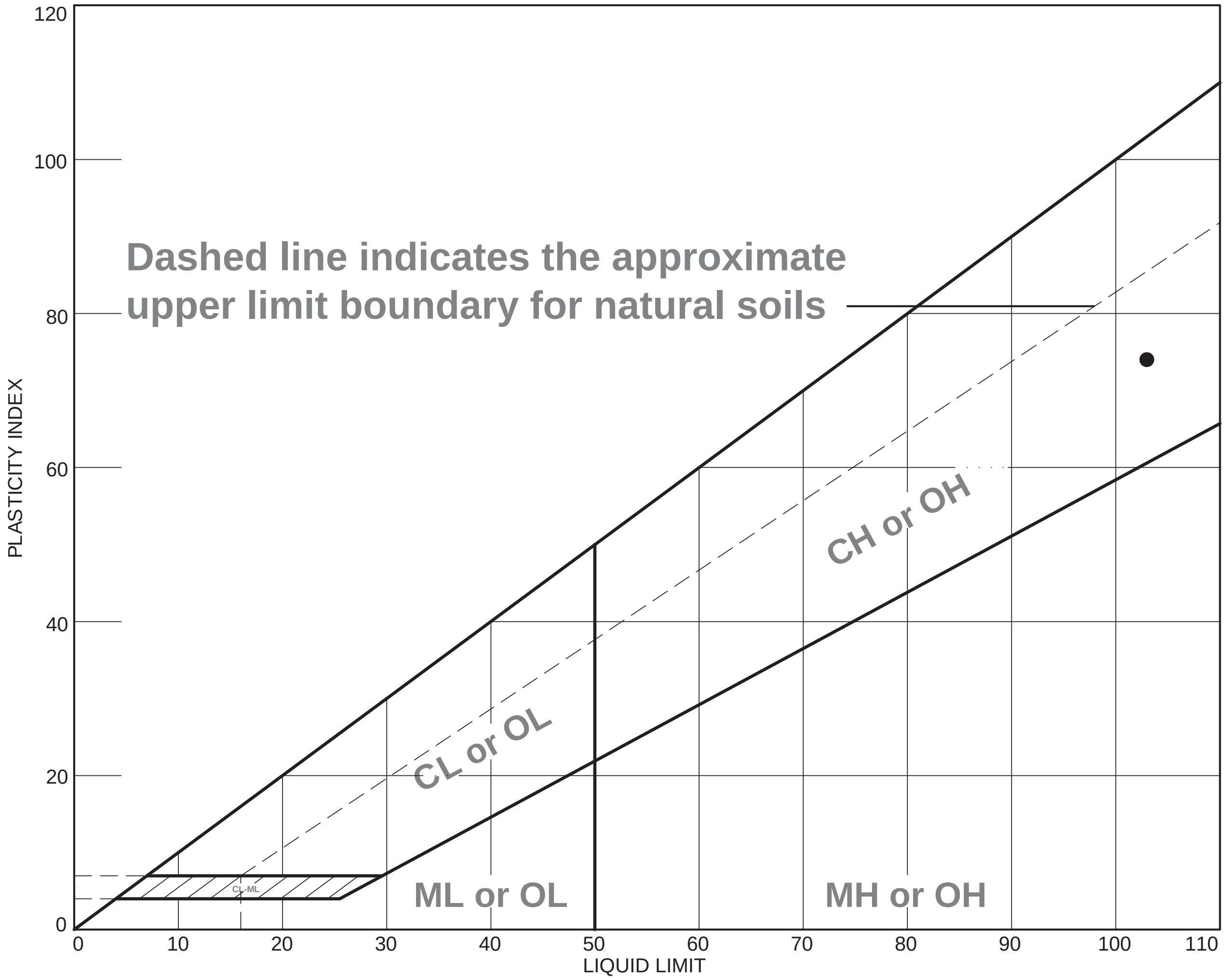
●**Depth:** 25.0 feet **Sample Number:** 1-B5 @ 25

Remarks:

ENGEO INCORPORATED

Tested By: GC **Checked By:** DS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs.	103	29	74			

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

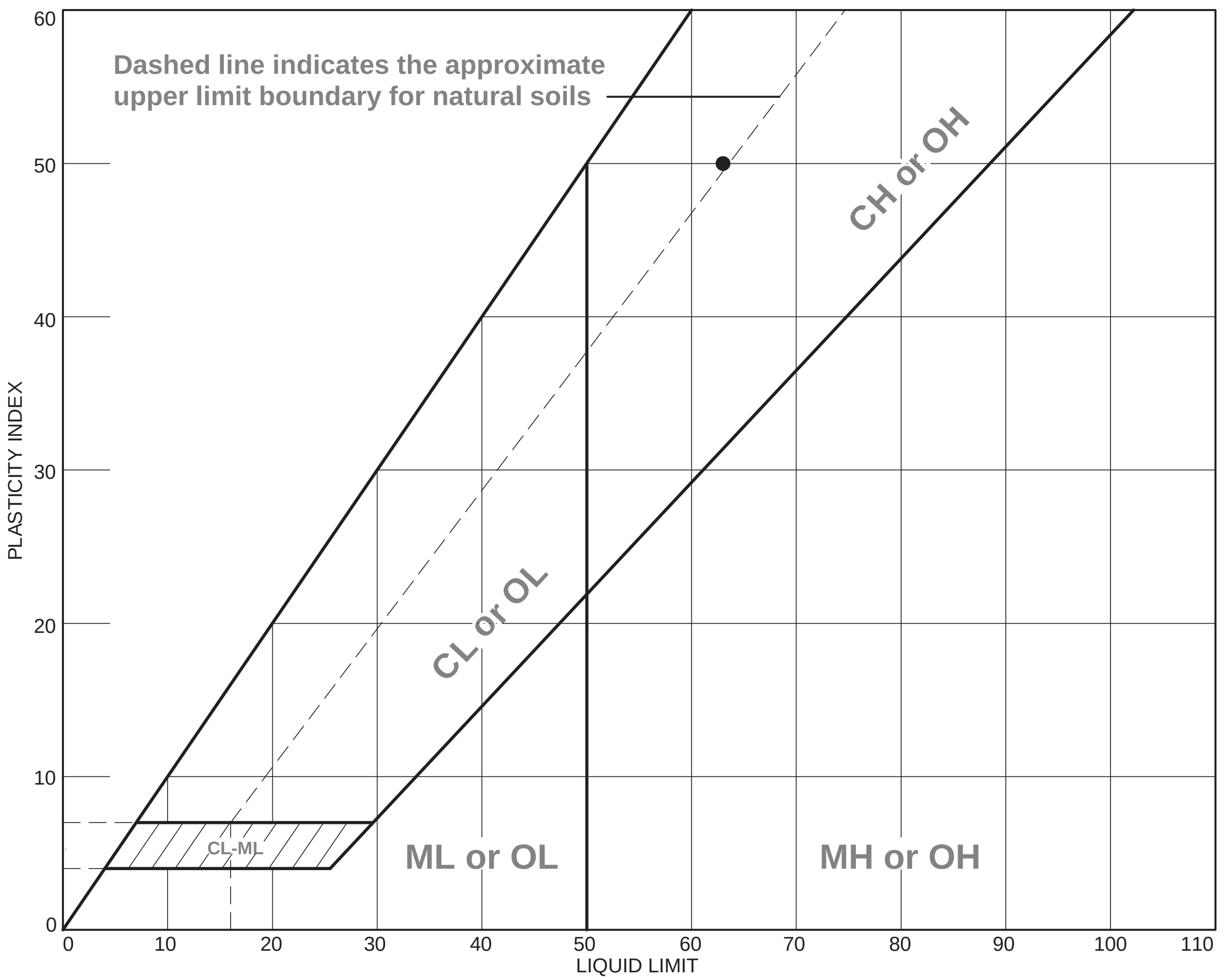
● **Depth:** 10.0 feet **Sample Number:** 1-B6 @ 10

Remarks:

ENGEO INCORPORATED

Tested By: GC **Checked By:** DS

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs.	63	13	50			

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

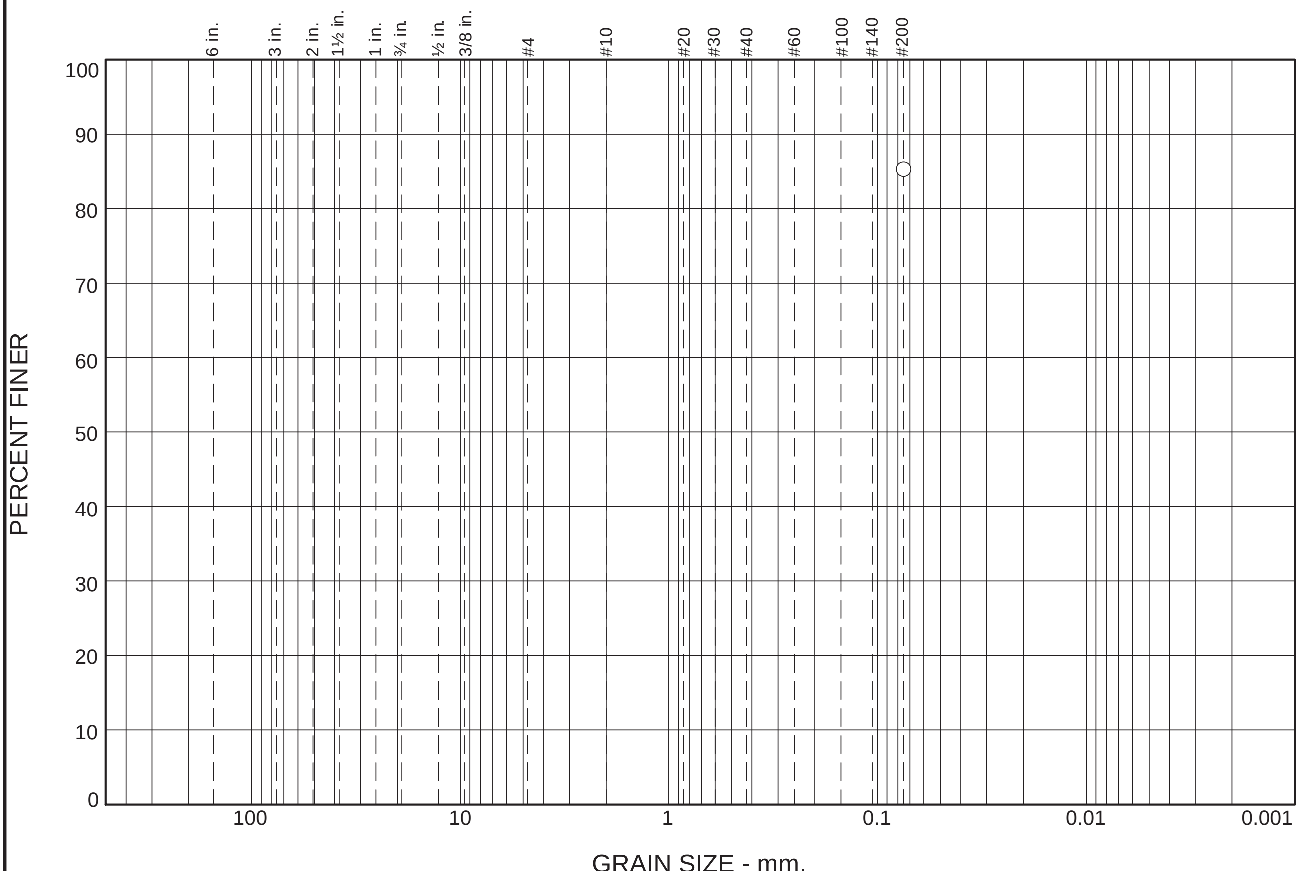
● **Depth:** 15.0 feet **Sample Number:** 1-B6 @ 15

Remarks:

ENGEO INCORPORATED

Tested By: GC **Checked By:** DS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						85.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	85.3		

* (no specification provided)

Soil Description

See exploration logs.

Atterberg Limits

PL= 14 LL= 33 PI= 19

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Sample Number: 1-B1 @ 18 **Depth:** 18.0 feet

Date: 9.7.12

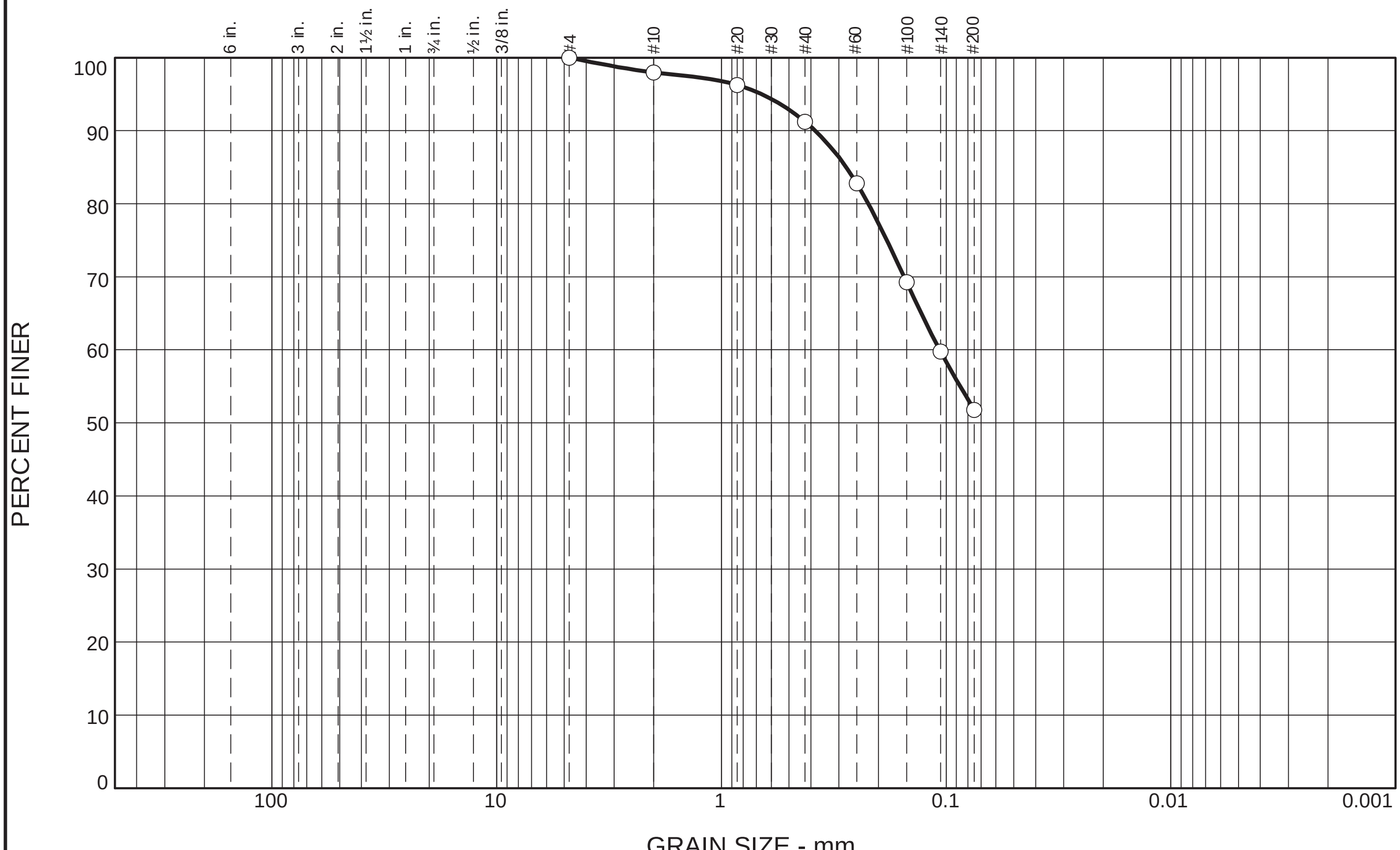
ENGEO INCORPORATED

Client: San Mateo County Sherriff's Office
Project: San Mateo County Sherriff's Replacement Correctional Facility

Project No: 9515.000.000

Tested By: AV **Checked By:** DS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.0	6.8	39.4	51.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.0		
#20	96.2		
#40	91.2		
#60	82.8		
#100	69.2		
#140	59.8		
#200	51.8		

* (no specification provided)

Material Description

See exploration logs.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3832 D_{85}= 0.2782 D_{60}= 0.1070
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: 1-B1 @ 34.5 **Depth:** 34.5 feet

Date: 9.7.12

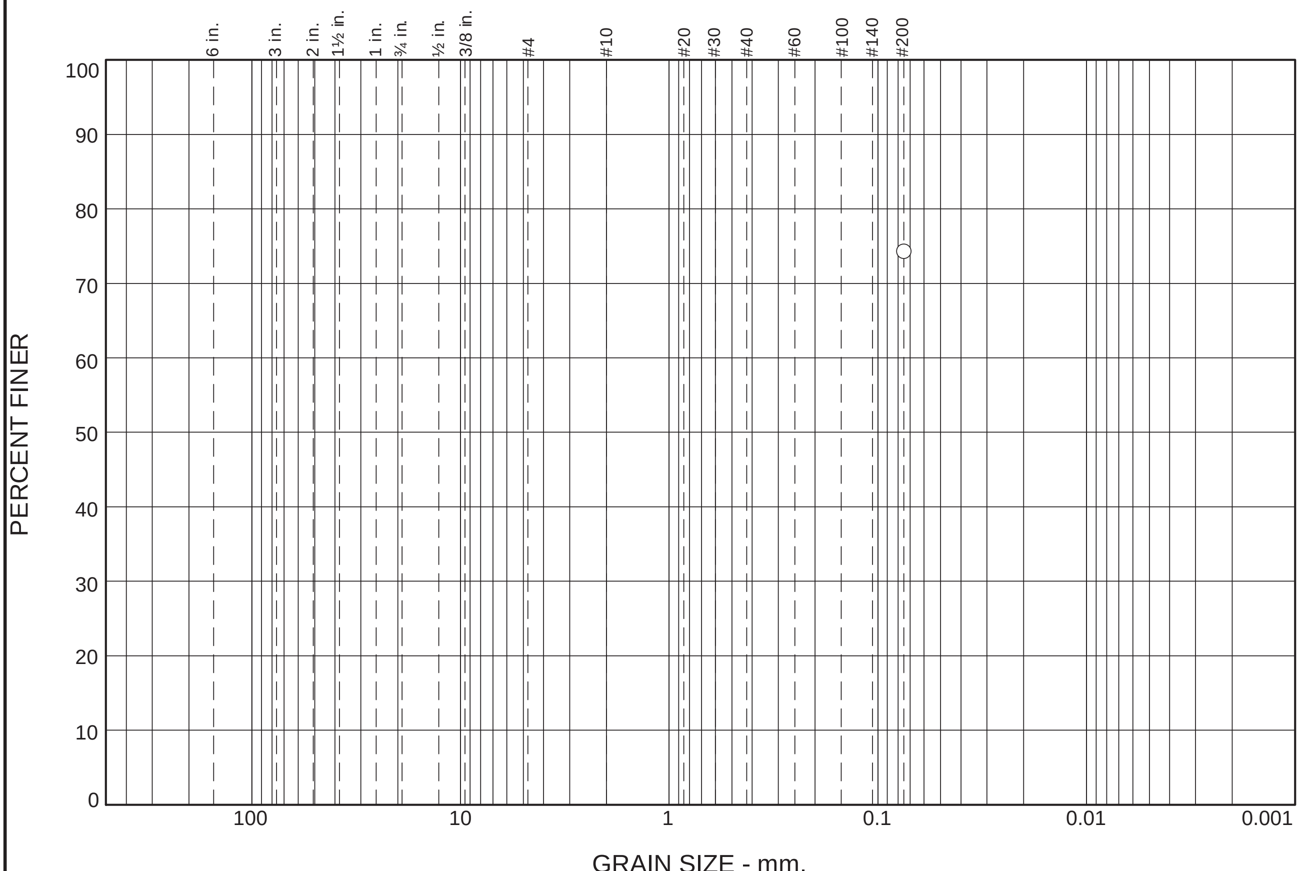
ENGEO INCORPORATED

Client: San Mateo County Sherriff's Office
Project: San Mateo County Sherriff's Replacement Correctional Facility

Project No: 9515.000.000

Tested By: AV **Checked By:** DS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						74.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	74.3		

* (no specification provided)

Soil Description

See exploration logs.

Atterberg Limits

PL= 18 LL= 30 PI= 12

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Sample Number: 1-B2 @ 40 **Depth:** 40.0 feet

Date: 9.11.2012

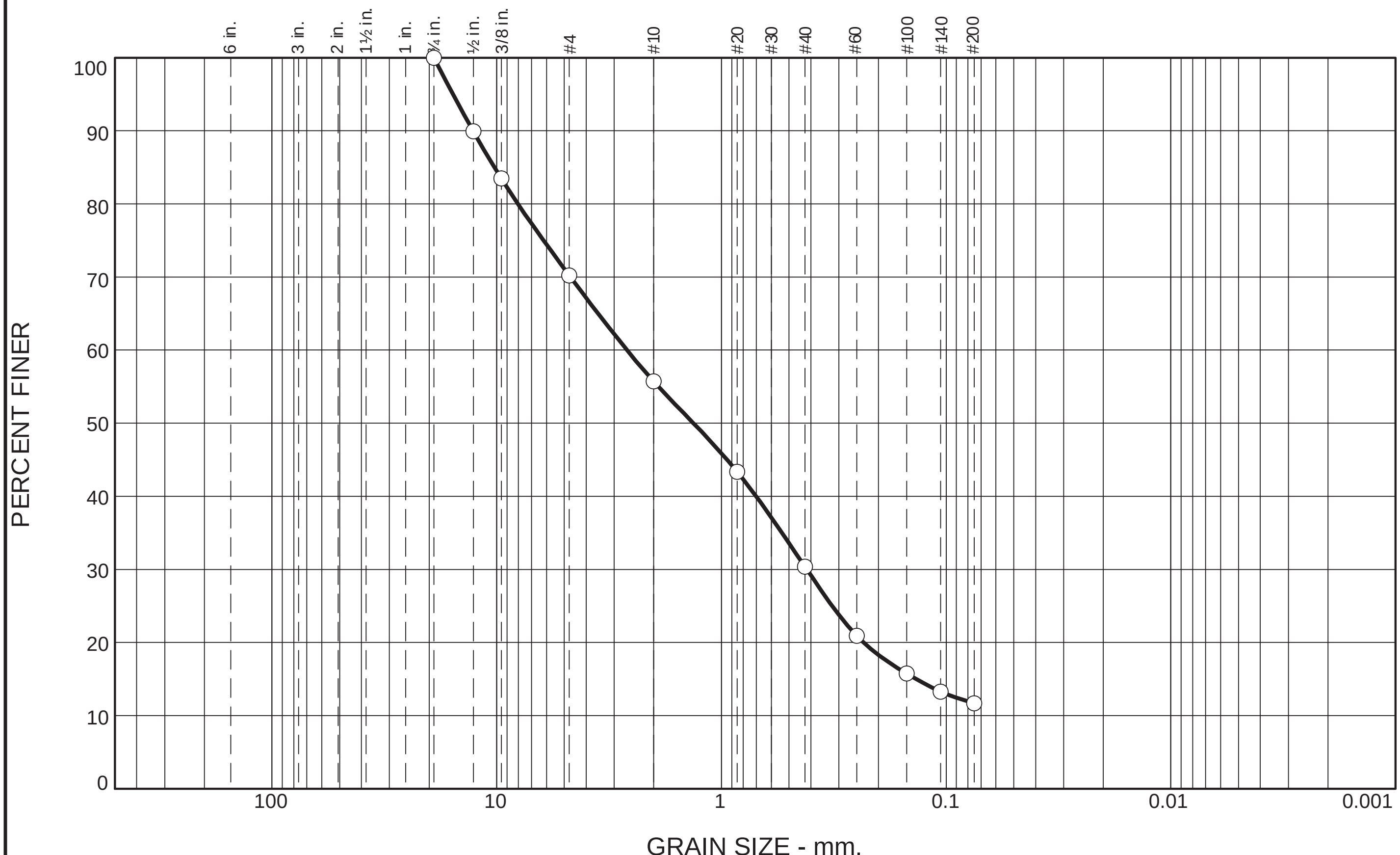
ENGEO INCORPORATED

Client: San Mateo County Sherriff's Office
Project: San Mateo County Sherriff's Replacement Correctional Facility

Project No: 9515.000.000

Tested By: AV **Checked By:** DS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	29.8	14.5	25.3	18.7	11.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	89.9		
3/8	83.5		
#4	70.2		
#10	55.7		
#20	43.3		
#40	30.4		
#60	20.9		
#100	15.8		
#140	13.3		
#200	11.7		

* (no specification provided)

Material Description

See exploration logs.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 12.7497 D_{85}= 10.2330 D_{60}= 2.6311
D_{50}= 1.3330 D_{30}= 0.4168 D_{15}= 0.1359
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: 1-B2 @ 20 **Depth:** 20.0 feet

Date: 9.7.12

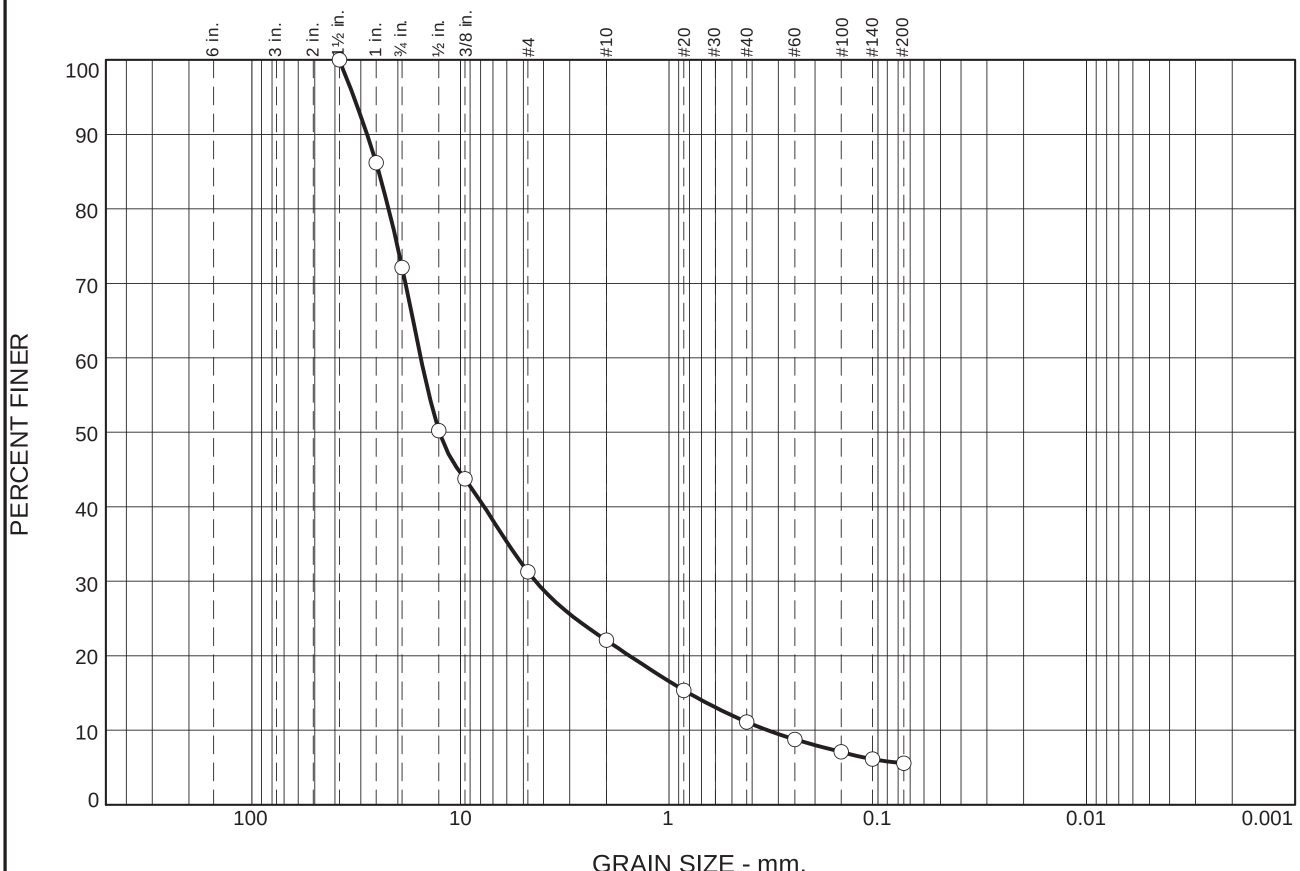
ENGEO INCORPORATED

Client: San Mateo County Sherriff's Office
Project: San Mateo County Sherriff's Replacement Correctional Facility

Project No: 9515.000.000

Tested By: AV **Checked By:** DS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	27.9	40.8	9.2	11.0	5.5	5.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2	100.0		
1	86.2		
3/4	72.1		
1/2	50.2		
3/8	43.7		
#4	31.3		
#10	22.1		
#20	15.4		
#40	11.1		
#60	8.8		
#100	7.1		
#140	6.1		
#200	5.6		

* (no specification provided)

Soil Description

See exploration logs.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 28.0228 D_{85}= 24.6889 D_{60}= 15.5096
D_{50}= 12.6171 D_{30}= 4.3636 D_{15}= 0.8072
D_{10}= 0.3371 C_u= 46.01 C_c= 3.64

Classification

USCS= AASHTO=

Remarks

Sample Number: 1-B2 @ 25 **Depth:** 25.0 feet

Date: 9.11.12

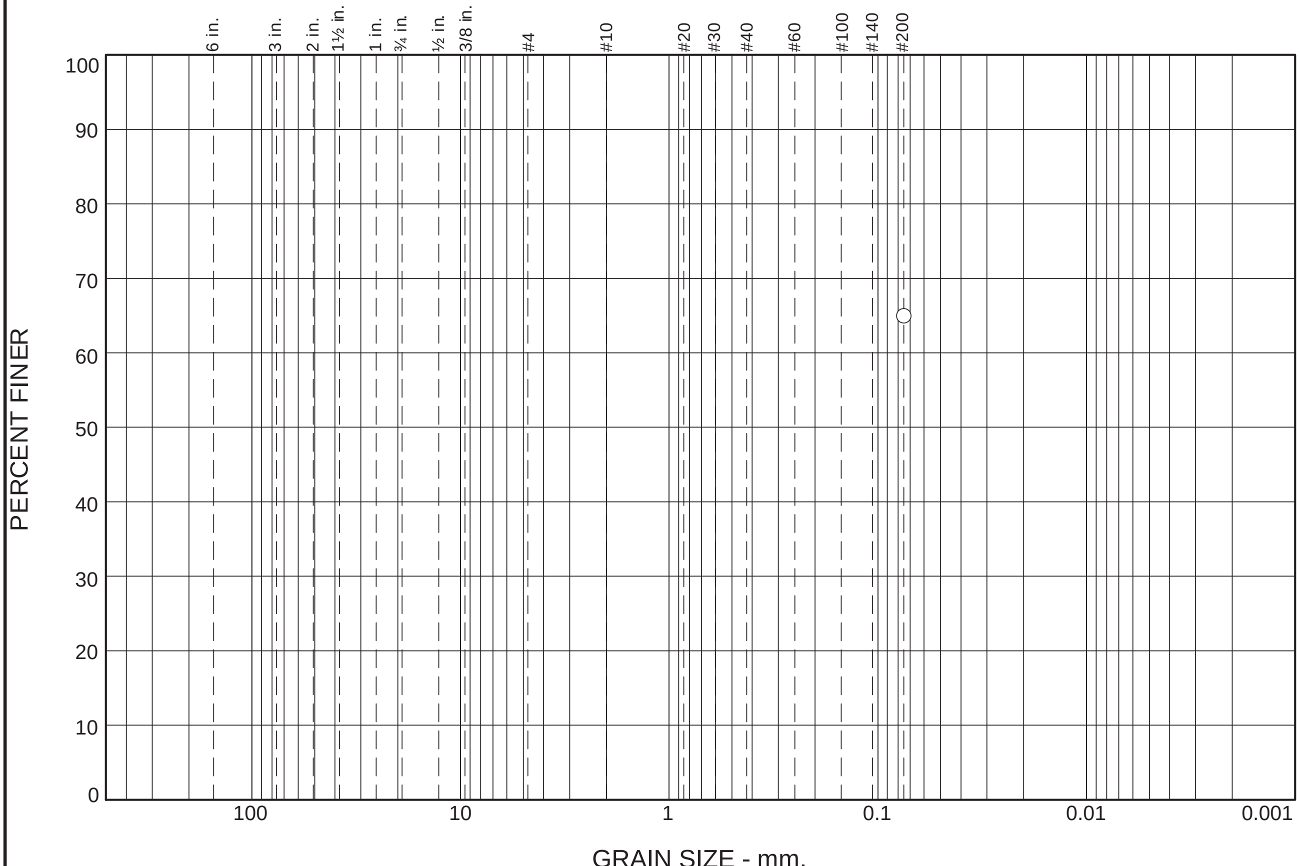
ENGEO INCORPORATED

Client: San Mateo County Sherriff's Office
Project: San Mateo County Sherriff's Replacement Correctional Facility

Project No: 9515.000.000

Tested By: AV **Checked By:** DS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						65.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	65.0		

* (no specification provided)

Soil Description

See exploration logs.

Atterberg Limits

PL= 13 LL= 37 PI= 24

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Sample Number: 1-B3 @ 35 **Depth:** 35.0 feet

Date: 9.11.2012

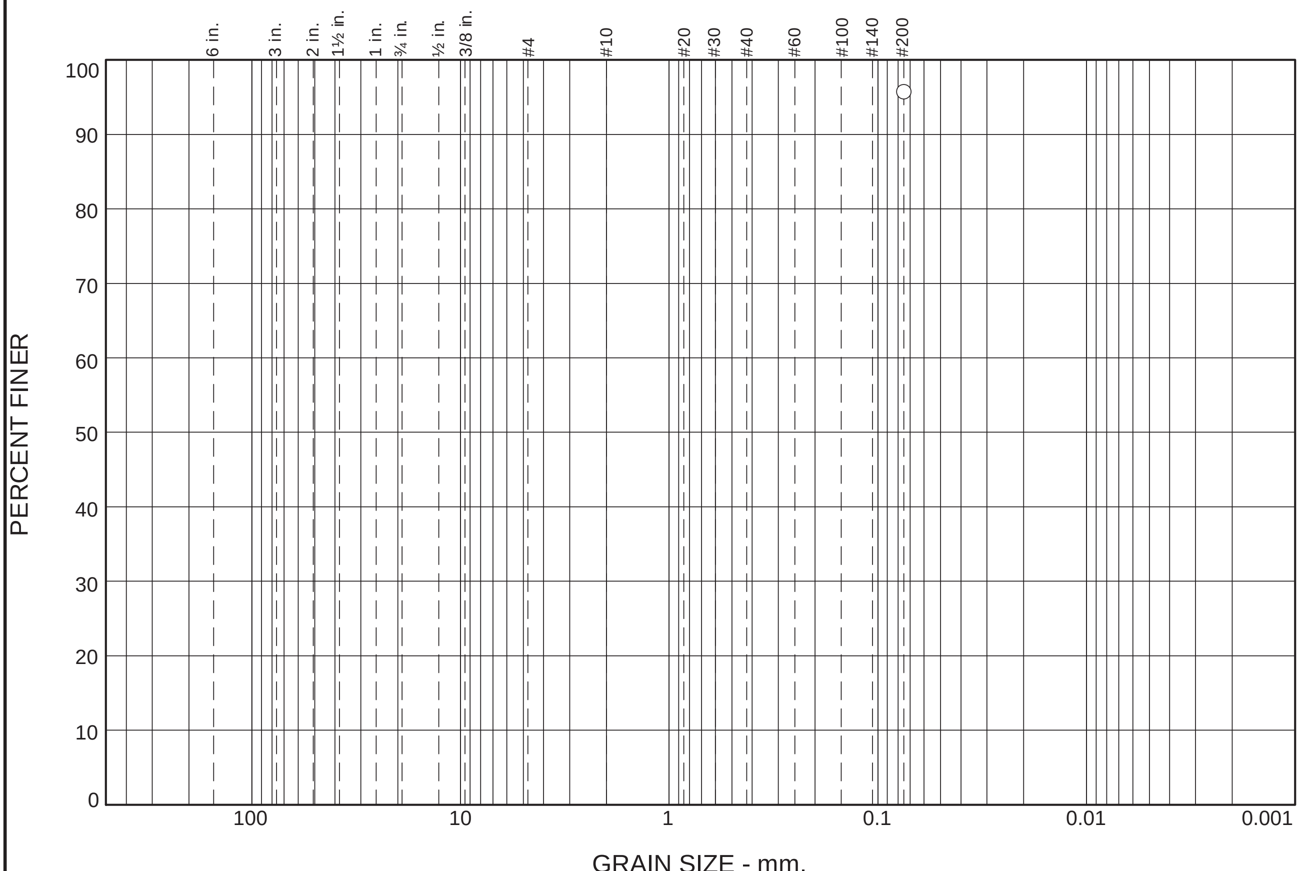
ENGEO INCORPORATED

Client: San Mateo County Sherriff's Office
Project: San Mateo County Sherriff's Replacement Correctional Facility

Project No: 9515.000.000

Tested By: AV **Checked By:** DS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						95.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	95.7		

* (no specification provided)

Soil Description

See exploration logs.

Atterberg Limits

PL= 22 LL= 37 PI= 15

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Sample Number: 1-B4 @ 55 **Depth:** 55.0 feet

Date: 9.11.2012

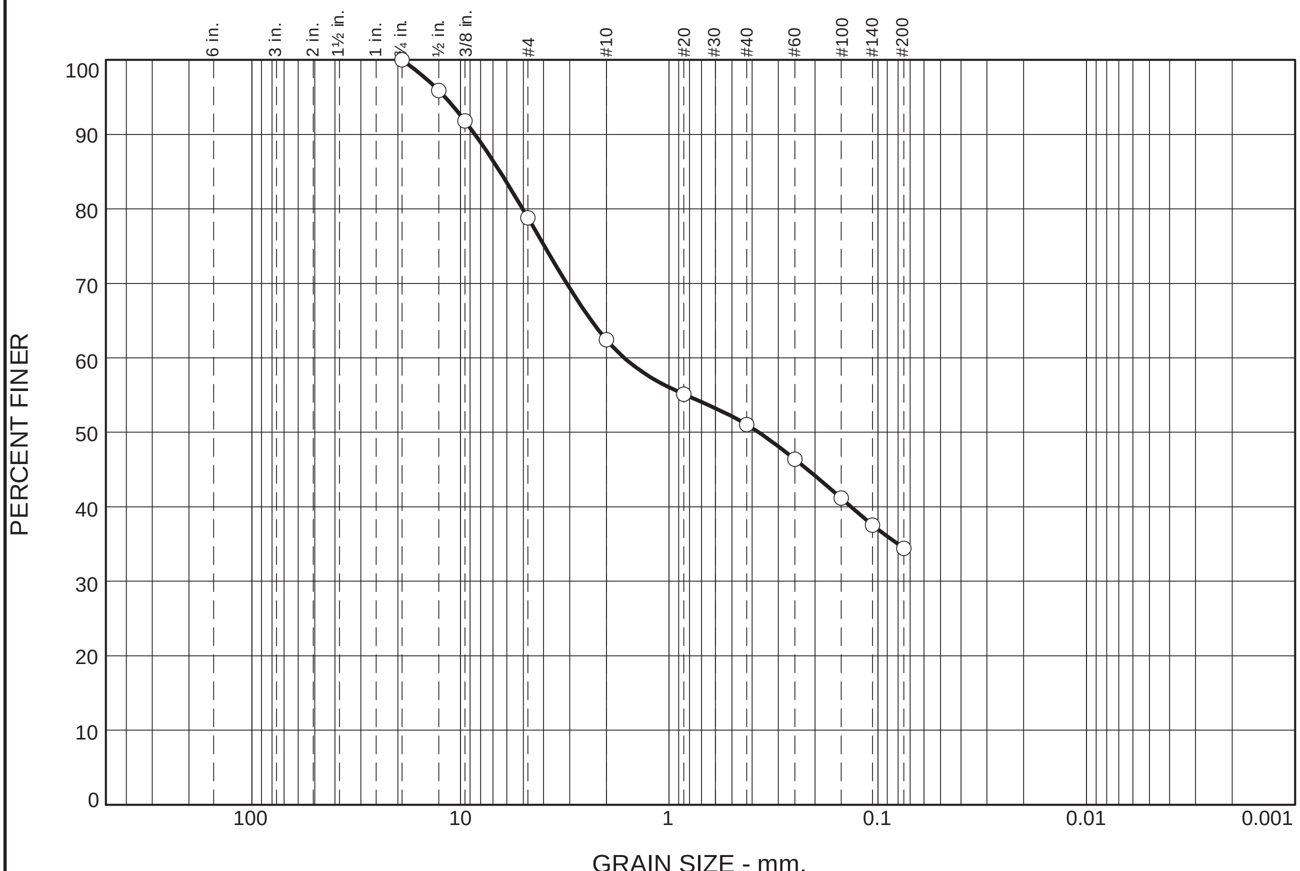
ENGEO INCORPORATED

Client: San Mateo County Sherriff's Office
Project: San Mateo County Sherriff's Replacement Correctional Facility

Project No: 9515.000.000

Tested By: AV **Checked By:** DS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	21.2	16.4	11.4	16.6	34.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	95.9		
3/8	91.8		
#4	78.8		
#10	62.4		
#20	55.1		
#40	51.0		
#60	46.4		
#100	41.2		
#140	37.5		
#200	34.4		

* (no specification provided)

Soil Description

See exploration logs.

Atterberg Limits

PL= 12 LL= 31 PI= 19

Coefficients

D_{90}= 8.5297 D_{85}= 6.4768 D_{60}= 1.6428
D_{50}= 0.3725 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(2)

Remarks

Sample Number: 1-B4 @ 20 **Depth:** 20.0 feet

Date: 9.10.12

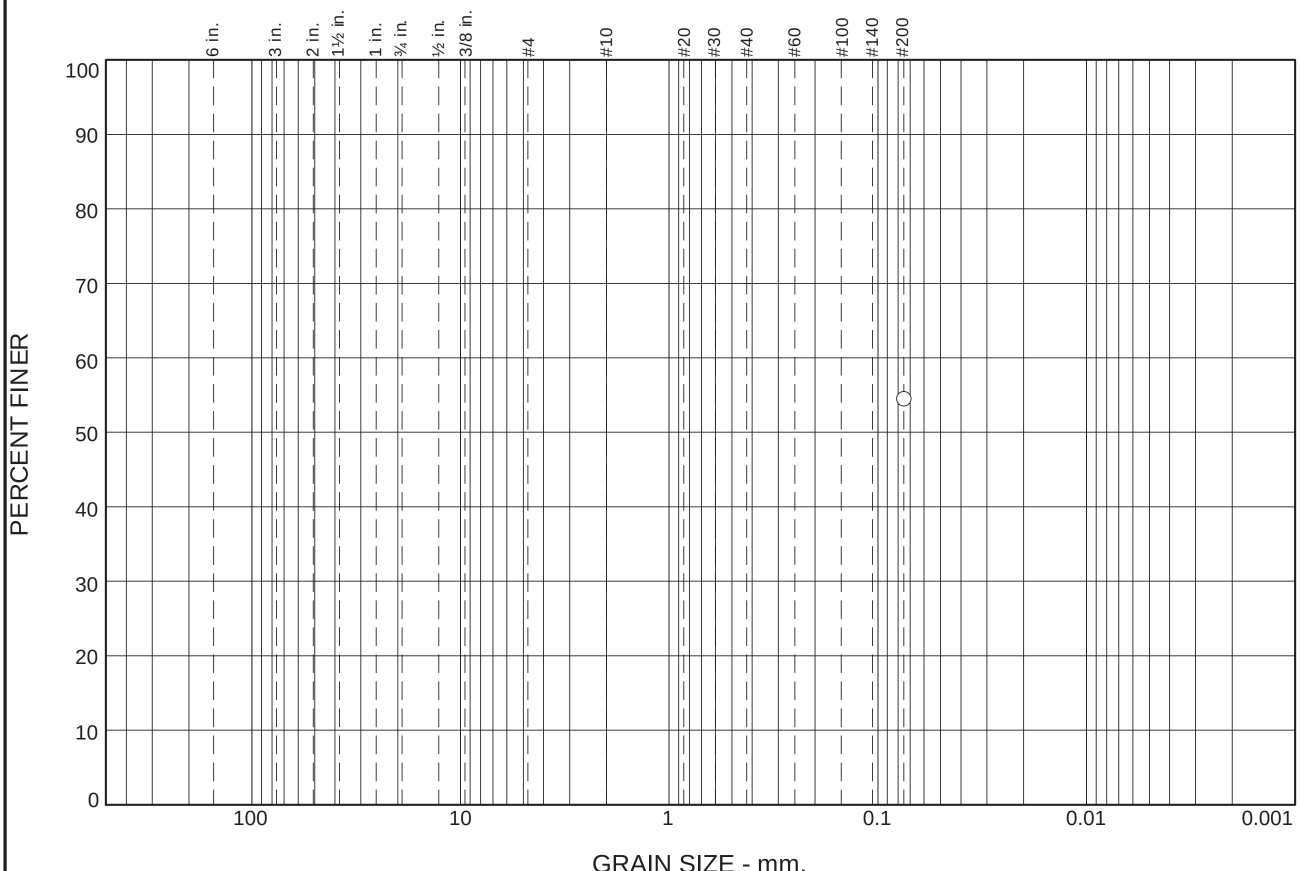
ENGEO INCORPORATED

Client: San Mateo County Sherriff's Office
Project: San Mateo County Sherriff's Replacement Correctional Facility

Project No: 9515.000.000

Tested By: AV **Checked By:** DS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						54.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	54.5		

* (no specification provided)

Soil Description

See exploration logs.

Atterberg Limits

PL= 13 LL= 31 PI= 18

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Sample Number: 1-B5 @ 25 **Depth:** 25.0 feet

Date: 9.10.12

ENGEO INCORPORATED

Client: San Mateo County Sherriff's Office
Project: San Mateo County Sherriff's Replacement Correctional Facility

Project No: 9515.000.000

Tested By: AV **Checked By:** DS

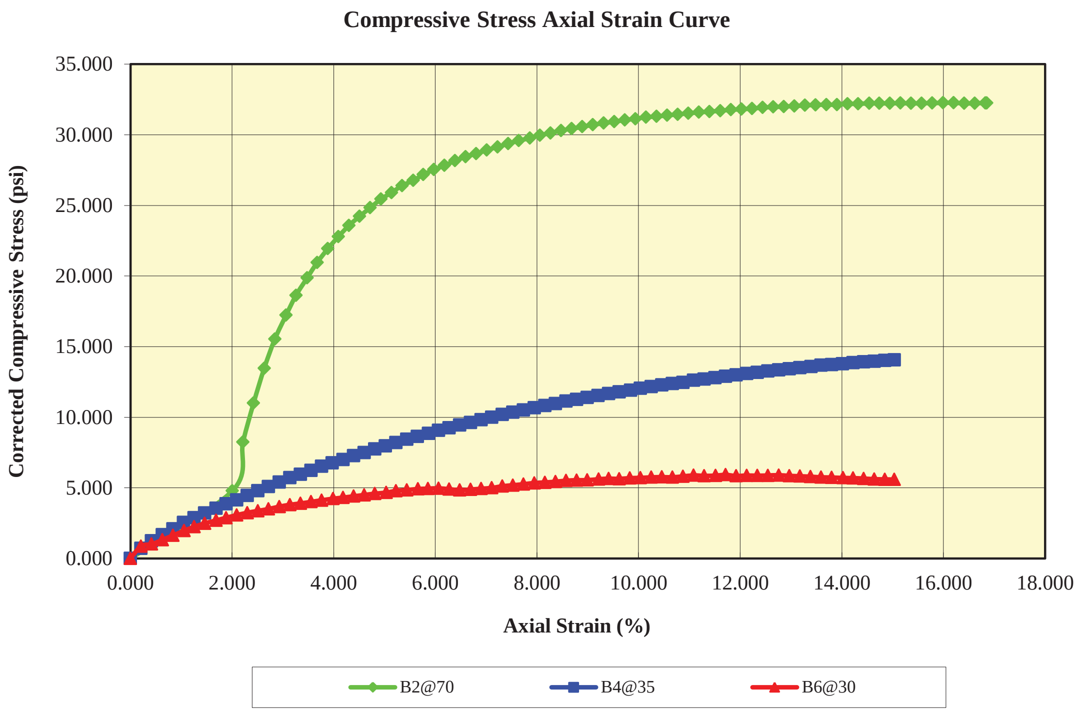
ENGEO Incorporated

Unconfined Compression Test Report (ASTM D2166)

Checked By G. Criste Date 9.7.12

Computed By D. Seibold Date 9.7.12

Tested By D. Seibold Date 9.7.12



Before Test	Specimen			
	B2@70	B4@35	B6@30	
Water Content (%)	29.17	36.50	25.16	
Dry Density (pcf)	96.900	80.800	100.400	
Saturation (%)	100.00	92.38	100.00	
Void Ratio	0.71	1.05	0.65	
Diameter (in)	2.390	2.375	2.410	
Height (in)	5.010	5.000	5.000	
Height-to-Diameter Ratio	2.096	2.105	2.075	
Test Data	**B2@70**	**B4@35**	**B6@30**	
Unconfined Compressive Strength (psi)	32.274	14.065	5.924	
Unconfined Compressive Strength (tsf)	2.322	1.012	0.426	
Undrained Shear Strength (psi)	16.137	7.033	2.962	
Strain at Failure (%)	16.200	15.033	11.712	
Strain Rate (in./min.)	0.050000	0.050000	0.050000	

Project Information		Sample ID	Description
Project Number	9515.000.000	B2@70	See exploration logs
Project Name	San Mateo County Sherriff's Replacement	B4@35	See exploration logs
		B6@30	See exploration logs
Test Date	9.7.12		
Project Location	San Mateo, California		
Client	San Mateo County Sherriff's Office		
Remarks			

Index Properties	B2@70	B4@35	B6@30	
Specific Gravity:	2.65	2.65	2.65	
Liquid Limit:				
Plastic Limit:				

EN GEO

Unconsolidated Undrained Triaxial Test (ASTM D2850)

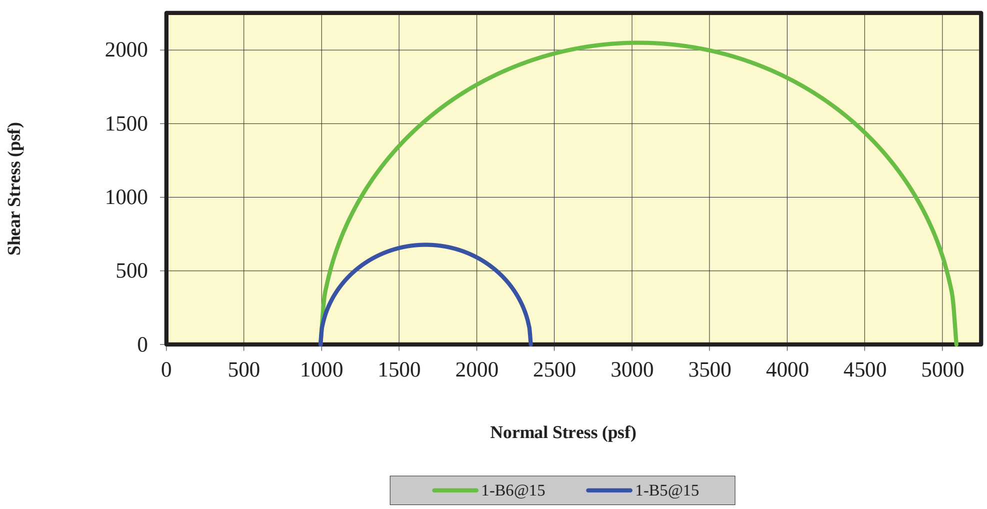
Date:

Checked By:

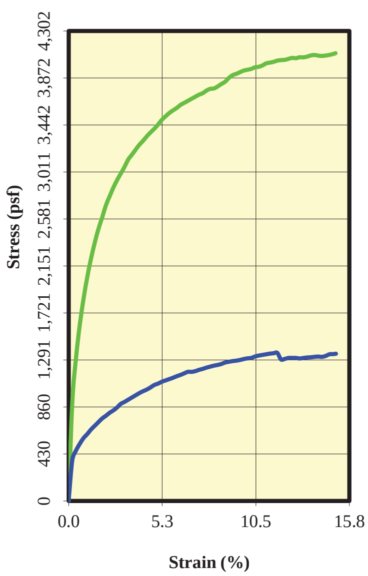
Date: 9.9.12

Tested By: D. Seibold

Mohr Circles



Stress-Strain Curve



Before Test	Specimen 1-B6@15	1-B5@15		
Water Content (%)	21.85	24.59		
Dry Density (pcf)	106.84	95.25		
Saturation (%)	100.00	88.43		
Void Ratio	0.55	0.74		
Diameter (in)	2.375	2.420		
Height (in)	4.990	4.990		
Liquid Limit	-	-		
Plastic Limit	-	-		
Specific Gravity	2.650	2.650		
Height-to-Diam. Ratio	2.101	2.062		
After Test	**1-B6@15**	**1-B5@15**		
Water Content (%)	21.85	24.59		
Saturation (%)	100.00	88.43		
Strain Rate (in/min)	0.05	0.05		
Peak Deviator Stress (psf)	4097.0	1354.7		
Axial Strain @ Failure (%)	15.010	11.736		
	Cell Pressure			
Cell (psf)	993.6	993.6		
Back (psf)	n/a	n/a		
	Principle Stresses at Failure			
σ1 (psf)	5090.6	2348.3		
σ3 (psf)	993.6	993.6		

Mohr-Coulomb Strength Parameters		Sample Description
Cohesion, c (psf)	0.0	See Exploration Logs
Friction Angle Ø	0.00	

Project Information			
Project Name:	San Mateo County Sherriff Replacement		
Project Number:	9515.000.000	Job Number:	9515.000.000
Location:	San Mateo, California	Boring Number:	Various
Client:	San Mateo County Sherriff's Office	Sample Number:	Various
Remarks:			

LABORATORY MINIATURE VANE SHEAR

ASTM D4648

APPARATUS USED: Wykeham Farrance, Model 27-WF1730/4

Sample #	Sample ID	Remold? (Y/N)	Test depth (ft)	Spring number	Shear strength (psf)
1	1-B1 @ 10	N	12	4	454
2	1-B3 @ 8	N	9.5	2	430
3	1-B6 @ 10	N	12	1	551

PROJECT NAME: San Mateo County Sherriff's Replacement Correctional Facility

DATE: 09/07/12

PROJECT NUMBER: 9515.000.000

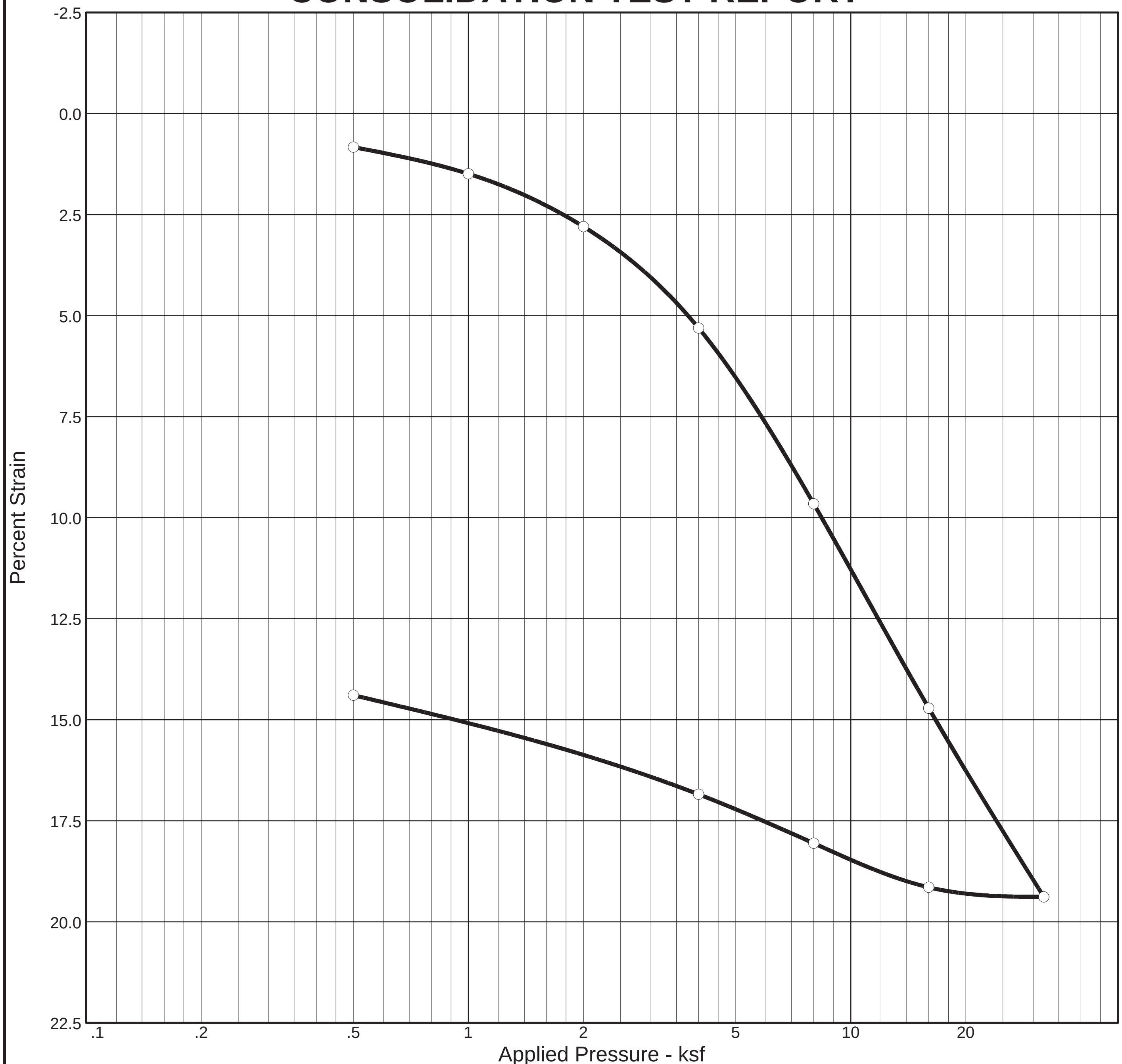
CLIENT: San Mateo County Sherriff's Office

PHASE NUMBER: 002

Tested by: GC
Reviewed by: DS

ENGEO INCORPORATED

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
97.3 %	35.7 %	84.5			2.683			0.983

MATERIAL DESCRIPTION

See exploration logs.

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

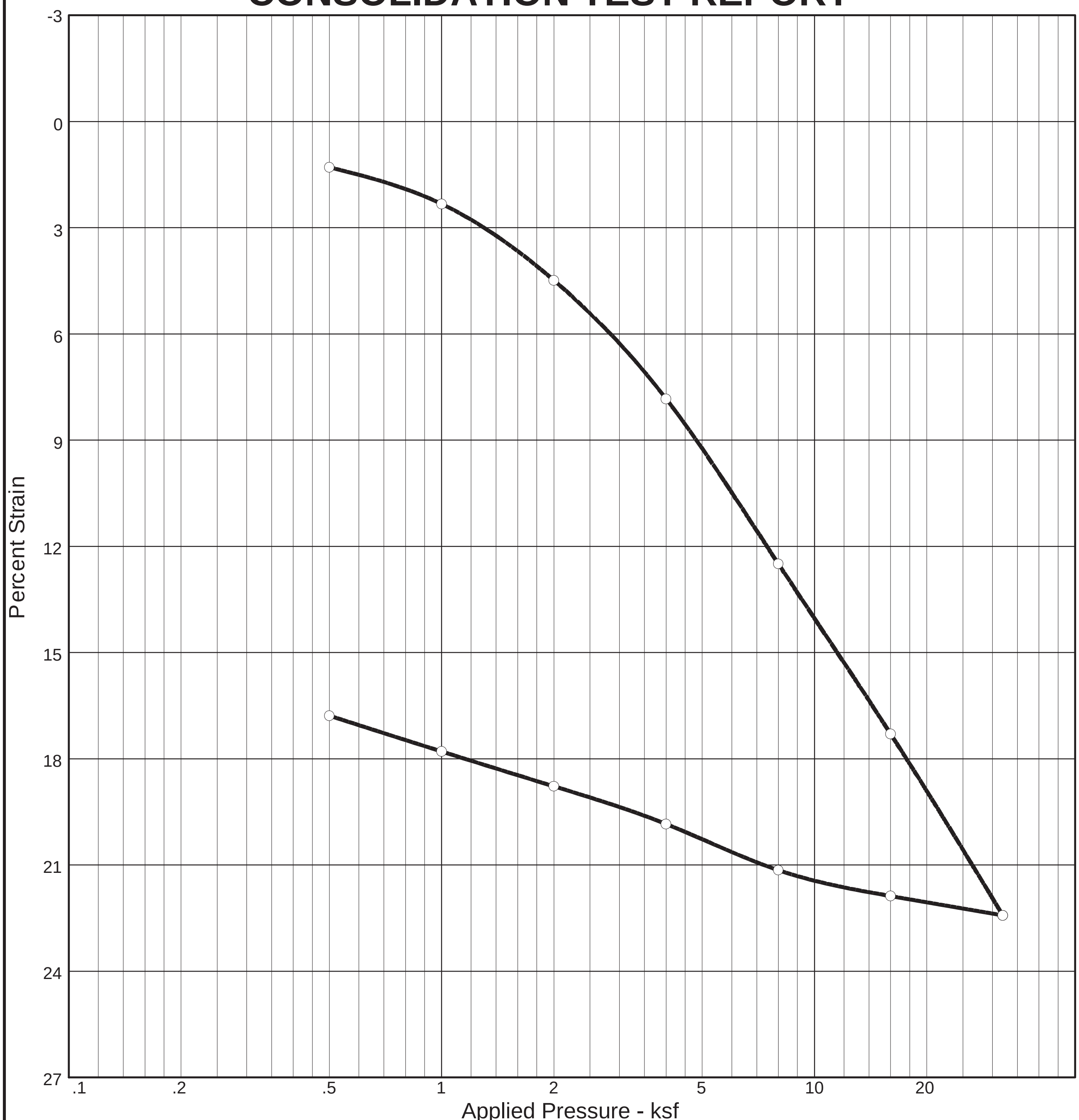
Source: 1-B2 **Sample No.:** 1-B2 @ 10

ENGEO INCORPORATED GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS MATERIALS TESTING

Remarks:

Starting load of 0.500 ksf and 3 rebound points per project manager request;Starting height = 0.7730 in.

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
100.0 %	51.2 %	70.7			2.690			1.377

MATERIAL DESCRIPTION

See exploration logs.

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

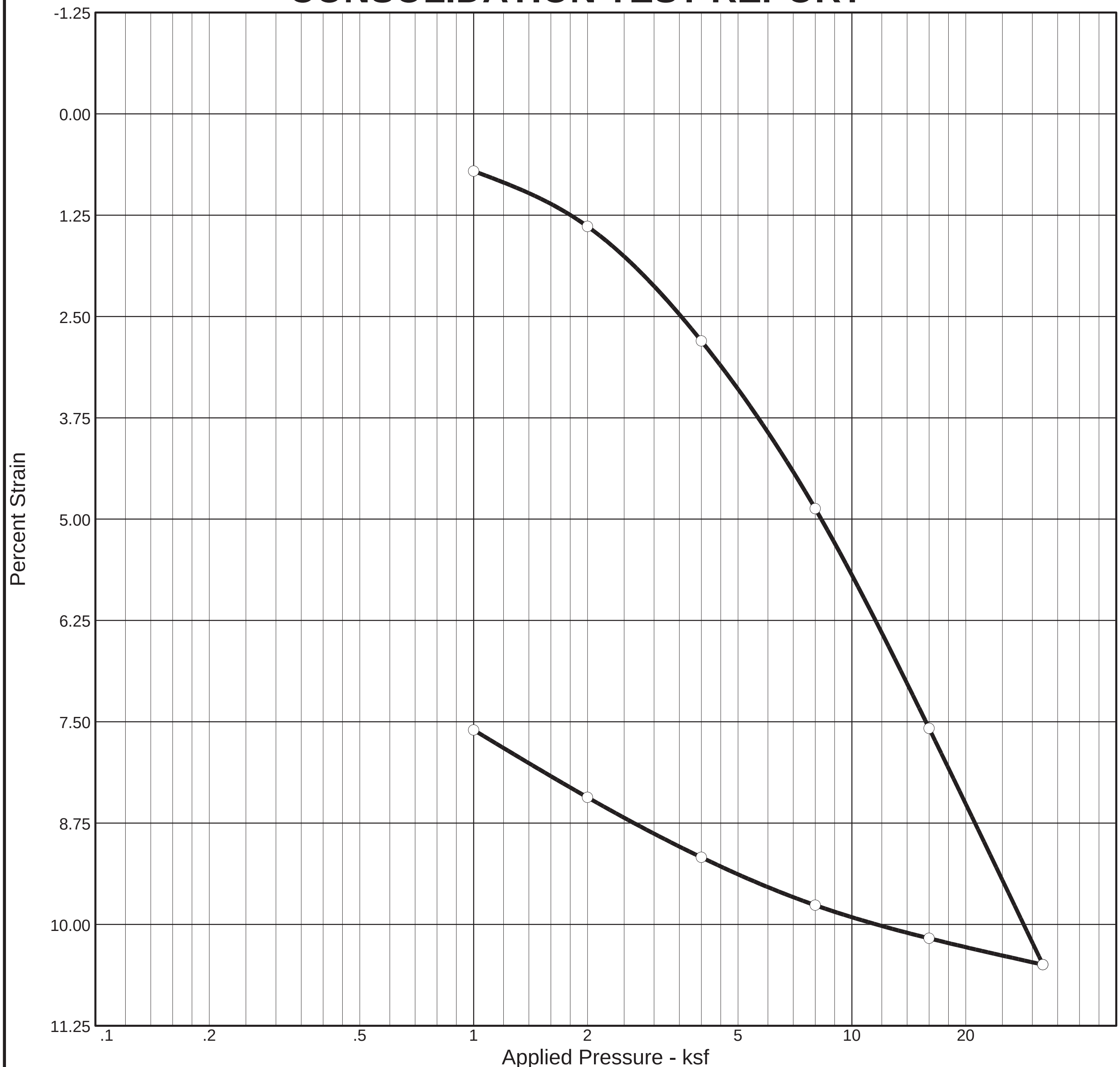
Project: San Mateo County Sherriff's Replacement Correctional Facility

Source: 1-B3 **Sample No.:** 1-B3 @ 8

Remarks:
Starting height = 0.7820 in.;
Starting load of 0.500 ksf per
request of project manager

ENGEO INCORPORATED
GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS
MATERIALS TESTING

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
93.2 %	20.9 %	105.5			2.719			0.610

MATERIAL DESCRIPTION

See exploration logs.

Project No. 9515.000.000 **Client:** San Mateo County Sherriff's Office

Project: San Mateo County Sherriff's Replacement Correctional Facility

Source: 1-B4 **Sample No.:** 1-B4 @ 10

ENGEO INCORPORATED GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS MATERIALS TESTING

Remarks:

Starting height = 0.7690 in.; Starting load of 1.0 ksf per project manager request

APPENDIX D

CERCO

Corrosivity Test Results

A P P E N D I X D

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 **462 2771** Fax. 925 **462 2775**
www.cercoanalytical.com

18 September, 2012

Job No.1209044
Cust. No.10169

Ms. Janet Kan
ENGEO Inc.
2010 Crow Canyon Place, Suite 250
San Ramon, CA 94583

Subject: Project No.: 9515.000.000
Project Name: San Mateo Sherriff Replacement
Corrosivity Analysis – ASTM Test Methods

Dear Ms. Kan:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on September 07, 2012. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, this sample is classified as "corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration is 580 mg/kg. Because the chloride ion concentration is greater than 300 mg/kg, it is determined to be sufficient to attack steel embedded in a concrete mortar coating. Chloride ion concentrations greater than 300 mg/kg are considered corrosive to embedded reinforcing steel; and, as such, the concrete mix design shall be adjusted accordingly by a qualified corrosion engineer.

The sulfate ion concentration is 98 mg/kg and is determined to be insufficient to damage reinforced concrete structures and cement mortar-coated steel at this location.

The pH of the soil is 8.2, which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 480-mV, which is indicative of aerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

Cheryl McMillen for

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 **462 2771** Fax. 925 **462 2775**
www.cercoanalytical.com

Client: ENGEO Incorporated
Client's Project No.: 9515.000.000
Client's Project Name: San Mateo Sherriff Replacement
Date Sampled: 4-Sep-12
Date Received: 7-Sep-12
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 18-Sep-2012

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1209044-001	1-B3 @ 20	480	8.2	-	850	-	580	98

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Detection Limit:	-	-	10	-	50	15	15
Date Analyzed:	11-Sep-2012	11-Sep-2012	-	10-Sep-2012	-	11-Sep-2012	11-Sep-2012

* Results Reported on "As Received" Basis

Cheryl McMillen
Laboratory Director

<u>**Quality Control Summary**</u> **- All laboratory quality control parameters were found to be within established limits**

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

20 September, 2012

Job No.1209103
Cust. No.10169

Ms. Janet Kan
ENGEO Inc.
2010 Crow Canyon Place, Suite 250
San Ramon, CA 94583

Subject: Project No.: 9515.000.000
Project Name: San Mateo Sherriff Replacement
Corrosivity Analysis – ASTM Test Methods

Dear Ms. Kan:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on September 14, 2012. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurements, Samples No.002 and No.003 are classified as "severely corrosive", and Samples No.001, No.004 and No.005 are classified as "corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentrations ranged from 110 to 4,000 mg/kg. Because the chloride ion concentrations are greater than 300 mg/kg, they are determined to be sufficient to attack steel embedded in a concrete mortar coating. Chloride ion concentrations greater than 300 mg/kg are considered corrosive to embedded reinforcing steel; and, as such, the concrete mix design shall be adjusted accordingly by a qualified corrosion engineer.

The sulfate ion concentrations ranged from 16 to 730 mg/kg and are determined to be sufficient to potentially be detrimental to reinforced concrete structures and cement mortar-coated steel at these locations. Therefore, concrete that comes into contact with this soil should use sulfate resistant cement such as Type II, with a maximum water-to-cement ratio of 0.55.

The pH of the soils ranged from 7.8 to 8.7, which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potentials ranged from 140 to 480-mV. Sample No.005 is indicative of potentially "moderately corrosive", and Samples No.002, No.003 and No.004 are indicative of potentially "slightly corrosive" soil resulting from anaerobic soil conditions, and Sample No.001 is indicative of aerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

Cheryl McMillen for

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: ENGEO Incorporated
Client's Project No.: 9515.000.000
Client's Project Name: San Mateo Sherriff Replacement
Date Sampled: 14-Sep-12
Date Received: 14-Sep-12
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 20-Sep-2012

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1209103-001	1-B2 @ 8.5'	480	8.1	-	900	-	3,800 (1)	610
1209103-002	1-B3 @ 46'	260	8.1	-	230	-	2,100 (1)	230
1209103-003	1-B4 @ 31'	330	7.8	-	140	-	4,000 (1)	730
1209103-004	1-B4 @ 71'	250	8.7	-	1,600	-	110	16
1209103-005	1-B6 @ 9'	140	7.9	-	610	-	360	130

	Redox	pH	Conductivity	Resistivity	Sulfide	Chloride	Sulfate
Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Detection Limit:	-	-	10	-	50	15	15
Date Analyzed:	18-Sep-2012	18-Sep-2012	-	17-Sep-2012	-	19-Sept-2012 & 20-Sep-2012	19-Sep-2012

Cheryl McMillen
Laboratory Director

* Results Reported on "As Received" Basis

N.D. - None Detected

(1) Detection limit is elevated to 75 mg/kg due to dilution

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 **462 2771** Fax. 925 **462 2775**
www.cercoanalytical.com

9 October, 2012

Job No.1210039
Cust. No.10169

Ms. Janet Kan
ENGEO Inc.
2010 Crow Canyon Place, Suite 250
San Ramon, CA 94583

Subject: Project No.: 9515.000.000
Project Name: San Mateo Sherriff's Department
Corrosivity Analysis – ASTM Test Methods

Dear Ms. Kan:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on October 04, 2012. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, this sample is classified as "corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration reflects none detected with a detection limit of 15 mg/kg.

The sulfate ion concentration is 310 mg/kg and is determined to be sufficient to potentially be detrimental to reinforced concrete structures and cement mortar-coated steel at these locations. Therefore, concrete that comes into contact with this soil should use sulfate resistant cement such as Type II, with a maximum water-to-cement ratio of 0.55.

The pH of the soil is 8.0, which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 310-mV, which is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

Cheryl McNeil for

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: ENGEO Incorporated
Client's Project No.: 9515.000.000
Client's Project Name: San Mateo County Sherriff's Department
Date Sampled: 4-Oct-12
Date Received: 4-Oct-12
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 9-Oct-2012

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1210039-001	1-B2 @ 3	310	8.0	-	1,900	-	N.D.	310

Method:		ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Detection Limit:		-	-	10	-	50	15	15
Date Analyzed:		8-Oct-2012	8-Oct-2012	-	8-Oct-2012	-	8-Oct-2012	8-Oct-2012

* Results Reported on "As Received" Basis

N.D. - None Detected

Cheryl McMillen
Laboratory Director

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

APPENDIX E

Liquefaction Calculation Tables

A
P
P
E
N
D
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X

E

Candlestick Point Borings

Liquefaction Evaluation - Youd 2001, Seed 2003, I&B 2008 Methods -

Project Name: San Mateo County Jail, Redwood City, California
Project No.: 9515.000.000
Date: 5-Oct-12

Water Table depth at time of Exploration	Water Table depth at time of Liquefaction	amax/g	Mw	$V_{s*40'}$
5	5	0.71	7.9	625

* V_{S40} = Avg shear wave velocity in upper 40 feet expressed in ft/s

					At time of Exploration		At time of Liquefaction	
Boring Designation	Depth [ft]	Soil Type	N_m [Blows/ft]	FC	Total Stress [psf]	Effective Stress [psf]	Total Stress [psf]	Effective Stress [psf]
B2	25	GP	8	5	3000	1752	3000	1752
B2	45	SP	24	5	5400	2904	5400	2904
B3	25	GM	7	15	3000	1752	3000	1752
B4	20	SC	10	34	2400	1464	2400	1464
B5	20	ML	9	55	2400	1464	2400	1464
B6	20	GP	23	5	2400	1464	2400	1464
B6	25	GP	5	5	3000	1752	3000	1752
						0		0

N_m = Measured SPT Blow Count

YOUD 2001 Methodology Results

Boring Designation	Depth	CRR	CSR	FS
B2	25	0.09	0.74	0.12
B2	45	0.19	0.68	0.28
B3	25	0.11	0.74	0.14
B4	20	0.18	0.72	0.24
B5	20	0.16	0.72	0.23
B6	20	0.29	0.72	0.40
B6	25	0.07	0.74	0.09

TDL = Too Dense to Liquefy based on blowcount criteria

SEED 2003 Methodology Results

			CSR			Calculated FS		
Boring Designation	Depth	CRR	mean rd	rd + sigma	rd - sigma	mean rd	rd + sigma	rd - sigma
B2	25	0.06	0.69	0.78	0.60	0.09	0.08	0.10
B2	45	0.13	0.67	0.83	0.50	0.19	0.16	0.26
B3	25	0.06	0.69	0.78	0.60	0.09	0.08	0.10
B4	20	0.10	0.66	0.73	0.59	0.15	0.14	0.17
B5	20	0.10	0.66	0.72	0.59	0.16	0.14	0.17
B6	20	0.25	0.67	0.74	0.61	0.38	0.34	0.42
B6	25	0.05	0.69	0.78	0.60	0.07	0.06	0.08
0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

THC = CRR capped at 4, in high seismicity cases, verify

Idriss & Boulanger 2008 Methodology Results

Boring Designation	Depth	CRR	CSR	FS
B2	25	0.11	0.82	0.13
B2	45	0.22	0.88	0.25
B3	25	0.13	0.82	0.16
B4	20	0.18	0.78	0.23
B5	20	0.17	0.78	0.21
B6	20	0.31	0.76	0.41
B6	25	0.09	0.82	0.11
0	0	#DIV/0!	#DIV/0!	#DIV/0!

THC = CRR capped at 4, in high seismicity cases, verify

ENGEO Expect Excellence 40 years

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

ENGEO
2010 Crow Canyon Place
Suite 250
San Ramon, CA 94583

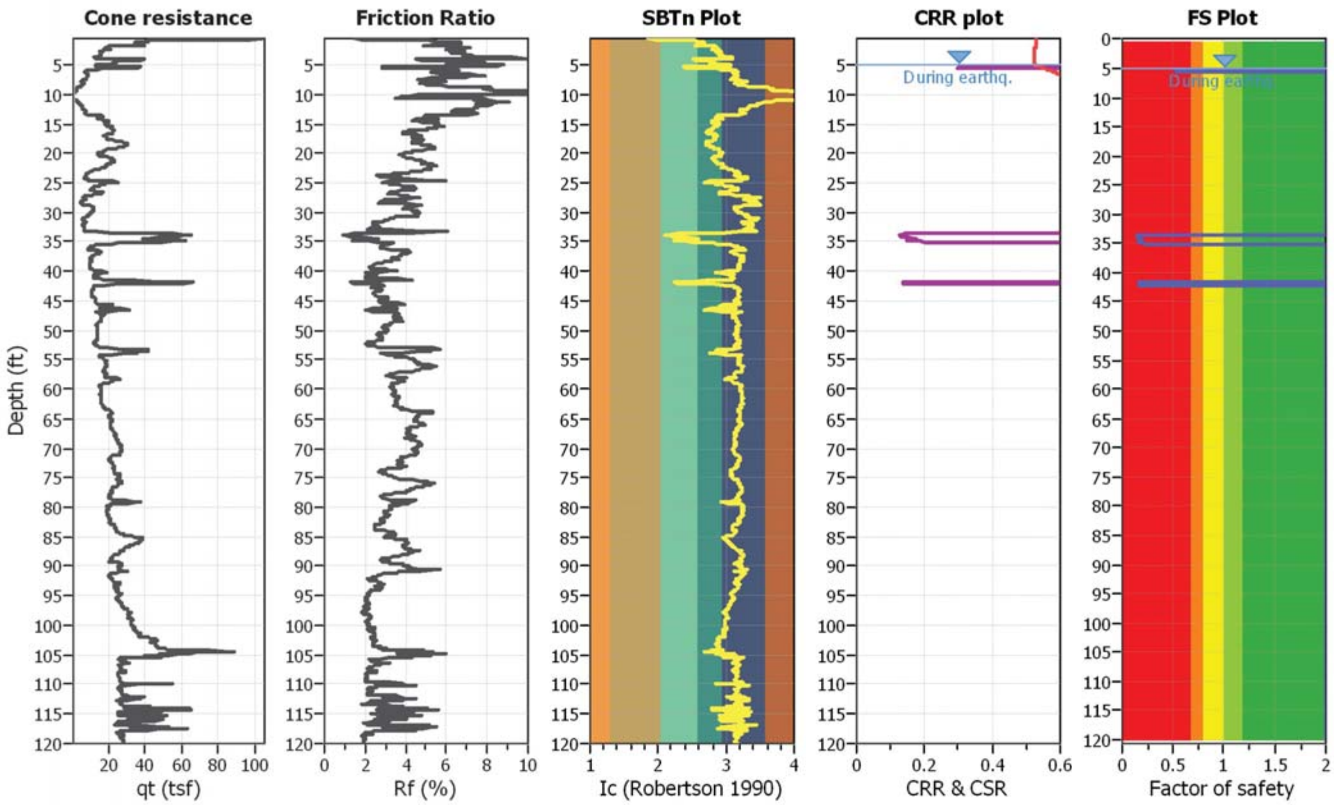
LIQUEFACTION ANALYSIS REPORT

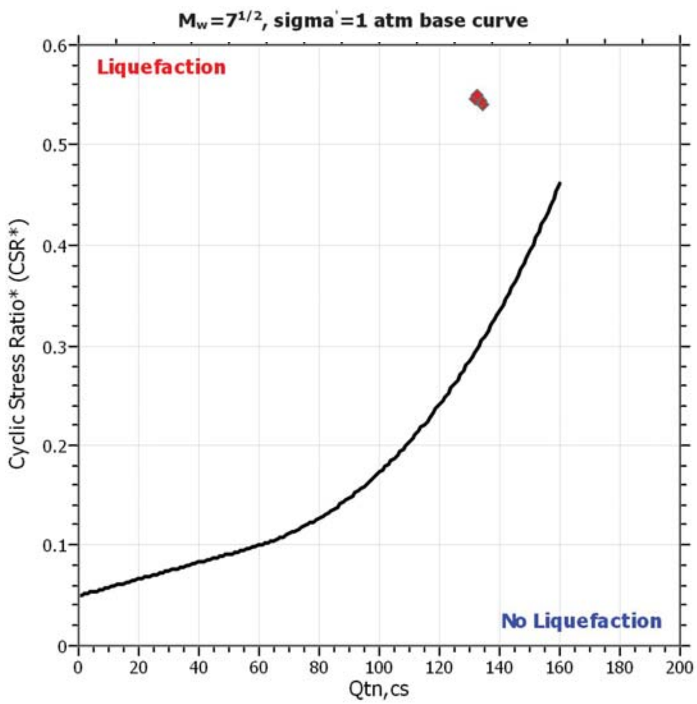
Project title : **Location :**

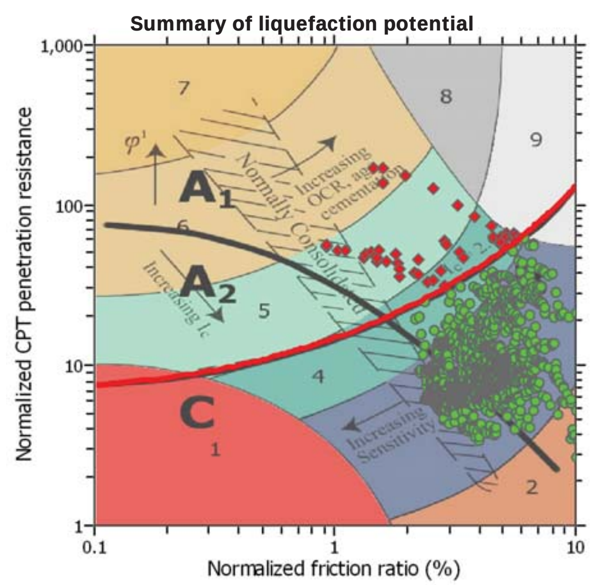
CPT file : CPT1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	10.70 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.90	Ic cut-off value:	2.60	Trans. detect. applied:	No		
Peak ground acceleration:	0.71	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

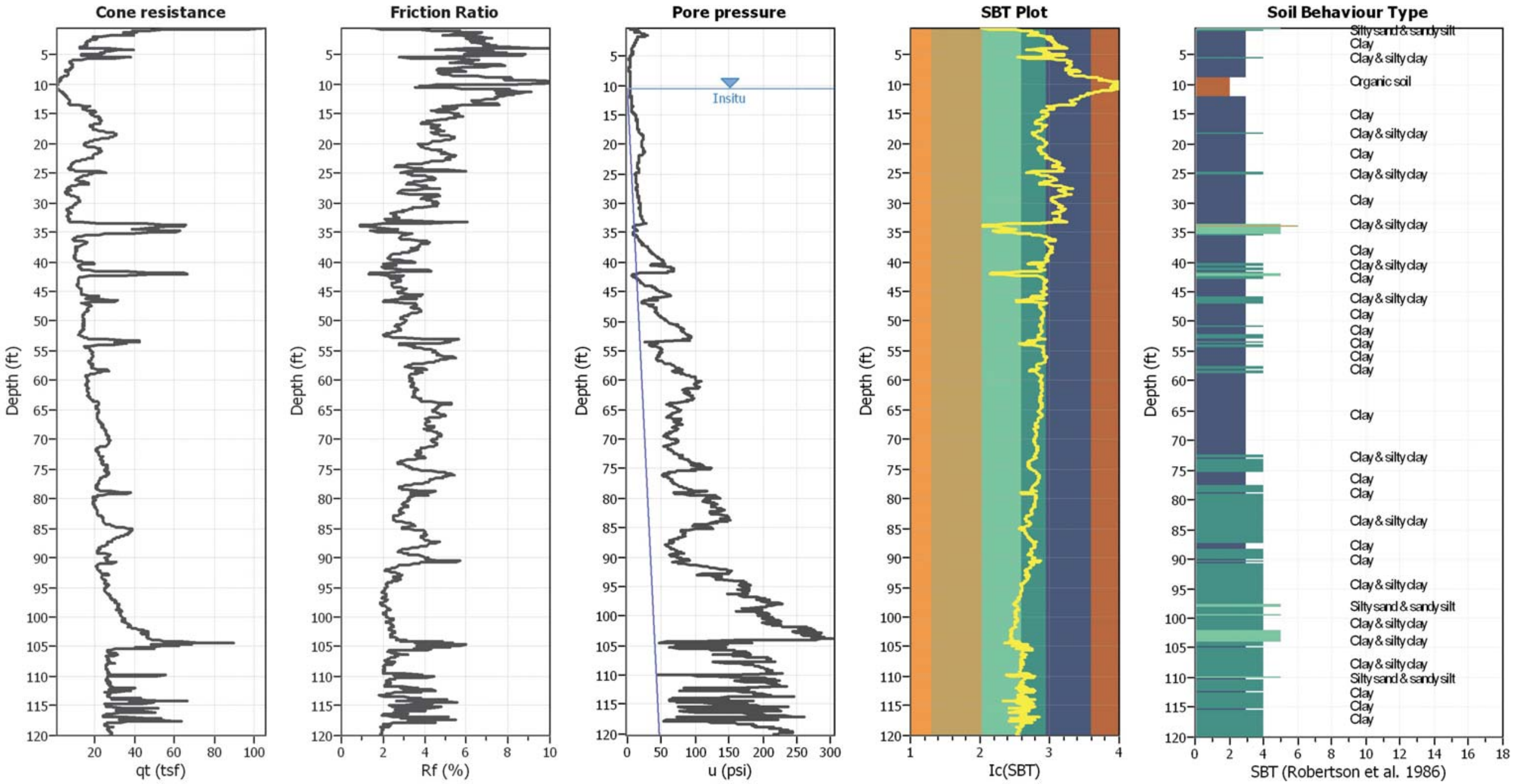






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



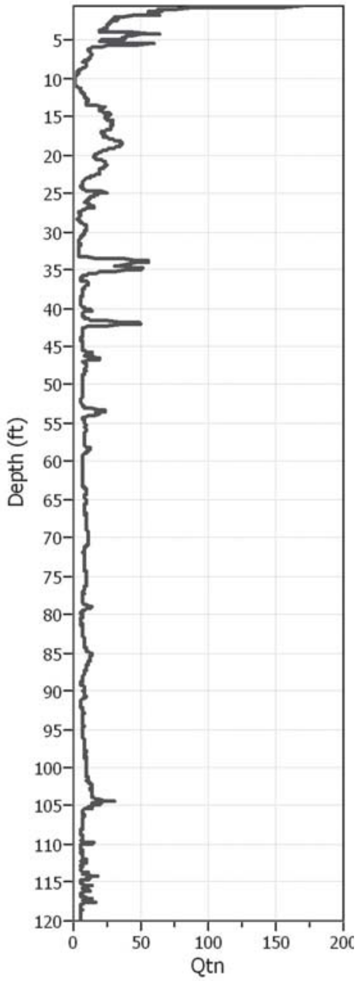
Input parameters and analysis data

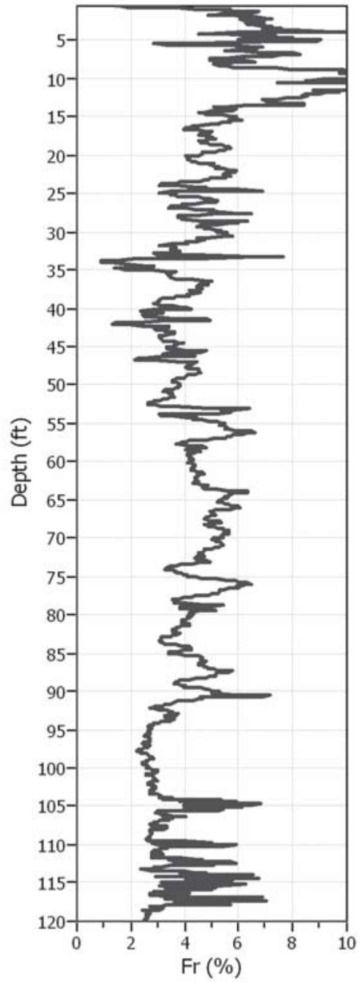
Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	10.70 ft	Fill height:	N/A	Limit depth:	N/A

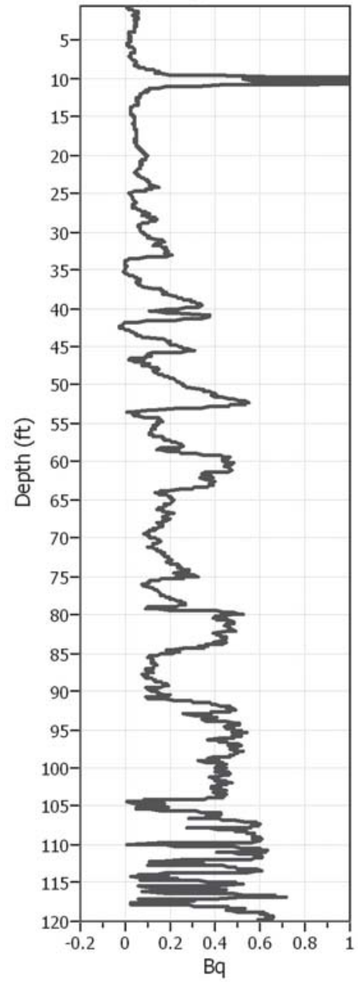
SBT legend

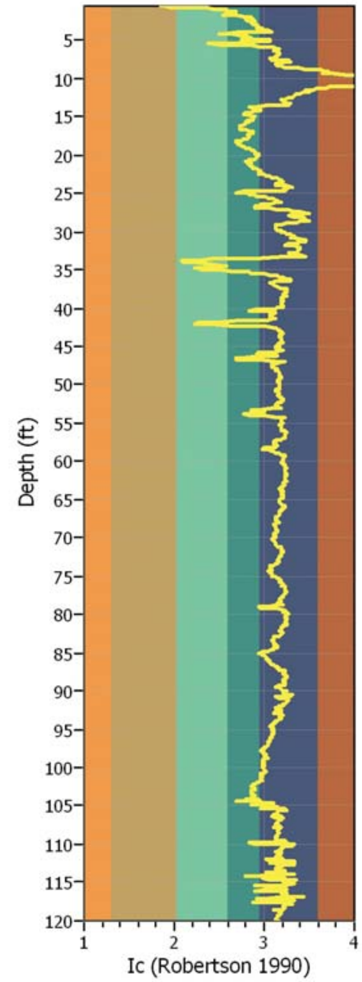
1. Sensitive fine grained	4. Clayey silt to silty	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

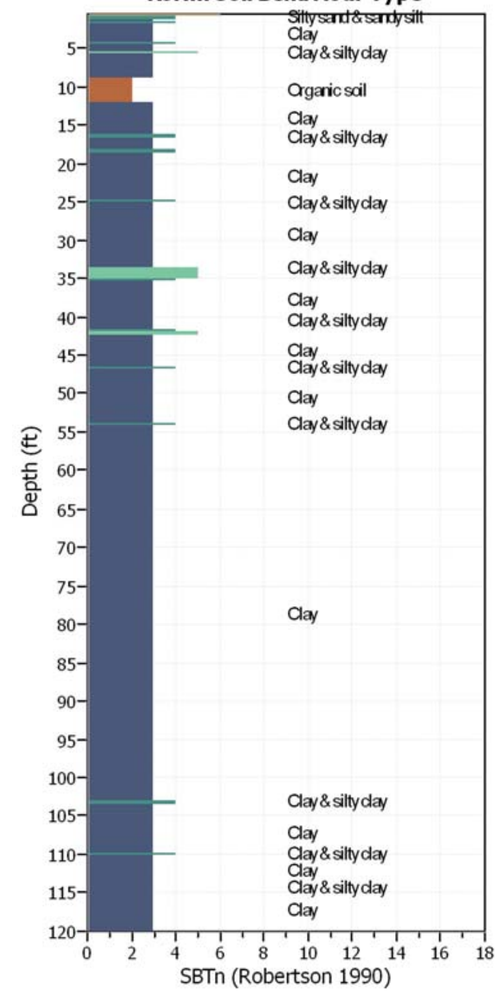
CPT basic interpretation plots (normalized)











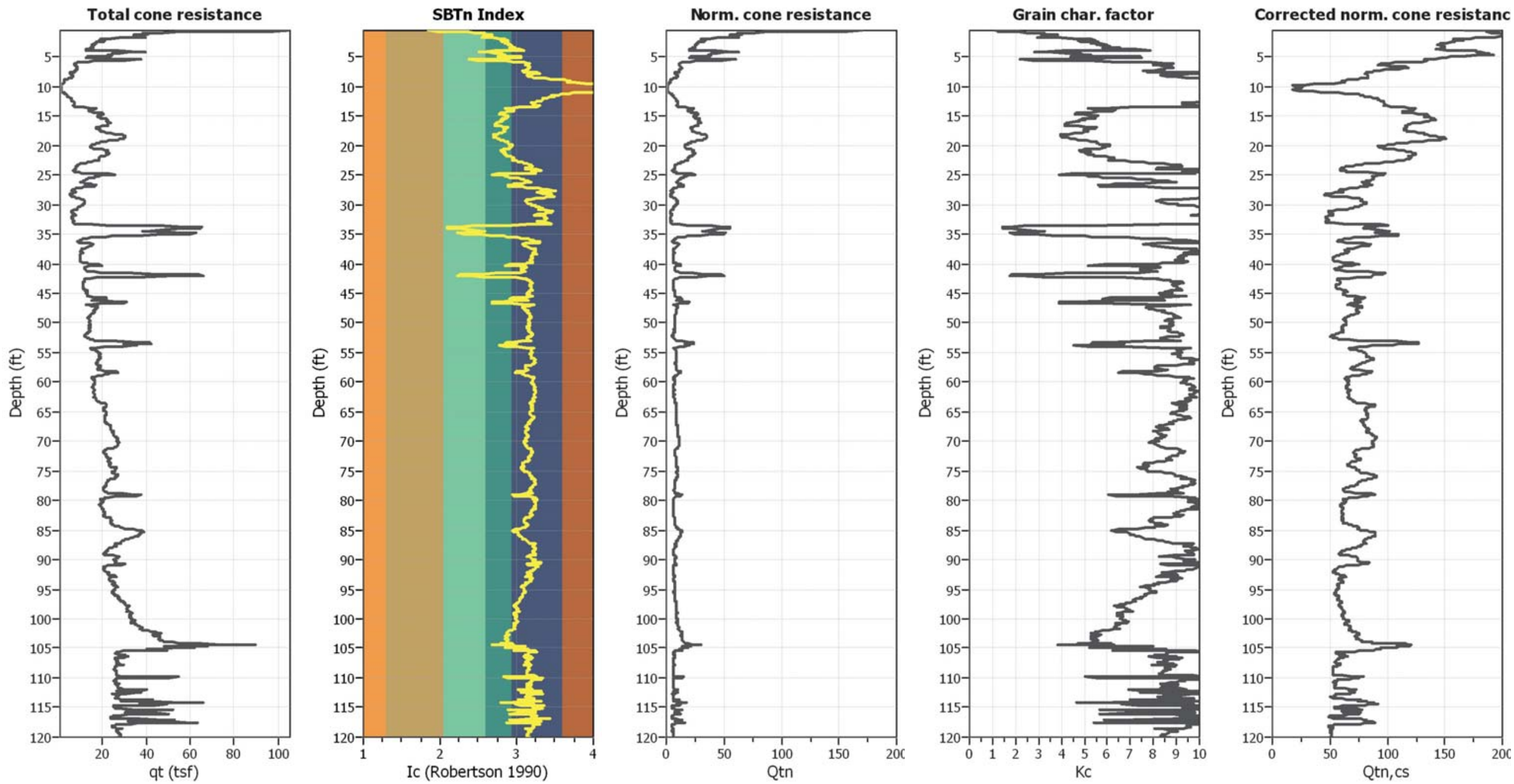
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	10.70 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

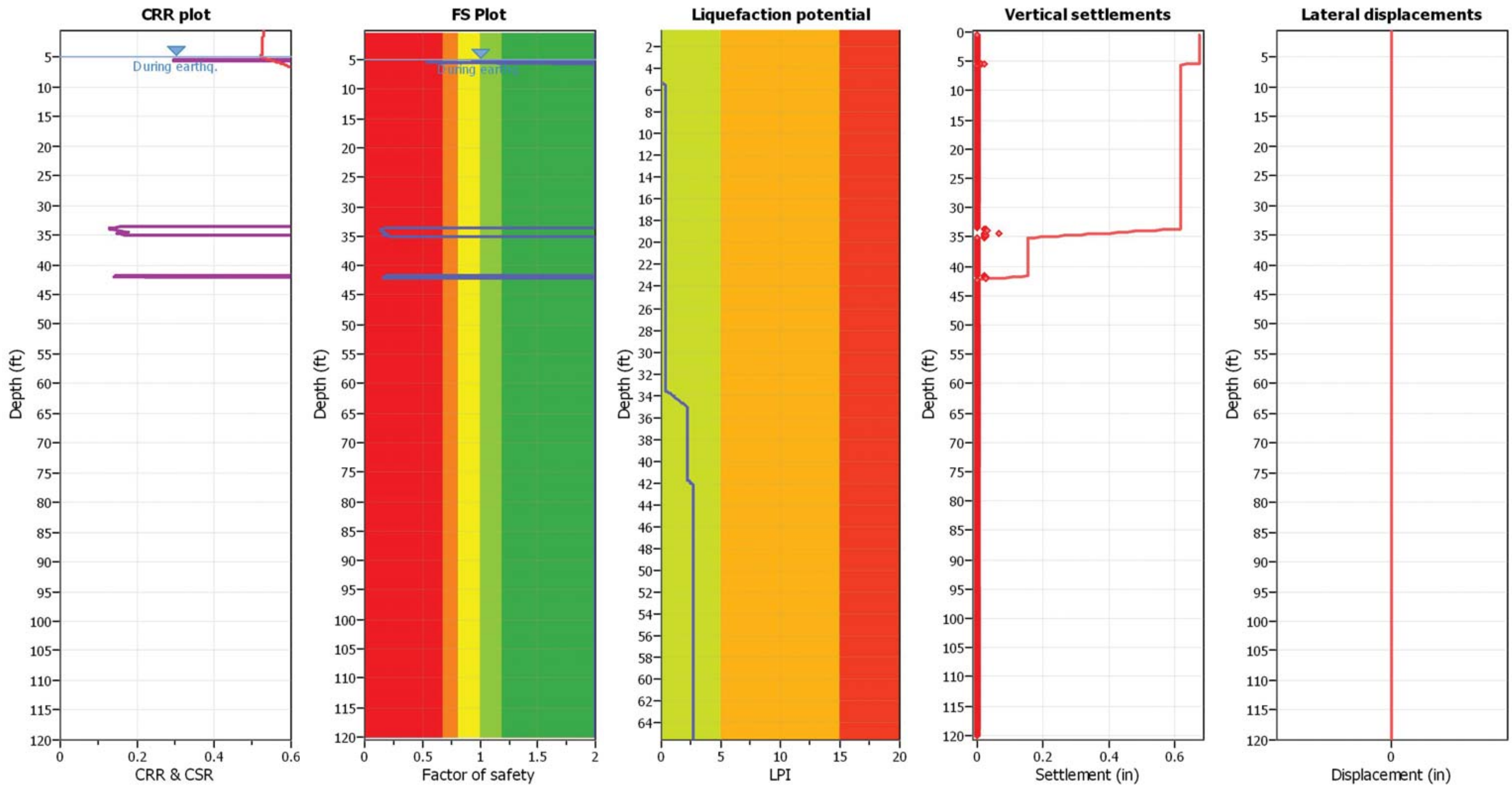
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	10.70 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	10.70 ft	Fill height:	N/A	Limit depth:	N/A

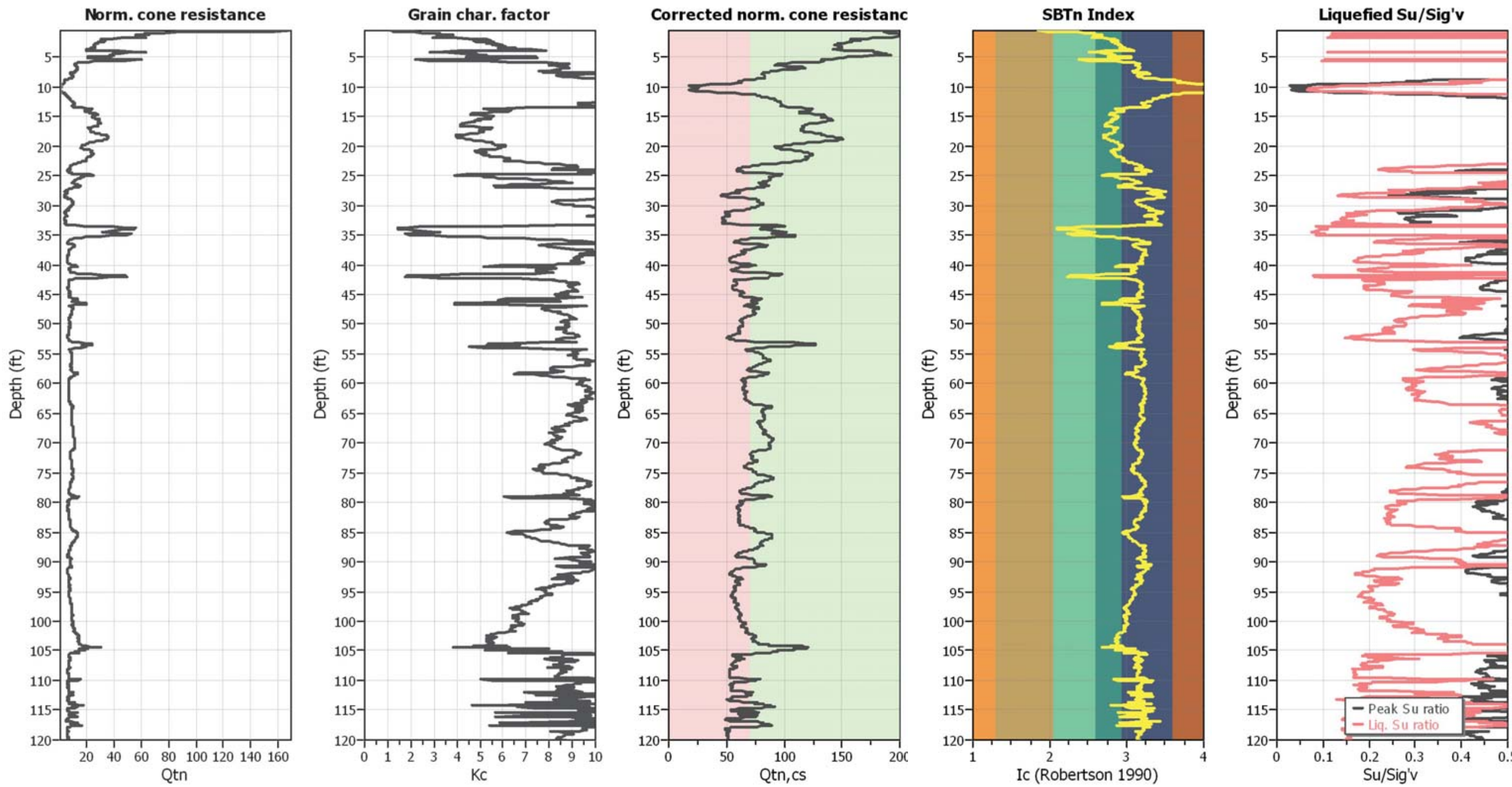
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

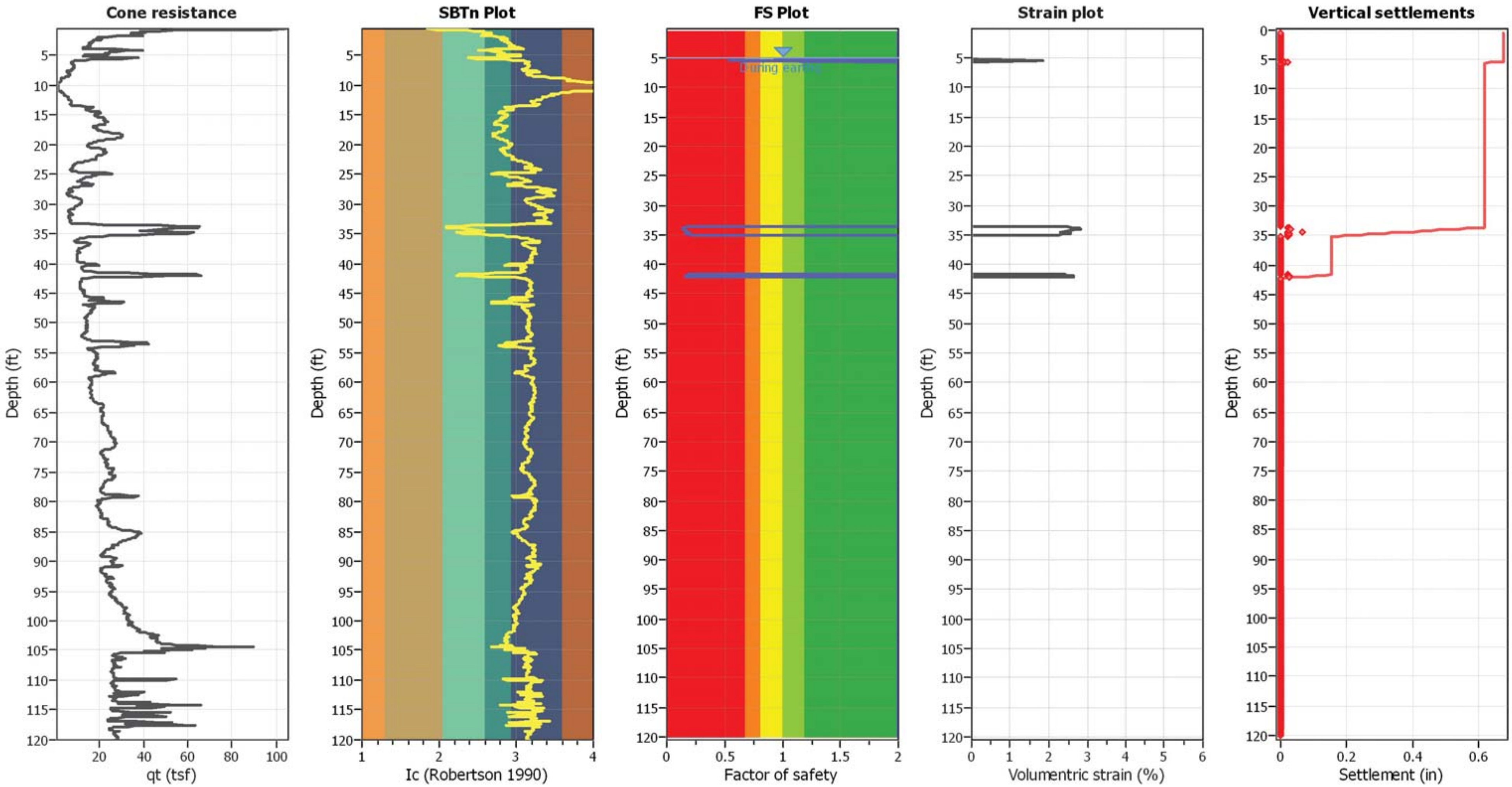
Check for strength loss plots (Olsen & Stark (2002))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	10.70 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

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

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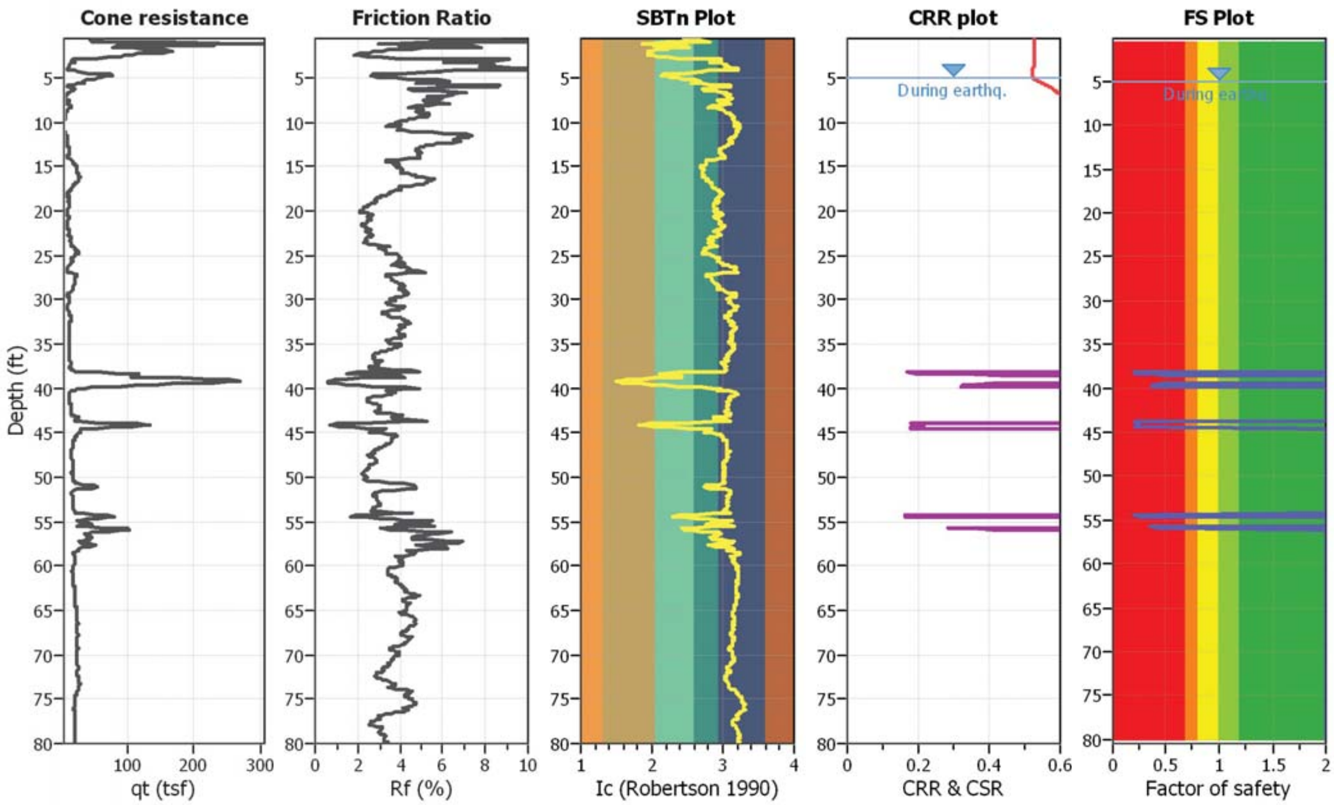
LIQUEFACTION ANALYSIS REPORT

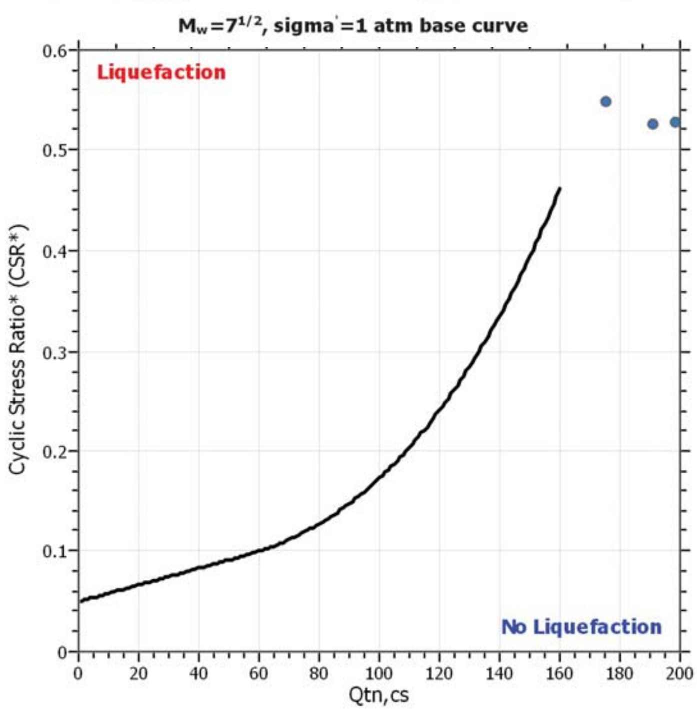
Project title : **Location :**

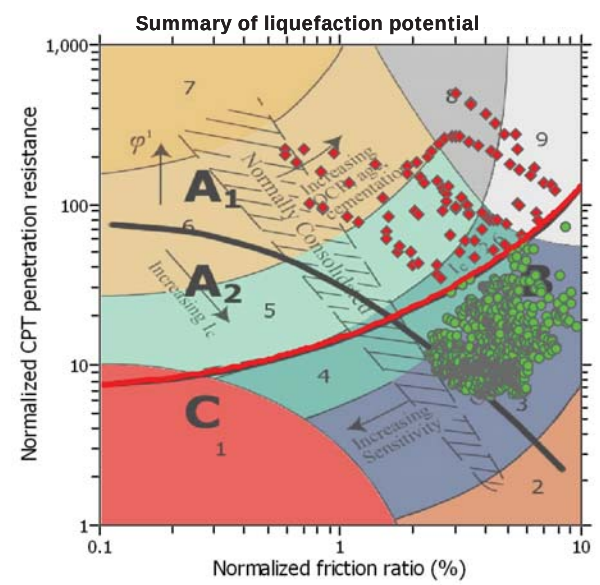
CPT file : cpt2

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	11.30 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.90	Ic cut-off value:	2.60	Trans. detect. applied:	No		
Peak ground acceleration:	0.71	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

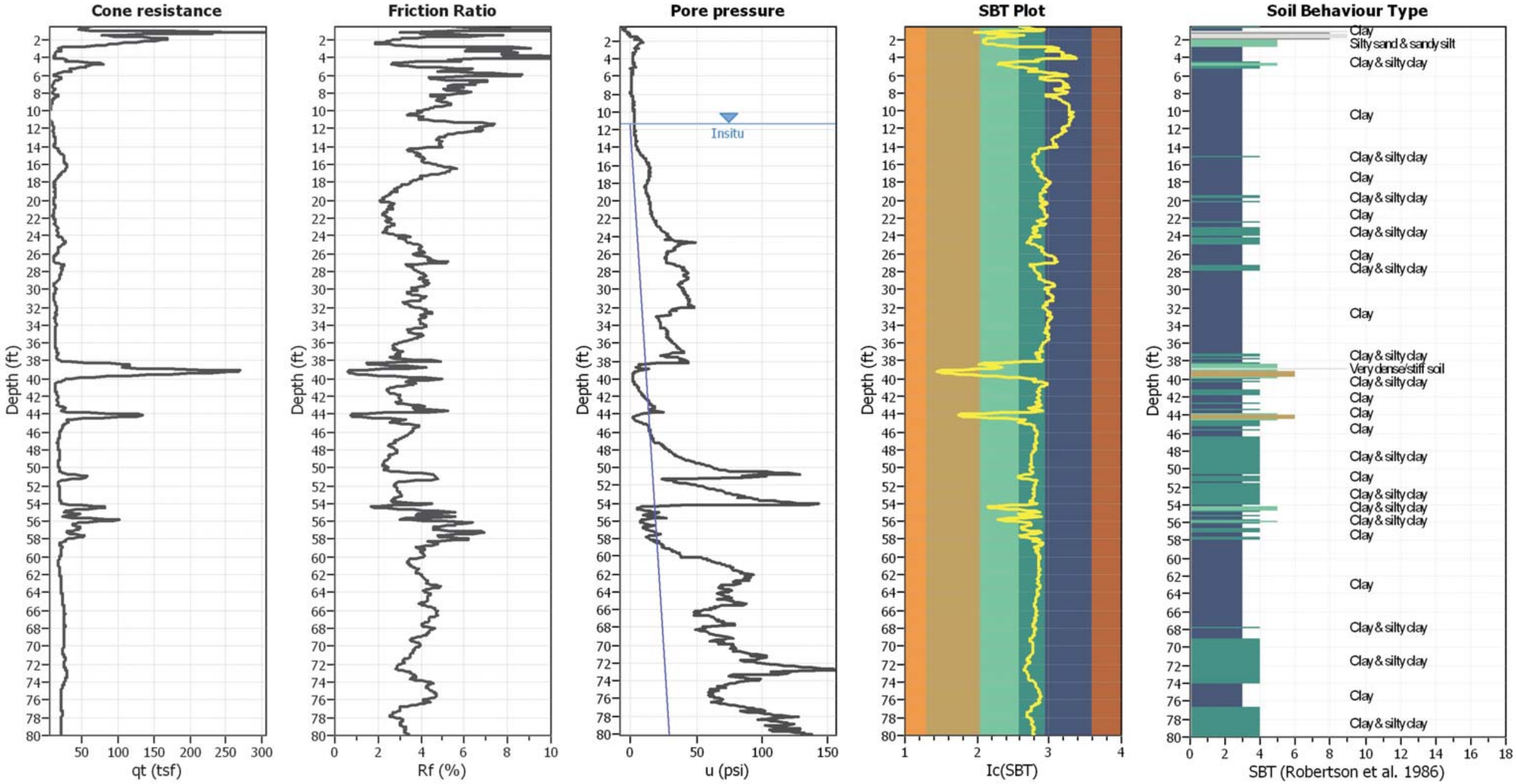






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



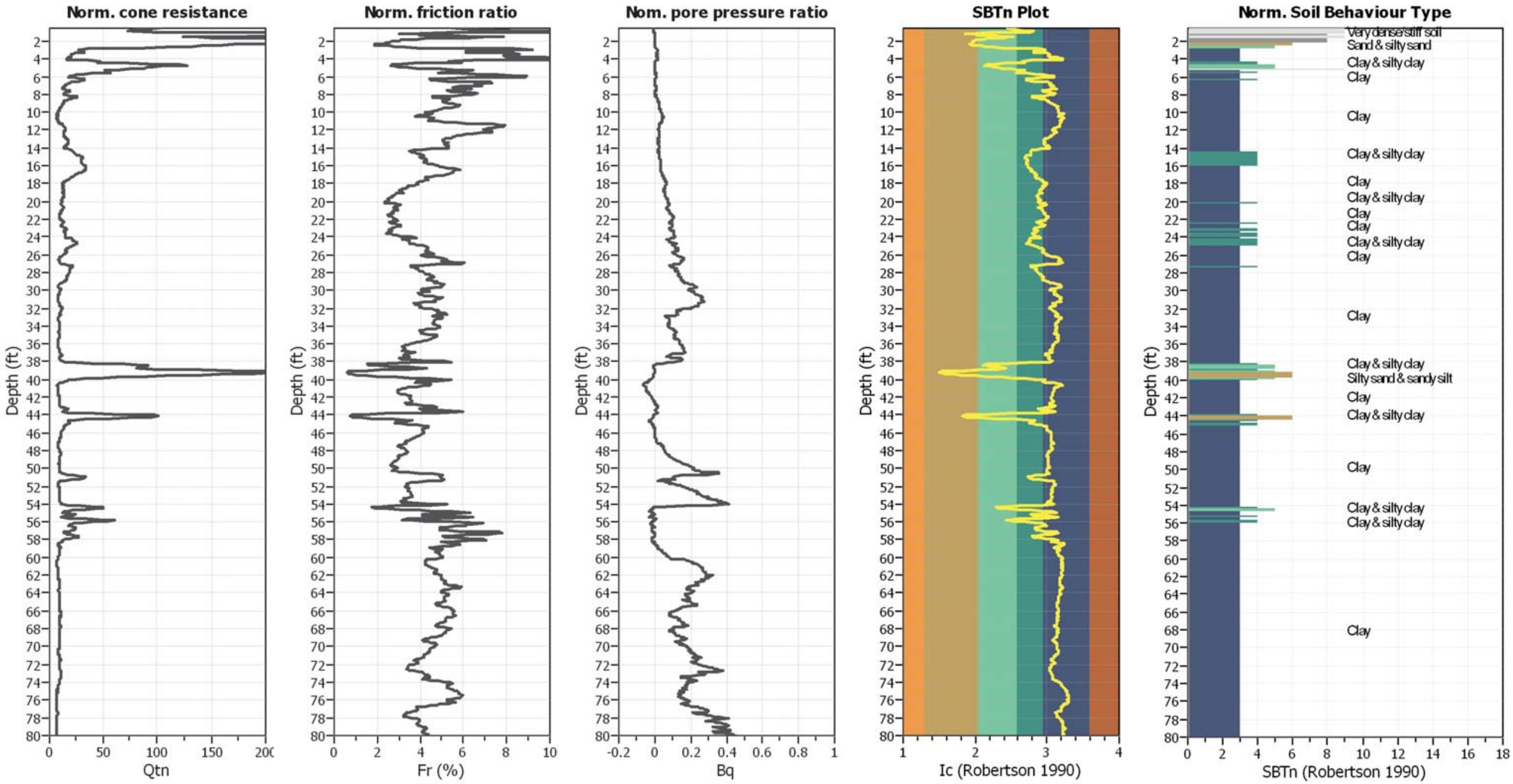
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.30 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



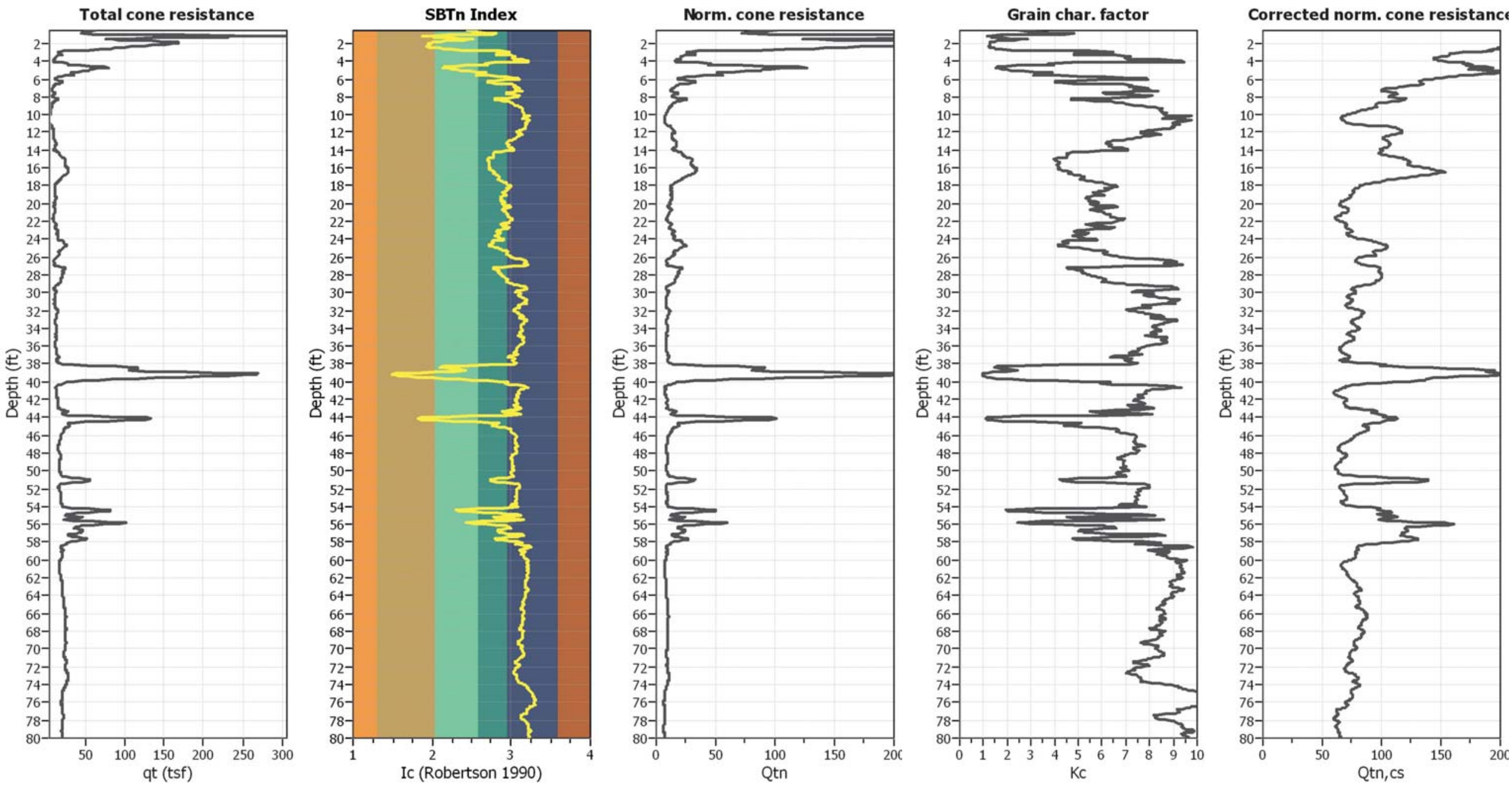
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.30 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

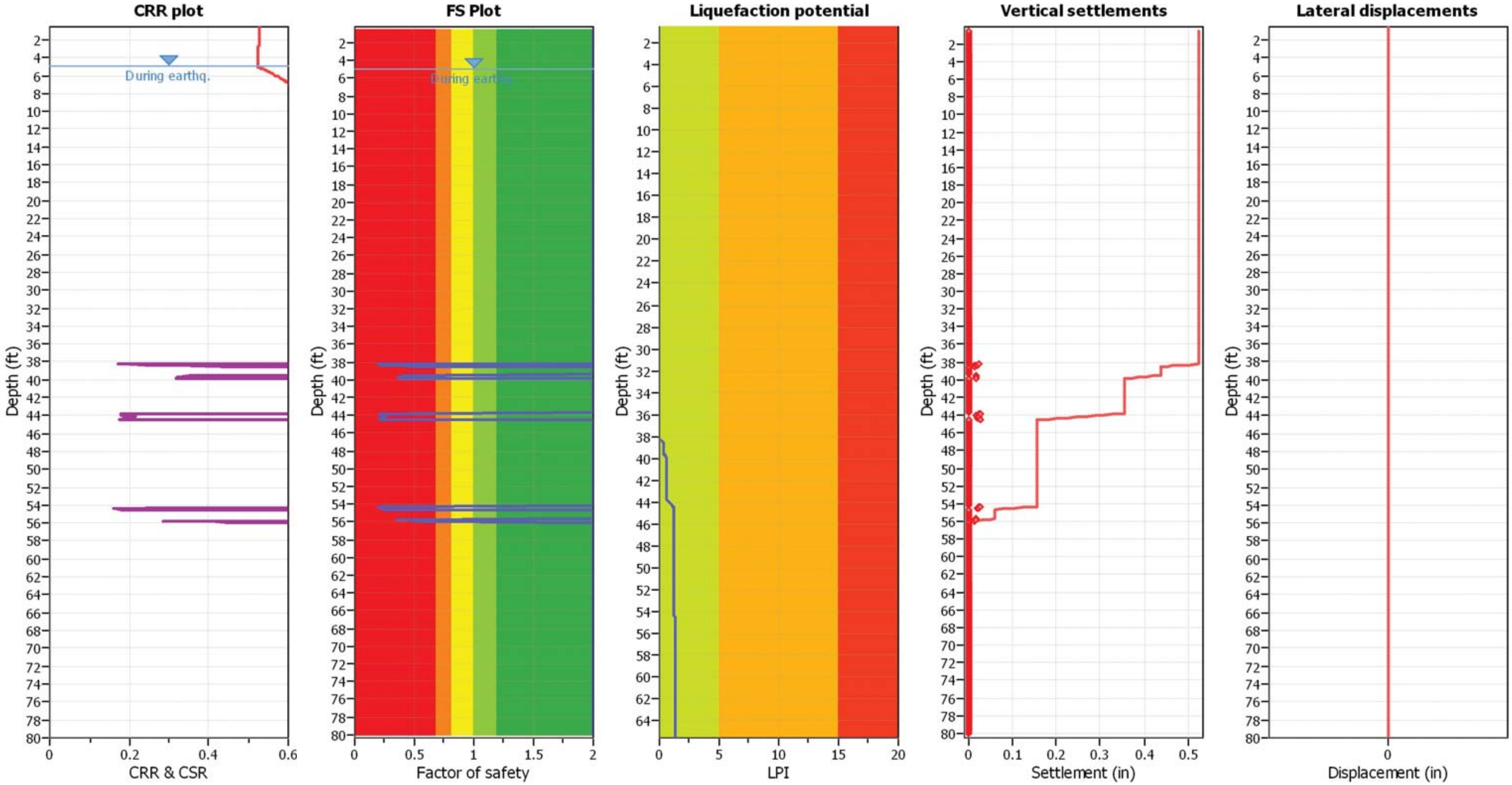
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.30 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.30 ft	Fill height:	N/A	Limit depth:	N/A

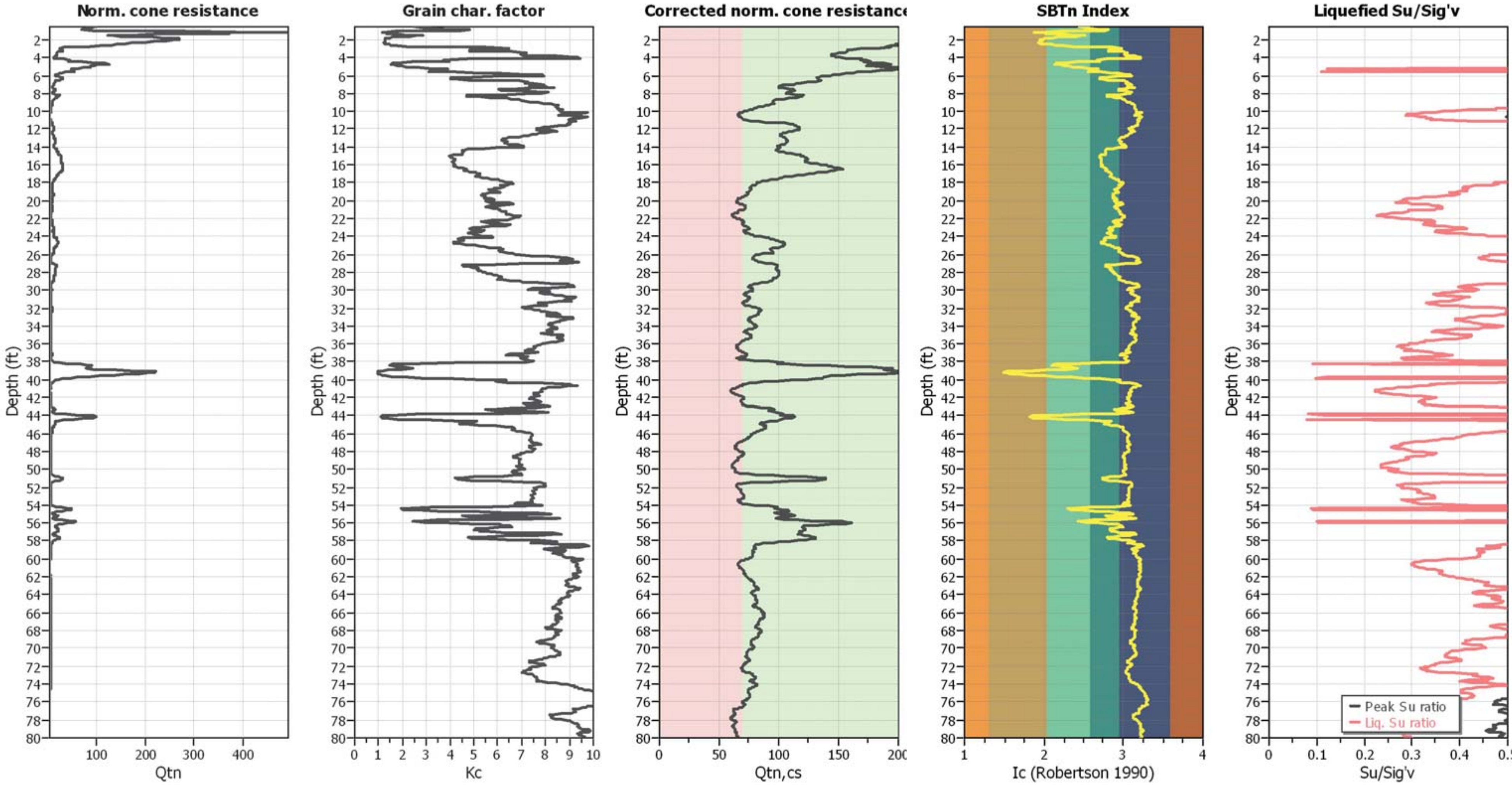
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

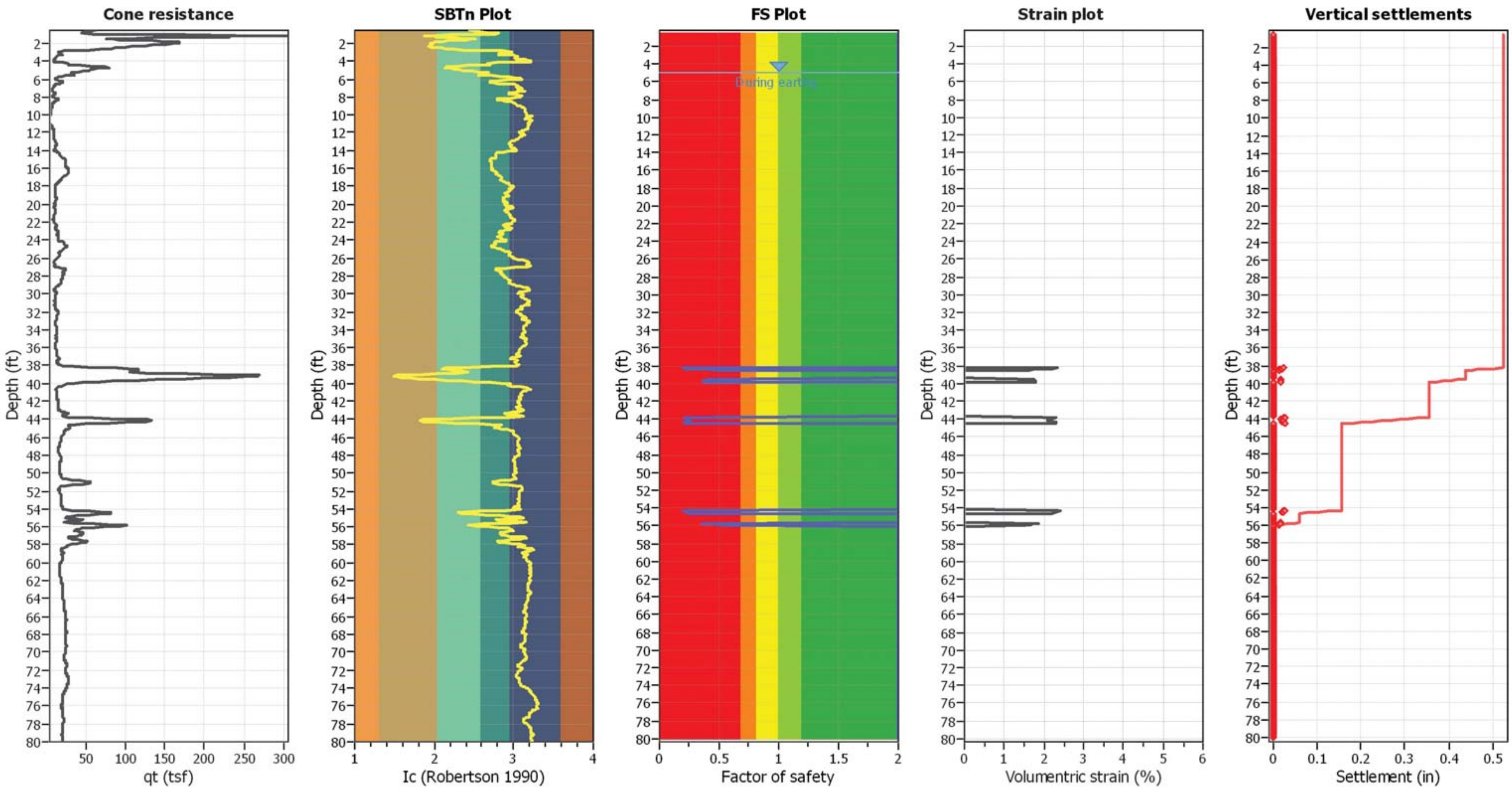
Check for strength loss plots (Olsen & Stark (2002))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	11.30 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

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

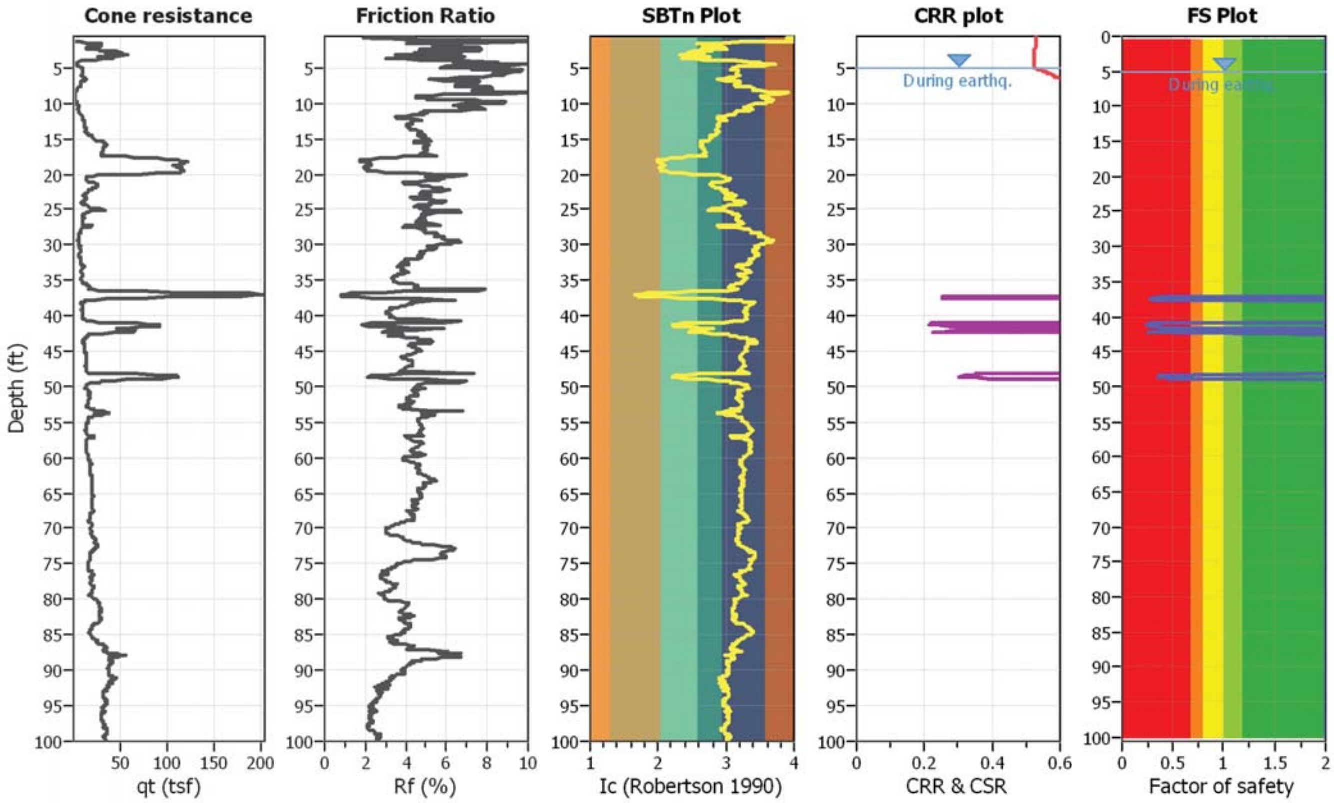
LIQUEFACTION ANALYSIS REPORT

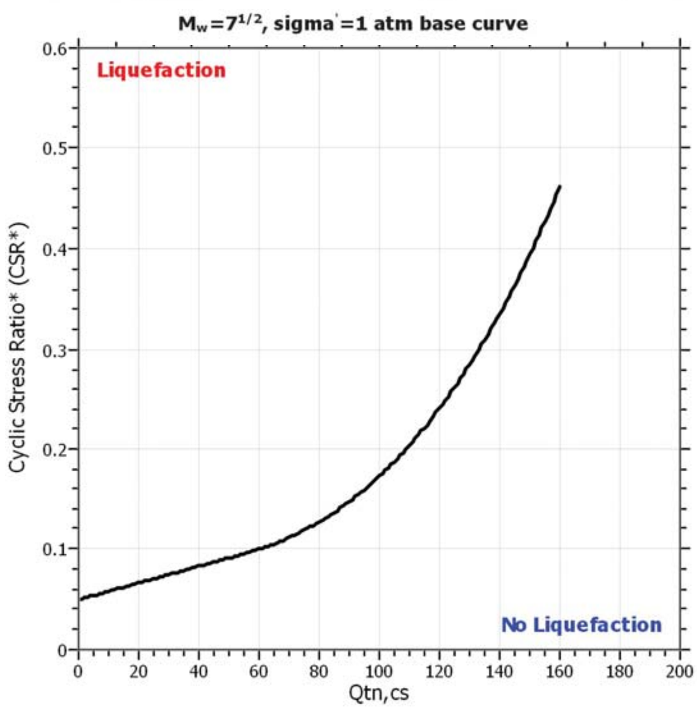
Project title : **Location :**

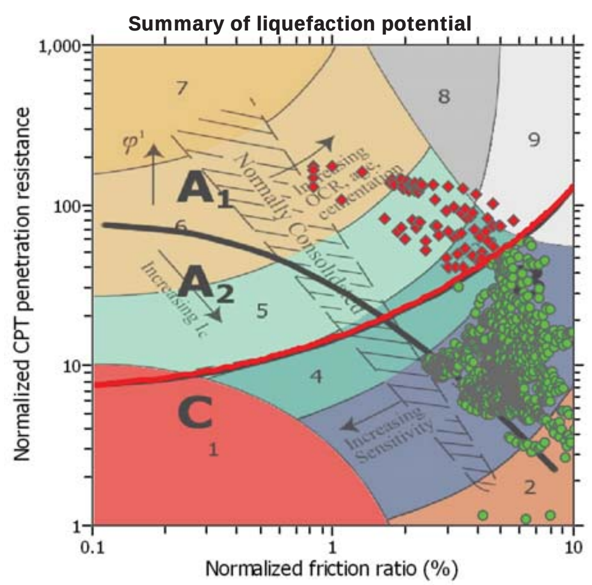
CPT file : cpt3

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	9.30 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.90	Ic cut-off value:	2.60	Trans. detect. applied:	No		
Peak ground acceleration:	0.71	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

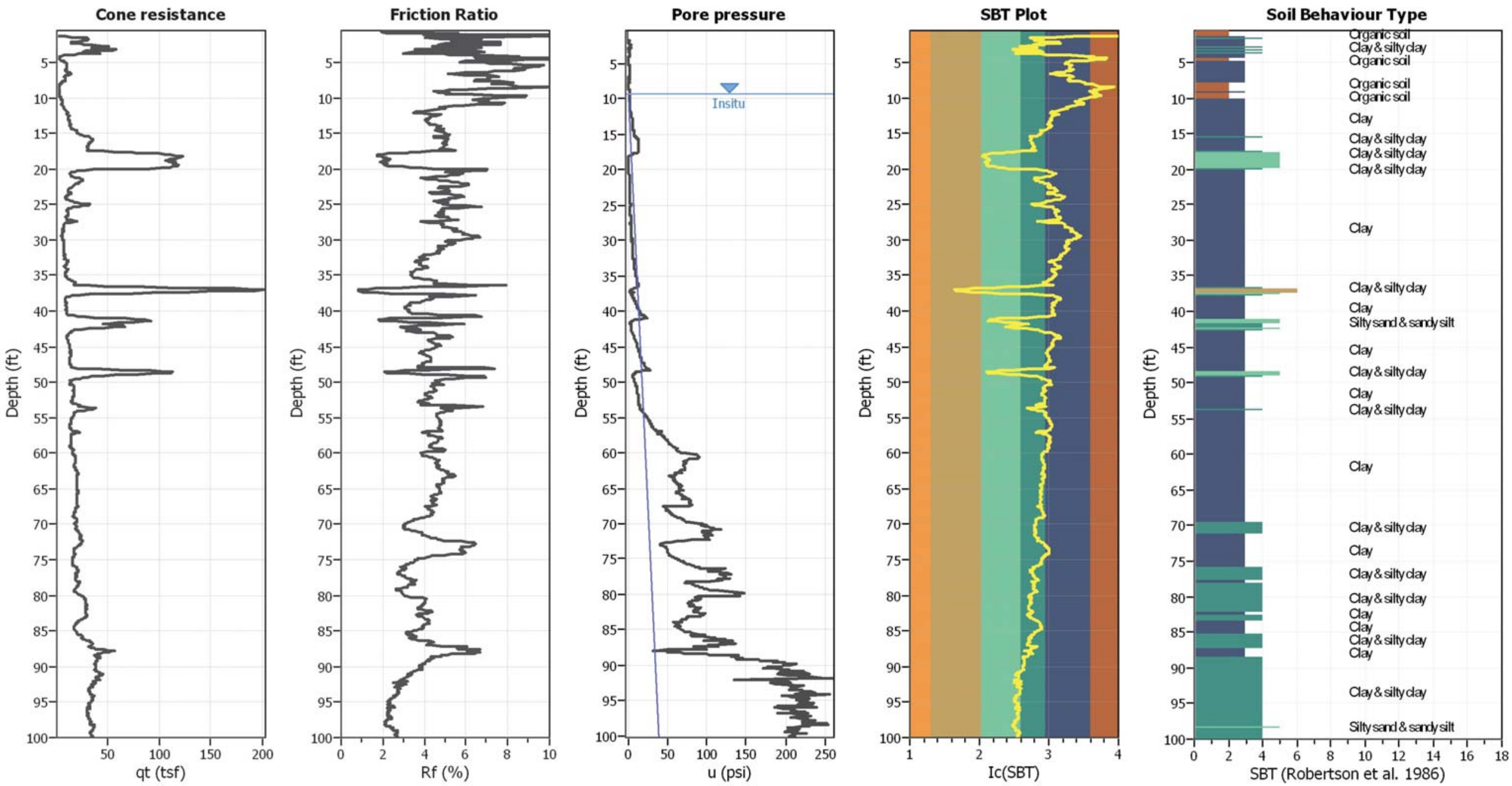






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



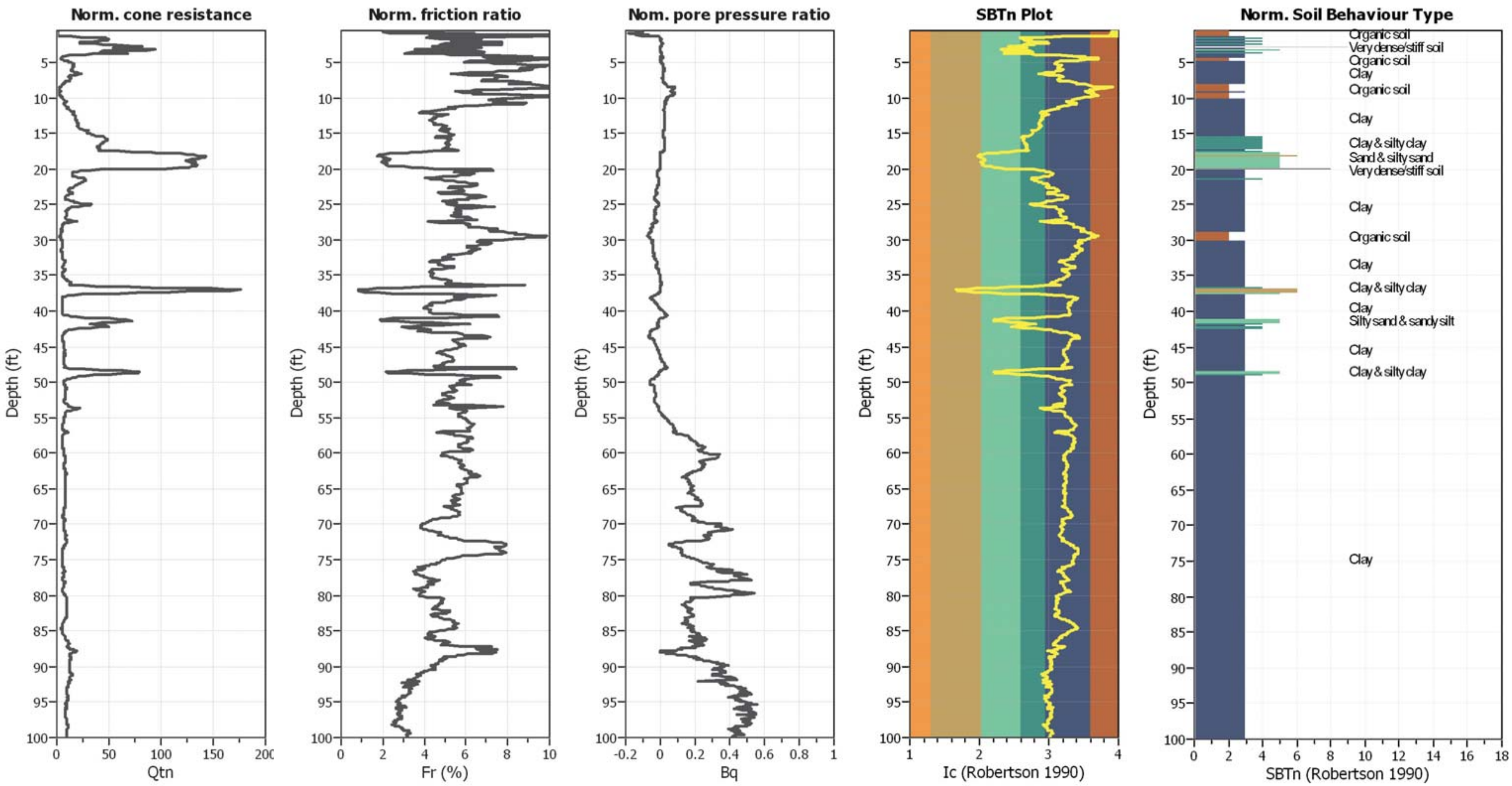
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



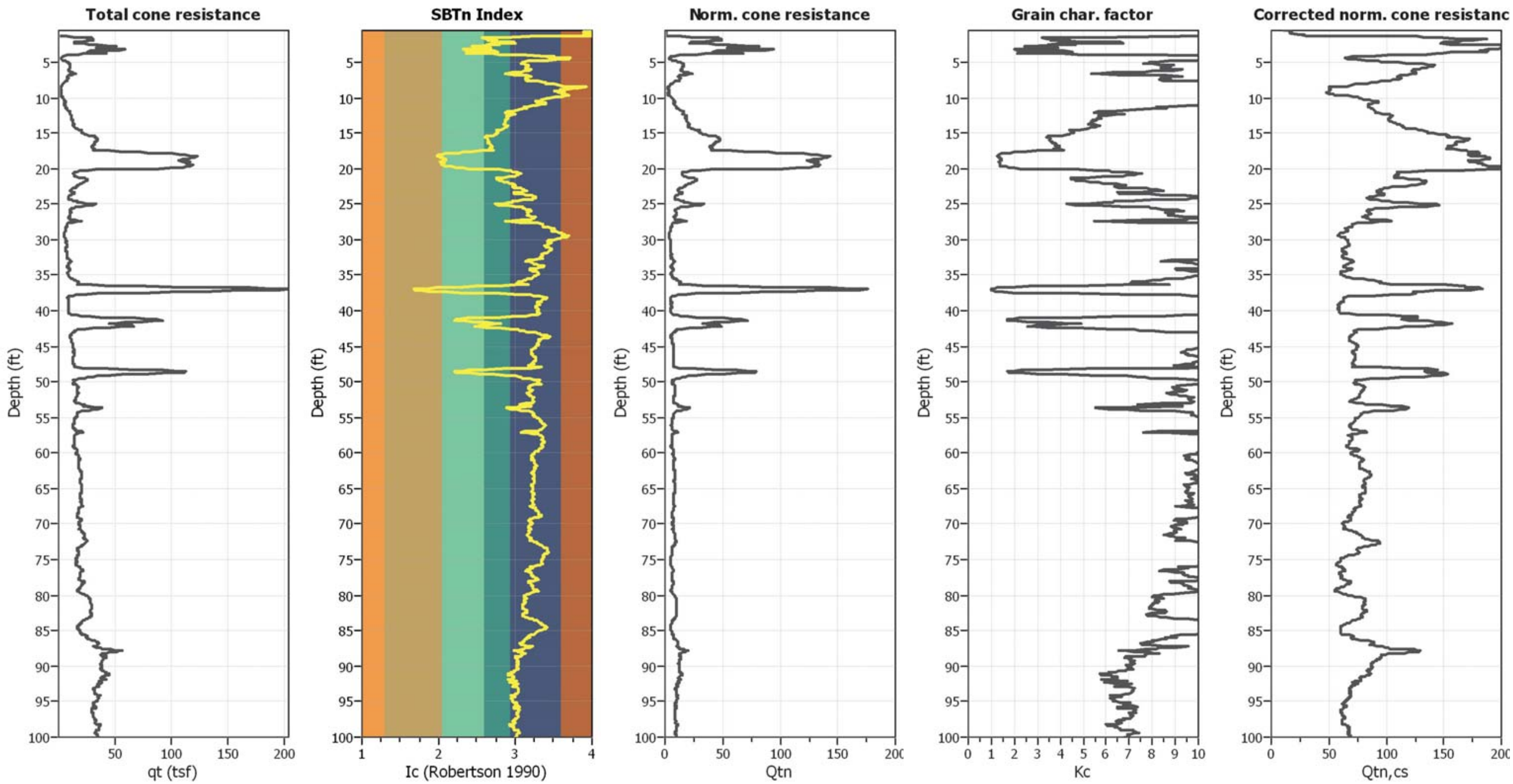
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

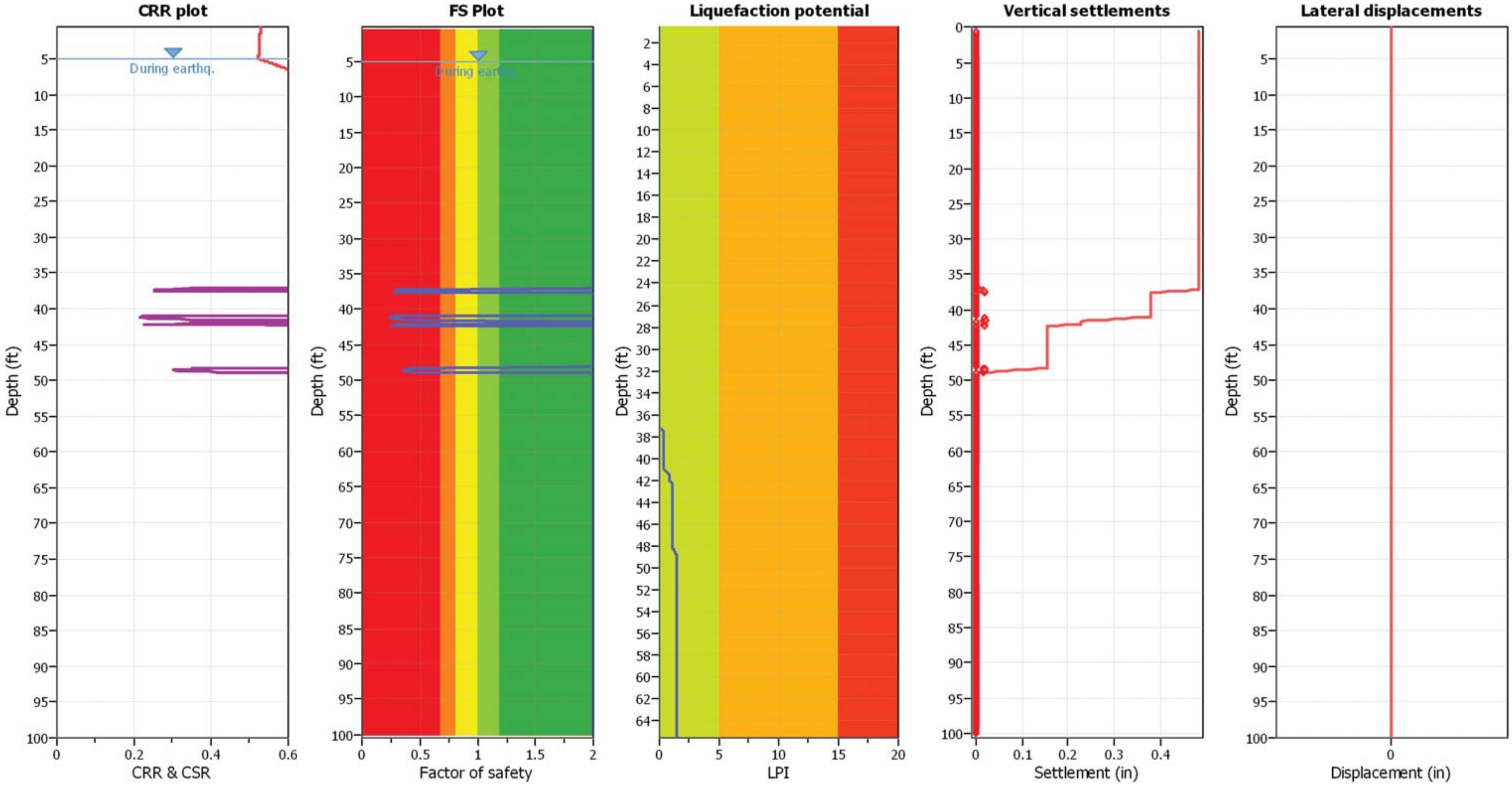
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

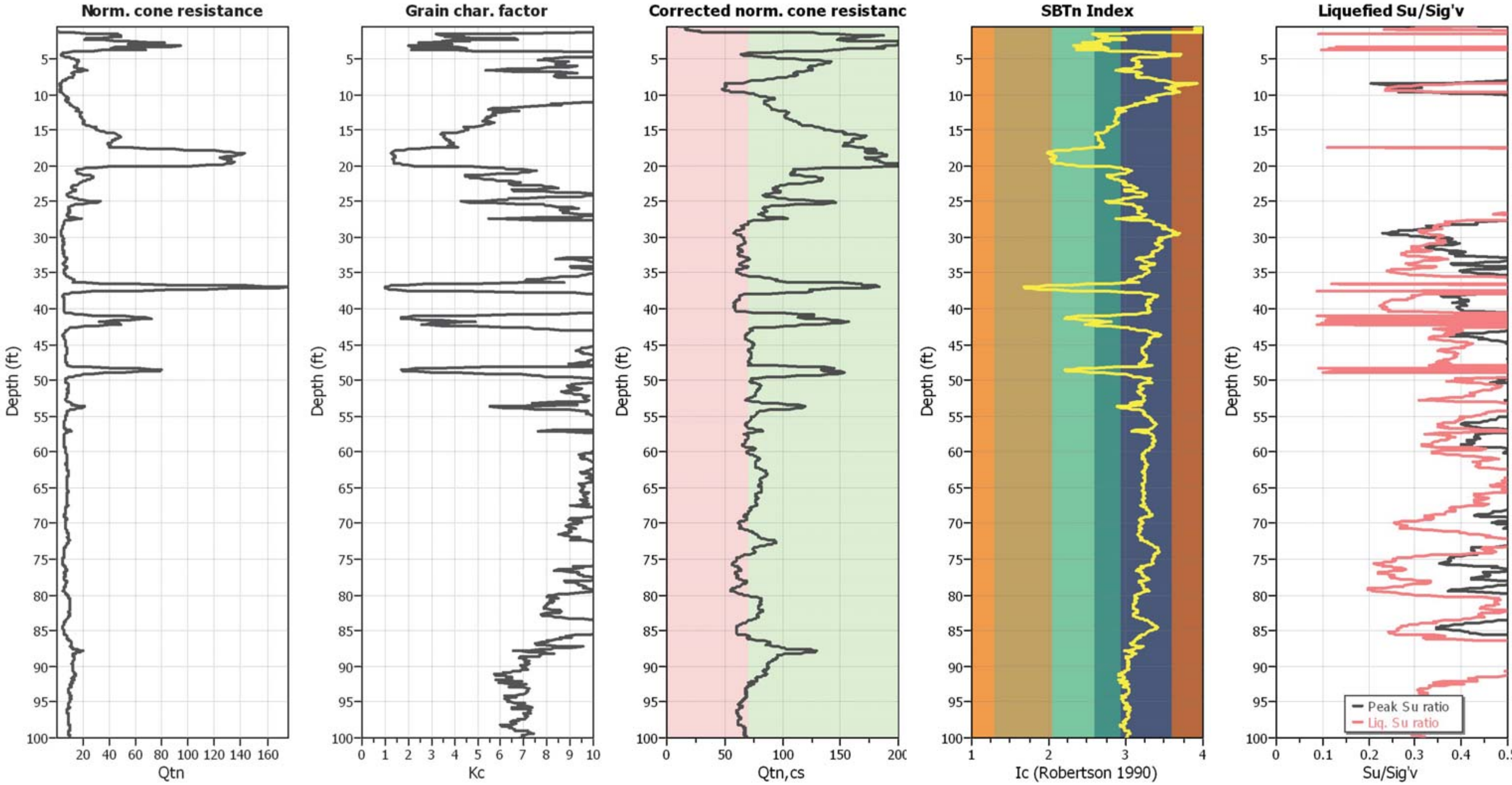
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

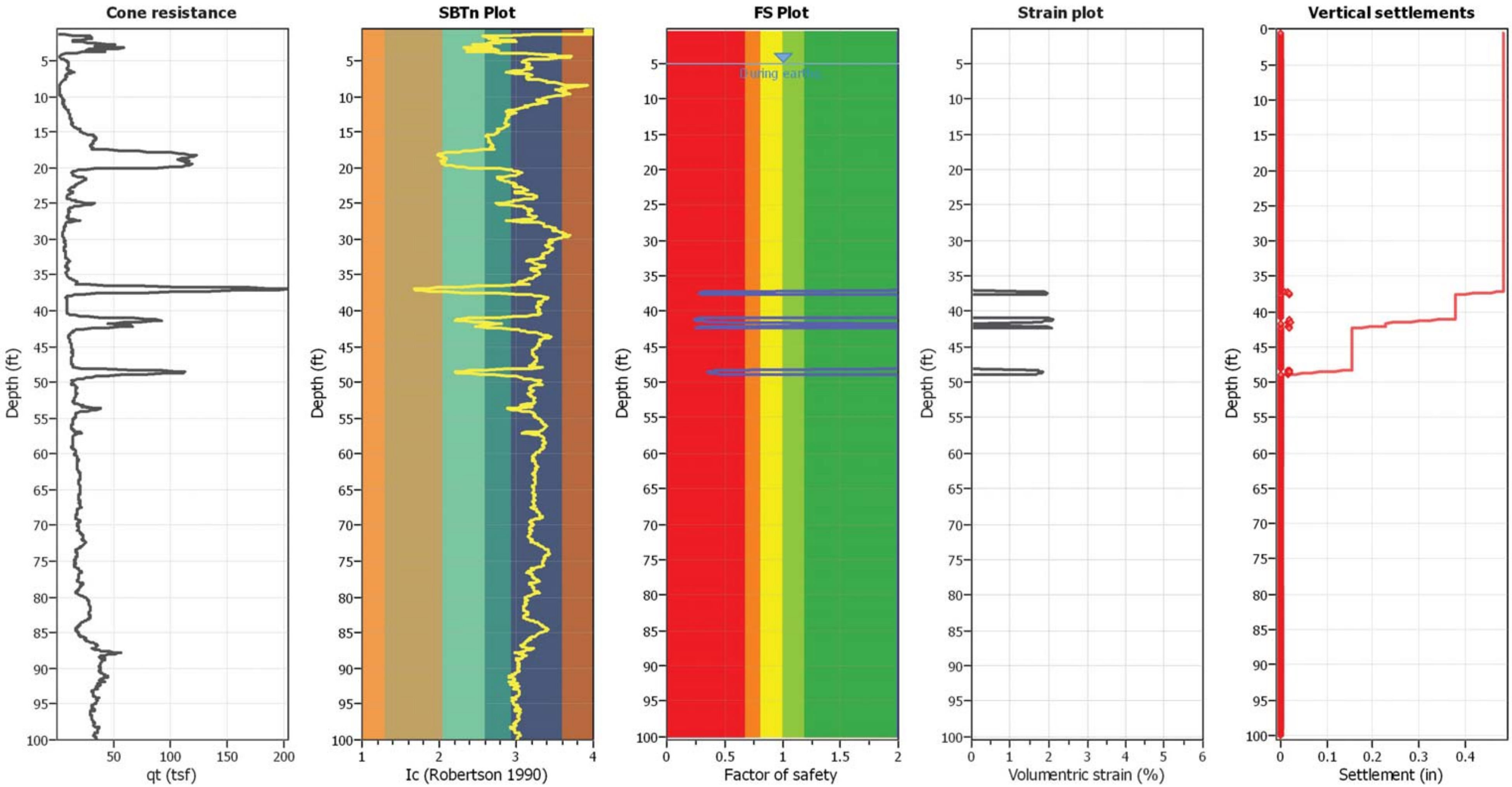
Check for strength loss plots (Olsen & Stark (2002))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

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

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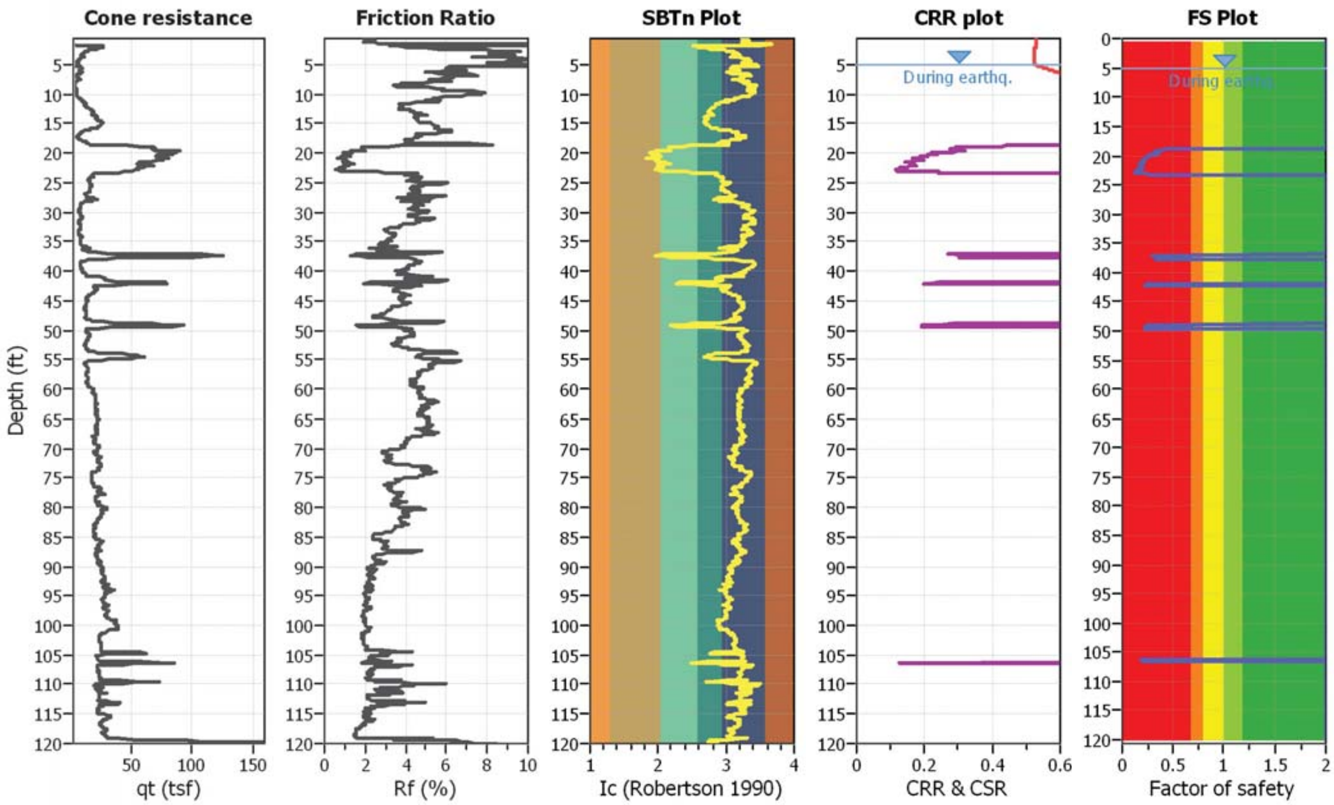
LIQUEFACTION ANALYSIS REPORT

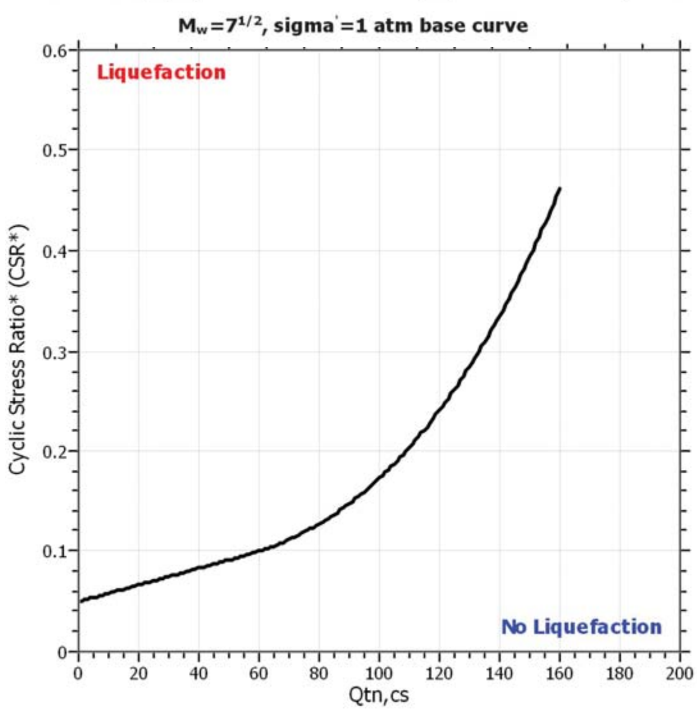
Project title : **Location :**

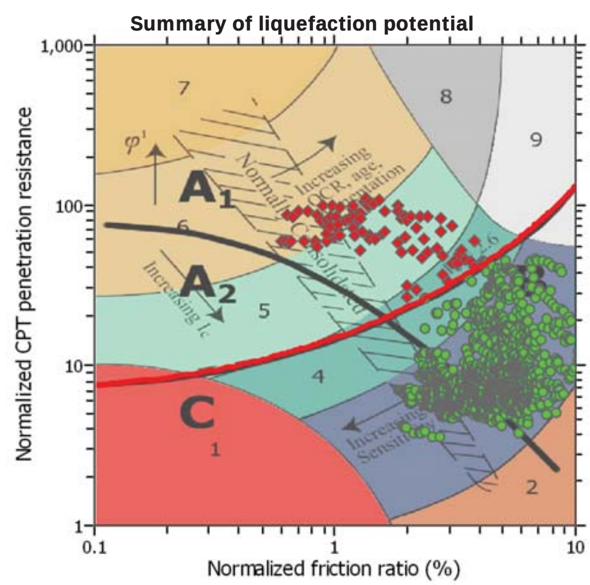
CPT file : CPT4

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.30 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.90	Ic cut-off value:	2.60	Trans. detect. applied:	No		
Peak ground acceleration:	0.71	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

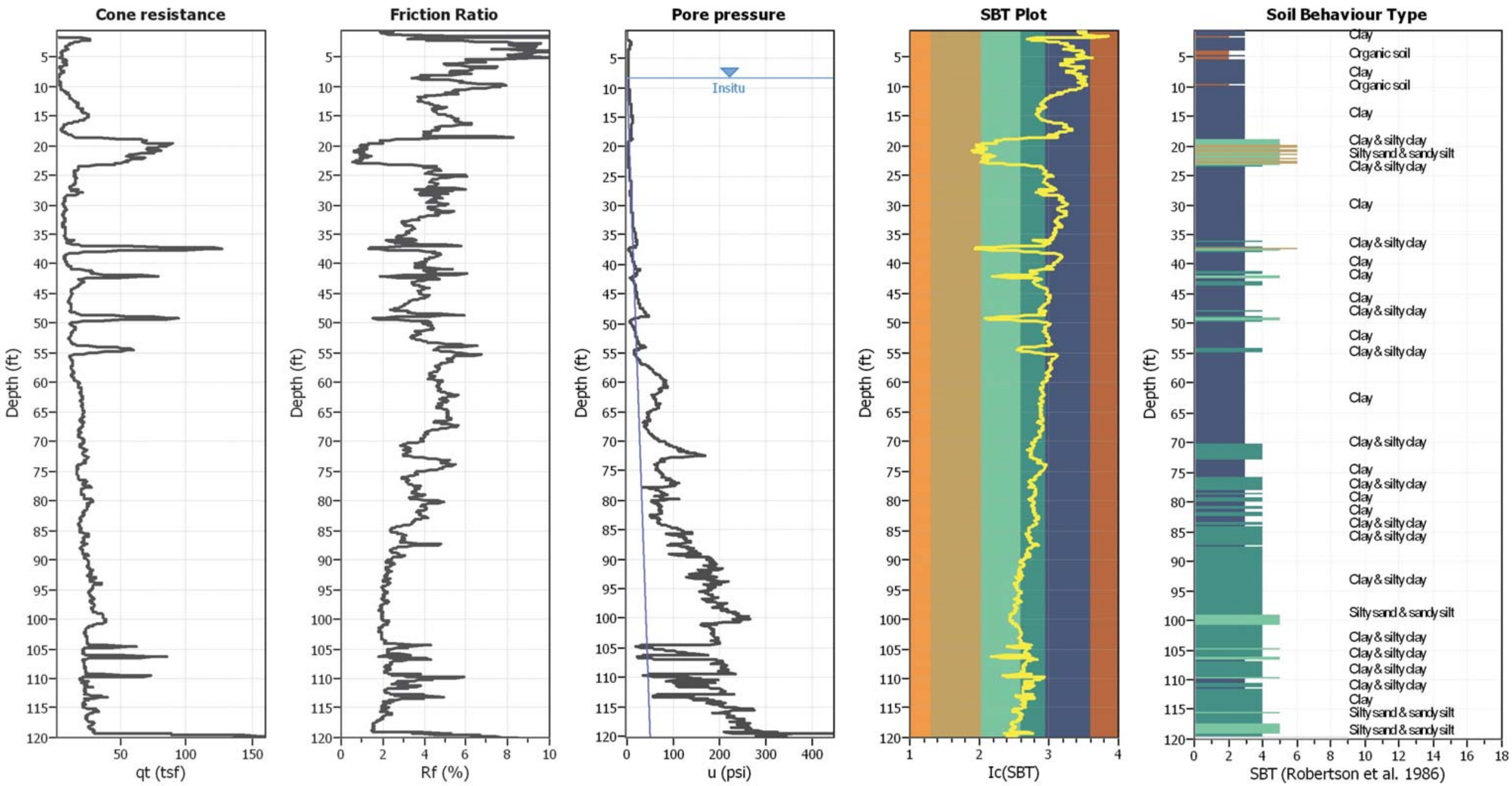






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



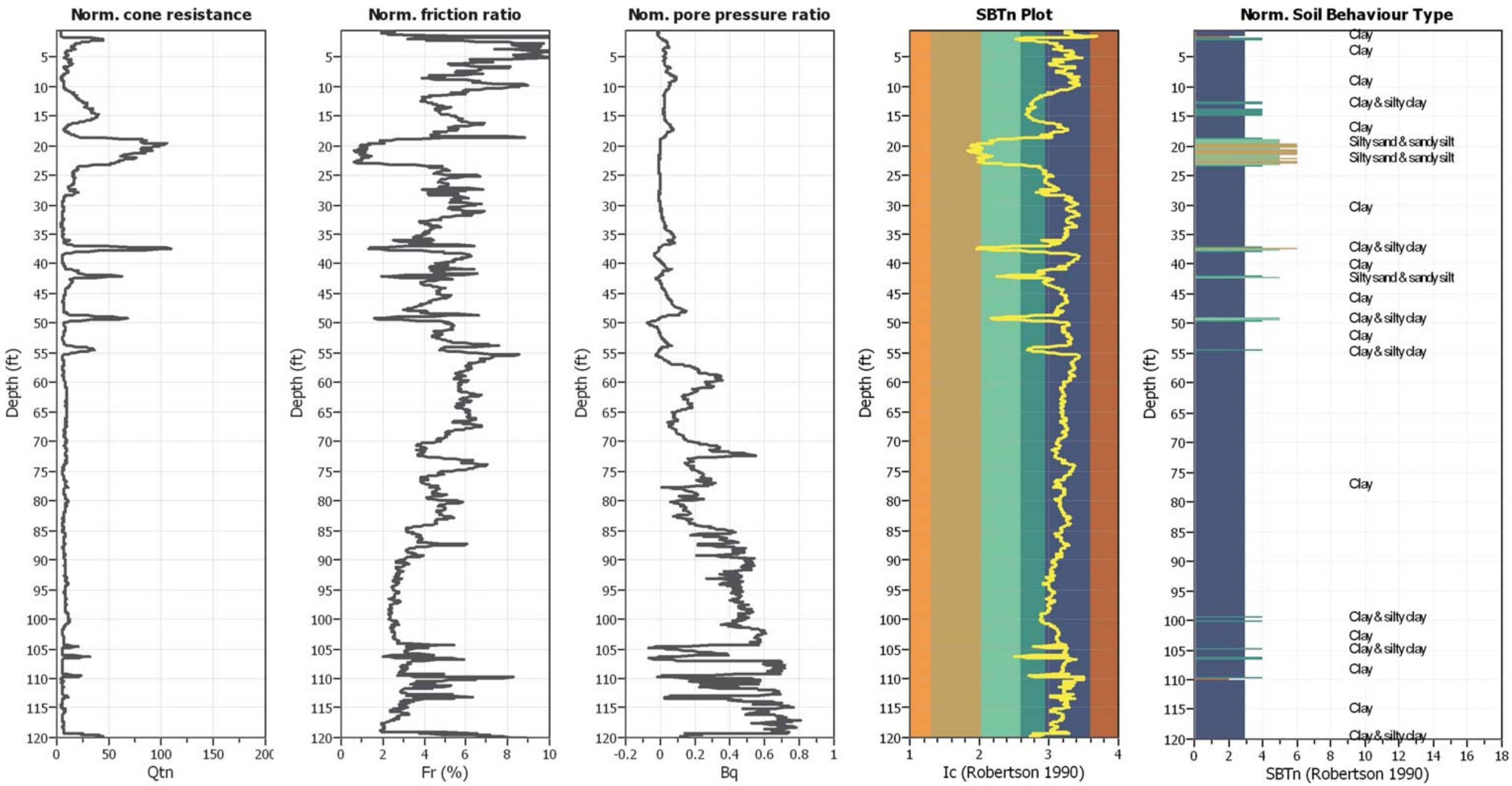
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.30 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



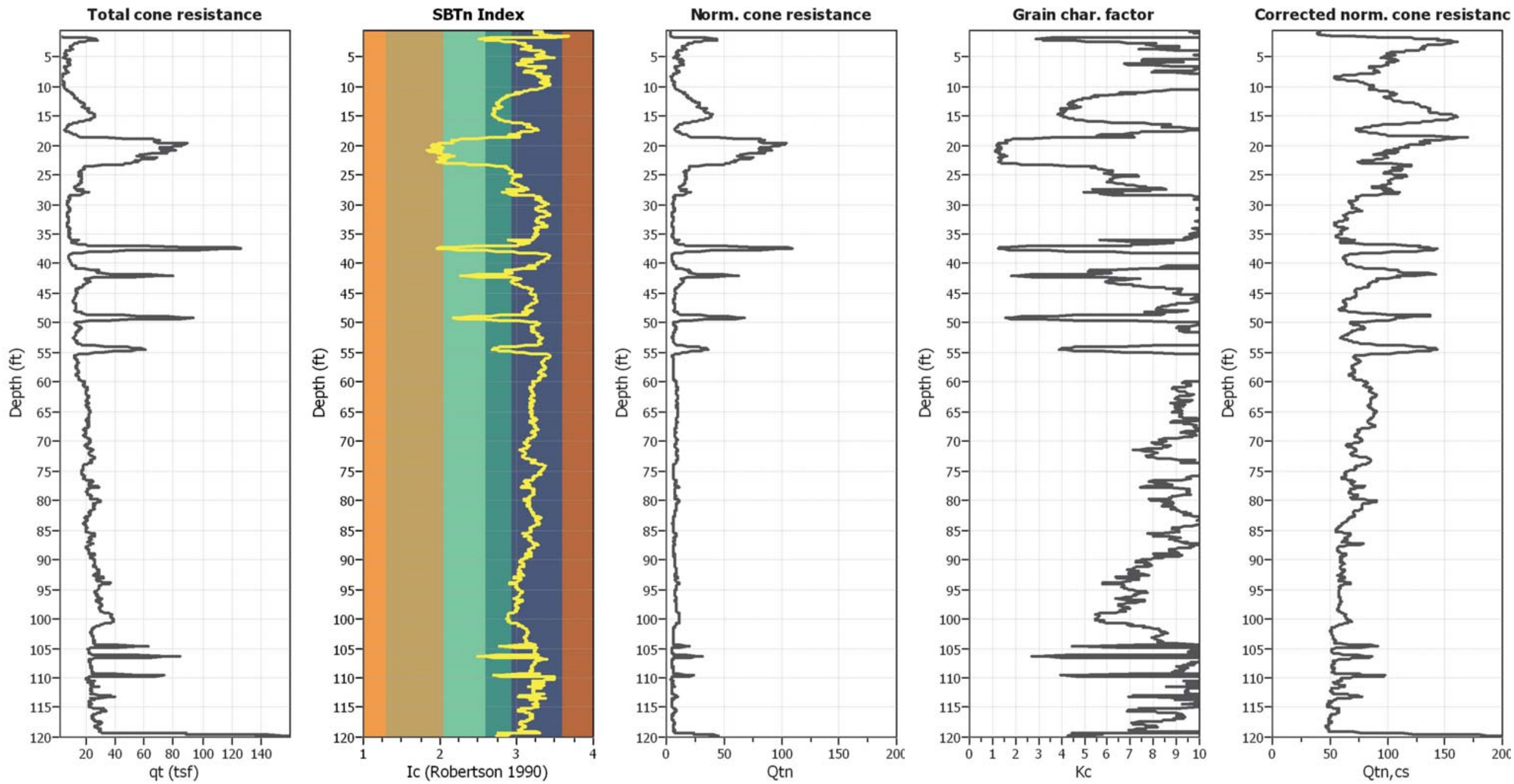
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.30 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

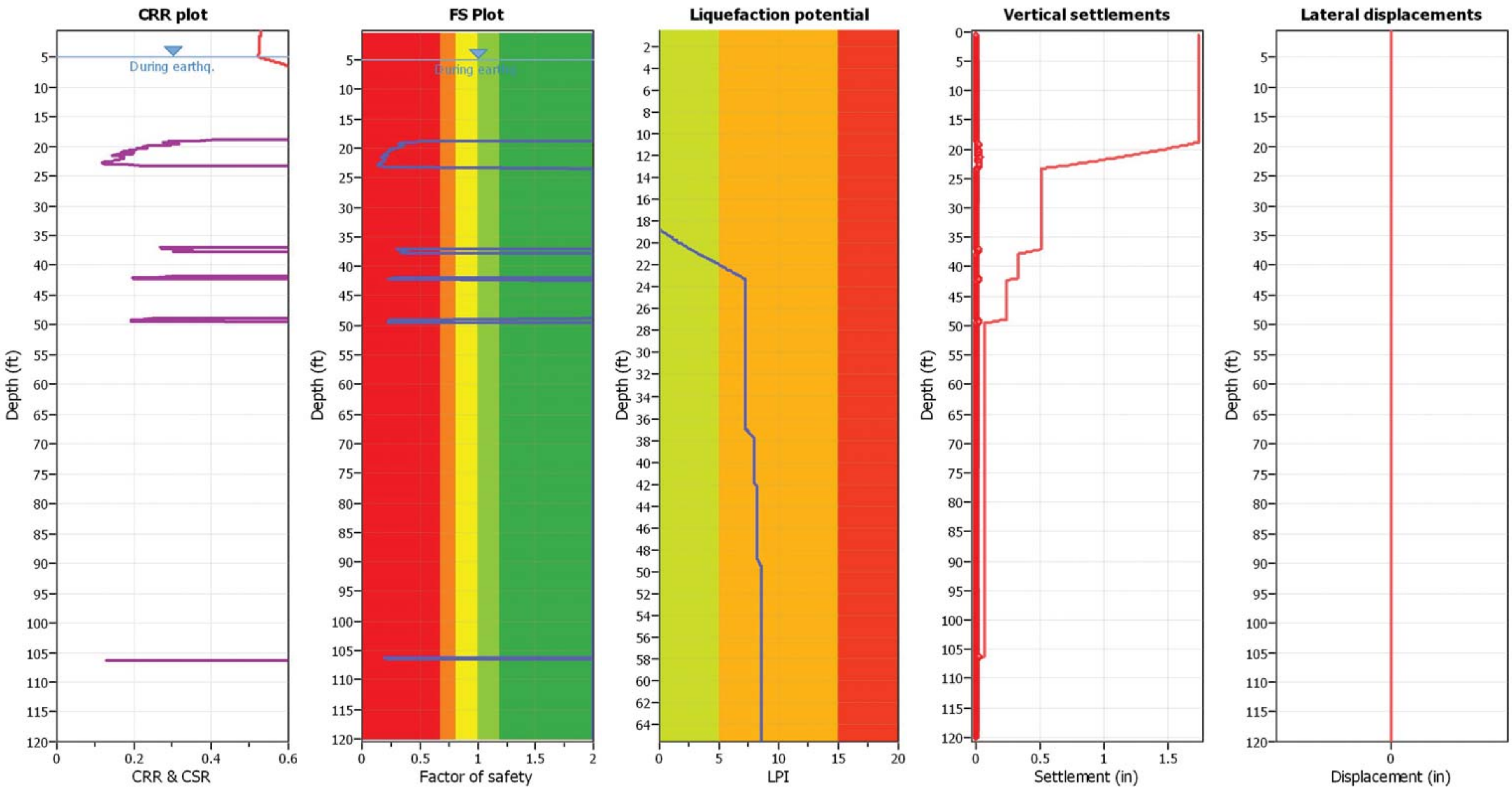
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.30 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.30 ft	Fill height:	N/A	Limit depth:	N/A

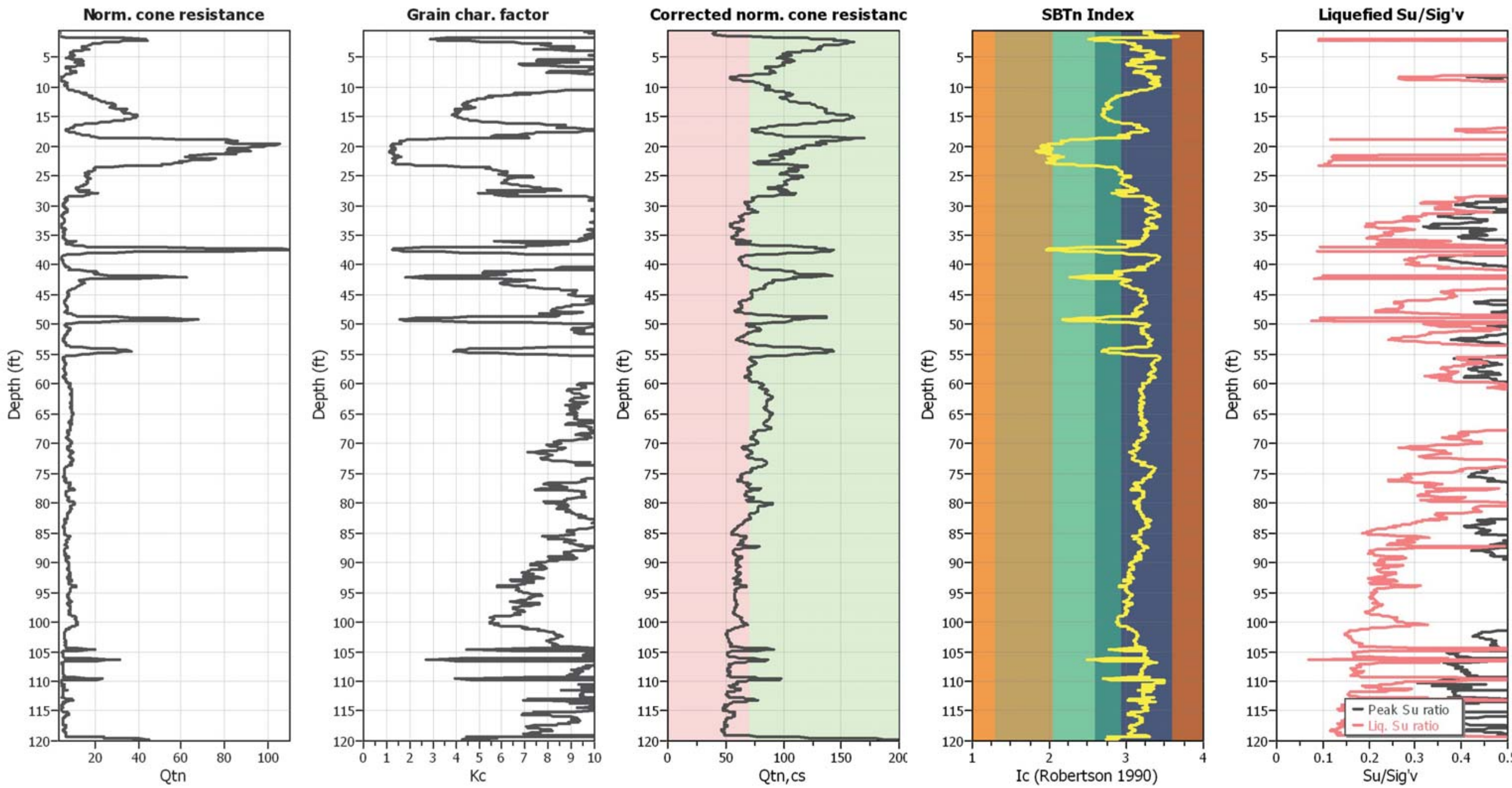
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

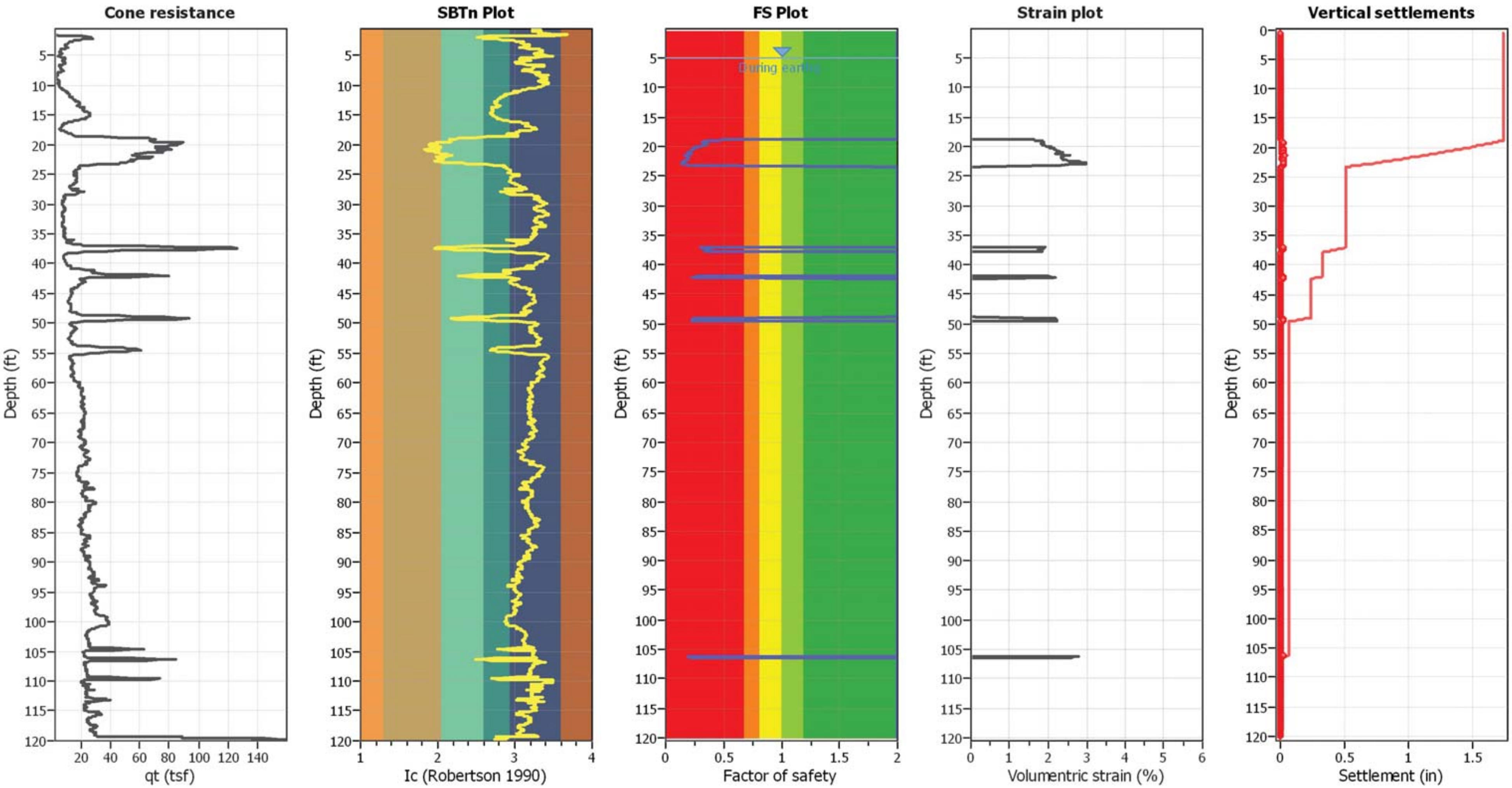
Check for strength loss plots (Olsen & Stark (2002))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.30 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

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

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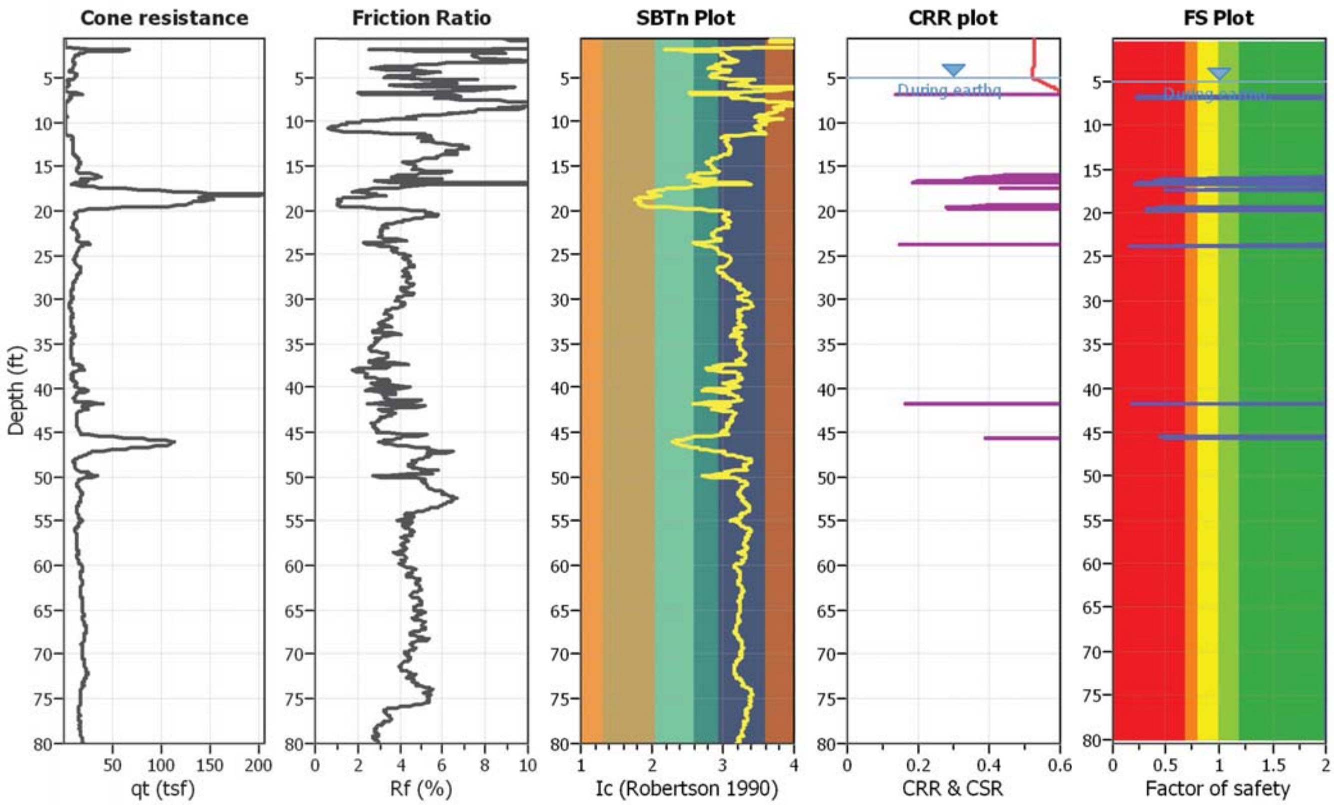
LIQUEFACTION ANALYSIS REPORT

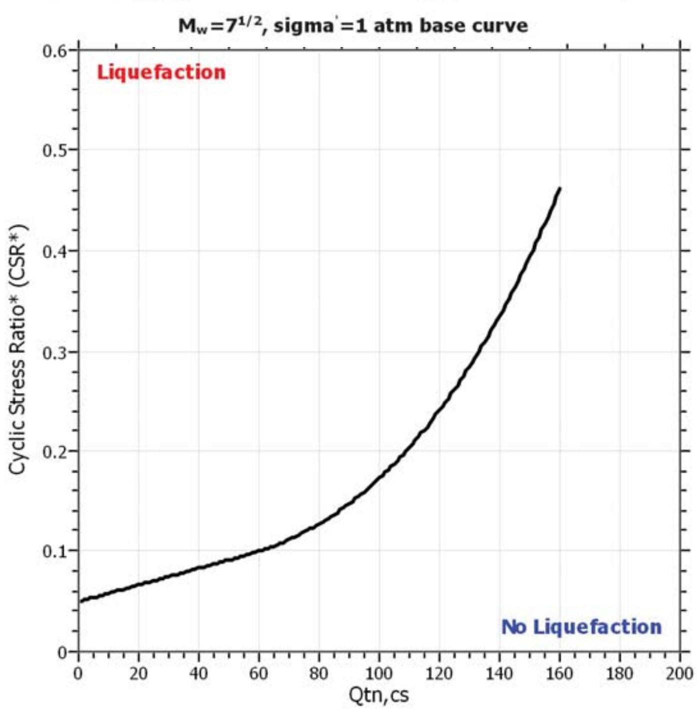
Project title : **Location :**

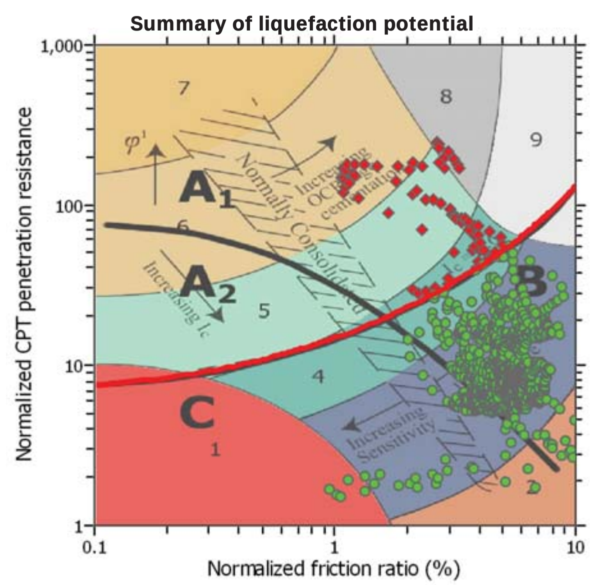
CPT file : CPT5

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	9.30 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.90	Ic cut-off value:	2.60	Trans. detect. applied:	No		
Peak ground acceleration:	0.71	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

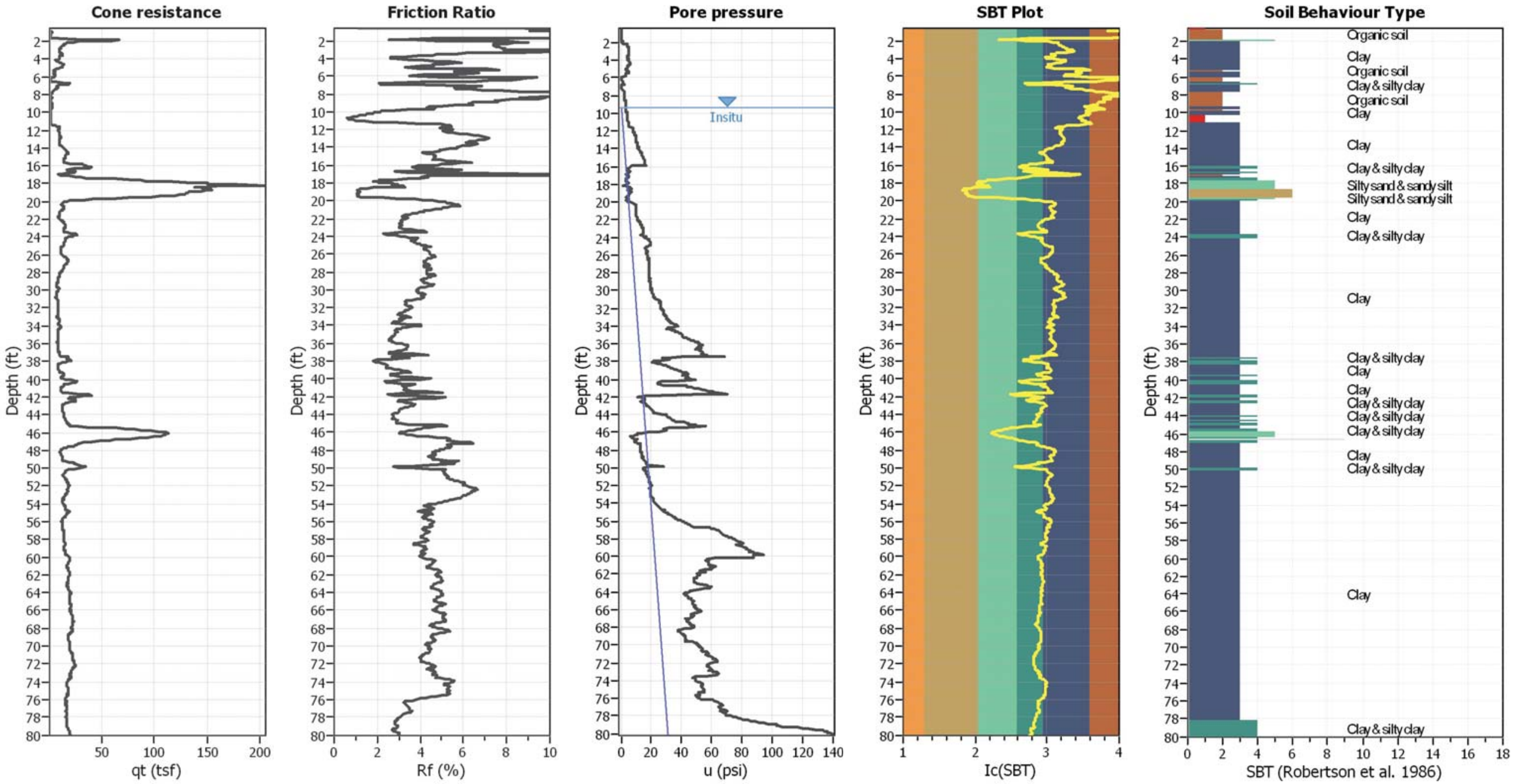






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



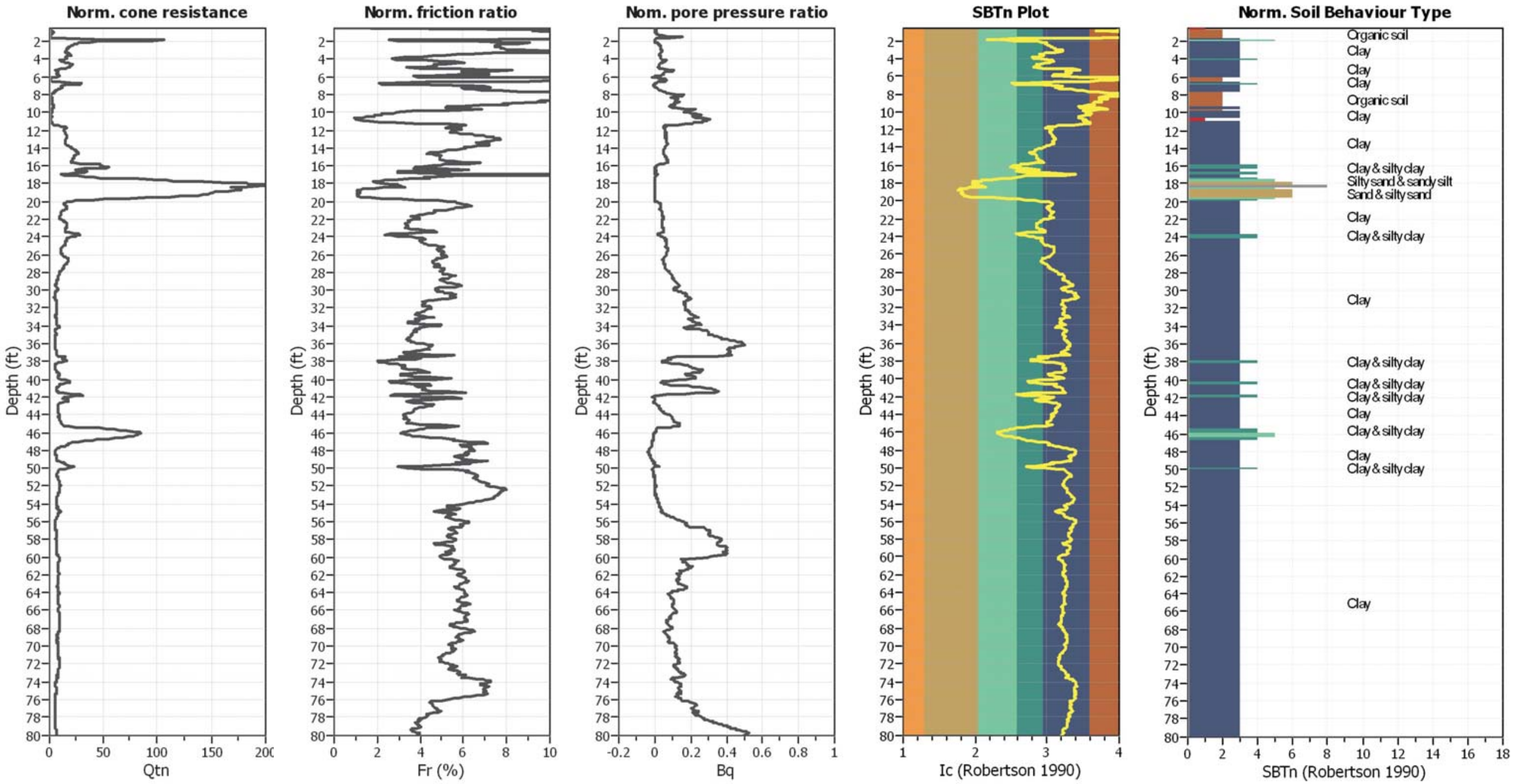
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



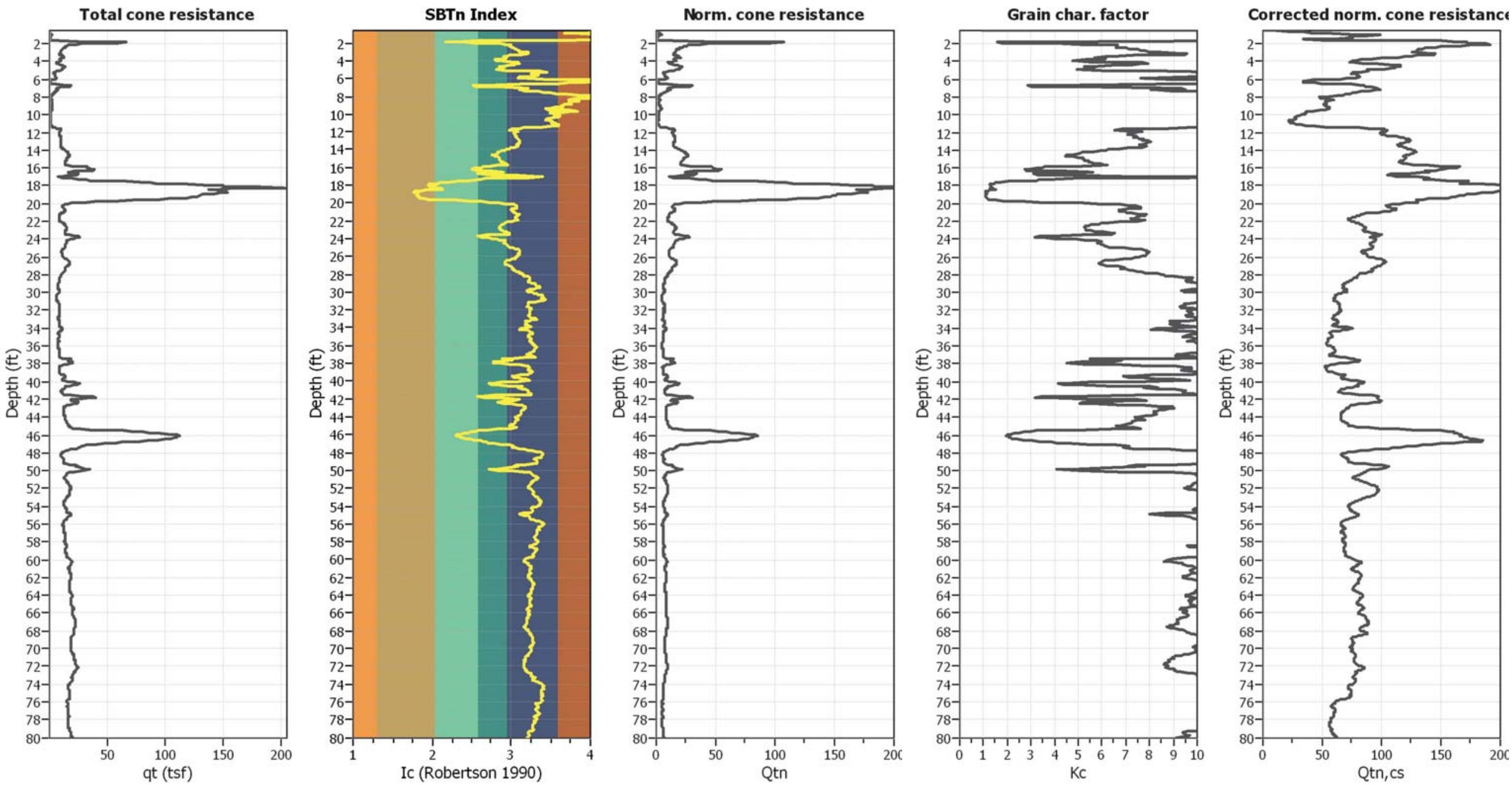
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

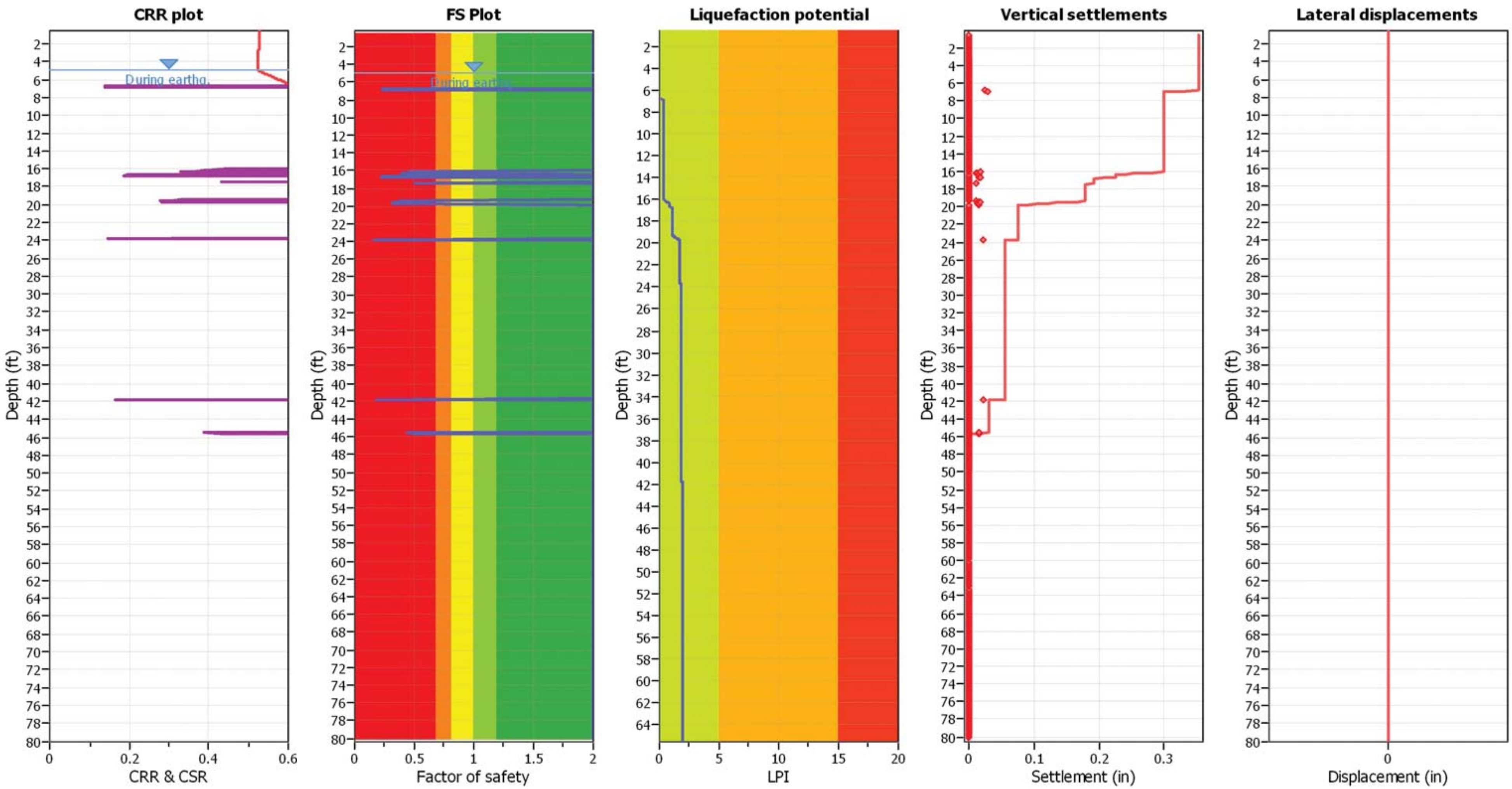
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

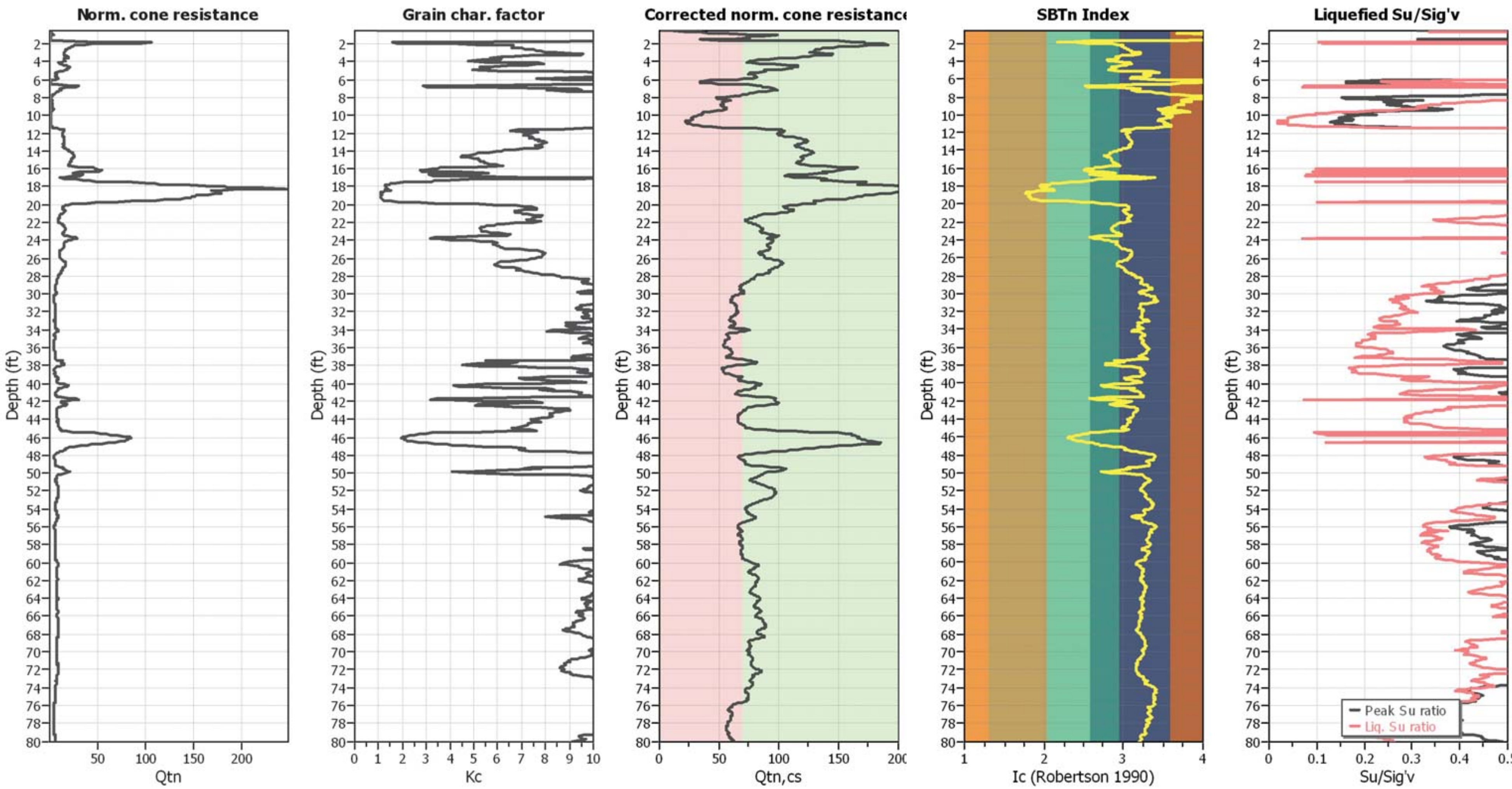
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

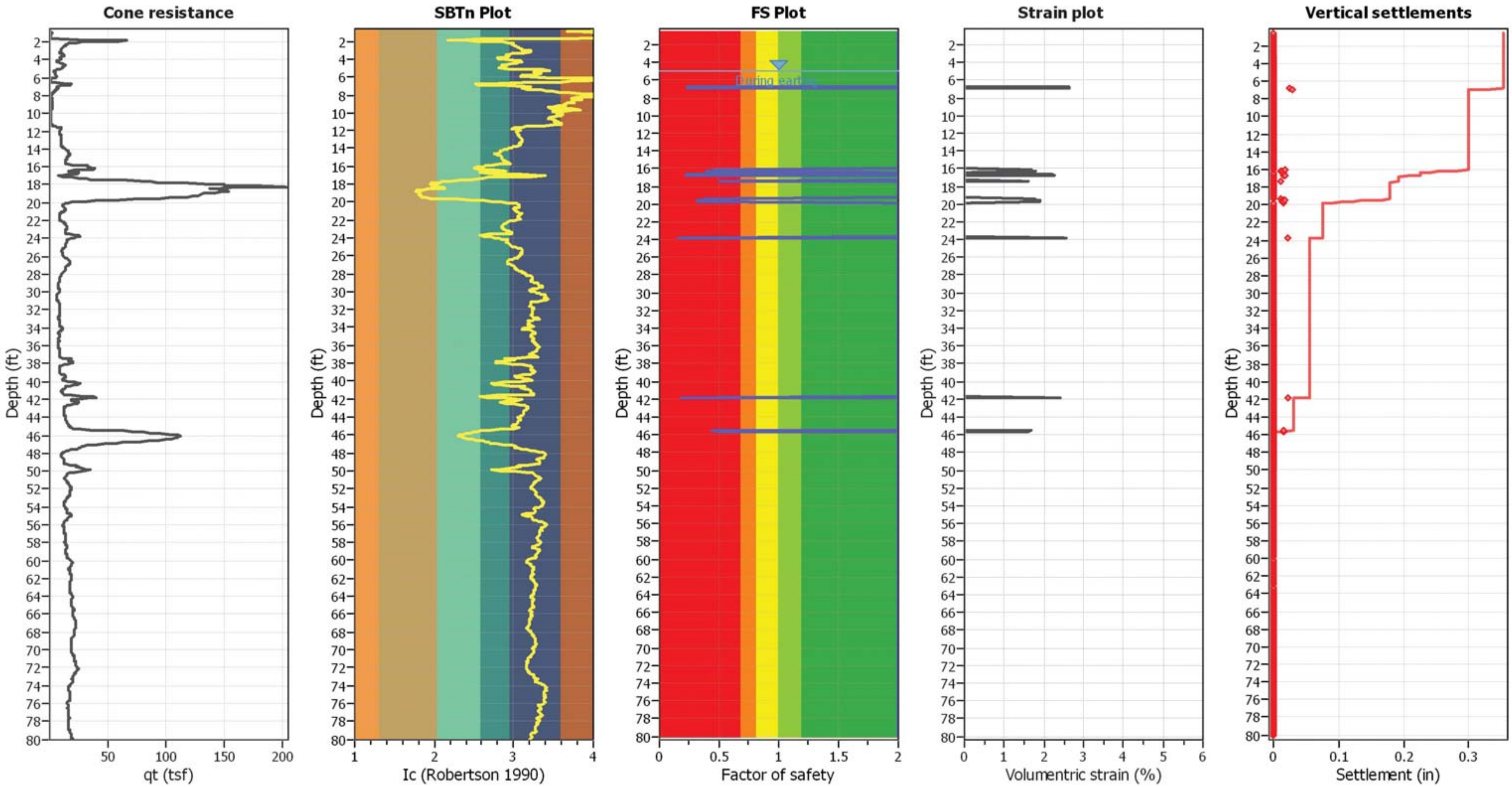
Check for strength loss plots (Olsen & Stark (2002))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	9.30 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

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

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San Ramon, CA 94583

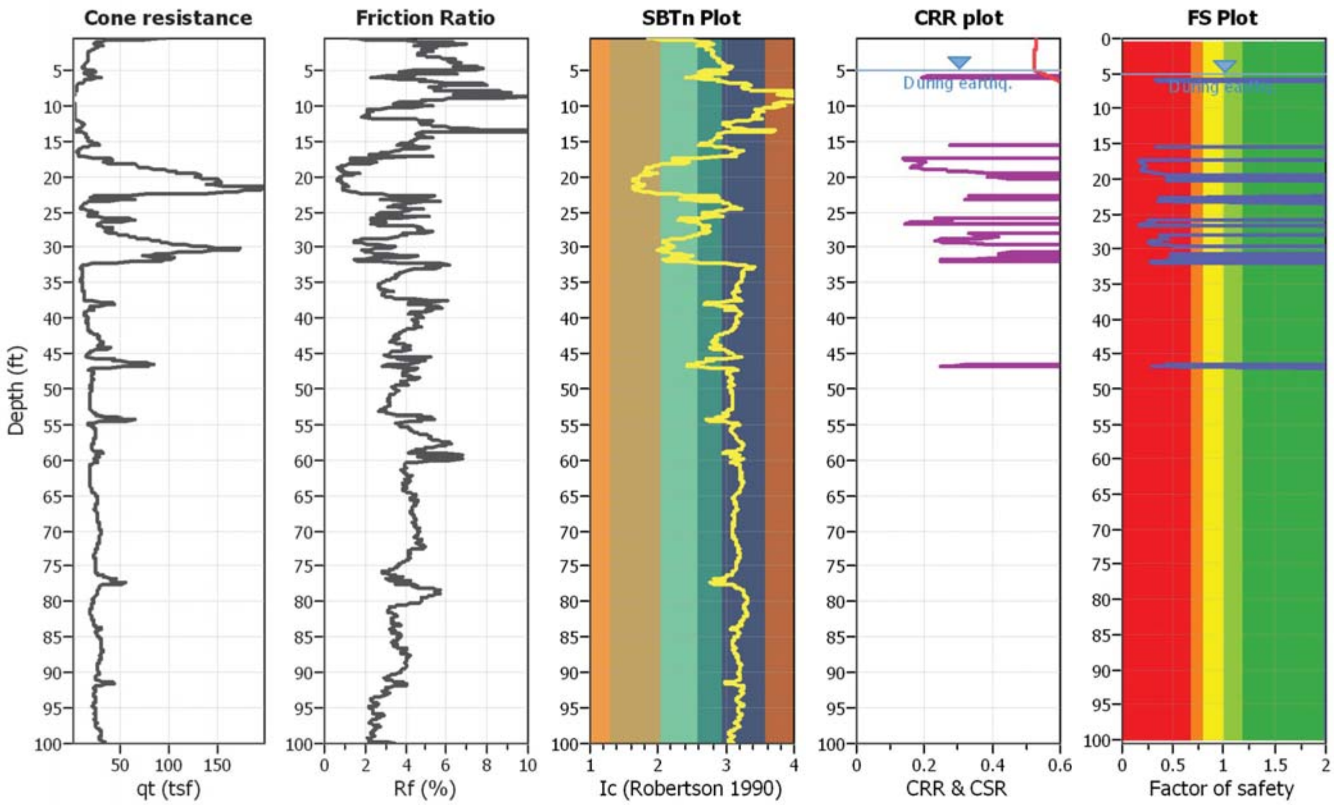
LIQUEFACTION ANALYSIS REPORT

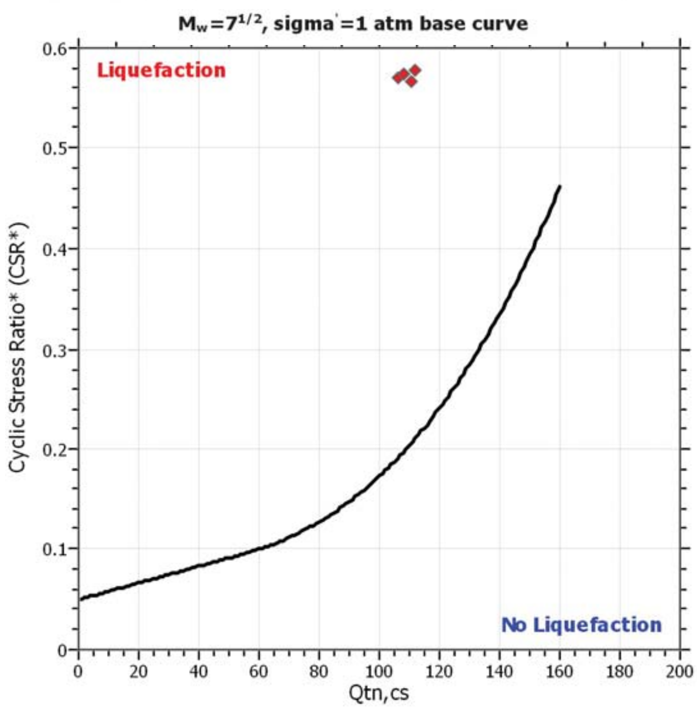
Project title : **Location :**

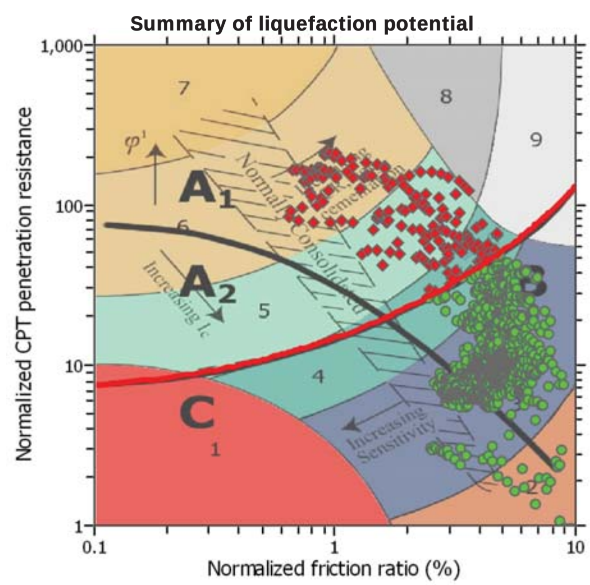
CPT file : CPT6

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	8.90 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	5.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.90	Ic cut-off value:	2.60	Trans. detect. applied:	No		
Peak ground acceleration:	0.71	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

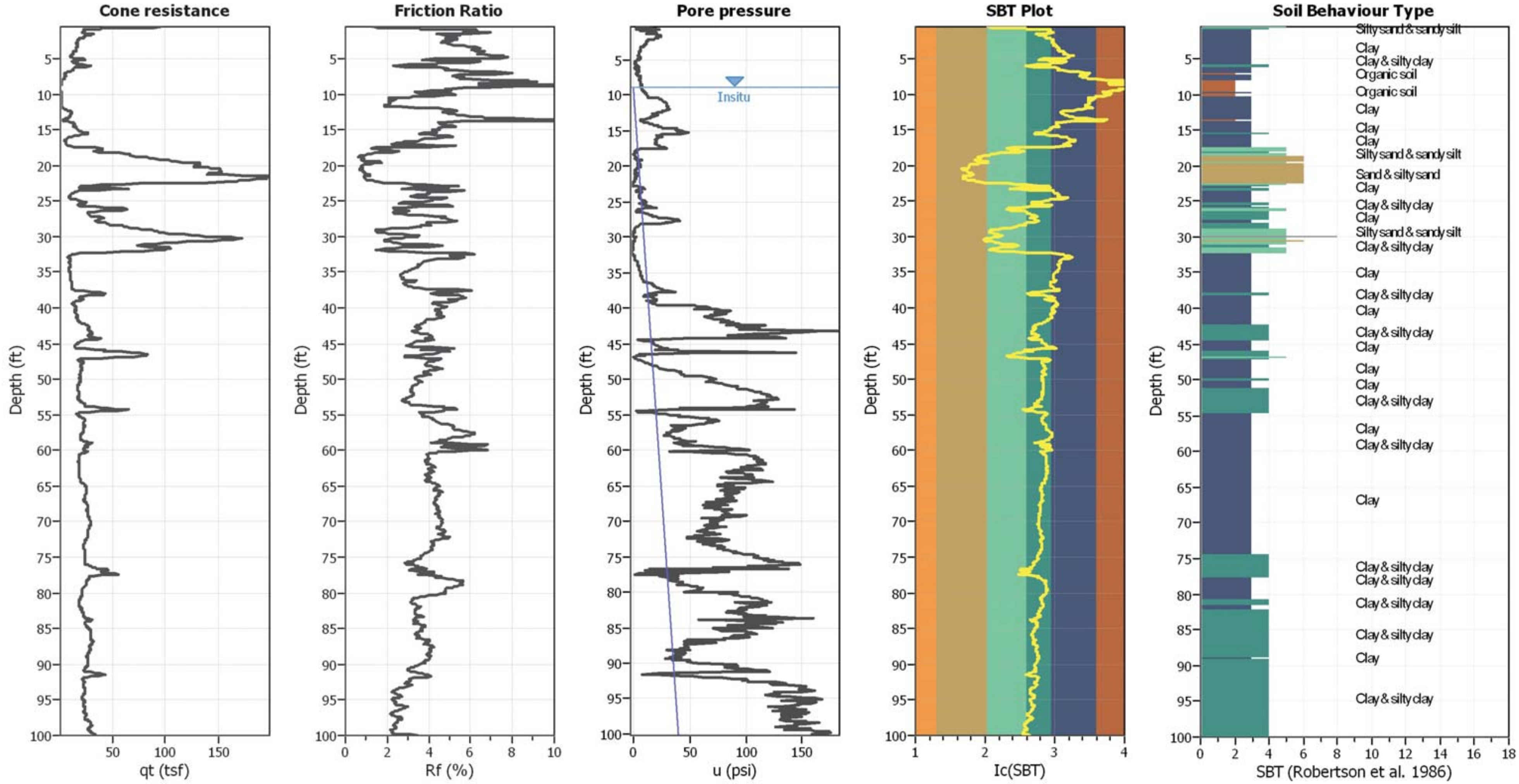






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



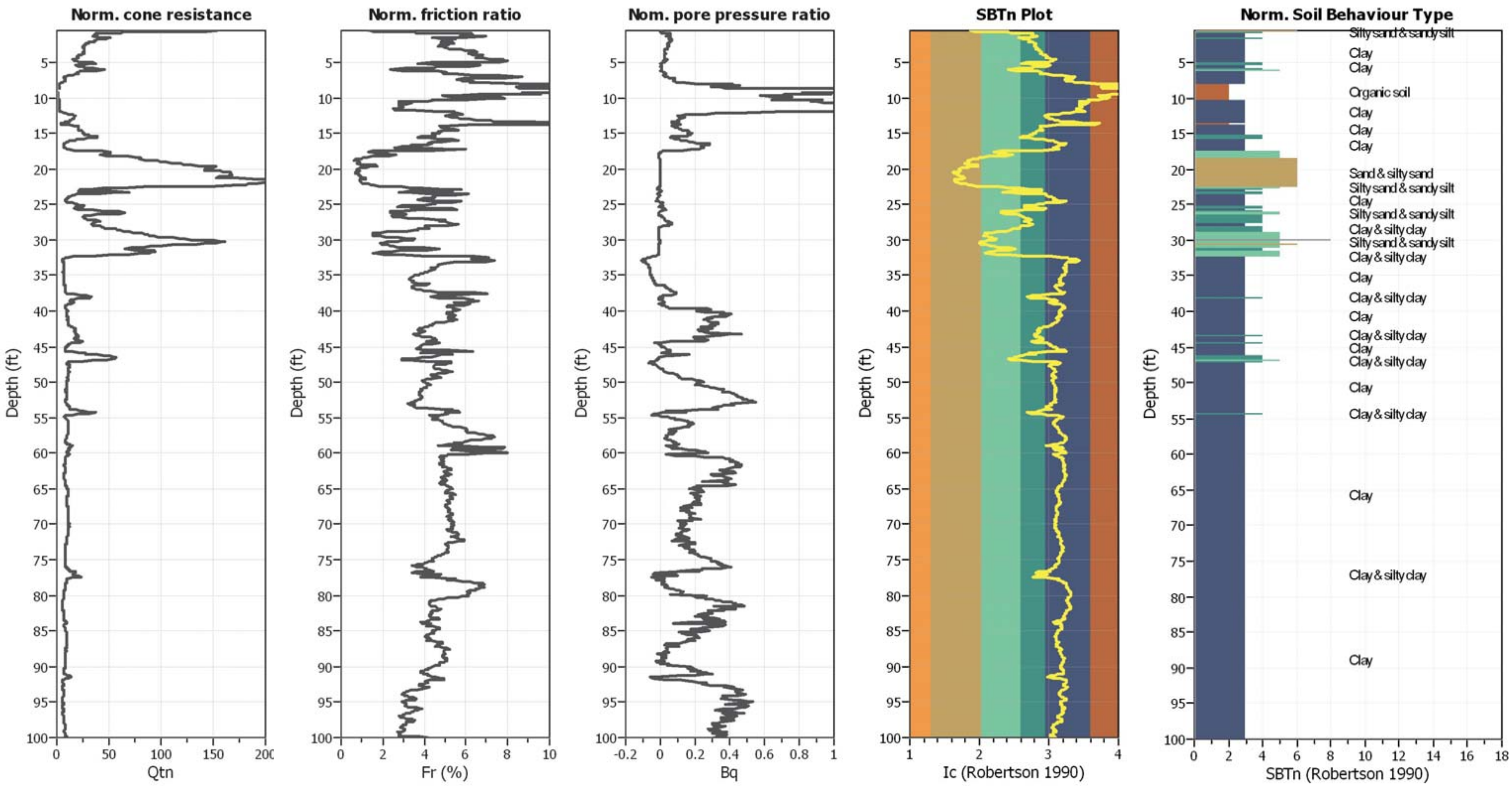
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.90 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



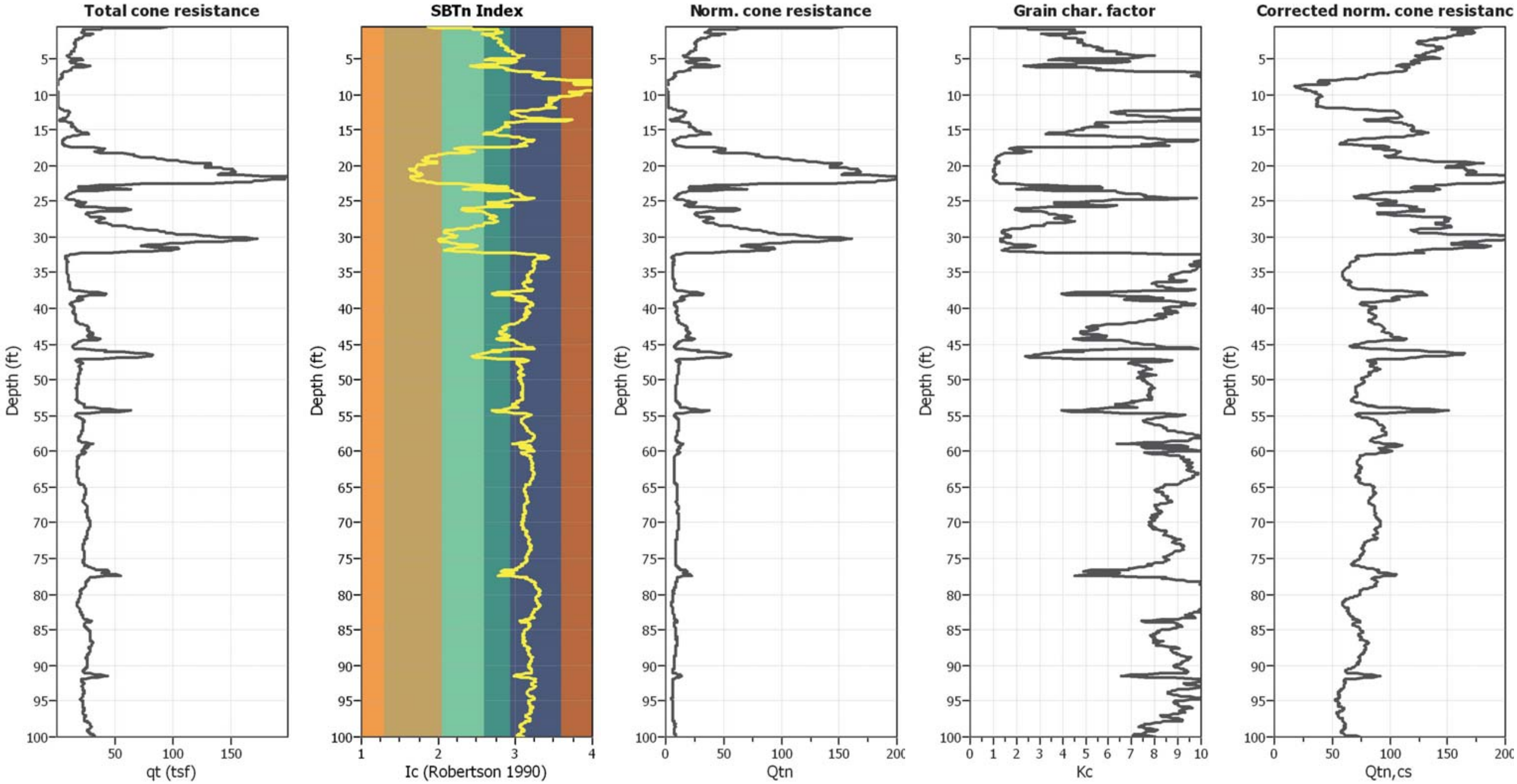
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.90 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

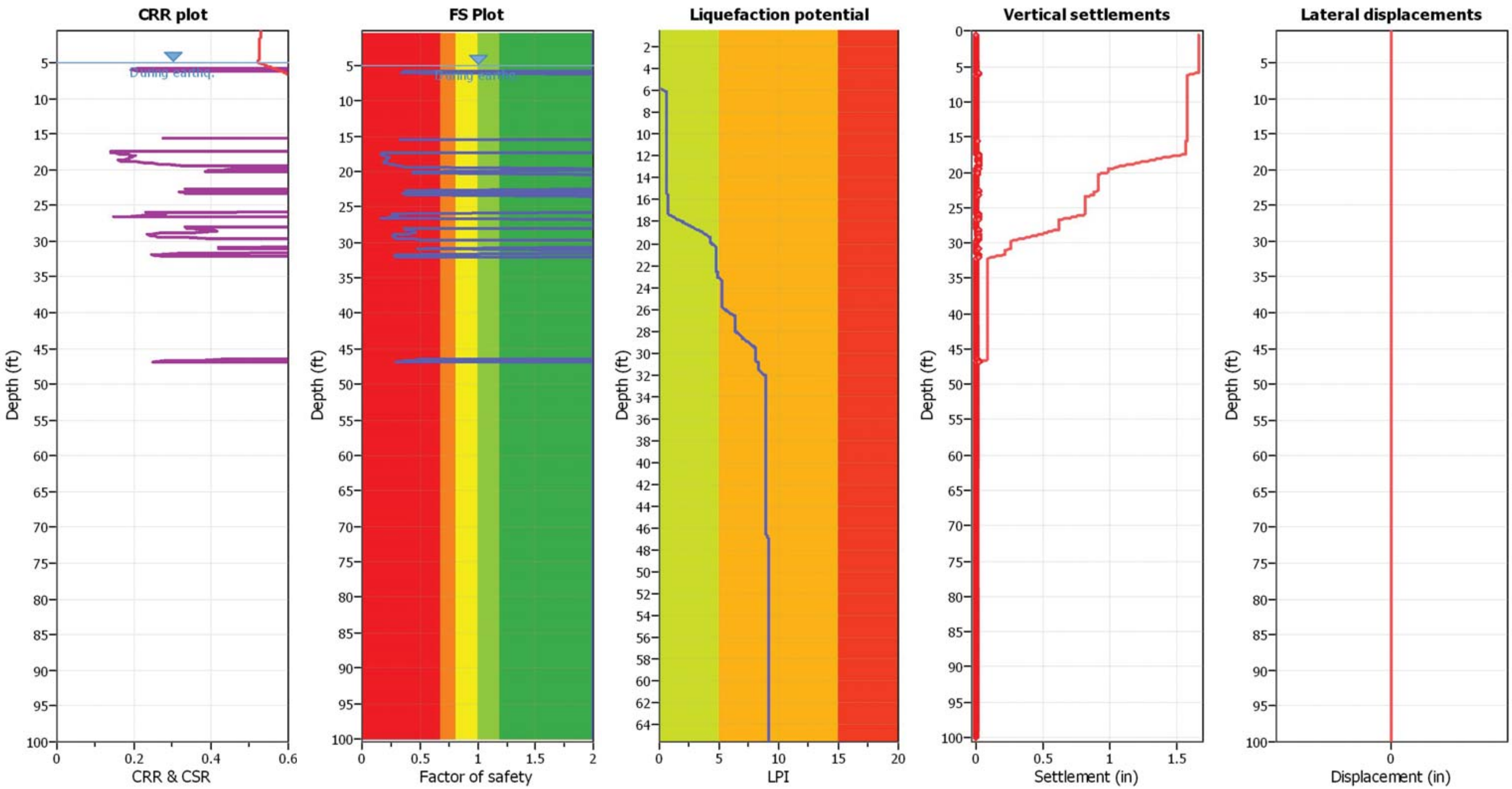
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.90 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.90 ft	Fill height:	N/A	Limit depth:	N/A

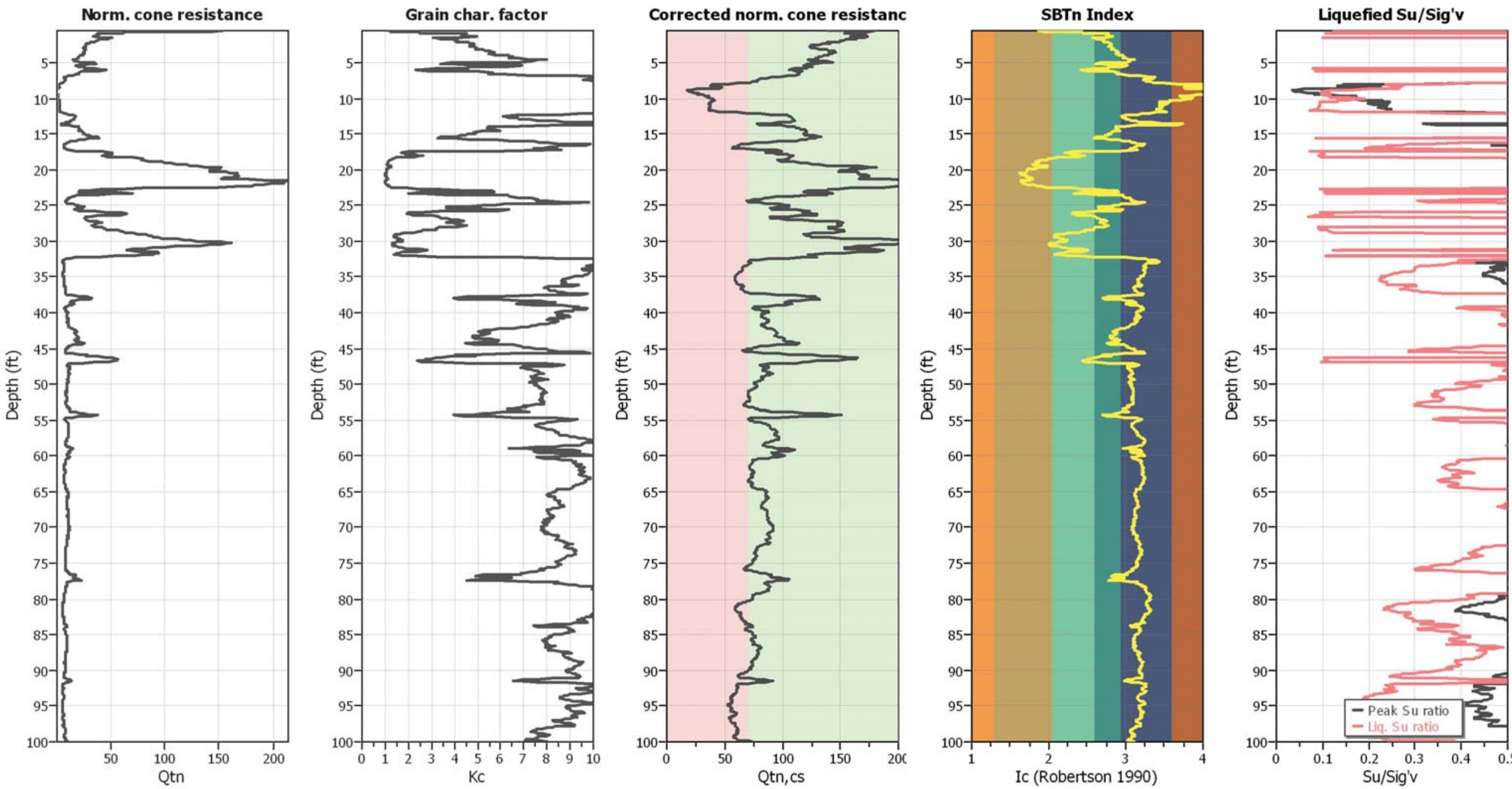
F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

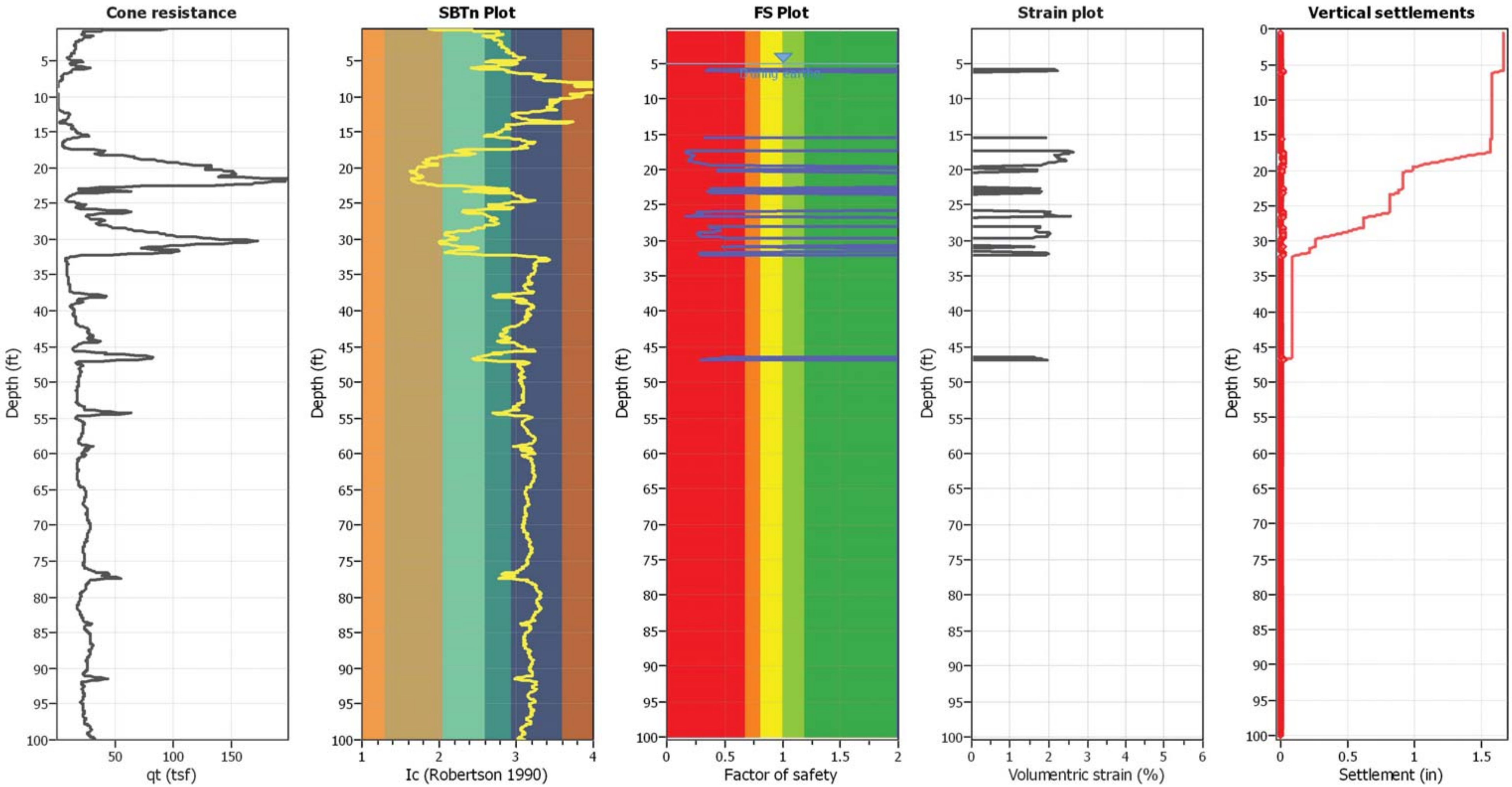
Check for strength loss plots (Olsen & Stark (2002))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	5.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.90	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.71	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	8.90 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements

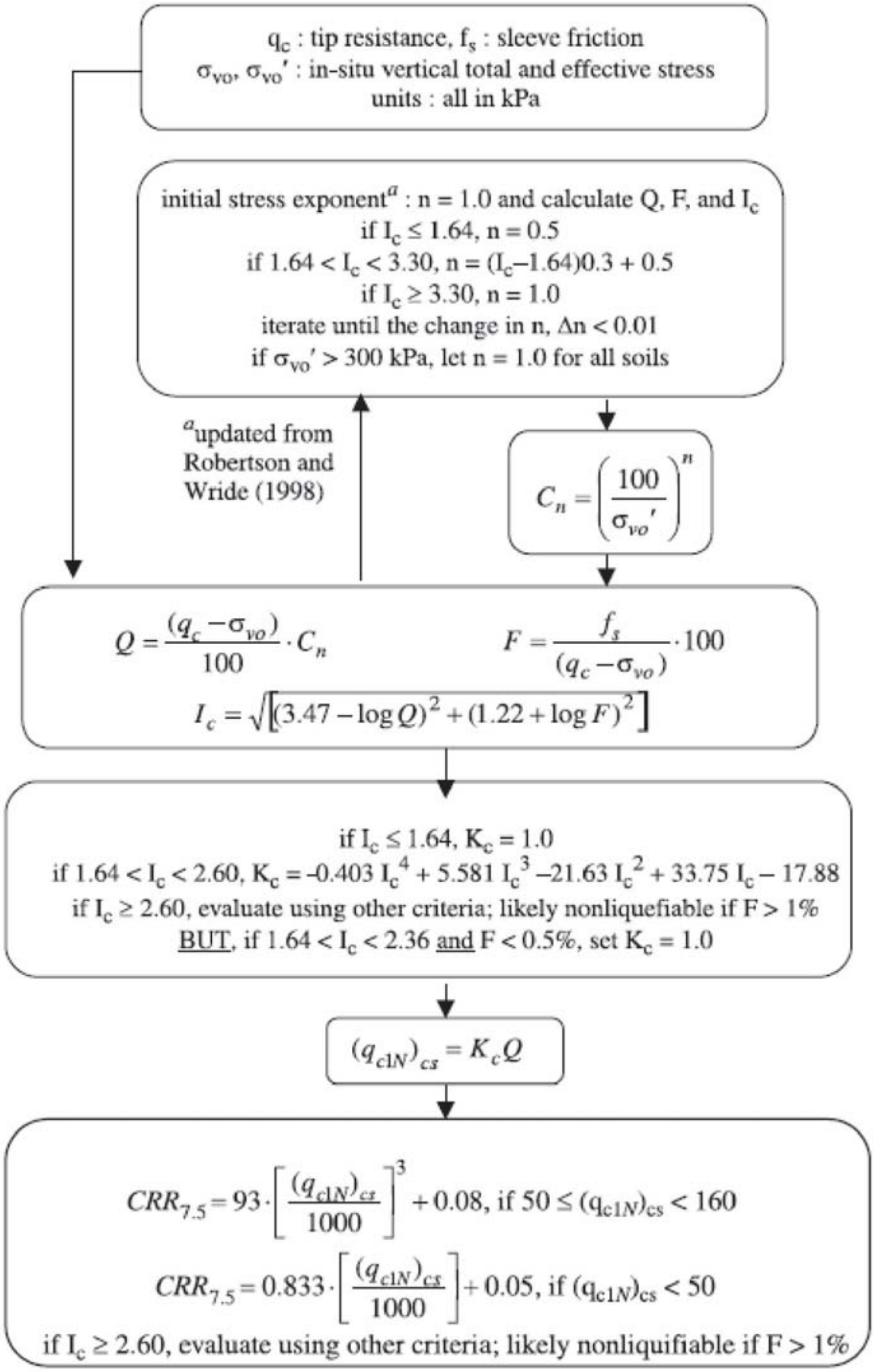


Abbreviations

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

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

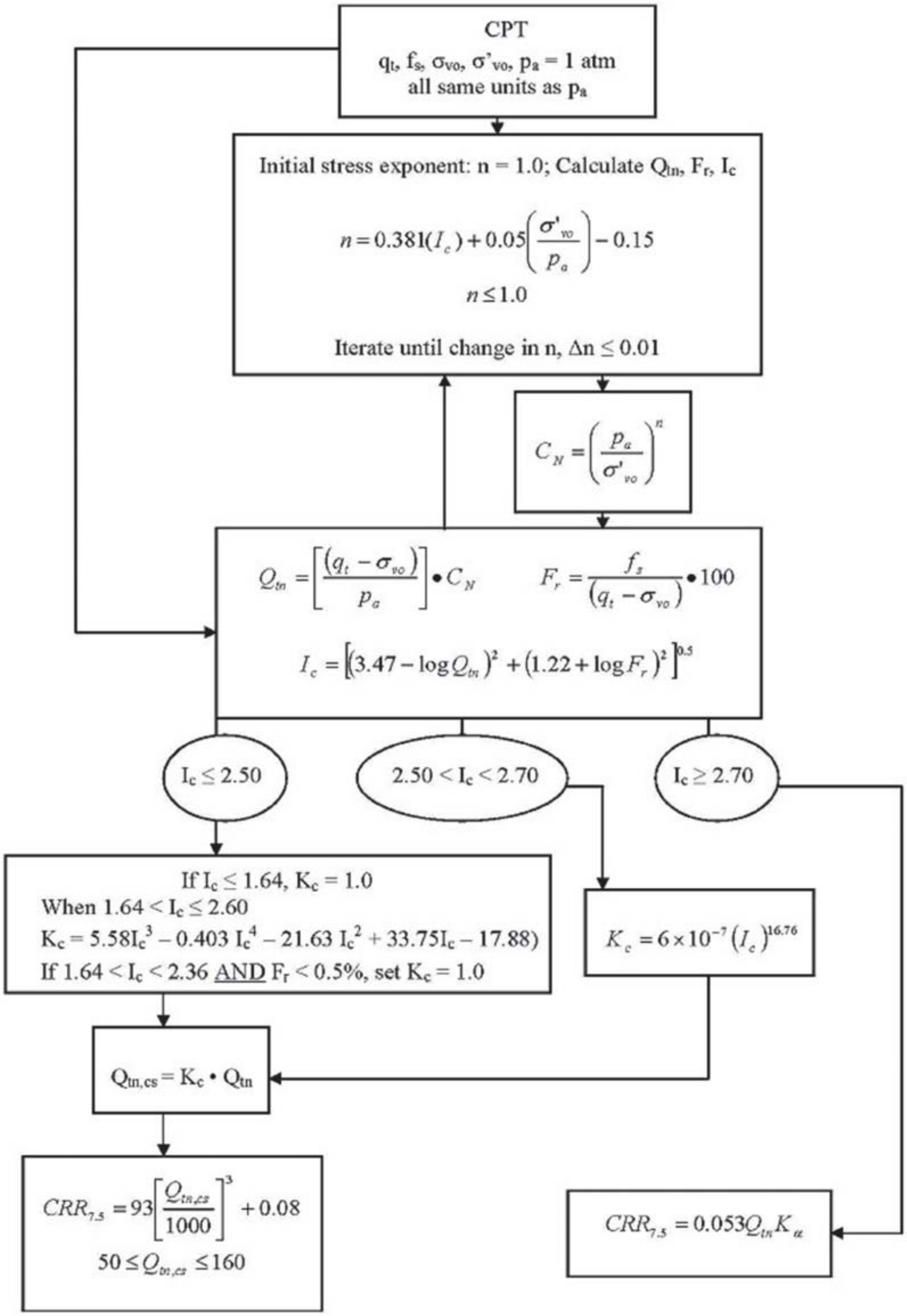
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of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



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

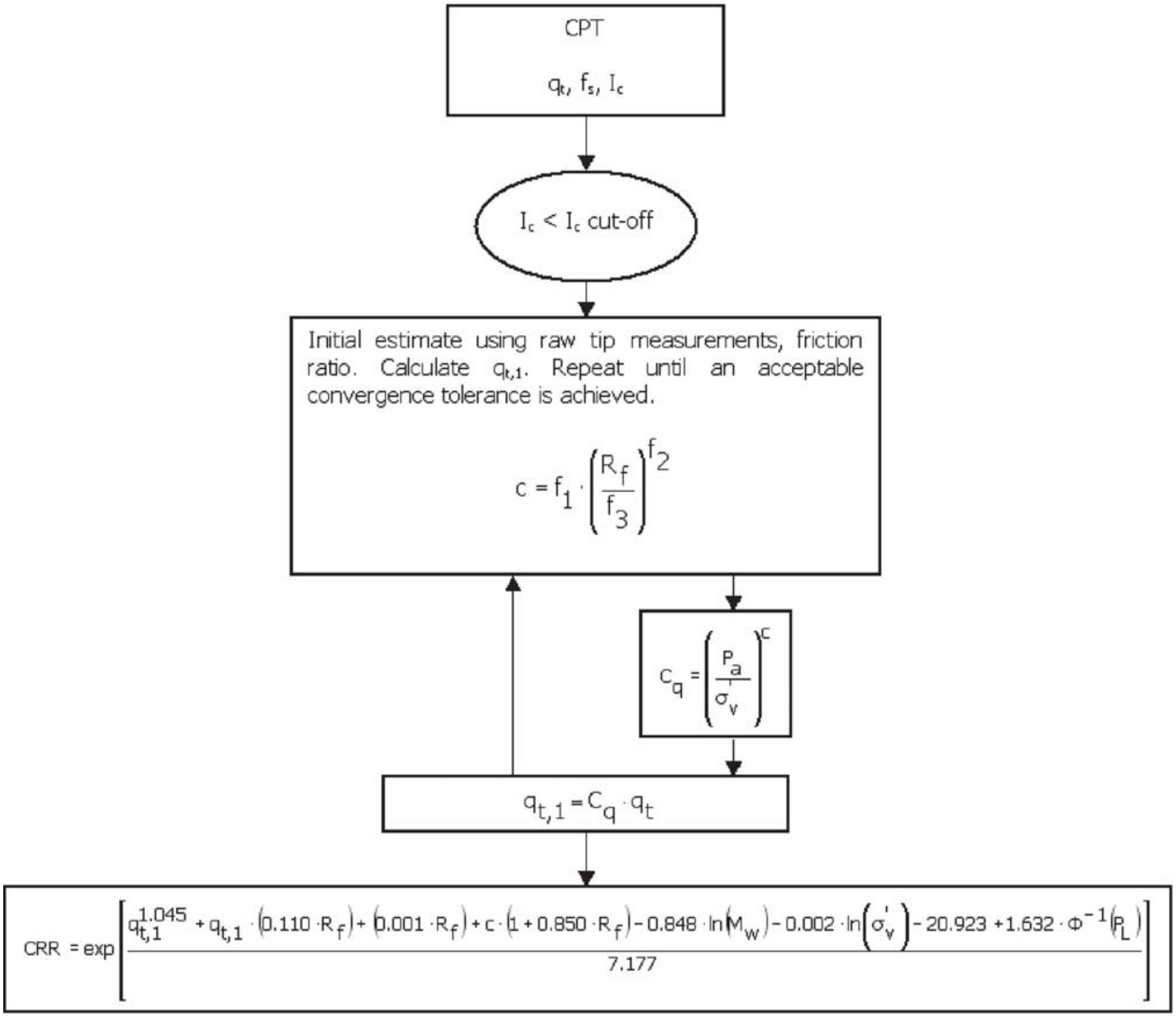
Procedure for the evaluation of soil liquefaction resistance (all soils) - Robertson (2010)

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

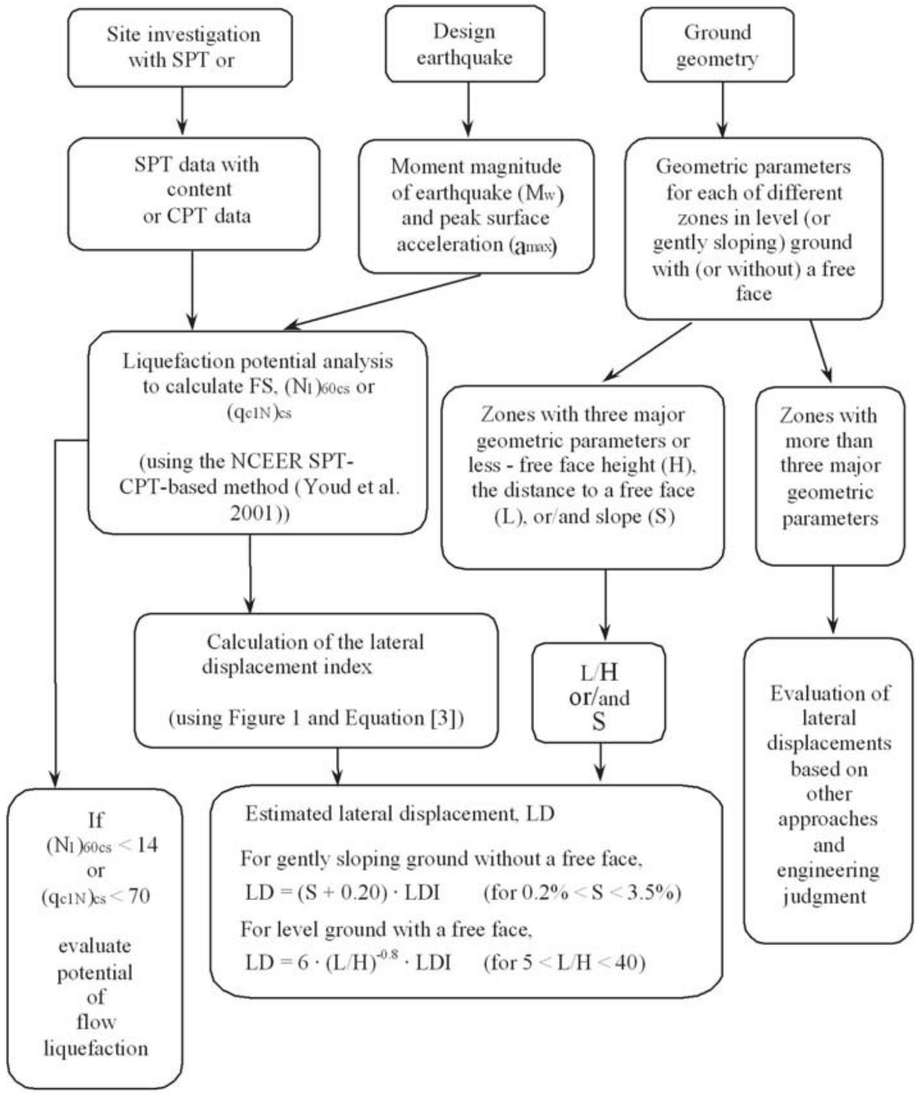


[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

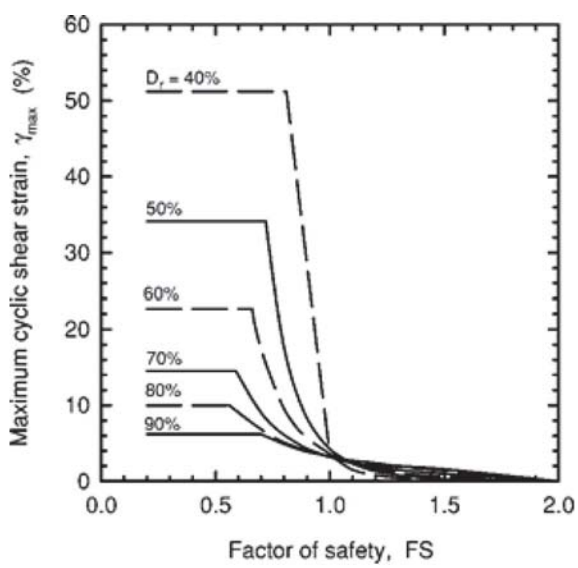
Procedure for the evaluation of soil liquefaction resistance (sandy soils) - Moss et al. (2006)



Procedure for the evaluation of liquefaction-induced lateral spreading displacements



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



[1] **Figure 1**

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

[1] **Equation [3]**

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

Procedure for the estimation of seismic induced settlements in dry sands

Average shear stress, τ_{av}

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

↓

Estimate small shear strain modulus, G_0

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

↓

Estimate shear strain amplitude, γ

(based on Pradel (1998))

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

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

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

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

↓

Estimate volumetric strain in 15 cycles

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

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

↓

Volumetric strain in design earthquake

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

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

↓

Seismic settlement, s

$$s = 2 \cdot \int_{0}^{GWT} \Sigma_{vol} \cdot dz$$

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

Liquefaction Potential Index (LPI) calculation procedure

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

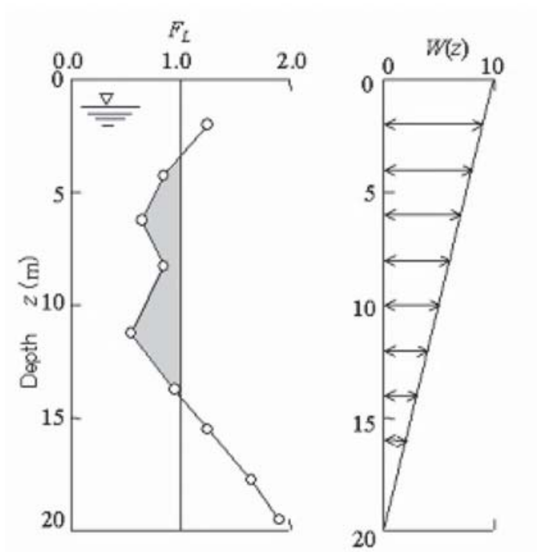
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

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

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

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

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



Graphical presentation of the LPI calculation procedure

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- R. E. S. Moss, R. B. Seed, R. E. Kayen, J. P. Stewart, A. Der Kiureghian, K. O. Cetin, CPT-Based Probabilistic and Deterministic Assessment of In Situ Seismic Soil Liquefaction Potential, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 132, No. 8, August 1, 2006

APPENDIX F

Pile Capacity Charts

A P P E N D I X F

Table F-1A
Vertical Capacities of Driven Piles
(Top of Pile at El. 10 feet)

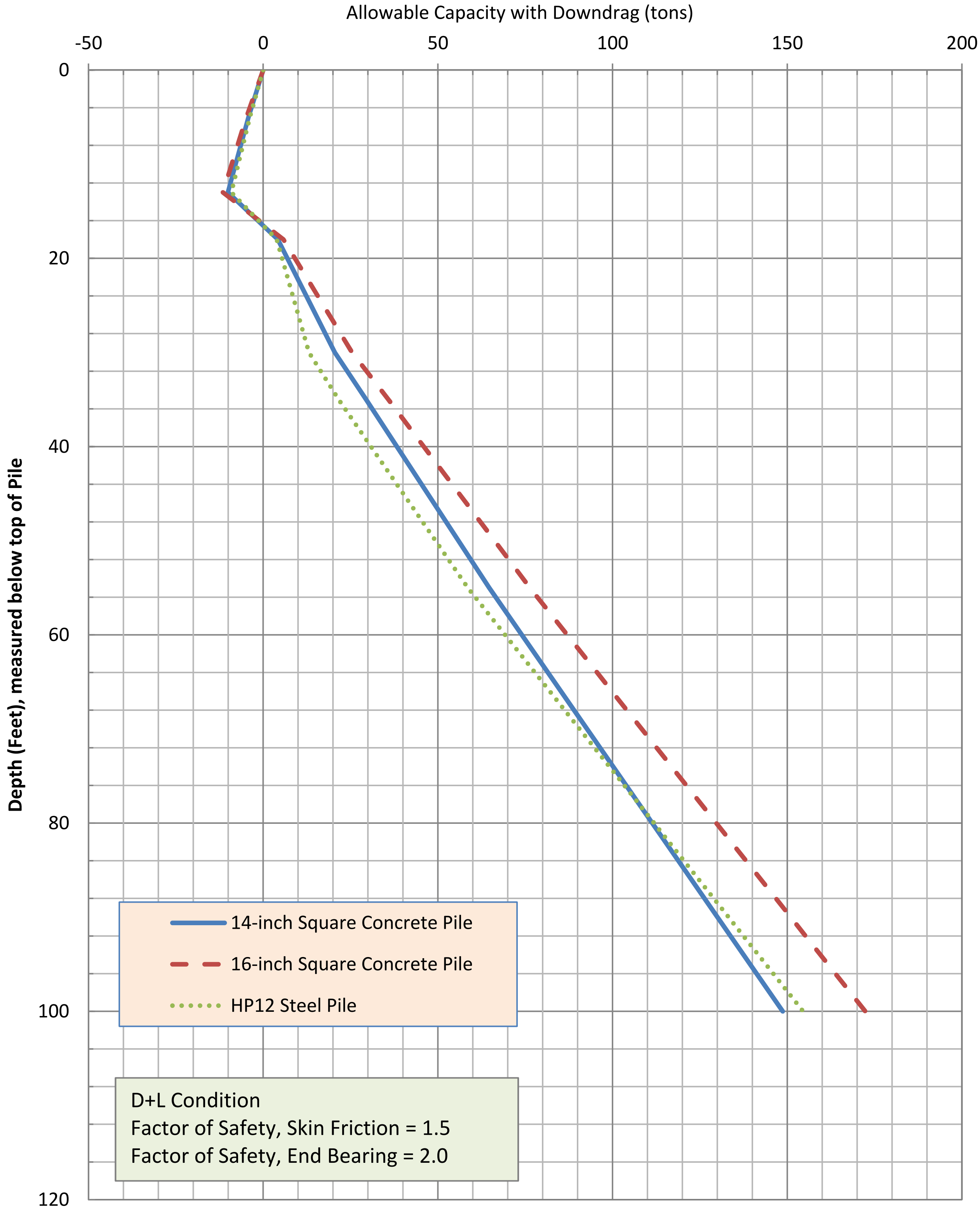
Pile Type	Allowable Downward Vertical Load (Tons) Dead Plus Live Loads FS = 1.5	Recommended Pile Length (feet)	Allowable Uplift Capacity (Tons) Dead Plus Live Load FS = 1.5	Ultimate Downward Vertical Load (Tons) FS = 1.0	Downdrag (Tons)
14" square concrete	100	74	90	150	10
	150	101	140	225	10
16" square concrete	100	66	90	150	12
	150	90	140	225	12
H Pile 12 x 84	100	74	90	150	9
	150	98	140	225	9

Table F-1B
Vertical Capacities of Driven Piles
(Top of Pile at El. 5 feet)

Pile Type	Allowable Downward Vertical Load (Tons) Dead Plus Live Loads FS = 1.5	Recommended Pile Length (feet)	Allowable Uplift Capacity (Tons) Dead Plus Live Load FS = 1.5	Ultimate Downward Vertical Load (Tons) FS = 1.0	Downdrag (Tons)
14" square concrete	100	**66**	90	150	**6**
	150	**93**	140	225	**6**
16" square concrete	100	**60**	90	150	**7**
	150	**82**	140	225	**7**

The above dead plus live loads may be increased by one-third under seismic loading conditions. Refer to Section 6.2.1 of the Geotechnical Exploration Report for details. Vertical capacities of steel H pile for a deepened pile cap condition (top of pile at Elevation 5 feet) can be provided when needed.

Allowable Vertical Pile Capacities
(Top of Pile at Elevation 10 feet)



Allowable Vertical Pile Capacities
(Top of Pile at Elevation 5 feet)

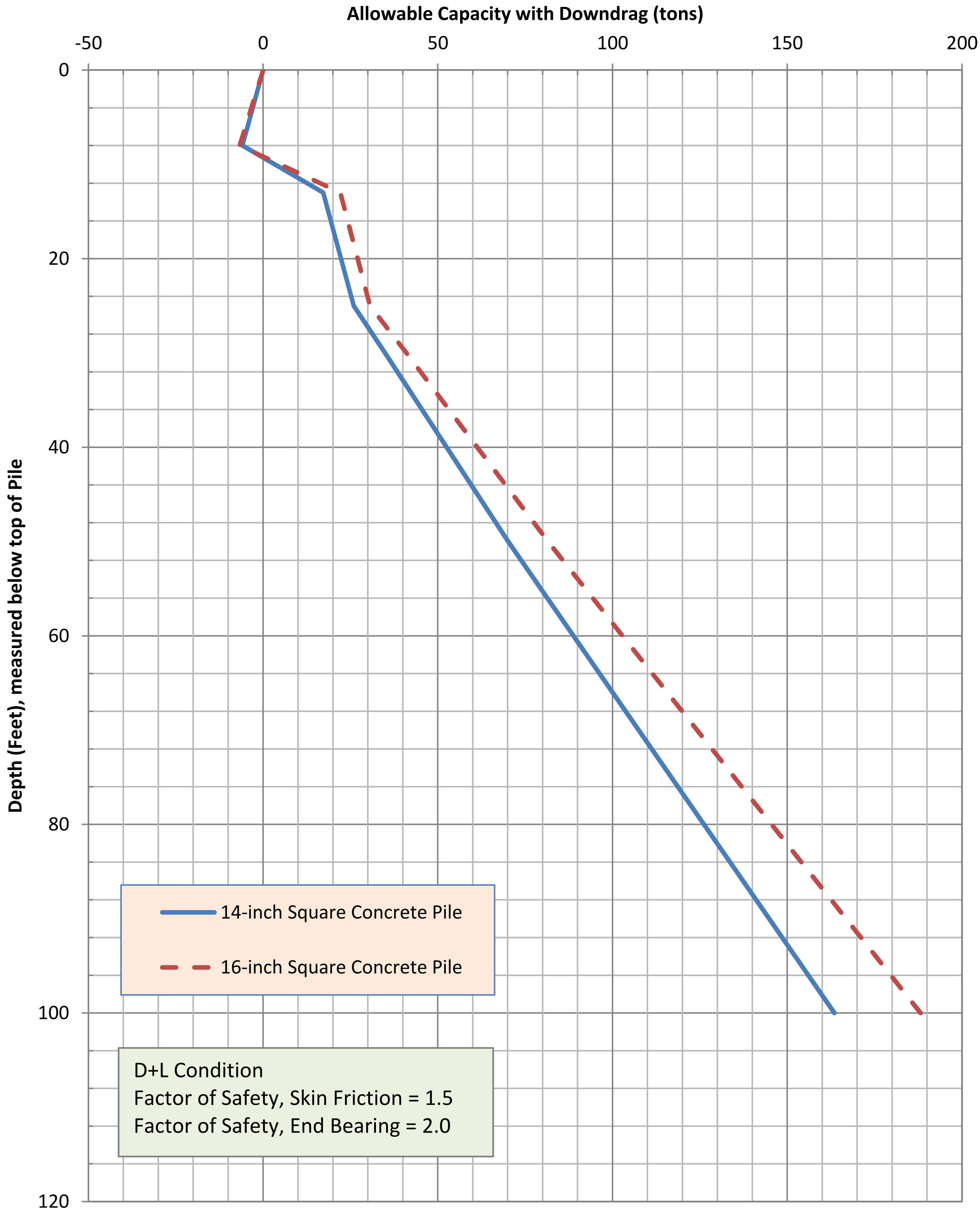


Table F-2
Pile Properties (provided by SOHA)

Pile Type	I (in^4)	E (ksi)
14-in Concrete Pile	3201	4415
16-in Concrete Pile	5461	4415

Pile Type	Ix (in^4)	Iy (in^4)	E (ksi)
HP 12x84	650	213	29000

Table F-3A
LPILE Analysis Soil Parameters
(Top of Pile at Elevation 10 feet)

Depth in Feet	USCS	L-Pile Soil Type	Eff. Unit Weight (pci)	Friction Angle (deg)	Cohesion (psi)	E50	K (pci)
above 5	SC to CH	STIFF CLAY	0.072	--	10	0.007	--
5 to 13	CH	SOFT CLAY	0.022	--	2.5	0.02	--
13 to 18	CL	STIFF CLAY	0.028	--	5	0.01	--
18 to 25	SP/SM	SAND	0.03	35	--	--	60
25 to 30	GP/GM	LIQUEFIED SAND	0.03	--	--	--	--
30 to 35	CL/ML	STIFF CLAY	0.036	--	7	0.007	--
35 to 55	ML/SM	STIFF CLAY	0.036	--	7	0.006	--
Below 55	CL	STIFF CLAY	0.036	--	13.5	0.005	--

Table F-3B
LPILE Analysis Soil Parameters
(Top fo Pile at Elevation 5 feet)

Depth in Feet	USCS	L-Pile Soil Type	Eff. Unit Weight (pci)	Friction Angle (deg)	Cohesion (psi)	E50	K (pci)
0 to 8	CH	SOFT CLAY	0.022	--	2.5	0.02	--
8 to 13	CL	STIFF CLAY	0.028	--	5	0.01	--
13 to 20	SP/SM	SAND	0.03	35	--	--	60
20 to 25	GP/GM	LIQUEFIED SAND	0.03	--	--	--	--
25 to 30	CL/ML	STIFF CLAY	0.036	--	7	0.007	--
30 to 50	ML/SM	STIFF CLAY	0.036	--	7	0.006	--
Below 50	CL	STIFF CLAY	0.036	--	13.5	0.005	--

Table F-4A
Lateral Capacities for Precast Concrete Piles
(Top of Pile at Elevation 10 feet)

Pile Type	Axial Load	Lateral Capacities (kips)			
		Free Head		Fixed Head	
		1/4" deflection	1/2" deflection	1/4" deflection	1/2" deflection
14-inch Square	100 Tons	13.9	18.2	23.2	30.8
	150 Tons	13.4	17.3	22.5	29.8
16-inch Square	100 Tons	16.7	21.7	27.7	37.0
	150 Tons	16.5	21.4	27.6	36.8
HP 12x84 **X-Axis**	100 Tons	13.9	18.2	23.3	30.9
	150 Tons	13.8	17.9	23.1	30.7
HP 12x84 **Y-Axis**	100 Tons	11.5	15.4	20.4	26.7
	150 Tons	11.0	14.4	20.0	26.1

Table F-4B
Lateral Capacities for Precast Concrete Piles
(Top of Pile at Elevation 5 feet)

Pile Type	Axial Load	Lateral Capacities (kips)			
		Free Head		Fixed Head	
		1/4" deflection	1/2" deflection	1/4" deflection	1/2" deflection
14-inch Square	100 Tons	4.8	6.9	11.1	17.0
	150 Tons	4.6	6.6	11.0	16.7
16-inch Square	100 Tons	6.0	8.8	14.1	22.0
	150 Tons	5.8	8.5	14.0	21.8

*Lateral capacities of steel H pile for a deepened pile cap condition (Top of Pile at Elevation 5 feet) can be provided when needed.

Table F-5A
Load Deflection Characteristics for Precast Concrete Piles
(Top of Pile at Elevation 10 feet)

Pile Type	Deflection Characteristic	Pile Deflection			
		Free Head		Fixed Head	
		1/4" deflection	1/2" deflection	1/4" deflection	1/2" deflection
Axial Load = 100 Tons					
14-inch Square	Maximum Bending Moment (in-kips)	427	613	983	1509
	*Depth to Maximum bending Moment (feet)	4.4	5.2	0	0
	*1st Point of Fixity (feet)	10.3	12.6	16.3	17.8
	*2nd Point of Fixity (feet)	20.7	25.9	31.8	31.8
16-inch Square	Maximum Bending Moment (in-kips)	538	787	1327	2054
	*Depth to Maximum bending Moment (feet)	5.3	6.6	0	0
	*1st Point of Fixity (feet)	13.2	15.2	17.8	19.8
	*2nd Point of Fixity (feet)	29.0	31.7	32.3	33.7
HP 12x84 **X-Axis**	Maximum Bending Moment (in-kips)	449	655	1085	1672
	*Depth to Maximum bending Moment (feet)	5.2	6.7	0	0
	*1st Point of Fixity (feet)	11.8	14.8	17.7	19.2
	*2nd Point of Fixity (feet)	25.9	34.8	32.6	33.3
HP 12x84 **Y-Axis**	Maximum Bending Moment (in-kips)	453	665	1085	1672
	*Depth to Maximum bending Moment (feet)	5.2	6.7	0	0
	*1st Point of Fixity (feet)	11.8	14.8	17.8	19.2
	*2nd Point of Fixity (feet)	25.9	31.1	31.8	33.3
Axial Load = 150 Tons					
14-inch Square Axial Load = **150** Tons	Maximum Bending Moment (in-kips)	408	597	958	1479
	*Depth to Maximum bending Moment (feet)	4.0	6.0	0	0
	*1st Point of Fixity (feet)	11.1	13.1	16.2	18.2
	*2nd Point of Fixity (feet)	21.2	27.2	31.3	32.3
16-inch Square Axial Load = **150** Tons	Maximum Bending Moment (in-kips)	542	793	1324	2048
	*Depth to Maximum bending Moment (feet)	5.4	6.3	0	0
	*1st Point of Fixity (feet)	12.6	14.4	17.1	19.8
	*2nd Point of Fixity (feet)	29.7	32.4	32.4	33.3
HP 12x84 **X-Axis**	Maximum Bending Moment (in-kips)	322	481	713	1059
	*Depth to Maximum bending Moment (feet)	3.9	4.9	0	0
	*1st Point of Fixity (feet)	15.2	8.8	13.7	15.7
	*2nd Point of Fixity (feet)	17.6	19.6	23.5	27.4
HP 12x84 **Y-Axis**	Maximum Bending Moment (in-kips)	332	499	716	1062
	*Depth to Maximum bending Moment (feet)	3.9	4.9	0	0
	*1st Point of Fixity (feet)	6.9	7.8	13.7	15.7
	*2nd Point of Fixity (feet)	17.6	19.6	21.6	26.4

* Point of fixity is defined as point of zero lateral deflection. Lengths provided above are measure below top fo pile.

Table F-5B

Load Deflection Characteristics for Precast Concrete Piles

(Top of Pile at Elevation 5 feet)

Pile Type	Deflection Characteristic	Pile Deflection			
		Free Head		Fixed Head	
		1/4" deflection	1/2" deflection	1/4" deflection	1/2" deflection
Axial Load = 100 Tons					
14-inch Square	Maximum Bending Moment (in-kips)	284	480	748	1278
	*Depth to Maximum bending Moment (feet)	8.1	9.1	0	0
	*1st Point of Fixity (feet)	12.1	13.1	15.2	16.1
	*2nd Point of Fixity (feet)	27.3	27.3	27.3	29.3
16-inch Square	Maximum Bending Moment (in-kips)	392	671	1055	1826
	*Depth to Maximum bending Moment (feet)	9.9	10.6	0	0
	*1st Point of Fixity (feet)	13.9	15.2	17.2	17.8
	*2nd Point of Fixity (feet)	27.7	28.4	28.4	30.4
Axial Load = 150 Tons					
14-inch Square	Maximum Bending Moment (in-kips)	287	486	748	1275
	*Depth to Maximum bending Moment (feet)	8.1	9.1	0	0
	*1st Point of Fixity (feet)	12.1	13.1	15.2	16.2
	*2nd Point of Fixity (feet)	27.3	27.3	27.3	29.3
16-inch Square	Maximum Bending Moment (in-kips)	394	676	1054	1823
	*Depth to Maximum bending Moment (feet)	9.2	10.6	0	0
	*1st Point of Fixity (feet)	13.9	15.2	17.2	17.8
	*2nd Point of Fixity (feet)	27.7	28.4	28.4	30.4

* Point of fixity is defined as point of zero lateral deflection. Lengths provided above are measure below top fo pile.

Note: Load deflection characteristics of steel H pile for a deepened pile cap condition (Top of Pile at Elevation 5 feet) can be provided when needed.

APPENDIX G

Guide Contract Specifications

A P P E N D I X G

GUIDE CONTRACT SPECIFICATIONS

PART I - EARTHWORK

PREFACE

These specifications are intended as a guide for the earthwork performed at the subject development project. If there is a conflict between these specifications (including the recommendations of the geotechnical report) and agency or code requirements, it should be brought to the attention of ENGEO and Owner prior to contract bidding.

PART 1 - GENERAL

1.01 WORK COVERED

A. Grading, excavating, filling and backfilling, including trenching and backfilling for utilities as necessary to complete the Project as indicated on the Drawings.

B. Subsurface drainage as indicated on the Drawings.

1.02 CODES AND STANDARDS

A. Excavating, trenching, filling, backfilling, and grading work shall meet the applicable requirements of the Uniform Building Code and the standards and ordinances of state and local governing authorities.

1.03 SUBSURFACE SOIL CONDITIONS

A. The Owners' Geotechnical Exploration report is available for inspection by bidder or Contractor. The Contractor shall refer to the findings and recommendations of the Geotechnical Exploration report in planning and executing his work.

1.04 DEFINITIONS

A. Fill: All soil, rock, or soil-rock materials placed to raise the grades of the site or to backfill excavations.

B. Backfill: All soil, rock or soil-rock material used to fill excavations and trenches.

C. Onsite Material: Soil and/or rock material which is obtained from the site.

D. Imported Material: Soil and/or rock material which is brought to the site from offsite areas.

E. Select Material: Onsite and/or imported material which is approved by ENGEO as a specific-purpose fill.

F. Engineered Fill: Fill upon which ENGEO has made sufficient observations and tests to confirm that the fill has been placed and compacted in accordance with specifications and requirements.

G. Degree of Compaction or Relative Compaction: The ratio, expressed as a percentage, of the in-place dry density of the fill and backfill material as compacted in the field to the maximum dry density of the same material as determined by ASTM D-1557 or California 216 compaction test method.

H. Optimum Moisture: Water content, percentage by dry weight, corresponding to the maximum dry density as determined by ASTM D-1557.

I. ENGEO: The project geotechnical engineering consulting firm, its employees or its designated representatives.

J. Drawings: All documents, approved for construction, which describe the Work.

1.05 OBSERVATION AND TESTING

A. All site preparation, cutting and shaping, excavating, filling, and backfilling shall be carried out under the observation of ENGEO, employed and paid for by the Owners. ENGEO will perform appropriate field and laboratory tests to evaluate the suitability of fill material, the proper moisture content for compaction, and the degree of compaction achieved. Any fill that does not meet the specification requirements shall be removed and/or reworked until the requirements are satisfied.

B. Cutting and shaping, excavating, conditioning, filling, and compacting procedures require approval of ENGEO as they are performed. Any work found unsatisfactory or any work disturbed by subsequent operations before approval is granted shall be corrected in an approved manner as recommended by ENGEO.

C. Tests for compaction will be made in accordance with test procedures outlined in ASTM D-1557, as applicable. Field testing of soils or compacted fill shall conform with the applicable requirements of ASTM D-2922.

D. All authorized observation and testing will be paid for by the Owners.

1.06 SITE CONDITIONS

A. Excavating, filling, backfilling, and grading work shall not be performed during unfavorable weather conditions. When the work is interrupted by rain, excavating, filling, backfilling, and grading work shall not be resumed until the site and soil conditions are suitable.

B. Contractor shall take the necessary measures to prevent erosion of freshly filled, backfilled, and graded areas until such time as permanent drainage and erosion control measures have been installed.

PART 2 - PRODUCTS

2.01 GENERAL

A. Contractor shall furnish all materials, tools, equipment, facilities, and services as required for performing the required excavating, filling, backfilling, and grading work, and trenching and backfilling for utilities.

2.02 SOIL MATERIALS

A. Fill

1. Material to be used for engineered fill and backfill shall be free from organic matter and other deleterious substances, and of such quality that it will compact thoroughly without excessive voids when watered and rolled. Excavated onsite material will be considered suitable for engineered fill and backfill if it contains no more than 3 percent organic matter, is free of debris and other deleterious substances and conforms to the requirements specified above. Rocks of maximum dimension in excess of two-thirds of the lift thickness shall be removed from any fill material to the satisfaction of ENGEO.

2. Excavated earth material which is suitable for engineered fill or backfill, as determined by ENGEO, shall be conditioned for reuse and properly stockpiled as required for later filling and backfilling operations. Conditioning shall consist of spreading material in layers not to exceed 8 inches and raking free of debris and rubble. Rocks and aggregate exceeding the allowed largest dimension, and deleterious material shall be removed from the site and disposed offsite in a legal manner.

3. ENGEO shall be immediately notified if potential hazardous materials or suspect soils exhibiting staining or odor are encountered. Work activities shall be discontinued within the area of potentially hazardous materials. ENGEO environmental personnel will conduct an assessment of the suspect hazardous material to determine the appropriate response and mitigation. Regulatory agencies may also be contacted to request concurrence and oversight. *ENGEO will*

rely on the Owner, or a designated Owner's representative, to make necessary notices to the appropriate regulatory agencies. The Owner may request ENGEO's assistance in notifying regulatory agencies, provided ENGEO receives Owner's written authorization to expand its scope of services.

4. ENGEO shall be notified at least 48 hours prior to the start of filling and backfilling operations so that it may evaluate samples of the material intended for use as fill and backfill. All materials to be used for filling and backfilling require the approval of ENGEO.

B. Import Material: Where conditions require the importation of fill material, the material shall be an inert, nonexpansive soil or soil-rock material free of organic matter and meeting the following requirements unless otherwise approved by ENGEO.

Gradation (ASTM D-421):	Sieve Size	Percent Passing
	2-inch	100
	#200	15 - 70
Plasticity (ASTM D-4318):	Liquid Limit	Plasticity Index
	< 30	< 12
Swell Potential (ASTM D-4546B):	Percent Heave	Swell Pressure
(at optimum moisture)	< 2 percent	< 300 psf
Resistance Value (ASTM D-2844):	Minimum 25	
Organic Content (ASTM D-2974):	Less than 2 percent	

A sample of the proposed import material should be submitted to ENGEO for evaluation prior to delivery at the site.

2.03 SAND

A. Sand for sand cushion under slabs and for bedding of pipe in utility trenches shall be a clean and graded, washed sand, free from clay or organic material, suitable for the intended purpose with 90 to 100 percent passing a No. 4 U.S. Standard Sieve, not more than 5 percent passing a No. 200 U.S. Standard Sieve, and generally conforming to ASTM C33 for fine aggregate.

2.04 AGGREGATE DRAINAGE FILL

A. Aggregate drainage fill under concrete slabs and paving shall consist of broken stone, crushed or uncrushed gravel, clean quarry waste, or a combination thereof. The aggregate shall be free from fines, vegetable matter, loam, volcanic tuff, and other deleterious substances. It shall be of such quality that the absorption of water in a saturated surface dry condition does not exceed 3 percent of the oven dry weight of the samples.

B. Aggregate drainage fill shall be of such size that the percentage composition by dry weight as determined by laboratory sieves (U. S. Series) will conform to the following grading:

Sieve Size	Percentage Passing Sieve
1½-inches	100
1-inch	90 - 100
#4	0 - 5

2.05 SUBDRAINS

A. Perforated subdrain pipe of the required diameter shall be installed as shown on the drawings. The pipe(s) shall also conform to these specifications unless otherwise specified by ENGEO in the field.

Subdrain pipe shall be manufactured in accordance with one of the following requirements:

<u>Design depths less than 30 feet</u>
- Perforated ABS Solid Wall SDR 35 (ASTM D-2751)
- Perforated PVC Solid Wall SDR 35 (ASTM D-3034)
- Perforated PVC A-2000 (ASTM F949)
- Perforated Corrugated HDPE double-wall (AASHTO M-252 or M-294, Caltrans Type S, 50 psi minimum stiffness)

<u>Design depths less than 50 feet</u>
- Perforated PVC SDR 23.5 Solid Wall (ASTM D-3034)
- Perforated Sch. 40 PVC Solid Wall (ASTM-1785)
- Perforated ABS SDR 23.5 Solid Wall (ASTM D-2751)
- Perforated ABS DWV/Sch. 40 (ASTM D-2661 and D-1527)
- Perforated Corrugated HDPE double-wall (AASHTO M-252 or M-294, Caltrans Type S, 70 psi minimum stiffness)

<u>Design depths less than 70 feet</u>
- Perforated ABS Solid Wall SDR 15.3 (ASTM D-2751)
- Perforated Sch. 80 PVC (ASTM D-1785)
- Perforated Corrugated Aluminum (ASTM B-745)

B. Permeable Material (Class 2): Class 2 permeable material for filling trenches under, around, and over subdrains, behind building and retaining walls, and for pervious blankets shall consist of clean, coarse sand and gravel or crushed stone, conforming to the following grading requirements:

Sieve Size	Percentage Passing Sieve
1-inch	100
¾-inch	90 - 100
⅜-inch	40 - 100
#4	25 - 40
#8	18 - 33
#30	5 - 15
#50	0 - 7
#200	0 - 3

C. Filter Fabric: All filter fabric shall meet the following Minimum Average Roll Values unless otherwise specified by ENGEO.

Grab Strength (ASTM D-4632)..180 lbs
Mass Per Unit Area (ASTM D-4751)................................6 oz/yd^2
Apparent Opening Size (ASTM D-4751)...........................70-100 U.S. Std. Sieve
Flow Rate (ASTM D-4491)..80 gal/min/ft^2
Puncture Strength (ASTM D-4833)...................................80 lbs

D. Vapor Retarder: Vapor Retarders shall consist of PVC, LDPE or HDPE impermeable sheeting at least 10 mils thick.

2.06 PERMEABLE MATERIAL (Class 1; Type A)

A. Class 1 permeable material to be used in conjunction with filter fabric for backfilling of subdrain excavations shall conform to the following grading requirements:

Sieve Size	Percentage Passing Sieve
¾-inch	100
½-inch	95 - 100
⅜-inch	70 - 100
#4	0 - 55
#8	0 - 10
#200	0 - 3

PART 3 - EXECUTION

3.01 STAKING AND GRADES

A. Contractor shall lay out all his work, establish all necessary markers, bench marks, grading stakes, and other stakes as required to achieve design grades.

3.02 EXISTING UTILITIES

A. Contractor shall verify the location and depth (elevation) of all existing utilities and services before performing any excavation work.

3.03 EXCAVATION

A. Contractor shall perform excavating as indicated and required for concrete footings, drilled piers, foundations, floor slabs, concrete walks, and site leveling and grading, and provide shoring, bracing, underpinning, cribbing, pumping, and planking as required. The bottoms of excavations shall be firm undisturbed earth, clean and free from loose material, debris, and foreign matter.

B. Excavations shall be kept free from water at all times. Adequate dewatering equipment shall be maintained at the site to handle emergency situations until concrete or backfill is placed.

C. Unauthorized excavations for footings shall be filled with concrete to required elevations, unless other methods of filling are authorized by ENGEO.

D. Excavated earth material which is suitable for engineered fill or backfill, as determined by ENGEO, shall be conditioned for reuse and properly stockpiled for later filling and backfilling operations as specified under Section 2.02, "Soil Materials."

E. Abandoned sewers, piping, and other utilities encountered during excavating shall be removed and the resulting excavations shall be backfilled with engineered fill as required by ENGEO.

F. Any active utility lines encountered shall be reported immediately to the Owner's Representative and authorities involved. The Owner and proper authorities shall be permitted free access to take the measures deemed necessary to repair, relocate, or remove the obstruction as determined by the responsible authority or Owner's Representative.

3.04 SUBGRADE PREPARATION

A. All brush and other rubbish, as well as trees and root systems not marked for saving, shall be removed from the site and legally disposed of.

B. Any existing structures, foundations, underground storage tanks, or debris must be removed from the site prior to any building, grading, or fill operations. Septic tanks, including all drain fields and other lines, if encountered, must be totally removed. The resulting depressions shall be properly prepared and filled to the satisfaction of ENGEO.

C. Vegetation and organic topsoil shall be removed from the surface upon which the fill is to be placed and either removed and legally disposed of or stockpiled for later use in approved landscape areas. The surface shall then be scarified to a depth of at least eight inches until the surface is free from ruts, hummocks, or other uneven features which would tend to prevent uniform compaction by the equipment to be used.

D. After the foundation for the fill has been cleared and scarified, it shall be made uniform and free from large clods. The proper moisture content must be obtained by adding water or aerating. The foundation for the fill shall be compacted at the proper moisture content to a relative compaction as specified herein.

3.05 ENGINEERED FILL

A. Select Material: Fill material shall be "Select" or "Imported Material" as previously specified.

B. Placing and Compacting: Engineered fill shall be constructed by approved and accepted methods. Fill material shall be spread in uniform lifts not exceeding 8 inches in uncompacted thickness. Each layer shall be spread evenly, and thoroughly blade-mixed to obtain uniformity of material. Fill material which does not contain sufficient moisture as specified by ENGEO shall be sprinkled with water; if it contains excess moisture it shall be aerated or blended with drier material to achieve the proper water content. Select material and water shall then be thoroughly mixed before being compacted.

C. Unless otherwise specified in the Geotechnical Exploration report, each layer of spread select material shall be compacted to at least 90 percent relative compaction at a moisture content of at least three percentage points above the optimum moisture content. Minimum compaction in all keyways shall be a minimum of 95 percent with a minimum moisture content of at least 1 percentage point above optimum.

D. Unless otherwise specified in the Geotechnical Exploration report or otherwise required by the local authorities, the upper 6 inches of engineered fill in areas to receive pavement shall be compacted to at least 95 percent relative compaction with a minimum moisture content of at least 3 percentage points above optimum.

E. Testing and Observation of Fill: The work shall consist of field observation and testing to determine that each layer has been compacted to the required density and that the required moisture is being obtained. Any layer or portion of a layer that does not attain the compaction required shall be reworked until the required density is obtained.

F. Compaction: Compaction shall be by sheepsfoot rollers, multiple-wheel steel or pneumatic-tired rollers or other types of acceptable compaction equipment. Rollers shall be of such design that they will be able to compact the fill to the specified compaction. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer must be continuous so that the required compaction may be obtained uniformly throughout each layer.

G. Fill slopes shall be constructed by overfilling the design slopes and later cutting back the slopes to the design grades. No loose soil will be permitted on the faces of the finished slopes.

H. Strippings and topsoil shall be stockpiled as approved by Owner, then placed in accordance with ENGEO's recommendations to a minimum thickness of 6 inches and a maximum thickness of 12 inches over exposed open space cut slopes which are 3:1 or flatter, and track walked to the satisfaction of ENGEO.

I. Final Prepared Subgrade: Finish blading and smoothing shall be performed as necessary to produce the required density, with a uniform surface, smooth and true to grade.

3.06 BACKFILLING

A. Backfill shall not be placed against footings, building walls, or other structures until approved by ENGEO.

B. Backfill material shall be Select Material as specified for engineered fill.

C. Backfill shall be placed in 6-inch layers, leveled, rammed, and tamped in place. Each layer shall be compacted with suitable compaction equipment to 90 percent relative compaction at a moisture content of at least 3 percent above optimum.

3.07 TRENCHING AND BACKFILLING FOR UTILITIES

A. Trenching:

1. Trenching shall include the removal of material and obstructions, the installation and removal of sheeting and bracing and the control of water as necessary to provide the required utilities and services.

2. Trenches shall be excavated to the lines, grades, and dimensions indicated on the Drawings. Maximum allowable trench width shall be the outside diameter of the pipe plus 24 inches, inclusive of any trench bracing.

3. When the trench bottom is a soft or unstable material as determined by ENGEO, it shall be made firm and solid by removing said unstable material to a sufficient depth and replacing it with onsite material compacted to 90 percent minimum relative compaction.

4. Where water is encountered in the trench, the contractor must provide materials necessary to drain the water and stabilize the bed.

B. Backfilling:

1. Trenches must be backfilled within 2 days of excavation to minimize desiccation.

2. Bedding material shall be sand and shall not extend more than 6 inches above any utility lines.

3. Backfill material shall be select material.

4. Trenches shall be backfilled as indicated or required and compacted with suitable equipment to 90 percent minimum relative compaction at the required moisture content.

3.08 SUBDRAINS

A. Trenches for subdrain pipe shall be excavated to a minimum width equal to the outside diameter of the pipe plus at least 12 inches and to a depth of approximately 2 inches below the grade established for the invert of the pipe, or as indicated on the Drawings.

B. The space below the pipe invert shall be filled with a layer of Class 2 permeable material, upon which the pipe shall be laid with perforations down. Sections shall be joined as recommended by the pipe manufacturer.

C. Rocks, bricks, broken concrete, or other hard material shall not be used to give intermediate support to pipes. Large stones or other hard objects shall not be left in contact with the pipes.

D. Excavations for subdrains shall be filled as required to fill voids and prevent settlement without damaging the subdrain pipe. Alternatively, excavations for subdrains may be filled with Class 1 permeable material (as defined in Section 2.06) wrapped in Filter Fabric (as defined in Section 2.05).

3.09 AGGREGATE DRAINAGE FILL

A. ENGEO shall approve finished subgrades before aggregate drainage fill is installed.

B. Pipes, drains, conduits, and any other mechanical or electrical installations shall be in place before any aggregate drainage fill is placed. Backfill at walls to elevation of drainage fill shall be in place and compacted.

C. Aggregate drainage fill under slabs and concrete paving shall be the minimum uniform thickness after compaction of dimensions indicated on Drawings. Where not indicated, minimum thickness after compaction shall be 4 inches.

D. Aggregate drainage fill shall be rolled to form a well-compacted bed.

E. The finished aggregate drainage fill must be observed and approved by ENGEO before proceeding with any subsequent construction over the compacted base or fill.

3.10 SAND CUSHION

A. A sand cushion shall be placed over the vapor retarder membrane under concrete slabs on grade. Sand cushion shall be placed in uniform thickness as indicated on the Drawings. Where not indicated, the thickness shall be 2 inches.

3.11 FINISH GRADING

A. All areas must be finish graded to elevations and grades indicated on the Drawings. In areas to receive topsoil and landscape planting, finish grading shall be performed to a uniform 6 inches below the grades and elevations indicated on the Drawings, and brought to final grade with topsoil.

3.12 DISPOSAL OF WASTE MATERIALS

A. Excess earth materials and debris shall be removed from the site and disposed of in a legal manner. Location of dump site and length of haul are the Contractor's responsibility.

PART II - GEOGRID SOIL REINFORCEMENT

1. DESCRIPTION:

   Work shall consist of furnishing geogrid soil reinforcement for use in construction of reinforced soil slopes and retention systems.

2. GEOGRID MATERIAL:

   2.1 The specific geogrid material shall be preapproved by ENGEO.

   2.2 The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil or rock. The geogrid structure shall be dimensionally stable and able to retain its geometry under construction stresses and shall have high resistance to damage during construction, to ultraviolet degradation, and to all forms of chemical and biological degradation encountered in the soil being reinforced.

   2.3 The geogrids shall have an Allowable Strength (T_a) and Pullout Resistance, for the soil type(s) indicated, as listed in Table I.

   2.4 Certifications: The Contractor shall submit a manufacturer's certification that the geogrids supplied meet the respective index criteria set when geogrid was approved by ENGEO, measured in full accordance with all test methods and standards specified. In case of dispute over validity of values, the Contractor will supply test data from an ENGEO-approved laboratory to support the certified values submitted.

3. CONSTRUCTION:

   3.1 Delivery, Storage, and Handling: Contractor shall check the geogrid upon delivery to ensure that the proper material has been received. During all periods of shipment and storage, the geogrid shall be protected from temperatures greater than 140 °F, mud, dirt, dust, and debris. Manufacturer's recommendations in regard to protection from direct sunlight must also be followed. At the time of installation, the geogrid will be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be repaired by placing a patch over the damaged area. Any geogrid damaged during storage or installation shall be replaced by the Contractor at no additional cost to the owner.

3.2 Onsite Representative: Geogrid material suppliers shall provide a qualified and experienced representative onsite at the initiation of the project, for a minimum of three days, to assist the Contractor and ENGEO personnel at the start of construction. If there is more than one slope on a project, this criterion will apply to construction of the initial slope only. The representative shall also be available on an as-needed basis, as requested by ENGEO, during construction of the remaining slope(s).

3.3 Geogrid reinforcement may be joined with mechanical connections or overlaps as recommended and approved by the Manufacturer. Joints shall not be placed within 6 feet of the slope face, within 4 feet below top of slope, nor horizontally or vertically adjacent to another joint.

3.4 Geogrid Placement: The geogrid reinforcement shall be installed in accordance with the manufacturer's recommendations. The geogrid reinforcement shall be placed within the layers of the compacted soil as shown on the plans or as directed.

The geogrid reinforcement shall be placed in continuous longitudinal strips in the direction of main reinforcement. However, if the Contractor is unable to complete a required length with a single continuous length of geogrid, a joint may be made with the Manufacturer's approval. Only one joint per length of geogrid shall be allowed. This joint shall be made for the full width of the strip by using a similar material with similar strength. Joints in geogrid reinforcement shall be pulled and held taut during fill placement.

Adjacent strips, in the case of 100 percent coverage in plan view, need not be overlapped. The minimum horizontal coverage is 50 percent, with horizontal spacings between reinforcement no greater than 40 inches. Horizontal coverage of less than 100 percent shall not be allowed unless specifically detailed in the construction drawings.

Adjacent rolls of geogrid reinforcement shall be overlapped or mechanically connected where exposed in a wrap around face system, as applicable.

The Contractor may place only that amount of geogrid reinforcement required for immediately pending work to prevent undue damage. After a layer of geogrid reinforcement has been placed, the next succeeding layer of soil shall be placed and compacted as appropriate. After the specified soil layer has been placed, the next geogrid reinforcement layer shall be installed. The process shall be repeated for each subsequent layer of geogrid reinforcement and soil.

Geogrid reinforcement shall be placed to lay flat and pulled tight prior to backfilling. After a layer of geogrid reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geogrid reinforcement in position until the subsequent soil layer can be placed.

Under no circumstances shall a track-type vehicle be allowed on the geogrid reinforcement before at least six inches of soil have been placed. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and the geogrid reinforcement. If approved by the Manufacturer, rubber-tired equipment may pass over the geosynthetic reinforcement at slow speeds, less than 10 mph. Sudden braking and sharp turning shall be avoided.

During construction, the surface of the fill should be kept approximately horizontal. Geogrid reinforcement shall be placed directly on the compacted horizontal fill surface. Geogrid reinforcements are to be placed within three inches of the design elevations and extend the length as shown on the elevation view unless otherwise directed by ENGEO. Correct orientation of the geogrid reinforcement shall be verified by ENGEO.

Table I
Allowable Geogrid Strength
With Various Soil Types
For Geosynthetic Reinforcement In
Mechanically Stabilized Earth Slopes

(Geogrid Pullout Resistance and Allowable Strengths vary with reinforced backfill used due to soil anchorage and site damage factors. Guidelines are provided below.)

SOIL TYPE	MINIMUM ALLOWABLE STRENGTH, T_a (lb/ft)*		
	GEOGRID Type I	GEOGRID Type II	GEOGRID Type III
A. Gravels, sandy gravels, and gravel-sand-silt mixtures (GW, GP, GC, GM & SP)**	2400	4800	7200
B. Well graded sands, gravelly sands, and sand-silt mixtures (SW & SM)**	2000	4000	6000
C. Silts, very fine sands, clayey sands and clayey silts (SC & ML)**	1000	2000	3000
D. Gravelly clays, sandy clays, silty clays, and lean clays (CL)**	1600	3200	4800

* All partial Factors of Safety for reduction of design strength are included in listed values. Additional factors of safety may be required to further reduce these design strengths based on site conditions.

** Unified Soil Classifications.

PART III - GEOTEXTILE SOIL REINFORCEMENT

1. DESCRIPTION:

   Work shall consist of furnishing geotextile soil reinforcement for use in construction of reinforced soil slopes.

2. GEOTEXTILE MATERIAL:

   2.1 The specific geotextile material and supplier shall be preapproved by ENGEO.

   2.2 The geotextile shall have a high tensile modulus and shall have high resistance to damage during construction, to ultraviolet degradation, and to all forms of chemical and biological degradation encountered in the soil being reinforced.

   2.3 The geotextiles shall have an Allowable Strength (T_a) and Pullout Resistance, for the soil type(s) indicated as listed in Table II.

   2.4 Certification: The Contractor shall submit a manufacturer's certification that the geotextiles supplied meet the respective index criteria set when geotextile was approved by ENGEO, measured in full accordance with all test methods and standards specified. In case of dispute over validity of values, the Contractor will supply the data from an ENGEO-approved laboratory to support the certified values submitted.

3. CONSTRUCTION:

   3.1 Delivery, Storage and Handling: Contractor shall check the geotextile upon delivery to ensure that the proper material has been received. During all periods of shipment and storage, the geotextile shall be protected from temperatures greater than 140 °F, mud, dirt, dust, and debris. Manufacturer's recommendations in regard to protection from direct sunlight must also be followed. At the time of installation, the geotextile will be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be repaired by placing a patch over the damaged area. Any geotextile damaged during storage or installation shall be replaced by the Contractor at no additional cost to the owner.

   3.2 Onsite Representative: Geotextile material suppliers shall provide a qualified and experienced representative onsite at the initiation of the project, for a minimum of three days, to assist the Contractor and ENGEO personnel at the start of construction. If there is more than one slope on a project, this criterion will apply to construction of the initial slope only. The representative shall also be available on an as-needed basis, as requested by ENGEO, during construction of the remaining slope(s).

3.3 Geotextile Placement: The geotextile reinforcement shall be installed in accordance with the manufacturer's recommendations. The geotextile reinforcement shall be placed within the layers of the compacted soil as shown on the plans or as directed.

The geotextile reinforcement shall be placed in continuous longitudinal strips in the direction of main reinforcement. Joints shall not be used with geotextiles.

Adjacent strips, in the case of 100 percent coverage in plan view, need not be overlapped. The minimum horizontal coverage is 50 percent, with horizontal spacings between reinforcement no greater than 40 inches. Horizontal coverage of less than 100 percent shall not be allowed unless specifically detailed in the construction drawings.

Adjacent rolls of geotextile reinforcement shall be overlapped or mechanically connected where exposed in a wrap around face system, as applicable.

The Contractor may place only that amount of geotextile reinforcement required for immediately pending work to prevent undue damage. After a layer of geotextile reinforcement has been placed, the succeeding layer of soil shall be placed and compacted as appropriate. After the specified soil layer has been placed, the next geotextile reinforcement layer shall be installed. The process shall be repeated for each subsequent layer of geotextile reinforcement and soil.

Geosynthetic reinforcement shall be placed to lay flat and be pulled tight prior to backfilling. After a layer of geotextile reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geotextile reinforcement in position until the subsequent soil layer can be placed.

Under no circumstances shall a track-type vehicle be allowed on the geotextile reinforcement before at least six inches of soil has been placed. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and the geotextile reinforcement. If approved by the Manufacturer, rubber-tired equipment may pass over the geotextile reinforcement as slow speeds, less than 10 mph. Sudden braking and sharp turning shall be avoided.

During construction, the surface of the fill should be kept approximately horizontal. Geotextile reinforcement shall be placed directly on the compacted horizontal fill surface. Geotextile reinforcements are to be placed within three inches of the design elevations and extend the length as shown on the elevation view unless otherwise directed by ENGEO. Correct orientation of the geotextile reinforcement shall be verified by ENGEO.

Table II
Allowable Geotextile Strength
With Various Soil Types
For Geosynthetic Reinforcement In
Mechanically Stabilized Earth Slopes

(Geotextile Pullout Resistance and Allowable Strengths vary with reinforced backfill used due to soil anchorage and site damage factors. Guidelines are provided below.)

SOIL TYPE	MINIMUM ALLOWABLE STRENGTH, T_a (lb/ft)*		
	GEOTEXTILE Type I	GEOTEXTILE Type II	GEOTEXTILE Type III
A. Gravels, sandy gravels, and gravel-sand-silt mixtures (GW, GP, GC, GM & SP)**	2400	4800	7200
B. Well graded sands, gravelly sands, and sand-silt mixtures (SW & SM)**	2000	4000	6000
C. Silts, very fine sands, clayey sands and clayey silts (SC & ML)**	1000	2000	3000
D. Gravelly clays, sandy clays, silty clays, and lean clays (CL)**	1600	3200	4800

* All partial Factors of Safety for reduction of design strength are included in listed values. Additional factors of safety may be required to further reduce these design strengths based on site conditions.

** Unified Soil Classifications.

PART IV - EROSION CONTROL MAT OR BLANKET

1. DESCRIPTION:

   Work shall consist of furnishing and placing a synthetic erosion control mat and/or degradable erosion control blanket for slope face protection and lining of runoff channels.

2. EROSION CONTROL MATERIALS:

   2.1 The specific erosion control material and supplier shall be pre-approved by ENGEO.

   2.2 Certification: The Contractor shall submit a manufacturer's certification that the erosion mat/blanket supplied meets the criteria specified when the material was approved by ENGEO. The manufacturer's certification shall include a submittal package of documented test results that confirm the property values. In case of a dispute over validity of values, the Contractor will supply property test data from an ENGEO-approved laboratory, to support the certified values submitted. Minimum average roll values, per ASTM D 4759, shall be used for conformance determinations.

3. CONSTRUCTION:

   3.1 Delivery, Storage, and Handling: Contractor shall check the erosion control material upon delivery to ensure that the proper material has been received. During all periods of shipment and storage, the erosion mat shall be protected from temperatures greater than 140 °F, mud, dirt, and debris. Manufacturer's recommendations in regard to protection from direct sunlight must also be followed. At the time of installation, the erosion mat/blanket shall be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be removed by cutting OUT a section of the mat. The remaining ends should be overlapped and secured with ground anchors. Any erosion mat/blanket damaged during storage or installation shall be replaced by the Contractor at no additional cost to the Owner.

   3.2 Onsite Representative: Erosion control material suppliers shall provide a qualified and experienced representative onsite, for a minimum of one day, to assist the Contractor and ENGEO personnel at the start of construction. If there is more than one slope on a project, this criteria will apply to construction of the initial slope only. The representative shall be available on an as-needed basis, as requested by ENGEO, during construction of the remaining slope(s).

3.3 Placement: The erosion control material shall be placed and anchored on a smooth graded, firm surface approved by the Engineer. Anchoring terminal ends of the erosion control material shall be accomplished through use of key trenches. The material in the trenches shall be anchored to the soil on maximum 1½ foot centers. Topsoil, if required by construction drawings, placed over final grade prior to installation of the erosion control material shall be limited to a depth not exceeding 3 inches.

3.4 Erosion control material shall be anchored, overlapped, and otherwise constructed to ensure performance until vegetation is well established. Anchors shall be as designated on the construction drawings, with a minimum of 12 inches length, and shall be spaced as designated on the construction drawings, with a maximum spacing of 4 feet.

3.5 Soil Filling: If noted on the construction drawings, the erosion control mat shall be filled with a fine grained topsoil, as recommended by the manufacturer. Soil shall be lightly raked or brushed on/into the mat to fill the mat voids or to a maximum depth of 1 inch.

PART V - GEOSYNTHETIC DRAINAGE COMPOSITE

1. DESCRIPTION:

   Work shall consist of furnishing and placing a geosynthetic drainage system as a subsurface drainage medium for reinforced soil slopes.

2. DRAINAGE COMPOSITE MATERIALS:

   2.1 The specific drainage composite material and supplier shall be preapproved by ENGEO.

   2.2 The drain shall be of composite construction consisting of a supporting structure or drainage core material surrounded by a geotextile. The geotextile shall encapsulate the drainage core and prevent random soil intrusion into the drainage structure. The drainage core material shall consist of a three dimensional polymeric material with a structure that permits flow along the core laterally. The core structure shall also be constructed to permit flow regardless of the water inlet surface. The drainage core shall provide support to the geotextile. The fabric shall meet the minimum property requirements for filter fabric listed in Section 2.05C of the Guide Earthwork Specifications.

   2.3 A geotextile flap shall be provided along all drainage core edges. This flap shall be of sufficient width for sealing the geotextile to the adjacent drainage structure edge to prevent soil intrusion into the structure during and after installation. The geotextile shall cover the full length of the core.

   2.4 The geocomposite core shall be furnished with an approved method of constructing and connecting with outlet pipes or weepholes as shown on the plans. Any fittings shall allow entry of water from the core but prevent intrusion of backfill material into the core material.

   2.5 Certification and Acceptance: The Contractor shall submit a manufacturer's certification that the geosynthetic drainage composite meets the design properties and respective index criteria measured in full accordance with all test methods and standards specified. The manufacturer's certification shall include a submittal package of documented test results that confirm the design values. In case of dispute over validity of design values, the Contractor will supply design property test data from an ENGEO-approved laboratory, to support the certified values submitted. Minimum average roll values, per ASTM D 4759, shall be used for determining conformance.

3. CONSTRUCTION:

   3.1 Delivery, Storage, and Handling: Contractor shall check the geosynthetic drainage composite upon delivery to ensure that the proper material has been received. During all periods of shipment and storage, the geosynthetic drainage composite shall be protected from temperatures greater than 140 °F, mud, dirt, and debris. Manufacturer's recommendations in regards to protection from direct sunlight must also be followed. At the time of installation, the geosynthetic drainage composite shall be rejected if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, transportation, or storage. If approved by ENGEO, torn or punctured sections may be removed or repaired. Any geosynthetic drainage composite damaged during storage or installation shall be replaced by the Contractor at no additional cost to the Owner.

3.2 Onsite Representative: Geosynthetic drainage composite material suppliers shall provide a qualified and experienced representative onsite, for a minimum of one half day, to assist the Contractor and ENGEO personnel at the start of construction with directions on the use of drainage composite. If there is more than one application on a project, this criterion will apply to construction of the initial application only. The representative shall also be available on an as-needed basis, as requested by ENGEO, during construction of the remaining applications.

3.3 Placement: The soil surface against which the geosynthetic drainage composite is to be placed shall be free of debris and inordinate irregularities that will prevent intimate contact between the soil surface and the drain.

3.4 Seams: Edge seams shall be formed by utilizing the flap of the geotextile extending from the geocomposite's edge and lapping over the top of the fabric of the adjacent course. The fabric flap shall be securely fastened to the adjacent fabric by means of plastic tape or non-water-soluble construction adhesive, as recommended by the supplier. Where vertical splices are necessary at the end of a geocomposite roll or panel, an 8-inch-wide continuous strip of geotextile may be placed, centering over the seam and continuously fastened on both sides with plastic tape or non-water-soluble construction adhesive. As an alternative, rolls of geocomposite drain material may be joined together by turning back the fabric at the roll edges and interlocking the cuspidations approximately 2 inches. For overlapping in this manner, the fabric shall be lapped and tightly taped beyond the seam with tape or adhesive. Interlocking of the core shall always be made with the upstream edge on top in the direction of water flow. To prevent soil intrusion, all exposed edges of the geocomposite drainage core edge must be covered. Alternatively, a 12-inch-wide strip of fabric may be utilized in the same manner, fastening it to the exposed fabric 8 inches in from the edge and folding the remaining flap over the core edge.

3.5 Soil Fill Placement: Structural backfill shall be placed immediately over the geocomposite drain. Care shall be taken during the backfill operation not to damage the geotextile surface of the drain. Care shall also be taken to avoid excessive settlement of the backfill material. The geocomposite drain, once installed, shall not be exposed for more than seven days prior to backfilling.

Project No.
P2021.000.328

February 17, 2021

Ms. Sunali Yatagama
County of San Mateo
400 County Center
Redwood City, CA 94063

Subject: Maple Street Correctional Facility – Solar Power Generation
1300 Maple Street
Redwood City, California

PROPOSAL FOR A GEOTECHNICAL RECOMMENDATION LETTER

Reference: ENGEO; Geotechnical Exploration, San Mateo County, Replacement Correctional Facility, Redwood City, California; November 30, 2012; Project No. 9515.000.000.

Dear Ms. Yatagama:

We are pleased to submit this proposal to provide a geotechnical recommendation letter for the proposed solar panel system planned at the subject project in Redwood City, California. We previously served as geotechnical engineer of record (GEOR) during design and construction of the correctional facility and prepared the referenced geotechnical report.

PROJECT DESCRIPTION

Based on our review of the Solar Study prepared by Bartos Architects and discussions with the design team, we understand the project includes construction of new carports to support the proposed photovoltaic systems (PV). We understand the project team is currently contemplating supporting the proposed carports on either shallow isolated footings or drilled piers.

SCOPE OF SERVICES

We propose to assist the design team in developing foundation recommendations for the proposed solar panel carport structures. We will utilize the existing geotechnical data from our previous geotechnical exploration along with our knowledge from observing previous site grading activities. Our intent is to analyze both shallow footings and drilled piers for support of the structures and collaborate with the structural engineer in determining which foundation type might be more economical. We would then prepare a brief summary letter with the following.

- Updated 2019 California Building Code (CBC) Seismic Design Parameters. We assumed that the fundamental period of the proposed structures is less than 0.5 second; as such, the exception in Section 20.3.1 of ASCE 7-16 may be utilized and a Seismic Hazard Analysis is not required.
- Recommendations for shallow footings, including minimum dimensions, allowable bearing capacities, allowable lateral passive earth pressure and coefficient of sliding friction, and estimated long-term settlements.

- Recommendations for drilled piers, including minimum dimensions, allowable vertical and lateral capacities, and estimated long-term settlements.
- Applicability of other recommendations in the referenced geotechnical report, as needed.

FEE

We propose to provide the above-described geotechnical recommendation letter for a lump sum fee of $5,500.

ENGEO's liability for damage due to professional negligence, acts, errors, omissions, breach of contract and consequential damages shall be limited to ten thousand dollars or ENGEO's fees whichever is greater.

SCHEDULE

We will commence our services upon formal authorization to proceed. We anticipate completing the letter within 2 weeks after receiving formal notice to proceed.

PROFESSIONAL SERVICES AGREEMENT

If you are in agreement with the scope of services and fees outlined above, please sign the attached Professional Services Agreement and return to us authorization to proceed. *Our services will commence upon formal authorization*.

We look forward to working with you. If you have any questions regarding this proposal, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

Jonas F. Bauer
Project Engineer

Leroy Chan
Principal

jb/lc/mmg/cjn

Attachment: Professional Services Agreement

PROFESSIONAL SERVICES AGREEMENT

2010 Crow Canyon Place, Suite 250
San Ramon, CA 94583-4634
(925) 866-9000 □ FAX (888) 279-2698

Date: February 17, 2021

Project No.: P2021.000.328
Phase: 001
ENGEO Contact: Leroy Lai Wo Chan

Client: County of San Mateo
Client Contact: Sunali Yatagama
Billing Address: Project Development Unit, 400 County Center, Redwood City, CA 94063
Project Name and Location: SMC Correctional Facility Solar System, 1300 Maple Street, Redwood City, CA 94063
Scope of Services: In accordance with the attached proposal dated February 17, 2021.
Estimated Fees: $5,500; in accordance with the attached proposal dated February 17, 2021.

TERMS AND CONDITIONS

1. This agreement shall be binding upon the heirs, executors, administrators, successors and assigns of Client and ENGEO.
2. This agreement shall not be assigned by either Client or ENGEO without the prior written consent of the other.
3. This agreement contains the entire agreement between Client and ENGEO relating to the project(s) and the provision of services to the project(s). Any prior agreements, promises, negotiations or representations not expressly set forth in this agreement or its referenced documents are of no force or effect. Subsequent modifications to this agreement shall be in writing and signed by both Client and ENGEO.
4. ENGEO's waiver of any term, condition, or covenant, or breach of any term, condition, or covenant, shall not constitute the waiver of any other term, condition, or covenant, or the breach of any other term, condition, or covenant.
5. If any term, condition, or covenant of this agreement is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remaining provisions of this agreement shall be valid and binding on Client and ENGEO.
6. This agreement shall be governed by and construed in accordance with the laws of the State of California.
7. ENGEO shall only act as an advisor in all governmental relations. ENGEO shall not be construed as an agent of Client.
8. ENGEO shall sign certifications only if ENGEO approves the form of such certifications prior to the commencement of services, and provided such certifications are limited to statements of professional opinion and do not constitute a warranty or guarantee, express or implied.
9. All reports, documents, drawings and other instruments of ENGEO's service, and copies thereof, created by ENGEO pursuant to this agreement, shall remain the property of ENGEO. Client agrees that the instruments of service provided to Client by ENGEO shall not be subject to unauthorized reuse, that is, reuse without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the documents' applicability given new circumstances, not the least of which is passage of time. Accordingly, Client agrees to waive any claim against ENGEO, and defend, indemnify and hold ENGEO harmless from any claim or liability for injury or loss allegedly arising from unauthorized reuse of ENGEO's instruments of service. Client further agrees to compensate ENGEO for any time spent or expenses incurred by ENGEO in defense of any such claim, in accordance with ENGEO's prevailing fee schedule and expense reimbursement policy.
10. Samples will be discarded immediately after testing. Those not tested will be discarded 30 days after sampling. Samples shall remain the property of Client, and Client shall be responsible for removal and lawful disposal of hazardous materials and containers.
11. Client shall not permit or authorize changes in the reports and documents prepared by ENGEO pursuant to this agreement. Client acknowledges that any changes and their effects are not the responsibility of ENGEO and Client agrees to release ENGEO from all liability arising from the use of such changes and further agrees to defend, indemnify and hold harmless ENGEO, its officers, directors, principals, agents and employees from and against all claims, demands, damages or costs arising from the changes and their effects.
12. Client acknowledges that its right to utilize the services and instruments of service provided pursuant to this agreement will continue only so long as Client is not in default pursuant to the terms and conditions of this agreement and Client has performed all obligations under this agreement. Client further acknowledges that ENGEO has the unrestricted right to use the services provided pursuant to this agreement as well as all instruments of service provided pursuant to this agreement.
13. Client is to furnish ENGEO free access to the project site in order to make the necessary borings, reconnaissance, or other explorations, whether invasive or noninvasive. ENGEO will exercise reasonable care; but some damage is unavoidable. Cost of repair is not included in the fee and is Client's responsibility.
14. Client shall furnish ENGEO the locations of all underground utilities or buried structures. ENGEO shall not be liable for damage to any utilities or structures which were not accurately defined and/or located by the Client.
15. ENGEO and Client agree that there are risks of earth movement and property damage inherent in field exploration, land development and repair; that ENGEO has not been authorized to perform the exhaustive and economically infeasible investigation necessary to eliminate such risks; and that ENGEO thus does not guarantee or warrant the results of its work.
16. Upon written request, Client shall execute and deliver, or cause to be executed and delivered, such additional instruments, documents, governmental fees and charges which are necessary for ENGEO to perform its obligations under this agreement.
17. Client agrees not to use or permit any other person to use reports or other instruments of service prepared by ENGEO, which reports or other instruments of service are not final and which are not signed, stamped or sealed by ENGEO. Client agrees to be liable and responsible for any such use of nonfinal reports, or other instruments of service not signed, stamped or sealed by ENGEO and waives liability against ENGEO for their use. Client further agrees that final reports or other instruments of service are for the exclusive use of Client and may be used by Client only for the project described on the face hereof.
18. ENGEO has a right to complete all services agreed to be rendered pursuant to this agreement. Either Client or ENGEO may terminate this agreement at any time before completion of all services by giving seven (7) days written notice thereof to the other. If terminated by Client, Client agrees to release ENGEO and hold ENGEO harmless from all liability for work performed.
19. ENGEO shall be entitled to immediately, and without notice, suspend the performance of any and all of its obligations pursuant to this agreement if Client files a voluntary petition seeking relief under the United States Bankruptcy Code or if there is an involuntary bankruptcy petition filed against Client, and that petition is not dismissed within fifteen (15) days of its filing. Any suspension of services made pursuant to this paragraph shall continue until such time as this agreement has been fully and properly assumed in accordance with the applicable provisions of the United States Bankruptcy Code and in compliance with the final order or judgment issued by the Bankruptcy Court.
20. This agreement shall not be construed to alter, affect or waive any lien or stop notice right which ENGEO may have for the performance of services pursuant to this agreement. Client agrees to separately provide to ENGEO the present name and address of the record owner of the property on which the project is to be located. Client also agrees to separately provide ENGEO with the name and address of any and all lenders who would loan money on the project and who are entitled to receive a preliminary notice.
21. If payment for ENGEO's services is to be made on behalf of Client by a third-party lender, Client agrees that ENGEO shall not be required to indemnify the third-party lender, in the form of an endorsement or otherwise, as a condition of receiving payment for services.
22. Charges not paid within thirty (30) days of invoice will accrue a late charge at a rate of 1.5 percent per month. If Client fails to pay ENGEO within thirty (30) days after invoices are rendered, Client agrees that ENGEO has the right to consider such nonpayment a material breach of this entire agreement, and, upon written notice, the duties, obligations, and responsibilities of ENGEO under this agreement are terminated. In such event, Client shall promptly pay ENGEO for all fees, charges, and services provided by ENGEO including collection costs and related attorneys' fees. Client agrees that all billings from ENGEO to Client are correct, conclusive, and binding on Client unless Client, within ten (10) days from the date of receipt of such billing, notifies ENGEO in writing of alleged inaccuracies, discrepancies, or errors in the billing.
23. If ENGEO, pursuant to this agreement, produces reports, or other documents and/or performs field work, and such reports, and other documents and/or field work are required by one or more governmental agency, and one or more such governmental agency changes its ordinances, policies, procedures or requirements after the date of this agreement, any additional office or field work thereby required shall be paid for by Client as extra work.

24. Client agrees that if Client requests services not specified pursuant to the scope of services description within this agreement, Client agrees to pay for all such additional services as extra work.
25. In the event all or any portion of the work prepared or partially prepared by ENGEO is suspended, abandoned, or terminated, Client shall pay ENGEO for all fees, charges, and services provided for the project, not to exceed any limit specified herein. Client acknowledges if the project work is suspended and restarts, there will be additional fees due to suspension of the work which shall be paid by Client as extra work.
26. ENGEO is not responsible for delay caused by factors beyond ENGEO's reasonable control, including but not limited to, delays by reason of strikes, lockouts, work slowdowns or stoppages, accidents, acts of God, failure of Client to furnish timely information or approve or disapprove ENGEO's work promptly, faulty performance by Client or other contractors or governmental agencies. When such delays occur, Client agrees that ENGEO is not responsible for damages nor shall ENGEO be deemed to be in default of this agreement.
27. ENGEO shall not be liable for damages resulting from the actions or inactions of governmental agencies including, but not limited to, permit processing, environmental reports, dedications, general plans and amendments thereto, zoning matters, annexations or consolidations, use or conditional use permits, project or plan approvals, or building permits.
28. Client agrees that in the event Client institutes litigation to enforce or interpret the provisions of this agreement, such litigation shall be brought and adjudicated in the appropriate court in the county in which ENGEO's principal place of business is located, and Client waives the right to bring, try or remove such litigation to any other county or judicial district.
29. Client acknowledges that ENGEO is not responsible for the performance or work by third parties including, but not limited to, the construction contractor and its subcontractors.
30. Client acknowledges that the work performed pursuant to this agreement is based upon field and other conditions discovered at the time of preparation of ENGEO's work. Client further acknowledges that field and other conditions may change by the time project construction occurs and clarification, adjustments, modifications or other changes may be necessary to reflect changed field or other conditions. If the scope of services pursuant to this agreement does not include on-site construction observation, or if subsequent to this agreement Client retains other persons or entities to provide such services, Client acknowledges that such services will be performed by others and Client will defend, indemnify and hold ENGEO harmless from any and all claims arising from or resulting from the performance of such services by other persons or entities except claims caused by the sole negligence or willful misconduct of ENGEO; and from any and all claims arising from or resulting from clarifications, adjustments, modifications or other changes necessary to reflect changed field or other conditions, except claims caused by the sole negligence or willful misconduct of ENGEO.
31. In the event Client discovers or becomes aware of field or other conditions which necessitate clarifications, adjustments, modifications or other changes during the construction phase of the project, Client agrees to notify ENGEO and engage ENGEO to prepare the necessary clarifications, adjustments, modifications or other changes to ENGEO's work before construction activities commence or further activity proceeds. Further, Client agrees to have a provision in its construction contracts for the project which requires the contractor to notify Client of any changed field or other conditions so that Client may in turn notify ENGEO pursuant to the provisions of this paragraph.
32. Client agrees that the sole recourse for damages to Client arising from the services provided to Client by ENGEO under this agreement shall be against ENGEO and Client waives any claim against any employees, directors, officers, agents, or affiliates of ENGEO.
33. The fee(s) quoted in this contract is valid for 60 days from the contract date and unless stated otherwise, is approximate only.
34. ENGEO'S LIABILITY FOR DAMAGE DUE TO PROFESSIONAL NEGLIGENCE, ACTS, ERRORS, OMISSIONS, BREACH OF CONTRACT AND CONSEQUENTIAL DAMAGES WILL BE LIMITED BY CLIENT TO AN AMOUNT NOT TO EXCEED AN AGGREGATE LIMIT OF TWENTY-FIVE THOUSAND DOLLARS ($25,000) OR ENGEO'S FEE, WHICHEVER IS GREATER, REGARDLESS OF THE LEGAL THEORY UNDER WHICH SUCH LIABILITY IS IMPOSED. In the event that Client does not wish to limit ENGEO's liability in accordance with the provisions stated herein, ENGEO agrees to waive this limitation upon written notice from the Client received within five (5) days after the date this agreement is fully executed, and Client agrees to pay Two Hundred Fifty Thousand Dollars, ($250,000.00) or an additional sum equivalent to ten percent (10%) of the total fee, whichever is greater, said consideration to be called "Waiver of Limitation of Professional Liability Charge." This charge will in no way be construed as being a charge for insurance of any type, but will be increased consideration for the greater risk involved in performing work for which there is no limitation of liability. ENGEO and Client each agree that in no event will either hold the other liable for incidental or consequential damages in connection with any claim arising from or related to this agreement or ENGEO's services. Client further agrees to notify any contractor and subcontractor who may perform work in connection with any design, report or study prepared by ENGEO of such limitation of professional liability for design defects, errors, omissions, professional negligence, breach of contract and consequential damages, and to require as a condition precedent to their performing their work, a like limitation of liability on their part as against ENGEO.
35. Client agrees that in accordance with generally accepted construction practices, construction contractor will be required to assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property; that this requirement shall be made to apply continuously and not be limited to normal working hours, and Client further agrees to defend, indemnify and hold ENGEO harmless from any and all liability, real or alleged, in connection with the performance of work on this project, excepting liability arising from the sole negligence of ENGEO.
36. Client acknowledges that ENGEO's scope of services for this project does not include removal or abatement of environmental contaminants. Should ENGEO or any other party encounter such materials on the job site, or should it in any other way become known that such materials are present or may be present on the job site or any nearby areas which may affect ENGEO's work, ENGEO may, at its option, terminate work on the project until such time as Client retains ENGEO to mitigate, abate and/or remove environmental contaminants. Client agrees that the discovery of unanticipated environmental contaminants may make it necessary for ENGEO to take immediate measures to protect health and safety. Client agrees to compensate ENGEO for all costs incident to the discovery of environmental contaminants.
37. Client recognizes that ENGEO's failure to detect the presence of environmental contaminants at a site, even though environmental contaminants may be assumed or expected to exist through the use of appropriate sampling techniques, does not guarantee that environmental contaminants do not exist at the site. Similarly, Client recognizes that ENGEO's subsurface explorations may not encounter environmental contaminants at a site, which may later be discovered. Client agrees to waive any claim against ENGEO and agrees to defend, indemnify and hold ENGEO harmless from claims or liability for injury or loss arising from ENGEO's failure to detect the presence of environmental contaminants through techniques commonly employed for the purpose.
38. Client agrees to save, indemnify, and hold harmless ENGEO against any and all liability, claims, judgments, or demands, arising from injuries or death of persons (Client's employees, subcontractors, and consultants included), damage to property, diminution in property value arising directly or indirectly out of the obligations herein undertaken or out of the services rendered by ENGEO, save and except claims or litigation arising through the sole negligence or sole willful misconduct of ENGEO, and will make good to and reimburse ENGEO for any expenditures, including reasonable attorneys fees, ENGEO may incur in such matters, and, if requested by ENGEO, will defend any such suits at the sole cost and expense of the Client.
39. Subject to any shorter period provided under applicable statutes of limitations, Client agrees that it will not assert any claim or action arising from or in any way related to ENGEO's services under this agreement later than three years following the Completion Date. This provision applies regardless of whether such claim or action alleges breach of contract, tort, indemnity, or any other legal theory, and regardless of whether it alleges any patent or latent deficiency in ENGEO's services. The Completion Date relating to the services performed under this agreement is the date of the last published technical document required under this agreement.

ENGEO INCORPORATED	**CLIENT: County of San Mateo**
By: ____________ Date: ________	By: ____________ Date: ________
Print Name: ____________	Print Name: ____________
Title: ____________	Title: ____________
Engineer's License No.: ____________	